Autism and Child Psychopathology Series
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Johnny L. Matson *Editor*

Handbook of Treatments for Autism Spectrum Disorder

Springer

Autism and Child Psychopathology Series

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1 Historical Development of Treatment

Lauren B. Fishbein, Maura L. Rouse,
Noha F. Minshawi, and Jill C. Fodstad

Introduction

In 1943, Leo Kanner published his seminal paper "Autistic Disturbances of Affective Contact." He identified a condition which he called early infantile autism or what is referred to today as autism spectrum disorder (ASD). Kanner described 11 cases in which children displayed a set of symptoms including profound social withdrawal, obsessive desire for sameness, and absence of language or language that did not serve a social purpose (Kanner, 1943, 1949). Since Kanner's identification of autism, there has been a great deal of focus on better understanding the etiology and treatment of autism. When autism was first identified, it was thought to be a form of childhood schizophrenia. Some researchers considered autism to be caused by psychological and environmental factors, whereas others argued that autism was caused by biological factors. Clinical research and treatment approaches over time have evolved from those rooted firmly in a psychodynamic theoretical orientation to those based on a behavioral theoretical orientation.

According to psychodynamic theory, autism was caused by psychogenic factors, particularly emotionally cold parenting (e.g., refrigerator mothers). Based on this conceptualization, psychodynamic treatments focused on using play therapy to improve the mother-child bond and help children resolve past conflicts and traumatic events. This initial understanding and attitude toward the treatment of autism was characterized by little hope for clinically significant change (Lovaas, 1979; Rimland, 1964); as understanding of the disorder changed to include biological bases, researchers and clinicians began focusing their attention on identifying more effective, alternative treatment approaches.

Behavioral treatments or more specifically applied behavior analysis (ABA) emphasized a systematic evaluation of specific behaviors and changing these behaviors through using reinforcement and punishment. Behavioral studies conducted by researchers such as Ferster (1961) and Lovaas (1970, 1987) represented a sharp departure from traditional psychotherapy approaches and demonstrated clinically significant changes in the behaviors of individuals with autism through increasing prosocial behaviors (e.g., communication, socialization), decreasing problem behaviors (e.g., aggression and self-injury), and including parents in the delivery of behavioral treatments to promote maintenance and generalization of treatment gains.

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Over the past several decades, there has been a theoretical shift toward more behavioral orientations that have changed the overall attitudes toward the treatment of autism from one of little hope to one which is more optimistic. This chapter provides a review of the historical developments that influenced the way autism has been conceptualized and treated since Kanner first identified early infantile autism. Additionally, the implementation of early psychodynamic and behavioral treatments to improve the symptoms of autism is discussed and evaluated. Furthermore, we highlight the important events and research studies that have influenced the identification of effective autism treatments and the growth of applied behavior analysis as the gold standard treatment for autism.

Early Conceptualizations of Autism

Initially, autism was considered to be a form of childhood schizophrenia and was conceptualized within a psychodynamic framework. According to psychodynamic theory, autism was caused by psychogenic factors, such as psychological and environmental variables (Abbate, Dunaeff, & Fenichel, 1955; Schopler, 1965). Within this framework, autism was considered a reaction to an overwhelming inner or outer assault at a vulnerable developmental stage between 6 and 18 months of age when the child is differentiating himself from his mother (Garcia & Sarvis, 1964). Many authors argued that autism developed as a result of being raised by "refrigerator mothers" who were described as emotionally cold. Children with autism were thought to have emotionally deficient parents, especially mothers, and that children withdrew to escape their parents' cold nature that led to the child developing a paranoid attitude (Abbate et al., 1955; Bettelheim, 1959; Clancy & McBribe, 1969; Garcia & Sarvis, 1964; Kanner, 1949; Speers & Lansing, 1963). In a paper emphasizing the individualized application of psychodynamic approaches of the assessment, conceptualization, and treatment of four children with infantile autism, Garcia and Sarvis (1964) asserted that if the mother counter-rejected the child, this led to a less reversible form of autism which they called "chronic autistic disease." Once a child developed chronic autistic disease, it was thought that the child's paranoid attitudes were consolidated and more resistant to change through psychotherapy.

The belief that refrigerator mothers were responsible for their child's autism was further influenced by the work of Bruno Bettelheim. In 1967, Bettelheim published "The Empty Fortress: Infantile Autism and the Birth of the Self" asserting that autism was the result of emotionally cold parenting and that autism was not caused by biological abnormalities (Bettelheim, 1967). He illustrated this argument by comparing the home environments of autistic children to concentration camps and likening mothers to Nazi prison guards. Bettelheim expanded on Kanner's theory of a psychogenic cause of autism by recommending that children be removed from their parent's care, which he referred to as parent-ectomies.

In the 1960s, clinicians began to disagree about how to best conceptualize autism. In contrast to Bettelheim's emphasis on the role of emotionally cold parents, lack of parental warmth, and nurturing in early childhood in the development of autism, Rimland (1964) conceptualized autism as a biologically based, neurological disorder. Rimland was a critic of purely psychogenic explanations of autism and noted that there was a lack of compelling evidence to support the refrigerator mother theory. In his work, "Infantile Autism: The Syndrome and Its Implications for Neural Theory of Behavior," he refuted the theory that autism could be explained by psychogenic factors alone. He explained that purely psychogenic causal theories, such as the refrigerator mother theory, had significant impact on those affected by autism, especially family members who experienced shame, guilt, and martial conflict as a result of being considered the cause of the child's symptoms. He suggested the need for experimental and biological psychologists to investigate alternative, biologically based causal explanations of autism, citing evidence from studies of the reticular formation in the brain to help explain the etiology of autism.

The divide between Bettelheim and Rimland's conceptualizations further widened as Rimland began advocating for parents by providing support and education. He developed organizations and a research institute dedicated to determining the causes of autism and developing appropriate treatments. In 1969, Kanner delivered an important speech at the National Society for Autistic Children where he drastically shifted his conceptualization from a purely psychogenic conceptualization and agreed with Rimland that autism was caused by biological factors (Feinstein, 2011).

Autism Versus Childhood Schizophrenia

When autism was first identified, the condition was considered a form of childhood schizophrenia (Abbate et al., 1955). In 1965, Schopler (1965) expanded on Rimland's (1964) conceptualization that infantile autism was a congenital disorder by further indicating that it should be considered separate from childhood schizophrenia. The work of Sir Michael Rutter (1972) further differentiated childhood schizophrenia from infantile autism. Rutter concluded that the use of the term childhood schizophrenia was no longer useful for conveying scientific meaning as the term had been applied to any array of nonspecific childhood problems. In his paper, he reconceptualized autism as a disorder that presented early in infancy with three main features including deficits in social development, deviant and delayed language development, and ritualistic behaviors.

Rutter (1972) indicated that there were several key differences between childhood schizophrenia and autism with respect to differences in symptomatology, onset, and course of the disorders. In regard to differences in the symptoms of both disorders, Rutter noted that a key characteristic of autism was the failure of the child with autism to develop social relationships, whereas children with schizophrenia exhibited a loss of a sense of reality after a period of typical social development. The two conditions could be further differentiated based on how fantasy manifests in both conditions, where children with autism exhibit deficits in fantasy and children with schizophrenia exhibit excesses in fantasy. Children with schizophrenia frequently exhibited psychotic symptoms such as delusional thought content, especially thoughts of persecution, as well as auditory and/or visual hallucinations. Children with infantile autism rarely exhibited these symptoms of psychosis. Additionally, autism could be described as a failure of development, while schizophrenia was better described as a loss of the sense of reality after development was well established. Delusions and hallucinations were key symptoms of childhood schizophrenia but they were not characteristic of autism. There were also differences in intellectual functioning in both populations with mental retardation (MR, now termed intellectual disability [ID]) being more common in autism. Rutter highlighted differences in the sex distribution of both disorders, where autism was three to four times more likely in males than females and rates of schizophrenia in adults were similar for males and females. In summary, Rutter suggested that autism developed on the basis of a disorder of cognitive impairment that involved impairment in language comprehension and deficits in utilizing language and conceptual thinking.

Rutter's (1972) reconceptualization of autism as distinct from schizophrenia was reflected by several changes in the field. In 1978, the *Journal of Autism and Childhood Schizophrenia* changed its name to the *Journal of Autism and Developmental Disorders* (Feinstein, 2011). In addition, when the *Diagnostic and Statistical Manual of Mental Disorders, Third Edition* (DSM-III: American Psychiatric Association, 1980), was published, infantile autism was recategorized from falling under the heading of "childhood schizophrenia" to the heading "pervasive developmental disorders." These two changes were important in reclassifying autism and showing a shift in the understanding of autism as a developmental disorder as opposed to a psychiatric disorder (DeMyer, Hingtgen, & Jackson, 1981).

Early Psychodynamic Treatments for Autism

Given that initial conceptualizations of autism were based on psychogenic factors and the refrigerator mother theory, early treatment approaches were rooted in psychodynamic theory. Psychodynamic theory was based on Freud's theory of abnormal behavior which emphasized the underlying factors that influence human behavior and that resolution of pathology came from therapists helping the patient to resolve underlying sources of psychological conflict (e.g., Abbate et al., 1955; Garcia & Sarvis, 1964). In general, psychodynamic therapy included play therapy approaches that were thought to help reveal past conflicts or traumas and allow the therapist to provide a supportive environment to encourage the individual to reveal more of these conflicts and develop a bond with the therapist. For example, Garcia and Sarvis (1964) presented a psychodynamic-based approach to the evaluation and treatment of four children with infantile autism. The authors described the flexible application of a variety of treatment components including any of the following methods: redirection, limit setting, play therapy, parent counseling, restarting development at the age of onset, enrollment in preschool, and/or school collaboration.

Some authors have suggested that the family should be the unit of treatment rather than the individual child in order to help the child develop a family bond and provide the child with a framework for normal socialization through the acquisition of social and language skills. In a study of 53 children with autism conducted over a 10-year period by Clancy and McBride (1969), children and mothers were hospitalized together to promote the maternal-child bond. The first goal of the therapist was to intrude upon the child. Once the child responded consistently to the therapist, treatment delivery was transferred from the therapist to the mother. The authors used mealtimes, followed by playtime, as a way to enhance the quality of the mother-child interaction. The next step focused on increasing eye contact by requiring children to make eye contact in order to get their demands met. The authors reported that maternal-child bonds were created within the first month of treatment, but regressions were seen once the child returned to the natural family environment. Of the 53 children treated in the study, the authors reported that 12 were considered to be treated effectively, as measured through improvements in the maternal-child bond, use of language, and improvements in feeding abnormalities.

Other studies delivered treatment through an intensive, nonresidential school program for children with schizophrenia, including infantile autism. Abbate et al. (1955) presented a model of a nonresidential day program called The League School for children with schizophrenia including children with infantile autism. The goals of the day school program were to enhance ego development and functioning. The authors presented a collaborative model of treatment that included involvement of social workers, educators, and a psychiatrist to determine whether a particular child may benefit from the school program. The program enrolled 12 children in total, 7 of which were diagnosed with autism. The school philosophy viewed teachers as the important contact for the child and treatment focused on child-directed play to facilitate the development of relationships. Teachers were also required to deliver treatment based on their intuition about the child's internal psychic events and impose limits to help increase the child's ego differentiation and object relationship development. There was one teacher for every two children to allow for individual work and attention on the child. The goal was to find ways to establish contact with the child which was often started through physical contact combined with rhythmic movements such as cuddling, rocking, or swinging the child. Once the teacher established contact with the child, treatment was centered on child-led play while therapists commented on and described the child's actions. To evaluate treatment outcomes, detailed anecdotal records on child progress, problems, needs, and treatment planning meetings were kept by teachers on a daily basis (Abbate et al., 1955).

In a longitudinal study of children with infantile autism and childhood schizophrenia by Eaton and Menoloascino (1967), children were assigned to either intensive treatment, moderate treatment, or no treatment conditions. Intensive treatment included initial hospitalization followed by day treatment or outpatient treatment. The children in the treatment condition received play therapy for a minimum of 3 days a week. They also received milieu therapy, special education, speech therapy, and medication management. Parents were required to participate in couple therapy for a minimum of once per week in addition to each parent receiving individual therapy. Children in the moderate treatment condition received play therapy once per week on an outpatient basis. Their parents were seen for parent counseling and medication management less than once a week. Families assigned to the no treatment condition received the same baseline and follow-up evaluations as the patients in the other two conditions. At follow-up, the children with infantile autism showed minimal to no improvement with respect to language development, intellectual functioning, or adaptive behaviors, such as toilet training.

Psychodynamic treatment components often included play therapy activities to promote social contact, music activities to facilitate responding, as well as water play to help the child increase pleasure and decrease social withdrawal. This was thought to renew the privilege of infancy and provide the child with a sense of mastery and control. Art therapy, music therapy, and dramatic play were additional components thought to promote an emotional release and expression of feeling and needs (Abbate et al., 1955; Garcia & Sarvis, 1964; Speers & Lansing, 1963).

Many psychodynamic treatments also involved parental participation in a variety of ways. In one study, mothers and children were hospitalized together (Clancy & McBride, 1969). Other studies have required parents to participate in group and/or individual therapy with the goal of helping them to become more aware of their own narcissistic and dependency needs (Abbate et al., 1955; Eaton & Menoloascino, 1967; Speers and Lansing, 1963), and one study required parents to receive couple therapy in addition to individual therapy (Eaton & Menoloascino, 1967). Several studies also emphasized the importance of parent training and/or parent collaboration in their child's treatment (Abbate et al., 1955; Clancy & McBride, 1969).

Over the years, researchers have demonstrated that autism is not caused by past trauma and psychodynamic interventions showed little promise for change (e.g., Cantwell & Baker, 1984; Lovaas, 1979). As Lovaas, Freitag, Gold, and Kassorla (1965) pointed out, psychoanalytic play therapy provides the most attention and therapeutic support to children when they display more severe problems, which potentially reinforced the problem behaviors and become countertherapeutic. Furthermore, Lovaas (1979) published a paper comparing and contrasting psychodynamic and behavioral treatments for autism. In his critique of psychodynamic treatments, Lovaas described psychodynamic treatments as based on an illness model, characterized by poorly defined approaches that included variations of play therapy and inclusion of parents and/or teachers in treatment. The description of these approaches was vague, did not use scientifically rigorous methods to demonstrate change, and prohibited replication across studies. Given that psychodynamic treatments failed to demonstrate treatment efficacy through both the absence of objective data and anecdotal reports of minimal change in patients, the field began to shift toward identifying more effective treatments. Through more rigorous scientific methods, treatments based on operant conditioning showed promise with respect to providing a more optimistic direction in developing and disseminating treatments that fostered clinically significant changes and improvement in the quality of life of individuals with autism.

The Development of Behavior Therapy

The field of psychology began to experience a shift in the focus of the conceptualization, study, and treatment of autism in the beginning to middle of the 1960s. Whereas the early autism pioneers such as Kanner (1943) and Bettelheim (1967) considered the diagnosis of autism as a core deficit caused by a lack of attachment with a maternal figure, researchers and clinicians in the latter half of the century began to study autism in terms of individual behaviors that were exhibited. Early behavioral studies were based on operant conditioning principles characterized by learning that took place by the effects of reinforcement and punishment (e.g., Ferster & DeMyer, 1961; Roos & Oliver, 1969; Hundziak, Maurer, & Watson, 1965). Operant conditioning, first used to change animal behavior, was later discovered to be useful to shape children's behavior. Behavior modification, characterized by the systematic evaluation of behavior, was an approach researchers began to turn to as a way to understand changes in behavior (Keehn & Webster, 1969). This systematic examination of behavior began with case studies of objective, specific, and measurable data in an effort to gather information that properly and accurately defined the experiences of individuals diagnosed with autism.

The literature has an abundance of case studies examining specific behaviors of children with autism, often measuring increases or decreases in behaviors of interest. Several early behavioral studies contributed to the overall growth of behavioral interventions for autism. These studies were important because they not only focused on the objective measurement of change in observable behaviors but also because they represented a sharp departure from traditional psychotherapy approaches.

The studies conducted by Ferster (e.g., Ferster, 1961, Ferster & DeMyer, 1961) were the first laboratory studies using experimental analysis of behavior to treat behaviors associated with autism. They were instrumental in setting the groundwork for behavioral treatment studies to address symptoms of autism. The results from these studies demonstrated that behaviors could be shaped and maintained by reinforcing consequences in a laboratory setting. These seminal studies using the experimental analysis of behavior in children with autism provided a basis for using objective techniques to control a child's current behavioral repertoire and develop new, more appropriate behaviors. Ferster and DeMyer (1961) conducted a study with three children with autism in an inpatient hospital. The experimental design included many devices that were operated by a coin or key and provided a reinforcing consequence to the child (i.e., a generalized reinforcer). The generalized reinforcer (i.e., coin) could be exchanged for small trinkets, packages of food, a music handset, an electric organ, and a picture viewer. Alone in the observation room, children pressed keys to receive their chosen reinforcer. Reinforcers were then delivered contingently to shape children's behaviors (e.g., point to a target picture, match simple figures). The results demonstrated that it was possible to bring the behavior of these individuals under environmental control through techniques of operant reinforcement.

The shift from psychodynamic treatments toward behavioral treatments became more evident through a case study by Jensen and Womack (1967). The authors employed traditional psychodynamic treatment during the first year but shifted to the use of operant conditioning procedures after minimal improvements were seen through psychodynamic therapy. The psychodynamic components of treatment included milieu therapy, play therapy several times per week, and psychotherapy for the child's mother. There were improvements seen including improved relationships with certain individuals, increased frequency of eye contact, increases in following directions, and more appropriate object use. Despite these improvements, therapists and staff remained discouraged from these relatively insignificant results from this intensive, year-long treatment. Therefore, an operant conditioning program was used as an adjunct to traditional psychodynamic therapy in order to maximize the child's progress.

Jensen and Womack's (1967) operant conditioning program included identifying potential positive reinforcers, identifying target behaviors to increase (e.g., social contact with peers, use of language, cooperative play), and identifying undesirable behaviors to decrease (e.g., tantrums, aggression, stereotyped behaviors).

This behavioral treatment program lasted 10 weeks and included reinforcing peer interactions and verbal behavior and extinguishing temper tantrums, aggression, and stereotyped behaviors. Several areas of improvement were noted including social smiling (previously absent at baseline), forming novel phrases and sentences (e.g., from only single words at baseline to flexible use of greetings at the end of treatment), decreased ritualistic behavior, decreased aggressive behavior, and decreased temper tantrums. In addition to demonstrating significant changes in these target behaviors, the authors observed a change in therapist and staff attitudes whereby staff became more encouraged and enthusiastic about the changes observed following the 10-week behavioral intervention. Although no formal assessment of staff attitudes before, during, or after treatment was reported, researchers indicated that virtually all staff held a more positive view of the child after the treatment concluded, in part due to decreased problem behaviors. This study demonstrated that operant conditioning approaches could produce larger behavioral changes over the course of a substantially shorter time period (i.e., 10 weeks) as compared to those seen through psychodynamic approaches over a longer period of time (i.e., 1 year).

Inpatient psychiatric and residential settings were the first clinical settings in which behavioral modification treatments took place. Residential treatment programs supplied a long-term treatment option for children who required intensive, but less acute, support than would be needed for placement in an inpatient psychiatric unit (see Leichtman, 2008 for a review of the history of residential treatment). Residential treatment offered children a therapeutic environment with regular access to counselors. These programs also offered families case management services to aid in encouraging the reunification of children with their families when the timing was appropriate. Rubin and Simson (1960) reported that residential treatment was relatively successful, as most facilities at that time indicated that 60% of their residents returned to their family home. Implicitly then, even before parents formally participated in children's behavioral treatment, family involvement in therapy was viewed as an important element of children's overall treatment plan (Ward & Hoddinott, 1965).

As behavioral treatments were met with success in inpatient and residential settings, researchers began to apply these methods to shape behavior in outpatient settings. Wetzel, Baker, Roney, and Martin (1966) conducted a case study using behavioral principles in an outpatient clinic to treat a 6-year-old child with autism with a focus on changing specific behaviors. The treatment plan was designed to initially shape this young patient's behavior to increase approach to an object (i.e., bobo doll) by delivering reinforcement of attention when the patient performed the desired behavior (i.e., closeness to the object). As the patient gained success with this behavior, the researchers expanded the treatment plan to include other social behaviors (e.g., response to commands) and verbal behaviors (e.g., label objects, initiate verbal interaction). Success in increasing these more varied social behaviors and verbal behaviors continued as the participant's parents used shaping procedures outside of the outpatient treatment setting.

The success of the intervention by Wetzel and colleagues (1966) had implications for different ways to apply behavioral principles in an outpatient setting and, again, deviated from traditional psychotherapy approaches. Applying behavioral approaches in the outpatient environment was an extension of previous studies conducted in more controlled settings such as the laboratory (Ferster, 1961, Ferster & DeMyer, 1961) and inpatient settings (e.g., Lovaas, 1964, Lovaas, Freitag et al., 1965). With these results, researchers demonstrated that behavior change using operant conditioning could be extended to outpatient treatment settings with inherently less experimental control than would be found in hospital or lab settings. Wetzel et al. (1966) conducted one such study when they moved from a more controlled setting to a less controlled setting. This research began in the lab and extended to the child's natural environment (e.g., home and school). To maintain treatment integrity outside of controlled environments, emphasis was placed on the importance of functional relationships, selecting objective, specific, and observable behaviors as targets for change and reliance on objective data collection to inform treatment progress and outcomes. Wetzel and colleagues reported that after 20 therapy sessions, a child who once engaged in self-injurious behavior, temper tantrums, little interaction with others, and few adaptive skills had made such behavioral improvements once treatment was completed that the child was judged to be fit to be introduced into a special education classroom.

Additional case studies using operant conditioning techniques in the treatment of children with autism began to emerge and add to the literature. Risely (1968) described his work with a 6-year-old female patient with problematic behaviors (i.e., climbing on furniture) leading to significant injury. Through treatment focusing on specific behaviors, climbing behavior decreased, and consequently, alternative behaviors (i.e., maintaining eye contact and sitting in a chair) increased. Additionally, with Risely's (1968) emphasis placed on specific behaviors, rather than "autism" in general, this patient increased her ability to imitate behavior, a skill she (and many children with autism) lacked.

Risely's (1968) work points to behavioral excesses and deficits characteristic of autism. Although individuals with autism frequently have strengths and weaknesses in a variety of areas, this population tends to have deficits in prosocial and adaptive skills (e.g., verbal and nonverbal communication, social skills, pretend play; Rutter, 1978). Alternatively, children with autism tend to have excesses in several areas, notably, maladaptive behaviors (e.g., aggression, self-stimulatory behaviors; Margolies, 1977). With this knowledge, the goal of behavioral therapy became to increase children's prosocial, or desirable, behaviors and decrease their destructive, or maladaptive, behaviors. As the treatment of children with autism continued to expand out of the laboratory and into the environments of children's everyday lives, parents became more involved in the execution of behavioral treatment (e.g., Gelfand & Hartman, 1968).

Increasing Prosocial Behavior

Behavior modification techniques used to increase prosocial behavior and adaptive skills utilized reinforcement methods. Lovaas, Koegel, Simmons, and Long (1973) delineated between primary and secondary reinforcers, writing that while primary reinforcers (e.g., edibles) can be beneficial, all reinforcers need specific environmental conditions (i.e., motivation) for them to be meaningful and that individuals with autism benefit most from secondary reinforcers (e.g., verbal praise, tokens). Other researchers disagreed and stated that individuals with autism are not able to benefit from secondary reinforcers (Ferster & DeMyer, 1961). A general consensus existed such that the reinforcer must be durable and potent in a distraction-free environment for it to create meaningful behavioral change (Ferster & DeMyer; Hewett, 1965; Kanfer & Matarazzo, 1959; Skinner, 1953).

Reinforcement strategies were used to increase desirable behaviors. Several studies were conducted demonstrating the effectiveness of using reinforcement to increase prosocial skills, such as eye contact and compliance (Hartung, 1970; Craighead, O'Leary, & Allen, 1973). Early success was also experienced in shaping functional daily living skills (Lovaas et al., 1973). A major skill area in which individuals with autism have difficulty is social functioning (e.g., conversation skills, play skills). Perhaps due to the complexity of these skills and social interactions in general, effectively teaching these skills to individuals with autism proved to be difficult. In an effort to define and improve these skills necessary to function in the social world, Lovaas, Baer, and Bijou (1965) created a symbolic social stimulus that centered on the use of dolls, puppets, and movies. The dolls (inside plexiglass boxes that could be controlled with levers by participants to display either aggression or affection), puppets (inside plexiglass boxes that can be controlled to look at, "talk" to, and offer objects to the participant), and movies (shown continuously with sound; both the sound and picture were able to be controlled by the participant) offered examples of social situations in which the individual with autism could engage. The social event (controlled by the researcher) was contingent on the child's response. By creating these social situations, Lovaas et al. taught these very complex social skills. These researchers emphasized that the utility of the social stimuli was to determine if children engaged with the objects and how they did so. They noted that a lack of interaction with the stimuli was also telling data related to the child's social motivation.

Perhaps one of the most significant social behaviors in which individuals engage is verbal communication. Lovaas, Schreibman, and Koegel (1974) wrote of a stepwise language acquisition training program to improve children's communicative functioning. Their program shaped children's language in four steps of verbal imitation: (1) the child's vocalizations were reinforced by the therapist; (2) the child's vocalizations were reinforced contingently (i.e., only in response to the therapist's); (3) the child's vocalizations were reinforced contingently (until he matched a particular letter sound by the therapist); and (4) the child was reinforced contingently based on his ability to imitate different letter sounds. Once imitative speech was established, the therapist then began working with the child to create meaningful speech. Based upon their findings, Lovaas et al. concluded that an effective program for teaching children with autism functional language had to include lessons on discriminating between expressive (i.e., verbal) and comprehensive (i.e., nonverbal) speech, as most communicative situations included both components. The authors proposed shaping functional communication first (e.g., requesting food) for children with autism, then moving on to more abstract concepts (e.g., time) once the child improved language proficiency.

Decreasing Maladaptive Behavior

Margolies (1977) wrote that before improvements in prosocial behavior could be made, self-destructive behavior, such as head banging and scratching, had to be eliminated. To decrease these self-destructive behaviors and other disruptive behaviors including aggression and tantrums, behavioral researchers began to use forms of punishment and aversive conditioning (e.g., Lovaas, 1970; Buss, 1961; Deur & Park, 1970). Self-stimulatory behaviors (e.g., "autistic rocking," Risely, 1968) were also a focus of punishment procedures. Many forms of punishment have been used to decrease behaviors, from electric shock (e.g., Lovaas, Schaeffer, & Simmons, 1965) to time out (e.g., Lovaas, 1970) to verbal and physical punishments (e.g., slapping, immobilizing limbs; Jensen & Womack, 1967; Koegel & Covert, 1972).

Electric shock, now a controversial form of punishment, was accepted as a method to decrease behaviors in the 1960s and 1970s. For example, electric shock was used as a contingent punishment to decrease climbing behavior in a 6-year-old female (Risely, 1968). In this laboratory procedure, electric shock was locally applied (e.g., to a specific area of the leg), when the young girl began climbing on furniture. Overall, electric shock, paired with verbal punishment ("No!"), decreased inappropriate climbing behavior. Lovaas (1970) frequently relied on electric shock treatment to eliminate self-destructive behavior from children's behavioral repertoire, and he found it to be quite effective: "independently of how badly the child is mutilating himself or how long he has been doing so, we can essentially remove the self-destructive behavior within the first minute" (p.38). Lovaas indicated that regardless of the intensity of children's self-destructive behaviors, applying punishment procedures could quickly eliminate the behaviors of concern.

Decreasing self-destructive and disruptive behavior was the goal of the punishment procedures used by researchers such as Lovaas (1970) and Risely (1968). However, in order to affect behavior outside of the laboratory, greater generalization had to be obtained. One way to improve generalization was through the use of overcorrection procedures. Overcorrection, consisting of restitution (correcting the effects of the undesirable behavior) and positive practice (repeatedly practicing the desirable behavior), was first implemented in the treatment of a 50-year-old woman with profound intellectual disability who engaged in significant disruptive and aggressive behavior in an inpatient unit (Foxx & Azrin, 1972). Overcorrection with children with autism was used as a method to decrease disruptive and self-destructive behaviors (e.g., hand mouthing; Foxx & Azrin, 1973). As children engaged in overcorrection, they essentially learned new, more appropriate behaviors to replace their existing, less appropriate behaviors. Foxx and Azrin (1973) concluded that overcorrection is often more effective and enduring than punishment, particularly when shaping self-stimulatory behaviors. As will be discussed below, parent training focused on operant conditioning principles was also used as a method to generalize decreases in disruptive behavior (Wetzel et al., 1966).

Parent Training

As the study of autism treatment continued to shift away from a predominately psychodynamic approach, a major shift occurred in the delivery of treatment when parent involvement in behavioral modification arose (Gelfand & Hartman, 1968). Early in the history of behavior modification, reinforcement and punishment were only clinically applied by clinicians or researchers. However, parents began to be viewed as providers of reinforcement or those who withdrew reinforcement (Gelfand & Hartman; Wetzel, 1966). This development provided a major step forward in the field of behavioral treatment for autism in that treatment could now extend out of the laboratory setting and into the home; generalization into real-life situations could occur. Several considerations emerged when including parents in treatment that significantly impacted the child. As noted by Jensen and Womack (1967), assessing the overall functioning (e.g., coping ability) of the child's parents is necessary before implementing behavioral therapy with parent involvement. Parents' ability to cope with distressing situations has clear implications to the effectiveness and generalizability of the treatment in the home setting.

Along with general functioning, a number of other factors were believed to influence parents' response to children's behavior and their ability to implement behavioral treatment in their homes (Ferster, 1989). Parents' desire to stop the behavior from occurring can be a motivating factor in their responding to their child in a manner that will increase or decrease the likelihood that the behavior will continue. Parent distractedness ("prepotency of other performances"; doing something else while the child is engaging in a behavior) may unintentionally reinforce a behavior (Ferster, p. 6). Additionally, as most behaviors increased in intensity and frequency over time, parents often unknowingly reinforced the child's behavior by gradually changing their own behavioral response to accommodate their child (i.e., the child's behavior shaped the parents' behavior; Ferster, 1961). Because these factors likely influenced implementation of behavioral strategies at home, pointed parent education was a focus of some early studies demonstrating the effectiveness of parent training. For example, the parents of a 3-year-old male with autism attended 21 sessions during which they learned operant conditioning techniques (i.e., reinforcement, punishment), social learning theory, and how to track their child's behavior (Schell & Adams, 1968). Strategies parents learned during parent education sessions proved to be successful, as the child's problematic behaviors continued to remain decreased from baseline at a 4-month follow-up.

Growth of Behavioral Treatments for Autism

Overtime, behavioral interventions have grown, while psychodynamic approaches have failed to demonstrate effectiveness, and less emphasis was placed on an illness model. As the literature on behavioral treatments for autism began to grow, what was previously called behavior modification became known as applied behavior analysis (ABA). ABA is "the science in which tactics derived from the principles of behavior are applied systematically to improve socially significant behavior and experimentation is used to identify the variables responsible for behavior change (Cooper, Heron, & Heward, 2007, p. 20)."

There were a number of reasons that ABA became increasingly popular and more widely accepted. These reasons included the use of single subject methodology in behavioral studies, allowing for greater experimental control and demonstration of change across many areas of functioning. The behavioral approach also focused on changing specific, observable behaviors. The emphasis on the importance of socially valid targets for behavior change while planning for maintenance of change over time and generalization of behavioral responses across settings and people became a hallmark of ABA (Baer, Wolf, & Risely, 1968). There were several seminal research studies that demonstrated clinically significant changes using objective measures of change and experimental control. More emphasis was also placed on identifying the functions of target behaviors and using this data to inform the implementation of function-based interventions. In addition, state and national agencies performed independent evaluations of treatments for autism and classified ABA as an empirically supported treatment for autism and recommended ABA as the preferred treatment for autism.

Baer et al. (1968) outlined a number of dimensions with which to evaluate whether a particular intervention was considered to be ABA. First, ABA should be applied, such that the procedures produce socially significant change in an individual's life (e.g., improving language, socialization, self-help skills, or leisure skills). The second criterion was that ABA should have a behavioral focus, meaning that the intervention should focus on specific behaviors that are both measurable and reliably assessed. The analytic component described the importance of demonstrating functional relationships between manipulated events and measurable change observed in the target behavior (i.e., demonstrating experimental control of the occurrence of behavior). ABA must also be technological, meaning that the techniques used to change behaviors are fully identified, and all salient components must be clearly described and specified so that procedures can be replicated (e.g., rather than using the broad term "social reinforcement," ABA must provide a specific description such as the stimuli used, the contingency, and schedule of reinforcement). Another dimension was that the intervention should be conceptually systematic, meaning that the procedures used for change should specify the relevance to the behavioral principles from which they were derived. ABA interventions must also be considered effective and produce large enough effects for socially valid change. The final dimension of ABA was generalizability such that changes in behavior are maintained over time, across different (nontreatment) settings, and across a variety of related behaviors.

In the 1960s and 1970s, there was a growth in behavioral approaches to treatment. In the 1980s, these behavioral approaches become more specific and refined. Many studies using ABA demonstrated socially significant changes across many areas of functioning including socialization, adaptive behavior, communication, behavior problems, and restricted and repetitive behaviors. This standardized behavior analytic format included teaching skills using discrete trial training (DTT), compliance training, and contingent reinforcement.

The work of Ivar Lovaas prescribed a framework for which to implement a standardized treatment that still allowed for individualization. In his 1987 study, Lovaas demonstrated that the use of behavior modification techniques could produce significant increases in the cognitive functioning of children with autism. When Lovaas (1987) published his 15-year longitudinal study describing the improvements children with autism can attain through intensive treatment, the psychological community gained some hope that it had once lost. In this pivotal study, 19 children (prorated mental age of 11 months or more at chronological age of 30 months; chronological age less than 40 months or 46 months if nonverbal) diagnosed with autism received more than 40 h of intensive one-to-one treatment per week. Two control groups (group 1, 19 children received 10 h or less of one-to-one treatment per week; group 2, 21 children received no treatment) were also included. There were no significant differences between any of the groups at baseline.

Goals of the first year of Lovaas' (1987) treatment program were to decrease aggressive and self-stimulatory behaviors and increase compliance to verbal requests, play behavior, and imitation of others. During the second year of the program, researchers sought to increase children's expressive and abstract language skills and social behavior with peers. The third year focused on improving emotional expression, pre-academic skills, and observational learning. Children were enrolled in a participating preschool classroom at the appropriate age. Children's diagnosis of autism was not to be disclosed to the school so that they were treated as typically as possible. The goal of the treatment program was for children to progress into kindergarten and then into a mainstream first grade classroom, second grade, and so on. Once children were placed in a mainstream grade school classroom, intervention was decreased to 10 h or less per week.

Lovaas (1987) reported that the children enrolled in the treatment program improved in many areas of functioning. Most relevant to this discussion are gains in intellectual functioning. The experimental group made significantly higher gains in IQ points than the control groups; notably, this group gained 30 IQ points over control group one, and these gains remained stable at 1-year follow-up. Both control groups were unchanged from baseline. Lovaas reported that by first grade, the experimental group had nine children with IQ scores in the average to above average range (range, 94–120, eight children with IQ scores in the extremely low range (IQ range, 56–95), and two children with IQ scores below 30. Additionally, he reported that nine children were placed in mainstream first grade classrooms, eight children were placed in special education classes, and two children were placed in classrooms for children with autism or profound intellectual disability.

Another important development in the field of ABA occurred in 1994 when Iwata and colleagues conducted an experimental functional analysis of self-injurious behavior (Iwata, Dorsey, Slifer, Bauman, & Richman, 1994). The methods and results of this study offered researchers and clinicians guidance on conducting functional behavior assessments (FBA) and using the data to inform treatment development specific to a given individual. This study continued to shift researchers' and clinicians' understanding of the treatment of autism and associated behaviors through the treatment of self-injury, often a dangerous and challenging behavior for families and therapists (Iwata et al., 1994). Self-injury can take many forms (e.g., self-biting, head banging, hand mouthing, eye gouging), and Iwata et al. (1994) proposed a treatment program that decreased a variety of these behaviors. Researchers introduced four environmental conditions (i.e., social disapproval, academic demand, unstructured play, and child alone) to nine participants. The child's behavior was observed until a stable level of self-injury was observed, unstable levels of self-injury were observed for 5 days, or 12 days of sessions were completed.

Several within and between participant differences were observed; however, Iwata et al. (1994) suggested five general findings from this study. They reported that (1) children engaged in relatively low frequencies of self-injury during unstructured play, (2) self-injury was highest in the alone condition (external simulation was minimal), (3) some subjects had very high frequencies during the high demand (i.e., academic) condition, (4) one participant engaged in self-injury most often during the social disapproval ("Don't do that, you will get hurt") condition, and (5) two participants demonstrated an undifferentiated pattern of self-injury. In sum, Iwata et al. suggest that self-injury may be a function of reinforcement and motivational variables and provided a technology to be used in research and clinical settings in order to identify the function of problem behaviors.

Applied behavior analysis offered new hope and used clinical research methodology that permitted the demonstration of experimental control and placed an emphasis on the use of single case designs to help identify effective treatment approaches. The growth of ABA was further influenced by state and national efforts aimed at evaluating and identifying empirically supported treatments for autism (e.g., the New York State Department of Health, Early Intervention Program and the National Autism Center). The New York State Department of Health, Early Intervention Program published clinical practice guidelines regarding treatment of young children with autism that concluded ABA demonstrated the most empirical support and recommended ABA as the treatment of choice for young children with autism (1999). The National Autism Center (NAC) conducted the National Standard Project (NSP) to thoroughly review the current empirical support for various autism treatments (National Autism Center, 2009). Based on this thorough review, the NSP concluded that ABA demonstrated the strongest evidence base for the treatment of individuals with autism. The determination that ABA was an empirically supported treatment for autism by these state and national projects further influenced the growth of ABA treatments for autism. The extensive research base and seminal work by researchers such as Ferster, Lovaas, and Iwata over the past several decades have contributed to the growth of ABA interventions. Major shifts in the attitudes about autism treatment were seen as behavior change became more apparent, providing more hope for socially valid change in the lives of individuals with autism.

Conclusions

Since Kanner first identified autism as a psychological diagnosis in 1943, the understanding of the disorder has evolved. As the conceptualization of autism shifted away from a psychoanalytic focus to a behaviorally based approach, so too did treatment. This new emphasis brought optimism to what was once thought to be a rather hopeless prognosis. Parents are now viewed not as cause of their children's problems but as the facilitators of their treatment. The emphasis on objective and data-driven behavioral treatments gave rise to the popularity of ABA treatment programs, which is now supported as the most promising intervention for children with autism (NAC, 2009).

Although ABA is the most effective treatment for behavioral symptoms of autism to date, the future of autism treatment will likely need to include treatment for comorbid mental health conditions, such as anxiety or depressive disorders. ABA treatment programs focus solely on observable behaviors. However, children also experience thoughts and feelings that may not be as amendable to ABA treatment protocols as observable behaviors. Treatment of comorbid diagnoses should be a focus of therapy, as 70% of individuals diagnosed with autism also meet diagnostic criteria for one other psychiatric disorder and 40% meet diagnostic criteria for two or more disorders (American Psychiatric Association, 2013). While a behavioral treatment program, such as ABA, will/should likely play an important in the treatment of autism in the future, the strictly behavioral treatment programs will likely need to be supplemented with additional therapeutic approaches to address cognitive and emotional factors of comorbid conditions. This is of utmost importance, given that the majority of ABA practitioners (i.e., board certified behavior analysts [BCBA, BCBA-D], board certified assistant behavior analysts [BCaBA], registered behavior technicians [RBT], etc.) do not receive expert-level training in the diagnosis, evaluation, and treatment of mental health conditions.

Finally, children with autism benefit from earlier diagnosis. While children can be reliably diagnosed with autism by their second birthday (as early as 18 months), the median age of diagnosis in the United States is over 4 years old (Autism and Developmental Disabilities Monitoring Network [ADDM], 2014; Center for Disease Control and Prevention, 2015). This delay in diagnosis indicates that children with autism may be missing a critical time period when they could be receiving intervention. Similarly, significant differences in identification of children in different ethnic groups are a growing concern. Because non-Hispanic white children are more likely to be identified as meeting criteria for autism (ADDM, 2014), they are more likely to receive early intervention and therefore more likely to experience more favorable outcomes in the future. Early identification and diagnosis of all children with autism will lead to appropriate treatments and brighter futures.

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Substantiated and Unsubstantiated Interventions for Individuals with ASD

2

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Identifying Substantiated Treatments

There are several ways for researchers, practitioners, other professionals, students, and parents to identify whether a treatment is considered evidence-based or substantiated. One avenue to search for substantiated interventions is through websites developed by organizations that apply standards for evaluating the evidence for intervention and disseminate information about substantiated interventions to the public. What Works Clearinghouse (http://ies.ed.gov/ncee/wwc/) is one website that educators, behavior analysts, psychologists, and interested parties can use to search for the status of the evidence of an intervention. Under the "Find What Works!" link on this website, it is possible to search for evidence on treatments under numerous topic/outcome domains. For example, selecting the topic "Children and Youth with Disabilities" provides access to information in multiple domains (e.g., reading fluency, external behavior), for different grade levels, effectiveness ratings, extent of evidence, delivery method (e.g., small group), program type, gender, race, and region. Selecting choices from each area leads to a more detailed description of relevant interventions.

Another website that offers information about evidence-based practices for individuals with autism spectrum disorder (ASD) is the National Professional Development Center on Autism Spectrum Disorder (NCPD) (http://autismpdc.fpg.unc.edu/). Selecting "Evidence-based Practices" on the NCPD website leads to a page that describes how evidence-based practice is defined and a list of these practices. The list of evidence-based practices is updated on a yearly basis. Interested parties can select an intervention to receive a report that (a) summarizes the intervention, (b) provides step-by-step instructions regarding how to implement the intervention, and (c) a list of references that demonstrate the evidence for the intervention.

A second way for the public to receive information regarding substantiated interventions is through the National Autism Center's National Standards Project (National Autism Center, 2009). Launched in 2005, the purpose of the National Standards Project is to identify substantiated interventions for individuals with ASD. This project has occurred in two phases. Phase 1, which was completed in 2009, produced a report on the status of the evidence for interventions from research published between

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1959 and fall of 2007. Phase 2 of the project considered research on interventions for individuals with ASD published between 2007 and 2012. A full report of the results of Phases 1 and 2 is available to download upon free registration through the National Autism Center's website (http://www.nationalautismcenter.org/reports/). The reports also list interventions that are described as emerging or unestablished, based on the evidence reviewed from published research within the time period of the reports. These sections of the reports may be particularly useful to families or educators who are unfamiliar with published literature on interventions and seek to determine whether an intervention has evidence to support its use with individuals with ASD.

Review articles and meta-analyses are another way to evaluate the status of evidence for an intervention. Review articles often summarize the published literature in a topic area. For example, Lerman and Vorndran (2002) reviewed the status of basic and applied literature on punishment and suggested areas of additional research on punishment. Although not every intervention may be the focus of a review paper, many review papers exist for evidence-based practices (e.g., review of functional communication training by Tiger, Hanley, & Bruzek, 2008; review of extinction by Lerman & Iwata, 1996; review functional analysis by Beavers, Iwata, & Lerman,2013). Thus, educators, practitioners, and other professionals can gain useful information about the current status of an intervention by reading a review of an area of literature rather than attempting to find and read individual studies on a topic to judge the current evidence for the intervention. However, review papers do not always include every study on the topic of the review nor do they describe the quality of the studies included in a review. That is, some studies included in a review might not use empirically sound methodology.

Several review papers are dedicated to the identification of evidence-based practices to provide recommendations for practitioners regarding substantiated interventions for individuals with ASD (e.g., Odom, Boyd, Hall, & Hume, 2010; Odom, Collet-Klingenberg, Rogers, & Hatton, 2010; Reichow & Volkmar, 2010; Wong, et al., 2015). Additional reviews are also available for interventions used with individuals with intellectual and developmental disabilities (e.g., Lilienfeld, 2005). As expected, there is overlap in the evidence-based practices identified within reviews regardless of differences in populations. These reviews are particularly beneficial for practitioners because the authors described criteria for evidence-based practice, how they identified articles for inclusion, and summarized the interventions identified as evidence-based practices.

Meta-analyses of literature are similar to reviews, except that the evidence for each study included in the meta-analysis is re-evaluated. Thus, the purpose of the meta-analysis is to evaluate the effectiveness of an intervention by combining data from relevant studies. Data from all studies in a topic area are collected, coded to determine effect size, and statistical analyses are used to interpret the outcomes of studies that are grouped together. The results of the meta-analysis are used to determine if an intervention has sufficient support to characterize the intervention as substantiated, based on the criteria developed by the field in which the intervention is used. For example, Virues-Ortega (2010) conducted a meta-analysis of the literature on comprehensive applied behavior analytic (ABA) intervention for young children with autism. The meta-analysis included 22 studies with 323 participants in intervention groups. The results showed that comprehensive ABA intervention produced positive outcomes in multiple domains (e.g., language, adaptive behavior, and intellectual functioning) for children with ASD.

The results of meta-analyses have been used by insurance companies to determine the evidence for an intervention to make determinations regarding coverage of treatment for members. Meta-analyses have also been considered by state and federal organizations to determine public policies. Thus, meta-analyses of interventions provide an important contribution to the literature, practice guidelines, and public policy.

Importance of Identifying Evidence for Interventions

Due to the plethora of available treatments for individuals with ASD, it can be challenging for parents, educators, and professionals to determine which interventions to use. The demand for quick and easy interventions, in combination with the increased prevalence of ASD, has resulted in the development of many "fad" or unsubstantiated interventions. Unsubstantiated interventions can be found in internet searches; are recommended by well-meaning friends, family, and treatment team members; and may be prevalent in some educational settings.

Unsubstantiated interventions may be popular choices because they report that impressive outcomes can occur quickly. Typically, unsubstantiated interventions rely on testimonials from other people to provide evidence for their effectiveness. For example, quotes from families who have used the intervention are included in the intervention materials as evidence for the effectiveness of intervention. Nevertheless, there may be few or no empirically sound studies demonstrating the effectiveness of the intervention.

It may be the case that a family or treatment team would like to use an unsubstantiated intervention, because they do not identify any concerns with trying the intervention to determine whether it works for the individual with ASD. However, certain unsubstantiated interventions could be harmful. For example, Facilitated Communication is an unsubstantiated intervention that became widely used with individuals with ASD in the early 1990s (Green & Shane, 1994). The intervention claims to unlock the individual's potential to communicate with others by assisting the individual to type messages on a keyboard. The intervention purports to resolve communication difficulties caused by a motor praxis problem and difficulty identifying the correct words to use during communication. Facilitators provided physical assistance to the individual with ASD to type messages; the eventual goal is to reduce and remove the assistance of the facilitator. During the widespread use of this intervention, some typed messages claimed physical or sexual abuse from a family member, and criminal charges were brought against family members based on the claims. Well-designed studies conducted on Facilitated Communication showed that the facilitator was actually producing the message rather than the individual with ASD (e.g., Montee, Miltenberger, & Wittrock, 1995; Wheeler, Jacobson, Paglieri, & Schwartz, 1993). In addition, the Association for Behavior Analysis International (ABAI) issued a position statement on Facilitated Communication stating that there is no direct benefit of this intervention and it is a discredited technique (ABAI, 1995).

Other unsubstantiated interventions have produced physical harm and even death in individuals with ASD. For example, chelation therapy is an intervention used to remove heavy metals from the blood. Some parents who believe that their child was exposed to mercury from vaccinations have used this intervention. In 2005, a boy from Pennsylvania who was diagnosed with autism died in the physician's office shortly after receiving chelation therapy. Furthermore, the National Institute of Mental Health reported that investigators no longer planned to conduct a funded study of chelation therapy for children with autism due to little scientific merit and unacceptable safety risks (Mitka, 2008).

There are other potential costs associated with use of unsubstantiated interventions. For example, if the intervention takes time away from the individual's schedule that could be spent using substantiated interventions, the individual has lost precious treatment time. Many parents seek intervention for their child with ASD upon initial diagnosis to help the child gain skills that will bridge the gap between the child's skills and those of their peers. Thus, time allocated to unsubstantiated interventions can prevent progress from occurring.

Using unsubstantiated interventions also may have a long-term effect on behavior and delay progress once initiated. For example, a child with ASD who has an extremely limited diet and begins a gluten- and casein-free diet may be even more resistant to eating novel foods once a substantiated intervention is initiated. In addition, the expense for unsubstantiated treatments is not typically covered by medical insurance, and the family usually must pay for the intervention out of pocket. Furthermore, families invest time and energy in implementing unsubstantiated interventions, and the disappointing outcomes may discourage parents from seeking other substantiated interventions for their child with ASD. Therefore, reducing the use of unsubstantiated treatment by disseminating information about evidence-based practices to families, practitioners, educators, and other professionals is an important endeavor.

Review of Substantiated Treatments

Applied behavior analytic (ABA) interventions are among the most effective interventions for individuals with ASD (Barbaresi, Kausic, & Voigt, 2006; Lilienfeld, 2005). The evidence for ABA interventions has resulted in states mandating ABA services for children with ASD and insurance reform. In addition, many (a) professional organizations including the American Association on Intellectual and Developmental Disabilities, American Academy of Child and Adolescent Psychiatry, Association for Science in Autism Treatment, and Autism Speaks, among others; (b) federal agencies including the Centers for Disease Control, the Surgeon General of the United States, and the National Institute of Mental Health, among others; and (c) state task force committees including the New York State Department of Health and Maine Administrators of Services for Children with Disabilities, among others, recommend ABA interventions for individuals with ASD.

ABA interventions can be categorized as comprehensive or focused, and this distinction is based on the treatment goals of intervention. Comprehensive intervention seeks to address multiple domains of functioning (i.e., language skills, social skills, motor skills, adaptive functioning, and cognitive skills) and is recommended to occur at a high level of intensity (e.g., at least 25 h per week) over a prolonged period of time (e.g., 3 years). In comparison, focused intervention typically seeks to address one targeted area (e.g., problem behavior), may occur at a lower level of intensity (e.g., 10 h per week), and has a shorter treatment duration (e.g., 6 months). The review of substantiated interventions will be divided into these two areas and provide a discussion of several evidence-based interventions within these two categories.

Comprehensive Treatment Models

Early Intensive Behavioral Intervention (EIBI) Based on the University of California at Los Angeles Young Autism Project model (UCLA YAP; Lovaas, 1981, 1987, 2003), EIBI is the most widely researched and requested comprehensive treatment model (Green et al., 2006). EIBI is grounded in the principles of applied behavior analysis (ABA) and is an intensive treatment (i.e., up to 40 h a week for 2 or more years) that targets the core deficits of ASD (e.g., communication and social deficits, restricted interests, social emotional reciprocity, and inflexibility). Effective components of EIBI include (a) highly structured one-on-one teaching strategies (i.e., discrete trial training; DTT), (b) an individualized treatment approach focusing on each child’s current repertoires and deficits, (c) a functional approach to address challenging behavior that interferes with learning, and (d) programming for generalization and maintenance of skills. Typically EIBI is supervised by professionals trained in ABA, and there are a number of treatment manuals that have been created to guide the sequence of skills targeted for intervention (e.g., Leaf & McEachin, 1999; Lovaas, 2003; Maurice, Green, & Foxx, 2001).

In the first empirical evaluation of the UCLA YAP, Lovaas (1987) compared pretreatment and posttreatment IQ and educational placements for a group of children with ASD, who received EIBI (40 h a week) for 2 or more years, to a control group receiving a range of other special education services. The results showed that 47% of the group receiving EIBI (*n* = 19) achieved posttreatment IQ scores in the normal range and were educated in a general education classroom. These results were compared to the 2% of children from the control group ($n = 40$) who achieved the same outcome. Furthermore, these treatment gains maintained for the EIBI group for up to 6 years. That is, a follow-up evaluation showed that children in the EIBI group continued to have higher IQ scores and less restrictive educational placements when compared to the control group (McEachin, Smith, & Lovaas, 1993).

There has been much debate regarding the significance of the findings from the original studies published by Lovaas and colleagues with potential methodological limitations identified (Gresham & MacMillan, 1998). However, a number of comprehensive studies have been published since, addressing some of the limitations from the original studies and documenting the effectiveness of EIBI implemented in school (Eikeseth, Klintwall, Jahr, & Karlsson, 2012; Eikeseth, Smith, Jahr, & Eldevik, 2002), center-based (Cohen, Amerine-Dickens, & Smith, 2006), and home-based (Remington et al, 2007; Sallows & Graunpner, 2005; Smith, Groen, Wynn, 2000) settings. Reichow (2012) reviewed five meta-analyses of EIBI conducted between 2009 and 2010 (Eldevik et al., 2009; Makrygianni & Reed, 2010; Reichow & Wolery, 2009; Spreckley & Boyd, 2009; Virués-Ortega, 2010). Despite the many methodological differences between the meta-analyses, four of the five meta-analyses concluded that EIBI can be an effective intervention, capable of producing gains in IQ and adaptive behavior for many children with ASD. At this time, EIBI is the comprehensive treatment model with the most empirical support; thus, this treatment should be strongly considered when making treatment decisions for children with ASD.

Learning Experiences and Alternative Program for Preschoolers and Their Parents (LEAP) The LEAP model uses an inclusive educational approach for teaching preschoolers with ASD (Hoyson, Jamieson, & Strain, 1984). The theoretical and conceptual foundations of LEAP are largely based on ABA, and the primary components of LEAP include (a) using naturalistic teaching strategies (e.g., embedding learning experiences into naturally occurring classroom routines); (b) teaching children with ASD alongside their typically developing, same-age peers; (c) teaching typically developing peers to facilitate the social and communicative behaviors of peers with ASD; (d) utilizing a range of evidence-based focused interventions (e.g., incidental teaching, pivotal response training, picture-exchange communications system); and (e) using a structured parent-skill training curriculum (Strain & Bovey, 2011).

In the largest-scale study to date, Strain and Bovey (2011) conducted a clustered randomized control trial of the LEAP model. Of the 56 inclusive preschool classrooms that participated in this study, 28 classrooms were randomly assigned to the full LEAP treatment condition ($N = 117$) in which the teachers received 2 years of ongoing training and consultation on the implementation of LEAP. The other 28 classrooms were assigned to a control condition ($N = 117$) in which the teachers received the LEAP intervention manual and training presentations but did not receive ongoing consultation or training. Outcomes of this study showed that teachers in the treatment group achieved a high level of implementation fidelity at the end of 2 years, implementing an average of 87% of the treatment components. In comparison, classrooms in the control condition were only implementing an average of 38% of the treatment components at the end of 2 years. Strain and Bovey also found that children in the treatment group made significantly more gains on measures of cognitive, language, autism symptoms, problem behavior, and social skills following 2 years of LEAP, as compared to children in the control group.

Early Start Denver Model (ESDM) This model is a comprehensive developmental behavioral intervention for young children with ASD. The ESDM developed out of the Denver model (Rogers, Hall, Osaki, Reaven, Herbison, 2000), and it is the only early intervention model that has been validated with a randomized control trial for children with ASD as young as 18 months (Dawson et al., 2010). The ESDM integrates empirically supported ABA techniques with relationship-based, developmental, and play-based approaches. Training is individualized for each child, and specific learning objectives are based on the Early Start Denver Model Curriculum Checklist, a play-based assessment tool that outlines skills across different developmental domains, which are sequenced in the order they occur during typical development. The main components of the ESDM include (a) a well-defined developmental curriculum (Rogers & Dawson, 2010), (b) established teaching strategies from ABA (e.g., prompting, prompt fading, chaining), (c) techniques from pivotal response training (e.g., following the child's lead, turn taking), (d) activities that promote positive emotional exchanges between children and key adults through play routines (e.g., positive affect and empathetic response toward the child), and (e) a focus on parent and family involvement (e.g., parents are taught to incorporate the ESDM strategies throughout the child's waking hours).

At present, there has been one randomized control trial conducted to evaluate the efficacy of the ESDM (Dawson et al., 2010). Dawson and colleagues randomly assigned 48 children with ASD between 18 and 30 months of age to one of two groups. One group received 2 years of intervention using the ESDM, and the other group received 2 years of intervention using interventions commonly available in the community. Following 2 years of intervention, the ESDM group showed significant improvements in IQ, adaptive behavior, and autism diagnosis. Children in the ESDM group showed an increase of an average of 17 IQ points compared to an average of seven points in the community intervention group. Additionally, only 56% of the children from the ESDM group retained their diagnosis of autistic disorder following 2 years of intervention, as compared to 71% of children in the community intervention group. The original randomized control trial on the ESDM was conducted in a university clinic setting, and more recent studies suggest that this model is also effective when implemented in community-based group settings (Eapen et al., 2013; Vivanti et al., 2014). Although the evidence available to support the use of the ESDM is promising, few comprehensive studies of this model have been conducted; thus, additional research is needed.

Focused Intervention

Focused interventions typically target one domain. For example, numerous focused interventions effectively treat severe problem behavior. Because of the range of ABA-based focused interventions that are available to children with ASD, a review of each of these is outside of the scope of this chapter. We will divide focused interventions into two areas; one area will describe focused interventions for behavioral supports, and the other area will describe focused interventions to promote skill acquisition.

Behavioral Supports A proportion of individuals diagnosed with ASD engage in one or more topographies of problem behavior such as aggression, disruption, and self-injurious behavior. Although problem behavior is not part of the diagnostic criteria for ASD, it is a comorbid symptom frequently reported by families and educators. The field of ABA has a successful history of assessing and treating problem behavior in individuals with ASD. Unique to the behavioral perspective, interventions are based on the identified function of the individual's problem behavior. That is, rather than treating all aggressive behavior with a specific intervention, behavior analysts identify the cause of behavior and develop a treatment that is tailored to address the cause of behavior. The process of assessing an individual's problem behavior is referred to as a functional behavior assessment.

Functional Behavior Assessment (FBA) FBA is used to ascertain the environmental variables influencing the occurrence of an individual's problem behavior. Due to extensive evidence that function-based interventions are more effective than randomly selected interventions (e.g., Iwata, Page, Cowdery, & Miltenberger, 1994), the re-authorization of IDEA in 2004 included a mandate for FBA in order to collect and analyze data about a student's problem behavior in school settings (Individuals with Disabilities Education Act, 2004).

FBA is comprised of three types of assessment. The first type of assessment is indirect, and information regarding the individual's behavior is obtained from people who frequently observe the occurrence of problem behavior. Indirect data are collected through interviews with teachers and caregivers, questionnaires, ratings scales, and other paper assessment methods. Indirect assessments do not include observations of the individual's behavior. Indirect assessments alone may not be sufficient to identify the cause of an individual's problem behavior (Smith, Smith, Dracobly, & Pace, 2012). Nevertheless, these data can be used to assist in collecting data through other assessment methods.

Descriptive assessments are a second type of FBA which includes direct observation of the individual's behavior. Observations of the individual in his or her natural setting, collection of information about events that occur before and after behavior, and collection of data regarding the occurrence of problem behavior occur during the descriptive assessment (Miltenberger, 2013). The information collected within a descriptive assessment is analyzed to determine patterns of environmental events that are temporally related to problem behavior. However, the cause of an individual's problem behavior is not identified based on a descriptive assessment. Rather, the data provide information about events that are correlated with behavior; one may also identify the probability of certain events coinciding with the occurrence of problem behavior.

The third type of FBA is an experimental analysis of behavior, or functional analysis, in which careful arrangement and experimental manipulation of events surrounding behavior lead to conclusions regarding the cause of behavior (e.g., the "triggers" or antecedent for behavior and consequences that occur following behavior and reinforce problem behavior). Functional analysis was described by Skinner (1953, 1957) and others; however, a methodology for conducting a functional analysis was developed by Iwata and colleagues and published in 1982 (Iwata, Dorsey, Slifer, Bauman, and Richman, 1982). This functional analysis (FA) includes test conditions in which one antecedent and one consequence are manipulated per condition. Test conditions include attention (adult attention is provided contingent on problem behavior), demand (a break from task demands is contingent on problem behavior), and alone/ignore (problem behavior is ignored). A control condition also is included in which motivation to engage in problem behavior is reduced by removing all demands, having an adult provide frequent attention, preferred toys or activities are available, and no consequences are provided for problem behavior. The conditions alternate such that participants experience each condition multiple times, and data collectors record the occurrence of the target problem behavior in each session. The rate of problem behavior in test conditions is compared to the rate of problem behavior in the control condition. Any test conditions with elevated and differentiated rates of problem behavior, in comparison to the control condition, are identified as potential variables maintaining problem behavior. For example, if an individual had elevated rates of problem behavior in the attention condition in comparison to the control condition, the outcome of the assessment suggests that problem behavior is maintained by positive reinforcement in the form of adult attention.

Variations of functional analysis procedures were developed to identify other potential functions of problem behavior (e.g., problem behavior maintained by access to tangible items, Northup et al., 1991), decrease the time to conduct the FA (e.g., Derby et al., 1992), and increase the feasibility of FAs conducted in a school setting (e.g., trial-based FAs; Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011).

There is an impressive literature base on the effectiveness of FA. Two literature reviews on FA collectively analyzed 435 peer-reviewed articles that included a FA of problem behavior (Beavers, Iwata, & Lerman, 2013; Hanley, Iwata, & McCord, 2003). In addition, articles that included a large number of participants for whom FAs were conducted in various settings provide evidence that FAs produce conclusive outcomes that can be used to develop treatment (Hagopian, Rooker, Jessel, & DeLeon, 2013; Iwata et al., 1994; Mueller, Nkomi, & Hine, 2011). For example, Mueller, Nkomi, and Hine (2011) found that FAs conducted with 69 participants in their school setting produced conclusive outcomes in over 90% of these cases.

The collection of research on FBA implemented with a large number of individuals, the success of these procedures in identifying the function(s) of an individual's problem behavior, and the rigorous experimental control in these published studies are why FBA is a substantiated focused intervention procedure.

Extinction Extinction is a highly effective intervention in which behavior that was previously reinforced no longer results in reinforcement. Removal of the reinforcer for behavior leads to the reduction and eventual cessation of behavior. For example, if adult attention in the form of reprimands is the reinforcer that occurs every time a child swears in the classroom, extinction would involve removing adult attention following swearing. Thus, every time the child swears, the classroom teacher would ignore the behavior rather than commenting on swearing. In this example, swearing would decrease over time and eventually cease.

Extinction is only effective if the reinforcer for problem behavior is no longer available following behavior. Thus, it is important to identify the cause of behavior to determine the reinforcer(s) that must be removed following behavior. Iwata and colleagues (1994) demonstrated the importance of using function-based extinction (i.e., extinction matching the reinforcer for behavior) by comparing extinction that matched the function of behavior to at least one other type of extinction that did not match the function of behavior. For example, one individual's self-injurious behavior was reinforced by the sensory consequences produced by the behavior. Function-based extinction involved fitting the individual with a helmet that attenuated the sensory stimulation produced by self-injurious head banging. The participant also received attention extinction (i.e., no attention was provided following self-injury) and escape extinction (i.e., no break from demands occurred following self-injury) without the helmet present. The results showed that only sensory extinction reduced self-injury. The other two types of extinction that did not match the function of behavior did not lead to a reduction in self-injury. Therefore, extinction should be implemented following a conclusive FBA.

Lerman and Iwata (1996) provided a detailed analysis of the use of extinction in basic and applied research. The authors described factors that may influence resistance to extinction such as the schedule of reinforcement for problem behavior, the magnitude of reinforcement for problem behavior, and the effort required to engage in a response. Practitioners considering the use of extinction as a substantiated intervention should read this article to consider how best to arrange extinction. In addition, the use of extinction may lead to a temporary increase in the occurrence of behavior (known as an extinction burst). Although extinction bursts may only occur in 24% of cases (Lerman & Iwata, 1995), treatment teams might consider how best to arrange the environment during extinction and respond appropriately to problem behavior should an extinction burst occur.

Although extinction is a substantiated intervention, it is frequently combined with other interventions. The combination of extinction and other interventions may make the use of extinction more effective in rapidly reducing behavior and decrease resistance to extinction (Lerman, Iwata, & Wallace, 1999; Moss, Ruthven, Hawkins & Topping, 1983; Rivas, Piazza, Patel, & Bachmeyer, 2010), and the combination of interventions may be more socially acceptable. For example, arranging reinforcement for an alternative behavior (e.g., doing classwork) while placing problem behavior (e.g., swearing) on extinction can produce a shift in response allocation from inappropriate behavior to appropriate behavior (e.g., Vollmer, Roane, Ringdahl, & Marcus, 1999).

Differential Reinforcement This substantiated behavior-change intervention arranges reinforcement for one behavior (e.g., an appropriate alternative behavior) and extinction for problem behavior. For example, a child who screams to get candy in line at the grocery store will receive candy following a polite request (e.g., "May I have candy, please?") and will no longer receive candy for screaming.

There are several applications of differential reinforcement for the treatment of problem behavior. These applications include (1) differential reinforcement of other behavior (DRO), (2) differential reinforcement of incompatible behavior (DRI), (3) differential reinforcement of alternative behavior (DRA), (4) differential reinforcement of low-rate behavior (DRL), and (5) differential reinforcement of high-rate behavior (DRH). There is considerably more research on DRO, DRA, and DRI than DRL and DRH. Thus, this chapter will focus in the discussion of differential reinforcement procedures on those applications with the most supporting research.

DRO involves reinforcing the omission of problem behavior for an established interval of time (Kodak, Miltenberger, Romaniuk, 2003; Tiger, Fisher, Bouxsein, 2009; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). For example, a boy with ASD may receive a break from his homework if he does not throw his pencil or crumple his paper for 1 min. The interval for the omission of problem behavior is established based on pre-intervention observations of the rate of problem behavior, and it should be slightly shorter than the average length of time between occurrences of behavior. For example, if a child hits approximately every 2 min, the DRO interval may begin at 1 min 30 s. If problem behavior occurs during the DRO interval, the time interval may be reset. For example, if a child hits at second 45 in the 1 min 30 s interval, the interval resets, and the child must omit problem behavior for another 1 min 30 s to obtain reinforcement. The DRO interval is gradually increased based on reductions in problem behavior. Practitioners who use DRO should establish criteria for increasing and decreasing DRO intervals based on behavior. For example, a practitioner might decide to increase the DRO interval from 1 min 30 s to 2 min if there is at least an 85% reduction in problem behavior across two consecutive intervention sessions. In addition, the practitioner might decide to decrease the interval (or return to the prior DRO interval) if problem behavior increases by more than 50% for three consecutive sessions.

Although DRO is an effective intervention to treat problem behavior, there are potential disadvantages to this intervention. First, someone must be available to consistently monitor behavior during the DRO interval. Tiger et al. (2009) taught a man with Asperger's syndrome to self-monitor behavior during DRO and deliver his own reinforcement following therapist-implemented DRO. This study provides a fruitful avenue of additional research to determine how to increase the utility of DRO in settings with limited supervision. Second, DRO does not teach an individual appropriate behavior to recruit reinforcement. Although some individuals may engage in appropriate behavior during DRO intervals (e.g., compliance with tasks; Kodak et al., 2003), it is possible to obtain reinforcement for simply sitting and not engaging in any appropriate behavior, as long as targeted problem behavior does not occur. Other interventions, such as DRA, may be preferable to use if individuals do not engage in appropriate behavior during DRO intervals. Finally, some individuals may not access reinforcement frequently if DRO intervals continuously reset. Although this may be avoided by carefully arranging DRO intervals, an individual could intermittently engage in problem behavior and fail to receive reinforcement for long periods of time, which could decrease the effectiveness of this intervention.

DRA involves the reinforcement of an alternative behavior and extinction for problem behavior, and it is one of the most common applications of differential reinforcement used by professionals to treat problem behavior. An alternative behavior is selected either because it is already in the individual's repertoire (Grow, Kelley, Roane, & Shillingsburg, 2008) or the behavior can be taught to the individual and is likely to reliably produce the reinforcer (Schlichenmeyer, Dube, & Vargas-Irwin, 2015). Prompts are used to occasion alternative behavior, and prompts are gradually faded as the individual consistently and independently engages in the appropriate behavior.

During the initial stages of DRA implementation, every instance of the alternative behavior is reinforced (i.e., a fixed-ratio 1 [FR 1] schedule of reinforcement for appropriate behavior). As treatment progresses, the practitioner gradually thins the schedule of reinforcement for appropriate behavior while maintaining low levels of problem behavior. For example, Kodak, Lerman, Volkert, and Trosclair (2007) provided a choice between a break and an edible item to children with ASD following increasing intervals of work completion. Treatment started with the completion of one task (FR-1 schedule) and gradually increased to an FR 20 or FR 40 schedule of task completion to obtain the choice of reinforcers. After DRA is thinned to a relatively lean schedule of reinforcement, it may be feasible for practitioners to maintain low levels of problem behavior for extended periods of time.

DRI is another application of differential reinforcement in which incompatible behavior produces reinforcement rather than problem behavior. Incompatible behavior is typically an appropriate behavior that cannot occur at the same time as problem behavior. For example, if the individual engages in self-injurious hand biting, an incompatible behavior might involve placing both hands underneath the legs in a seated position. DRI is considered a specific type of DRA; both differential reinforcement procedures arrange reinforcement for appropriate behavior, but DRI involves reinforcing only appropriate behavior that is incompatible with problem behavior.

Functional Communication Training Often conceptualized as a type of DRA, functional communication training (FCT) involves teaching individuals to engage in an alternative communicative response to obtain reinforcers. The communicative response may occur in many formats including a vocalization, picture exchange, sign language, and card touch, among others. The alternative response that is taught to the individual produces the same reinforcer that maintains the individual's problem behavior. Thus, similar to other focused behavioral interventions described above, FCT typically occurs following a conclusive FBA.

Tiger et al. (2008) published a review on FCT that also included practice guidelines for practitioners. This review included recommendations based on 21 published studies on FCT conducted with 204 participants. The practice guidelines noted the potential influence of the speed and effort of the communicative response on the occurrence of alternative and problem behavior, described how and in what settings the communicative response should be taught, how to arrange consequences for problem behavior, and how to thin reinforcement for communicative responses to make FCT feasible for long-term use across settings. The summary of the literature on FCT and the thoughtful recommendations within this review paper provide an excellent resource for professionals interested in using FCT in practice.

Skill Acquisition

There are numerous focused interventions that target specific skill deficits. Children with ASD may require intervention to teach language skills, enhance cognitive skills, improve adaptive functioning, develop motor skills, and teach social skills. To address the myriad of potential skill deficits, several interventions that promote skill acquisition received extensive support in the literature. Although the list of focused interventions for skill acquisition is lengthy, this chapter will describe several substantiated interventions that are commonly used in practice.

Discrete Trial Training (DTT) Training includes a highly structured, fast-paced format of instruction in which one adult works directly with one child in an environment with minimal distractions. Skills are typically broken down into smaller steps, and each step is repeatedly practiced in trials until mastery is reached. Trials are typically delivered during tabletop instruction and include the arrangement of specific antecedents (e.g., prompts) and consequences (e.g., praise and tangible reinforcers). DTT is a core component of the EIBI comprehensive intervention described earlier in this chapter.

DTT can be used to teach a variety of skills including gross motor imitation, labels of common objects, receptive identification, matching objects or pictures, vocal imitation, sight words, and play skills, among others (Leaf & McEachin, 1999; Lovaas, 1981). Instructors carefully collect data on child responding during each trial to determine mastery. Because DTT is highly structured and systematic, inexperienced staff (e.g., Severtson & Carr, 2012; Thompson et al., 2012), parents (e.g., Young, Boris, Thompson, Martin, & Yu, 2012), peers (Radley, Dart, Furlow, & Ness, 2015), and adults diagnosed with ASD (Lerman, Hawkins, Hillman, Shireman, & Nissen, 2015) have been trained to implement DTT with integrity.

Due to the highly structured nature of DTT, this intervention should be used in combination with other substantiated focused interventions to promote generalization of skills across settings and adults and to arrange intervention that also occurs in a less structured setting.

Pivotal Response Training (PRT) This training targets pivotal behaviors considered to be important behaviors upon which acquisition of other, untrained skills will occur. For example, language is a pivotal behavior because once an individual can communicate with others, novel and untrained skills may emerge such as play and social behavior. PRT is considered a type of naturalistic environmental training because learning opportunities occur in the individual's natural environment during play and everyday interactions.

PRT capitalizes on the child's motivation during instruction. For example, if a child indicates an interest in going into the backyard to play, the parent takes the opportunity to have the child practice asking to "go outside." Multiple cues are used during instructional opportunities so that skills are practiced in the presence of a variety of relevant antecedents. For example, a child may ask for a toy that her mother is playing with during free playtime in the home, and her mother gives her the toy that she requested. In other learning opportunities, the mother may offer a choice of toys, and the girl can practice asking for the toy under this choice arrangement. The same toy is present during play with siblings and friends to allow for practice requesting the toy from others.

PRT occurs based on the child's interest in an item or activity. That is, training opportunities are initiated by the child rather than by an adult. The adult follows the child's lead and identifies learning opportunities based on what the child approaches and the activities that the child initiates. By using child-driven instruction, motivation to learn may be higher than when the adult initiates instruction with an item or object that the child didn't select or approach (Dufek & Schreibman, 2014).

PRT can be used to teach individuals with ASD a variety of skills including requests for items, social initiations, imitation, and play skill, among others. Koegel, Carter, and Koegel (2003) used PRT to target language development with two children with autism. Children were taught to ask "What happened?" when the adult manipulated items in a pop-up book featuring preferred topics. The authors also measured use of regular past tense verbs during PRT. Participants rapidly learned to independently ask what happened during play, and they also acquired targeted verbs. In addition, training generalized to gains in other linguistic behaviors such as the number and diversity of verbs emitted by each participant.

The National Professional Development Center on Autism Spectrum Disorders categorized PRT as an evidence-based intervention based on nine studies with single-subject designs that showed positive outcomes for individuals with ASD between ages 2 and 16 (Vismara & Bogin, 2009).

Picture Exchange Communication System (PECS) This alternative communication intervention system is designed for individuals with no or limited vocal verbal behavior. The PECS teaching protocol is based on Skinner's taxonomy in Verbal Behavior (1957) and teaches communicative responses in a specific order to facilitate the development of multiple functions of verbal behavior (e.g., mands/requests for items or activities, tacts/labeling items or events in the environment).

PECS includes six phases of training. In Phase I, the individual learns to obtain and hand a picture to a communicative partner to access a highly preferred item. Only one picture is present during training. In Phase II, individuals are trained to be more persistent with exchanging pictures, and the skills developed in Phase I are practiced across communicative partners and settings to generalize the skill across people and locations. In Phase III, two or more pictures are present in a PECS binder, and the individual must remove a picture to request an item. In the beginning of this phase, a picture of a non-preferred item may be placed in the binder along with a picture that was previously trained in earlier phases. After the individual learns the discrimination among pictures of preferred and non-preferred items, pictures of other preferred items are added to the binder. Phase IV involves teaching the student to request items using a short sentence. A picture for “I want” is added to the binder, and the individual must place the “I want” picture and another picture of a preferred item on a sentence strip and hand the sentence strip to the communicative partner. This phase also includes pictures for adjectives (e.g., big, bouncy) and prepositions (e.g., under, in) that are taught and included in the short sentences that the individual places on the sentence strip. In Phase V, an adult asks the student, “What do you want?” The individual learns to make a short sentence requesting an item following this verbal prompt, because this type of question is frequently asked by caregivers and educators working with individuals with ASD and related disorders. In the last phase, another function of verbal behavior (i.e., tact/labeling) is taught. The individual learns to describe stimuli that she/he hears, sees, smells, and feels. New pictures such as “I see” and “I hear” are added to the binder to teach the individual to create a sentence that is relevant to the environmental event being described by the individual (Frost & Bondy, 2002).

There are more than 100 published studies on PECS and several review papers describing the efficacy of PECS in teaching communicative behavior (Sulzer-Azaroff, Hoffman, Horton, Bondy, & Frost, 2009; Tien, 2008) and the effects of PECS training on other behavior (e.g., problem behavior, vocalizations; Hart & Banda, 2010; Preston & Carter, 2009; Tincani & Devis, 2011). For example, Preston and Carter (2009) reviewed 27 studies on PECS. The authors concluded that the studies provide evidence for the effectiveness of PECS to teach nearly all participants some form of functional communication (e.g., mands). In addition, Hart and Banda (2010) performed a meta-analysis of the literature on PECS. Their meta-analysis included 13 published studies, and the results showed that all but one participant acquired functional communication with PECS.

Although practitioners and educators may endorse frequent use of PECS with individuals, it is unclear whether the picture-exchange program that is used aligns with the phases and specific procedures described in the PECS manual (Odom, Collet-Klingberg, et al. 2010). If practitioners are using a picture-exchange program that does not align with the PECS manual, a distinction should be made between implementing PECS versus a generic picture-exchange program. The latter may not have the same effectiveness as the PECS program since the empirical evidence reported in this chapter, and used to determine the status of PECS as a substantiated treatment, has only evaluated the PECS training package and not deviations from these procedures.

Prompts Prompts are used during instruction to rapidly teach individuals with ASD novel skills. Prompts are provided in order to ensure that an individual engages in the correct response under the correct stimulus conditions. There are two categories of prompts that can be used during instruction; they include response prompts and stimulus prompts.

Response prompts evoke the targeted response in the presence of the correct antecedents. For example, if the child is shown a letter in the alphabet, a response prompt is provided so that the child says the correct letter name in the presence of the letter. There are several commonly used response prompts in practice including verbal, model, gestural, and physical prompts. A verbal prompt involves telling the person how to engage in the correct response. For example, a child with dirty hands who stands in front of a sink in the restroom for an extended period of time may be given the verbal prompt, "Wash your hands," by an adult. A model prompt involves demonstrating how to perform the correct response while the individual watches the demonstration and has the chance to perform the behavior thereafter. For example, an adult might demonstrate how to wash hands in the sink, while the child watches. Then, the child might imitate the adult by washing his hands in a manner that is identical to the adult's demonstration. A gestural prompt may involve gesturing toward materials required for a correct response to occur. For example, an adult might gesture toward the paper towels in a public bathroom if a child has just washed his hands and is standing with wet hands by his side for a period of time. Finally, a physical prompt may be used to physically assist the child to engage in the correct response. For example, an adult might provide hand-over-hand guidance to the child by placing her hands over top of the child's hands and guiding the child to obtain a paper towel from the dispenser and dry off the fronts and backs of his hands.

The second category of prompts is stimulus prompts. A stimulus prompt involves adding or removing stimuli or changing some aspect of a stimulus so that a correct response is likely to occur. Two types of stimulus prompts are within-stimulus and extra-stimulus prompts. A within-stimulus prompt occurs when the stimulus is altered. Alterations to the stimulus can include, but are not limited to, manipulating the size, intensity, or color of the stimulus. For example, an adult might modify the letter "A" to be bold 100-point font when teaching a child to point to the letter "A" in an array of two other letters presented in 30-point font. An extra-stimulus prompt involves adding a stimulus to occasion a correct response. For example, a lawyer may place arrow stickers on a legal document to point out the locations in the document that the adult must place a signature.

Although prompts are used during instruction to occasion a correct response from an individual under the correct stimulus conditions, the goal of instruction is to fade prompts so that the individual performs the correct behavior independently and in the correct situation. Thus, prompt-fading strategies are included during instruction to transfer control over the correct response from the prompt to the relevant stimulus conditions of the task. Prompt fading involves gradually removing the prompt across repeated learning opportunities. Common prompt-fading procedures include least-to-most (Cronin & Cuvo, 1979), most-to-least (Striefel & Wetherby, 1973), and prompt delay (Touchette, 1971).

During least-to-most prompt fading, an instructional opportunity begins with the least intrusive prompt (e.g., a verbal prompt). If the individual does not complete the task within a specified time period (e.g., 5 s), the instructor provides a more intrusive prompt, such as a model prompt. If the individual still does not complete the task correctly within the specific time period, the most intrusive prompt is provided (e.g., a physical prompt). Prompts are faded within this procedure when the individual correctly completes the task upon presentation of the demand. That is, prompts are faded from instruction because the individual responds to the task prior to the programmed prompt.

Most-to-least prompting can include the same prompts as least-to-most prompting, except that instruction begins with the most intrusive prompt. The individual receives physical guidance for several trials before the prompt is faded to a model prompt. If the individual responds correctly at the less intrusive prompting level, the prompt is faded to a verbal prompt. If, at any point, the individual is not responding at a lower level of prompting (e.g., errors to verbal prompts), the subsequent trials would be conducted with a more intrusive prompt (e.g., model prompt).

Prompt delay (also referred to as time delay; Touchette, 1971) transfers stimulus control from a prompt to the relevant stimuli for the task by increasing the amount of time between the initiation of the task and a prompt. Initially, prompts are provided immediately with the onset of the task (referred to as a 0-s delay). Thereafter, the amount of time between the onset of the task and the prompt either gradually increases (e.g., 1 s, 2 s, and so on; referred to as a progressive prompt delay) or increases to the terminal delay for instruction (e.g., 5 s; referred to as a constant prompt delay). The prompt delay can also decrease to a previous delay value (e.g., reduce from a 3-s delay to a 2-s delay in the next trial) if the individual engages in errors during instruction. The goal of the prompt delay is to remove all prompts while maintaining high levels of correct responding.

Seaver and Bourret (2014) compared the efficacy and efficiency of prompts and prompt-fading strategies for ten individuals with ASD. First, the authors compared prompt types to determine the specific prompt that was most efficient for teaching a skill. The results showed that the most efficient prompt varied across participants, verifying the necessity of an assessment to determine ideal prompting strategies for each individual receiving services. Next, the authors compared least-to-most, prompt delay, and most-to-least to identify the prompt-fading strategy that was most efficient for participants. Seven participants with ASD participated in this comparison. Although the most efficient prompt-fading strategy varied across participants and was either prompt delay or least-to-most, the results of the least efficient strategy were consistent. The most-to-least prompt-fading strategy was the least efficient strategy for all seven participants.

Other studies comparing types of prompts and prompt-fading strategies also found idiosyncratic results; the most efficient strategy varies across participants (Lerman, Vorndran, Addison, & Kuhn, 2004; Libby, Weis, Bancroft, & Ahearn, 2008; Walls, Ellis, Zane, and VanderPoel, 1979). Therefore, practitioners working with individuals with ASD can use different types of prompts and prompt-fading strategies to teach skills. However, it may be beneficial to conduct an assessment to compare prompt types and prompt-fading strategies with each individual and across tasks to determine the teaching strategies that will be the most efficient for each individual. Practitioners who are interested in conducting these types of assessments can use the method described by Seaver and Bourret (2014) and Lerman et al. (2004) as models for how to design these assessments.

Unsubstantiated Treatments for ASD

Gluten-Free and Casein-Free Diet

Dietary interventions are frequently used by families of children with ASD (Green et al., 2006; Owen-Smith et al., 2015; Perrin et al., 2012). One of the most commonly used dietary interventions is the gluten-free and casein-free (GFCF) diet. This diet eliminates all food and beverages containing gluten, a protein found in wheat, barley, rye, and oats (e.g., flours, bread, pasta, pastries), and casein, a protein found in all dairy products (e.g., milk, yogurt, cheese, butter). The use of a GFCF diet is based on the etiological theory that the psychological and physiological symptoms of ASD can be linked to overactivity of the opioid system (opioid-excess theory; Shattock, Kennedy, Rowell, & Berney, 1990). It has been hypothesized that children with ASD do not properly digest gluten and casein, which causes high levels of opioid peptides. These excessive opioid peptides then leak out of the intestines (i.e., the "leaky gut hypothesis"; Whiteley, Rodgers, Savery, & Shattock, 1999), cross the blood-brain barrier, and attach to the opioid receptors (Mulloy et al., 2010). The overactivity of the opioid receptors is believed to cause behavior problems and other related symptoms of ASD.

There have been relatively few studies on the impact of the GFCF diet on the symptoms of ASD, and even fewer studies have been conducted with the level of experimental rigor necessary to support the use of a GFCF diet (Mari-Bauset, Zazpe, Mari-Sanchis, Llopis-Gonzalez, & Morales-Suarez-Varela, 2014; Mulloy et al., 2010). For example, in a systematic review of the literature on GFCF diets, Mulloy and collogues reviewed 14 studies evaluating the efficacy of the GFCF diets. Only three of the 14 studies used controlled experimental designs, none of which supported the use of a GFCF diet (Bird et al., 1977; Elder et al., 2006; Irvin, 2006). Finally, in one of the best controlled studies to date, Hyman and collogues (2016) examined the safety and efficacy of the GFCF diet in a double-blind, placebo-controlled study with 14 young children with ASD. These authors did not find evidence of any effect of the GFCF diet on measures of physiological functioning, behavioral disturbance (e.g., overactivity), or ASD-related behavior.

In addition to the current lack of evidence supporting the GFCF diet, there are a number of potential limitations and health risks associated with this diet. The GFCF diet can be both time and resource intensive. Families utilizing this intervention must commit to daily meal planning and preparation while taking special care to ensure their children are still meeting their nutritional needs. Additionally, GFCF diets require significant financial resources as most foods cost almost double the amount of food containing gluten and casein (Stevens & Rashid, 2008). There is also the potential for negative social consequences, as special diets may further isolate children with ASD from their typically developing peers. GFCF diets also have been linked to a number of adverse side effects including nutritional deficiencies (Arnold et al., 2003) and suboptimal bone development (Hediger et al., 2008). The evidence currently available does not support the use of a GFCF diet as an intervention for ASD; thus, families should not use this diet unless recommended by their doctor as treatment for food allergies.

Sensory Integration Therapy (SIT)

Children with ASD often present with sensory abnormalities (Rogers, Hepburn, & Wehner, 2003; Schaaf & Lane, 2015); thus, sensory-based treatments are frequently used as a component of intervention (Green et al., 2006; Smith & Antolovich, 2000; Watling et al., 1999). Proponents of SIT hypothesize that many of the core symptoms of ASD come from deficits in registering and modulating sensory input from the environment (Ayres, 1972). Sensory-based treatments focus on helping the individual respond adaptively to sensory inputs through controlled sensory activities, which target the proprioceptive, vestibular, and tactile sensory systems.

Activities used during therapy are individualized, based on each child's unique sensory profile (Dunn, 1999), but typically include wearing weighted vests or blankets, massage therapy, brushing, swinging, therapy balls, and related activities. Many studies have assessed the efficacy of SIT for ASD. For example, Lang et al. (2012) reviewed 25 studies using SIT with children with ASD. Only 3 of the 25 studies reviewed reported positive effects with SIT, 8 studies reported mixed findings, and 14 studies reported no benefits of SIT. The three studies that suggested SIT was effective had serious methodological limitations (e.g., participants were receiving additional interventions with SIT), which makes discrepancies across studies difficult to interpret. In addition, the negative findings from 4 of the 14 studies suggest that SIT may actually increase stereotypy and other problem behaviors (e.g., Devlin, Healy, Leader, & Hughes, 2011).

Despite the widespread lack of evidence for SIT, it remains one of the most popular treatments for ASD (Green et al., 2006). This finding is concerning, because implementing SIT takes both time and resources away from other evidence-based interventions. Furthermore, forms of SIT may be socially stigmatizing to the individual if implemented within a group of typically developing children (e.g., an adult brushes a child with ASD in a social setting). Finally, resources allocated to the materials needed for SIT can be expensive and may reduce the resources available for substantiated interventions.

Auditory Integration Therapy

Auditory integration therapy (AIT) started being used as an intervention for ASD in the early 1990s (Berard, 1993). Similar to supporters of SIT, advocates for AIT suggest that many of the symptoms of ASD are a result of sensory processing abnormalities. Auditory hypersensitivity (i.e., hyperacusis) is a condition in which exposure to certain sounds may cause pain and otherwise impair an individual's ability to function. AIT addresses auditory hypersensitivity by providing individuals with 10 h of digitally modified music or sound across 10 days with two 30-min sessions conducted daily. Music is presented through an auditory integration device, which alters the sounds by attenuating the frequencies for which the individual is hypersensitive, varying high and low frequencies and volume on a random basis. The aim of AIT is to exercise and tone the muscles in the ear to reduce sound sensitivity, which is supposed to decrease individuals' aberrant reactions to sounds (e.g., aggression, self-injurious behavior, rigidity, and stereotypic behavior).

At present, very few empirical studies have been conducted on AIT, and current support for this treatment is based on anecdotal caregiver reports of positive outcomes with AIT. In a review of the evidence for AIT, Dawson and Watling (2000) found only five empirical studies of AIT for individuals with ASD, and of those five studies, only three included a control condition (Bettison, 1996; Rimland & Edelson, 1995; Zollweg, Palm, & Vance, 1997). Of the three studies with a control condition, two studies found improvements in behavioral outcomes for both the control and AIT group. For example, Bettison randomly assigned 40 children with ASD or Asperger's syndrome to an AIT group and 40 to a control treatment. Parents and teachers were blind to the group assignment. Following the intervention, both groups showed significant improvements on behavioral and cognitive measures, and the treatment group did not differ from the control group. Thus, outcomes for AIT were not superior to those in the control group that did not receive AIT. The remaining study with a control condition reviewed by Dawson and Watling found that improvements in the AIT condition relative to the control condition were limited by inadequate pretreatment matching of the control and AIT groups.

The scientific evidence to support the use of AIT as a treatment for ASD is insufficient. AIT is also a costly procedure and puts children at risk of noise-induced hearing loss if the AIT device is used improperly (Sinha, Silove, Hayen, & Williams, 2011). At present, the American Academy of Audiology, the American Speech-Language-Hearing Association, the American Academy of Pediatrics, and the Educational Audiology Association agree that AIT should be considered experimental, and they do not endorse its use for the treatment of communication, behavioral, emotional, or learning disorders (American Speech-Language-Hearing Association, 2004).

Therapeutic Horseback Riding

Therapeutic horseback riding (THR) is a type of animal-assisted intervention which has been used in the treatment of individuals with ASD. THR focuses on developing an awareness of movement, weight distribution, hand-eye coordination, and improved speech and providing an individual with a wide range of tactile and auditory experiences (All, Loving, & Crane, 1999). THR is typically implemented by occupational therapists, speech-language pathologists, and physical therapists. The goals of treatment tend to be individualized for each child and will vary depending on which professional is implementing the treatment. For example, speech-language therapists will focus on communication goals, whereas physical therapists will focus on goals related to muscle movements, posture, and balance.

The evidence available to support the efficacy of THR for children with ASD is limited. Davis et al. (2015) reviewed the current literature on animal-assisted interventions for children with ASD. These authors identified six studies measuring changes in social skills, communication, and autism symptomology for children with ASD following THR. Four of the six studies were classified as having insufficient evidence to support the use of THR. The other two studies were classified as having a preponderance of evidence (Bass, Duchowny, & Llabre, 2009; Gabriels et al., 2012), with a number of limitations identified. For example, Bass and colleagues found that children with ASD exposed to 12 weeks of THR showed significant improvements in standardized measures of social functioning as compared to a control group. However, the positive results are difficult to interpret because the authors did not include any direct measures of behavior, the raters (i.e., participant's parents) were not blind to the purpose of the study, and several participants received other treatments (e.g., speech therapy) simultaneously with THR.

Jenkins and DiGennaro Reed (2013) evaluated the effects of THR for seven children with ASD using a single-case experimental design. These authors extended previous research on THR by incorporating direct measures of behavior change following the initiation of THR. Specifically, the experimenters directly measured changes in participants' affect, language, off-task behavior, compliance with demands, and problem behavior during activities at an afterschool program (e.g., games, snack, academics), at home, and during THR sessions. The results showed that THR did not result in clinically significant improvements from baseline for any of the dependent variables. Given the current lack of well-controlled studies demonstrating positive outcomes with THR, caregivers should be cautious when considering THR as a component of treatment for children with ASD.

How to Determine the Evidence of Treatment for a Client

Behavior analysts frequently work as part of a treatment team to provide services to a client. The behavior analyst may be the only person on the team who has familiarity with substantiated and unsubstantiated treatments for individuals with ASD. Thus, other treatment team members may suggest the use of an unsubstantiated intervention (including novel interventions that do not yet have research support) with a client. These recommendations can create an ethical dilemma for behavior analysts who have to maintain a professional working relationship with members of the treatment team while maintaining intervention practices that are in the best interest of the client (Behavior Analyst Certification Board, 2016). One of the most difficult ethical dilemmas may occur when a parent is adamant about the use of an unsubstantiated intervention with his or her child. If the intervention that the parent asks to use has not been the subject of any research, communicating the lack of research support for an intervention is not often a socially acceptable explanation for why alternative interventions should be considered. The remainder of this chapter will describe one example of how a behavior analyst could respond to this situation to maintain professional relationships with team members and evaluate the efficacy of the intervention with the client.

Identify and Define the Behavior(s) that the Intervention Purports to Address

A discussion of the behavior(s) that the unsubstantiated intervention putatively addresses can be helpful. It is possible that the team is unaware of the specific behavior(s) that the intervention may address, particularly if there are no published studies on the intervention. In this case, the team should identify the behavior(s) that the intervention will need to change in order to provide evidence for the benefits and continued use of the intervention. This discussion should result in the identification of specific behavior(s) and be accompanied by the development of an operational definition of each target behavior. Like all operational definitions, behavior should be observable, and the definition should facilitate objective data collection. In addition, the data collection system for the target behavior should be identified and agreed upon by the team. For example, the team may agree to collect frequency data on aggressive behavior during 30-min observation periods at approximately the same three times of day (9 am, 1 pm, and 6 pm).

The team also should decide on a time line for evaluating the intervention. If the intervention is reported to have immediate effects, the treatment time line may be relatively brief. However, intervention that may take time to change behavior (e.g., an SSRI) may require a longer evaluation period. Determining the potential length of treatment in advance will decrease the likelihood that the intervention is implemented for longer than necessary if the intervention is not having the intended effect on behavior.

Data Collection and Analysis

The individual(s) who will be responsible for data collection should be identified and trained to reliably record behavior. The field of behavior analysis sets reliability standards at a minimum of 80%. Thus, two independent data collectors should agree on the occurrence and nonoccurrence of behavior during at least 80% of recording opportunities, and comparison data should be collected during 30% of intervention intervals, if possible. The behavior analyst should volunteer to conduct training on data collection, participate in data collection (if possible), monitor the behavior during the evaluation period in a format that allows for visual inspection of data (e.g., a graph), and calculate the reliability of data to ensure that the field standards are upheld.

Data on target behavior(s) should be collected prior to the implementation of the intervention to establish a baseline. Collect data on each target behavior separately in case one behavior is more or less affected by the intervention than the other behavior(s). The behavior analyst should explain the purpose and necessity of baseline data collection, which is (a) used to predict patterns of behavior in the absence of intervention and (b) compared to data obtained during the intervention to determine an effect. Although it may be difficult for an eager treatment team to wait to implement the intervention while baseline data are collected, a discussion of the benefits of baseline data in initial team meetings (e.g., when the intervention is initially discussed) may assuage the team's concerns. The behavior analyst should attempt to collect enough baseline data (a minimum of three points, but more if data are variable or there is a trend in the direction of the treatment effect) to predict behavior in the absence of the intervention.

When the intervention is implemented, data collection should continue to occur in an identical manner to baseline. Occasionally, an unexpected behavior may emerge during intervention (e.g., excessive saliva secretions from the mouth). Rather than changing the data collection for existing target behavior, data on the new behavior should be collected simultaneously but separately. For example, calculations of the frequency of saliva exiting the mouth should be separated from calculations of the frequency of the other target behavior(s).

Ongoing meetings could occur to review data on the progress of intervention as a treatment team. During these meetings, the behavior analyst will show the treatment team the graphical depiction of data, explain the graph using language that everyone on the team can understand, and describe any treatment effects noted in the graph. If behavior does not change, that previously agreed-upon length of time that the team will conduct the intervention should be reviewed. If the intervention changes behavior in the intended direction (i.e., target behavior improves), the behavior analyst could suggest a brief reversal to baseline, if appropriate to the target behavior. It is important that the behavior analyst explain that the brief reversal is used to ensure that the observed treatment effect is caused by the intervention and not some other event that happened to occur at the same time that the intervention began (i.e., an extraneous variable). It may be difficult to convince the treatment team to remove an effective treatment, even if only for a brief time. The behavior analyst could remind the team of the effort in implementing the intervention in the long term and the benefits of ensuring that the effort dedicated to treatment is worthwhile by confirming that the intervention is the cause of the behavior change.

Discussing potential steps of treatment (i.e., baseline, treatment, brief withdraw of treatment, reinstatement of treatment) in initial team meetings and prior to implementation may make it more likely that the team agrees to withdraw treatment if an effect is observed. If the behavior analyst anticipates that the team will not agree to a reversal to baseline, or if a reversal design is not appropriate for the target behavior (e.g., the intervention seeks to teach a novel skill), other designs (e.g., multiple baseline across settings or behaviors) may be another way to demonstrate the effects of the intervention on behavior during the treatment evaluation.

If the team agrees to withdraw the intervention, additional baseline data are collected to determine whether baseline levels of behavior are recaptured. It is possible that target behavior will continue at the same level as when the intervention was in place. If this occurs, the team may decide to continue with baseline data collection to see if behavior change maintains over a long time period or eventually returns to the initial baseline level. The behavior analyst should explain that this pattern of behavior indicates that either the treatment effects are maintaining in the absence of intervention or the observed effect was the result of some extraneous variable and not due to the intervention. If behavior returns to previous baseline levels, the intervention should be reinstated and data collection continued.

Although there are other strategies that a behavior analyst and treatment team can use to evaluate the efficacy of an intervention, the description in this chapter is an example of one possible sequence of events. Regardless of the course of action determined by the treatment team, evaluating the efficacy of any non-substantiated intervention used with the client should be a consistent goal. The use of substantiated interventions can lead to more efficient skill acquisition and greater reductions in problem behavior. Thus, whenever possible, clients should receive substantiated interventions to produce the best intervention outcomes for individuals with ASD.

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Ethical Considerations Regarding Treatment

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Ethical Considerations Regarding Treatment

All decisions regarding treatment for autism spectrum disorder (ASD) can be regarded as ethical issues, as treatment has direct and lasting impact on the functioning of an individual and their family members. To maximize outcomes while minimizing harm, professionals in the ASD field must carefully consider many factors related to the ratio between benefit and risk when selecting intervention components and in the course of treatment implementation. The purpose of this chapter is to highlight and discuss several ethical considerations in the context of common ASD treatments.

Ethical codes for professional practice have been established for specific disciplines by organizations, such as the American Psychological Association (APA), which outline general principles and provide an overview of conduct governance. These formal guidelines help to provide a framework for making ethical decisions when working as a clinician and a researcher. Several historical events contributed to the development of these formal ethical codes; one of the most well known was the Nuremberg trials following unethical medical experiments conducted on prisoners of war during World War II. These trials led to the establishment of the Nuremberg Code, which highlights the necessity of voluntary, informed consent for human participants in research; additional emphasis was placed on preserving participant safety (The Nuremberg Code, 1947). The Declaration of Helsinki was later developed to expand the Nuremberg code and further address clinical research. A key component of this declaration is the principle that "it is the duty of the physician to promote and safeguard the health, well-being and rights of patients" (World Medical Association, 1964). In response to the unethical research practices used in the Tuskegee syphilis experiment, the Belmont Report was created in 1974 and outlined three central ethical principles that continue to be emphasized both in research and in practice today:

1. Respect for persons (i.e., that individuals be able to make their own decisions regarding participation and that those with diminished ability to make their own decisions are entitled to extra protections)
2. Beneficence (i.e., to protect the safety and well-being of the participant)
3. Justice (i.e., analysis of the distribution of risks and benefits; Department of Health, Education, and Welfare, 1978)

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These origins for ethical practice influenced the basis for the future of psychological work. The APA's "Ethical Principles of Psychologists and Code of Conduct" focuses on five fundamental principles for effective and ethical professional practice: beneficence and nonmaleficence, fidelity and responsibility, integrity, justice, and respect for people's rights and dignity. The APA also emphasizes the importance of competence, education and training, privacy and confidentiality, and human relations (e.g., conflict of interest, multiple relationships). Specific guidelines for assessment and therapy are also outlined (e.g., obtaining informed consent for testing and treatment decisions, planning for termination of therapy, maintaining confidentiality, avoiding multiple relationships in therapy; APA, 2010).

Intervention for individuals with ASD can be particularly complex due to the variability in symptom presentation across individuals, making careful ethical considerations imperative for effective practice. As such, focus is needed on ethical issues related to ASD treatment recommendations and implementation included and beyond what is detailed in relevant ethical guidelines. First and foremost, treatment recommendations made by clinicians should be evidence-based. This is especially relevant to the ASD population, as there are many unsubstantiated treatments that have emerged in recent years. Clinicians are obligated to be informed on the efficacy of different treatments and to consider the impact of individual client characteristics when determining appropriate intervention approaches. Beyond empirical support, there are several other important considerations for treatment planning. These include, but are not limited to, intrusiveness, cost, time commitment, and negative side effects. Many treatments can be expensive and intensive, requiring a great deal of time and effort from parents as well as professionals. These factors can impact parental preference for treatments and choices related to intervention planning. However, despite potential inconveniences associated with more intensive treatments, the possible benefits for the individual may well outweigh these drawbacks. Therefore, clinicians are ethically responsibility to help caregivers make these informed decisions.

As intervention programming guided by the principles of applied behavior analysis (ABA) is considered the gold standard of autism treatment, a majority of this chapter will focus on ethical considerations specifically related to ABA. However, topics related to psychopharmacology and alternative treatment options also warrant attention and will be discussed below. The chapter will conclude with discussion of the concept of informed choice.

Applied Behavior Analysis

Treatment using ABA strategies is currently the only evidence-based option for children with ASD and has been shown to produce, on average, comprehensive and lasting effects (Eldevik et al., 2009; Foxx, 2008). ABA involves applying methods derived directly from the scientific principles of learning and behavior (e.g., operant conditioning) in order to encourage socially significant behavior change. Methods commonly used to teach skills are discrete trial training and natural environment teaching; procedures like positive reinforcement, shaping, fading, and prompting are often used within these teaching procedures (Foxx, 2008). ABA programming, especially when applied to younger populations within early intensive behavioral intervention (EIBI), is both intensive (e.g., 20–40 h/week) and long term (e.g., for 2 or more years). Treatment is comprehensive and individualized in that all skill deficits and behavioral excesses present in a child will be operationally defined and systematically targeted (Green, Brennan, & Fein, 2002). In addition, intervention often occurs in small groups or in a one-on-one adult-to-child setting to encourage skill acquisition. Other factors stressed within ABA programming include thorough and objective progress monitoring and goal setting as well as planning for maintenance and generalization of skills (Foxx, 2008).

Beginning in the 1980s, evidence for the effectiveness of ABA strategies with individuals with ASD has grown exponentially (Foxx, 2008; Virués-Ortega, 2010). ABA has been shown to produce large gains in intellectual functioning, language, adaptive behavior, and social skills and has led to improvements in autism symptoms and challenging behaviors (Darrou et al., 2010; Eldevik et al., 2010; Foxx, 2008; MacDonald, Parry-Cruwys, Dupere, & Ahearn, 2014; Reichow, 2012; Virués-Ortega, 2010). Though there is an abundance of evidence supporting the use of ABA as the primary treatment for children with autism, there are several ethical considerations in the realm of ABA treatment that warrant attention. The Behavior Analyst Certification Board (BACB) does a thorough job outlining guidelines to ensure Board Certified Behavior Analysts (BCBAs) act ethically and responsibly in their professional activity (BACB, 2014). Some ethical obligations defined in the BACB codes mirror that of the APA ethical guidelines (e.g., boundaries of competence, obtaining consent, client right to effective treatment, remain up-to-date on scientific knowledge and make treatment decisions based upon this knowledge, reduce conflict with other professions); however, some are specific to behavior analysts (e.g., appraise effects of any treatment that may impact the goals of behavior change, objectively define goals of treatment and conduct risk-benefit analysis on the procedures to be implemented, uphold and advance the values, ethics, and principles of behavior analysis; APA, 2010; BACB, 2014; Schreck & Miller, 2010).

Ethical Considerations Regarding Effectiveness

According to both the APA and the BACB guidelines, we are professionally and ethically obligated to provide our clients treatment that works. However, there are several factors that must be considered within that. Though ABA has been shown to produce large gains on a group level, researchers have found that improvements in a given individual can vary widely. This differential response may be explained by a variety of factors related to the client as well as to the treatment procedure (Klintwall, Gillberg, Bölte, & Fernell, 2012). Ethical considerations related to these factors will be discussed in the following sections.

Client Characteristics

Client characteristics that predict responsiveness to ABA treatment components have not been fully identified which makes providing recommendations of best treatment options for a given individual with ASD difficult (Kamio, Haraguchi, Miyake, & Hiraiwa, 2015; Smith, Klorman, & Mruzek, 2015). Although research is inconsistent, the factors that have been most notably implicated in ABA and EIBI outcomes are ASD severity, intellectual functioning, and age (Kamio et al., 2015). In regard to autism symptomology, individuals with milder presentations of ASD at the start of treatment demonstrate greater improvements through treatment. This is particularly true for individuals with less severe social and language impairments (Sallows, Graupner, & MacLean, 2005; Smith et al., 2015). IQ is also a large predictor in treatment outcomes; children with ASD and comorbid intellectual impairments are less likely to show large gains compared to children with ASD and typical intellectual functioning (Sallows et al., 2005).

Lastly, there has been a substantial amount of research indicating the earlier a child is enrolled in treatment, the better the outcomes will be (Granpeesheh, Dixon, Tarbox, Kaplan, & Wilke, 2009; MacDonald et al., 2014; Smith et al., 2015). For example, children who begin treatment at younger ages have been found to make larger gains in IQ, adaptive functioning, and, to a lesser extent, social interaction and social communication abilities and ASD symptomology (Smith et al., 2015). Of note, there is limited data available demonstrating treatment effectiveness for children with ASD under 3 years old (Vismara, Colombi, & Rogers, 2009). Also in need of more research is the application of ABA principles to issues relevant to adult autism populations. Research and policy currently focus more attention on child populations, and though gains in childhood could prevent poorer prognosis in adulthood, there are many more adults with autism than there are children (Jang et al., 2014; Matson, Turygin, et al., 2012). While race, ethnicity, socioeconomic status, and area of residence have never been linked to treatment outcome, there is also a scarcity of research examining the effectiveness of ABA programming on underrepresented populations (Lord et al., 2005). Therefore, clinicians should be aware that direct evidence for the effectiveness of different treatment protocols is not available for many ethnic minorities, non-English speaking children, and individuals living in rural areas when recommending interventions or intervention planning (Lord et al., 2005).

Within the variability in responsiveness to ABA across individuals with ASD, there appears to be a small but significant subset of children who achieve a level of functioning that is indistinguishable from typically developing peers (Green et al., 2002; Matson, Tureck, Turygin, Beighley, & Rieske, 2012; Ozonoff, 2013; Smith et al., 2015). Lovaas (1987) was the first to label a group of children with ASD who achieved typical education and intellectual functioning post-treatment as "recovered" (Ozonoff, 2013). Since then, the concept of a cure or recovery from autism has grown; though, an objective and consistent definition of what recovery entails has yet to be provided (Bölte, 2014; Ozonoff, 2013). Evidence is available demonstrating that some children with ASD who undergo intensive ABA treatment no longer meet criteria for ASD post-treatment and that EIBI can alter brain development (Ozonoff, 2013); however, this occurs for only some children. Many children will not experience these large gains in functioning. Further, the children that do show dramatic gains in certain areas may continue to experience significant impairments in other domains of functioning (Warren et al., 2011).

Given this variability in individual outcome, use of the term "recovery" or "cure" in the marketing of ABA programming would be ethically problematic. Doing so may instill false hope in many families affected by ASD, as many children do not reach this outcome. This is particularly true for children with more severe ASD symptoms, low intellectual functioning, and who start ABA treatment at later ages. The concept of recovery may also change parental perceptions. When the only caregiver goal is to have their child no longer meet criteria for ASD, significant gains in symptomology may be ignored if they do not translate to normal functioning. Although the majority of children will not recover, progress can be made toward improved quality of life for individuals with ASD and their families. Therefore, other optimal outcomes need to be discussed with caregivers, and discussion of recovery should be avoided (Ozonoff, 2013; Warren et al., 2011).

Treatment Characteristics

Within the realm of ABA programming for individuals with autism, there is also a wide variety in how intervention is planned and implemented; there are many different intervention agents and supervisory models, treatment settings, and treatment intensities (Romanczyk, Callahan, Turner, & Cavalari, 2014). Strict guidelines for appropriate treatment intensity and duration, treatment setting, therapist training and supervision, and treatment components for a given individual do not exist (Reichow, 2012). Therefore, clinicians need to consider individual characteristics and research support in making these intervention decisions when practicing ethically.

Treatment Intensity and Duration For decades, researchers have stressed the importance of treatment intensity and duration in the effective delivery of ABA services. Findings generally indicate that higher intensity (i.e., h/week of therapy) and longer duration (i.e., months/years that therapy is provided) interventions produce greater treatment effects (Romanczyk et al., 2014; Virués-Ortega, 2010). Some researchers suggest that there is a point of diminished returns when treatment intensity becomes too high (Reed, Osborne, & Corness, 2007; Virués-Ortega, 2010). For example, Reed and colleagues (2007) found that although children receiving high-intensity treatment (M = 30 h/week) had better outcomes than children receiving low-intensity treatment (M = 12 h/week), further increase of hours of therapy per week within the high-intensity group was not related to further gains. The authors suggested that this may reflect an exhaustion of treatment effects after a certain level and that 40 h/week of therapy may not be optimal for all individuals with autism (Reed et al., 2007). However, this point of diminished returns has not been found consistently in the research literature. For example, Granpeesheh and colleagues (2009) found only an increasing trend where the rate of treatment gains rose as a function of the number of treatment hours for children under 7 years old. In regard to treatment duration, most ABA programming lasts for 2 or more years. However, complete termination of clients following treatment is not recommended. Instead, encouraging clients to seek out comprehensive assessments at certain timepoints over the lifespan and providing booster sessions as needed would be more appropriate. This would help to prevent regression in skills and allow for swift intervention following any new behavioral concerns (Matson, Tureck, et al., 2012).

Given the variability in the research regarding optimal treatment intensity and duration, treatment decisions should be informed by individual client characteristics and family factors (Romanczyk et al., 2014). One client variable that should be considered is age. Granpeesheh and colleagues (2009) found a differential response to varying levels of treatment intensities by age. While children under 7 years old showed greater levels of skill mastery with increased treatment hours, there was no relation between treatment intensity and number of objectives mastered in clients over 7 years of age (Granpeesheh et al., 2009). Further, due to the limited data available for very young children with ASD, there is no clear start point for when to begin therapy or for how much therapy young children should receive. Therefore, as the average age of ASD diagnosis continues to decrease, more research is warranted focusing on infants and toddlers in ABA programs (Matson & Konst, 2014).

Treatment Setting and Intervention Agent ABA programs can differ in the primary setting of treatment (e.g., one-on-one or group therapy in home- or clinic-based sessions) and the primary intervention agent (e.g., parents or behavior therapists). In regard to differential effectiveness of home-based versus clinic-based programs as well as parent-directed versus therapist-directed treatment, research evidence has been mixed. Some researchers have found no differences in outcomes related to treatment setting and intervention agent; though, others have shown that significantly more improvement occurs in clinic-based, therapist-directed programs (Reed et al., 2007; Virués-Ortega, 2010). Because of the inconsistency in research findings, it is important that clinicians use clinical judgment and consider client and family variables (e.g., preferences, feasibility, client symptom presentation) when deciding on treatment format. Clinic-based, therapist-directed, one-on-one treatment offers greater environmental control and thus encourages faster skill acquisition, while home-based, parent-directed treatment and group therapy offer a greater opportunity for skill generalization to more naturalistic settings and across individuals. Therefore, many ABA programs use a combination of treatment formats (i.e., a mixture of parent- and therapist-directed treatment within home- and clinic-based sessions) to take advantage of the benefits of each approach (Fava & Strauss, 2011).

Training and Supervision Most ABA services are provided within a tiered framework where a BCBA designs a treatment protocol and behavior technicians implement the protocol; this aids in cost-effectiveness as BCBAs can then manage several cases simultaneously and behavior technicians can provide a majority of direct services at lower costs. However, this model brings additional ethical considerations such as ensuring sufficient training and supervision of technicians and tracking treatment fidelity in addition to treatment effectiveness (Fisher et al., 2014; Romanczyk et al., 2014). Though the field has historically lacked consensus and formal guidelines regarding necessary skill development for behavior technicians, the BACB recently introduced the registered behavior technician (RBT) credential in attempts to standardize training of staff providing these direct services (Fisher et al., 2014). Within the RBT credential, the BACB requires technicians be trained and assessed in their knowledge and performance related to measurement, skill acquisition and behavior reduction procedures, documentation and reporting, and professional conduct (BACB, 2013). This new credential is encouraging. However, like any system-wide change, the RBT certification may take time to be fully adopted by ABA providers to the point where comprehensive evaluation of improvement in staffing can take place.

Additionally, the training required for the RBT credential is not provided directly by the BACB; instead, ABA agencies and BCBA supervisors design and carry out their own training programs (BACB, n.d.). Though, there is limited research available related to best practice for training intervention agents (e.g., behavior technicians, parents) to provide ABA treatment for individuals with ASD (Fisher et al., 2014). At current, a combination of didactic training on the conceptual bases of ABA treatment and in vivo training on the implementation of treatment plans appears optimal. Understanding the conceptual foundations of ABA strategies is important for problem-solving within intervention sessions when immediate supervision is not available (Granpeesheh et al., 2010); and, fidelity in conducting intervention plans is imperative for treatment effectiveness (Fisher et al., 2014; Klintwall et al., 2012). In regard to training modalities, evidence exists supporting the use of virtual training programs in improving knowledge of ABA principles in behavior technicians and parents as well as enhancing the accuracy of treatment delivery in behavior technicians (Fisher et al., 2014; Granpeesheh et al., 2010; Jang et al., 2012). Virtual training appears optimal because it is not only an effective method of training, but it is also convenient and accessible (Fisher et al., 2014).

The quantity (i.e., amount and frequency) and quality (i.e., supervisor credentials and experience) of supervision are also big factors to consider when practicing ethically as a behavior analyst (Romanczyk et al., 2014). In regard to quantity, researchers have shown that supervision intensity is significantly related to client outcomes (Romanczyk et al., 2014). Behavior technicians who noted receiving high levels of supervisor support also reported less emotional exhaustion and a greater sense of accomplishment and therapeutic self-efficacy in their work (Gibson, Grey, & Hastings, 2009). However, supervisors must be qualified to design treatment plans and provide feedback on their implementation for supervision intensity to be meaningful. In practice, supervisors are frequently BCBAs. As previously mentioned, the BCBA is a certificate available through the BACB. This credential is beneficial in that it ensures all practicing behavior analysts are trained in the same content and thus have a more uniform and comprehensive skillset when graduated. Individuals seeking the BCBA credential must also pass a certification examination assessing an extensive collection of important competencies. Once an individual earns a BCBA, continuing education requirements exist to ensure the maintenance of proficiency over time. Though the BCBA certification is useful in providing standardization in training and practice, a BCBA is not adequate to supervise any given case (Shook, 2005). Clinicians are ethically required to be aware of their boundaries of competence; if a client presents with a problem the supervisor has little experience in addressing, the behavior analyst is responsible for referring the client to appropriately qualified professionals and/or seeking supervision from qualified individuals on the case (Shook, 2005). Of note, the BACB also offers a Board Certified Assistant Behavior Analyst (BCaBA) certification that requires an individual hold a bachelor's degree as opposed to the BCBA's master's degree requirement. Individuals who earn BCaBAs practice under the supervision of BCBAs and are responsible for upholding the same ethical standards of practice.

Intervention Components There are several strategies used within ABA that warrant attention in regard to ethical practice. The first relates to the functional analysis of potentially harmful behaviors (e.g., self-injury, aggression). Functional analysis is an important assessment tool that allows for the experimental determination of the cause of behavior and involves systematically exposing clients to various controlled conditions to measure changes in rates of behavior. When the function of behavior is able to be determined, controlling variables can then be manipulated within an intervention plan to reduce or eliminate problem behavior more effectively; therefore, there are substantial benefits to conducting functional analyses. However, the process involves temporarily exposing clients to conditions that will make potentially dangerous behaviors more likely to occur. Therefore, functional analyses should be conducted by competent clinicians when determined necessary (e.g., when indirect measures fail to produce clear results), and specified termination criteria and safeguards should be in place to protect both clients and assessors (Poling, Austin, Peterson, Mahoney, & Weeden, 2012; Poling & Edwards, 2014). For in depth discussion regarding ethical considerations specific to functional analysis, refer to Poling et al. (2012).

The use of punishment in ABA programming has been a center of controversy for some time as well. According to the BACB ethical guidelines, reinforcement procedures should be employed above punishment procedures and, when punishment procedures are implemented, reinforcement-based procedures should be used concurrently (BACB, 2014). Further, the implementation of punishment-based strategies in schools and clinical settings is restricted, and many advocacy groups strongly oppose the use of punishment. However, many behavior analysts have conflicting opinions regarding the ethics of punishment; and, much of this conflict comes from how punishment is defined (Poling & Edwards, 2014). Punishment and negative reinforcement strategies are often categorized as “aversive” procedures because of their potentially unpleasant effects to clients. However, researchers and clinicians in the field do not agree with this label particularly because many behavior change strategies may produce discomfort or unpleasantness but clearly benefit clients (e.g., discrete trial training [DTT]; Poling & Edwards, 2014). In addition, for decades, researchers have shown that punishment procedures are effective in reducing problem behavior. Though concerns have been raised regarding difficulties with maintenance and generalization of treatment gains and a potential for negative side effects when using punishment and negative reinforcement procedures, the same concerns again have been noted for many other behavior change strategies (Gerhardt, Holmes, Alessandri, & Goodman, 1991; Poling & Edwards, 2014).

The substantial problem resulting from strict opposition to punishment and negative reinforcement procedures relates to the possible failure to provide the most effective treatment available for clients. For example, researchers have found that punishment leads to a faster cessation or reduction of problem behavior in comparison to reinforcement-based techniques and therefore may be a better treatment option for intense and dangerous self-injurious behavior or aggression (Gerhardt et al., 1991). Withholding this treatment option would then be considered unethical. On the contrary, the implementation of punishment and negative reinforcement strategies by untrained professionals holds potential for abuse of clients (Gerhardt et al., 1991). Therefore, perhaps “aversive procedures” need not be restricted in practice but better controlled through comprehensive training and monitoring of behavior analysts. In sum, clinicians agree that ethical treatment involves special consideration of what procedures work best for a particular client. Sometimes, punishment or negative reinforcement procedures may present as the best option available for a given presenting problem (Poling & Edwards, 2014). In these cases, Gerhardt et al. (1991) recommend reflecting on several points. First, the intent of imposing the discomfort associated with the use of punishment and negative reinforcement strategies should be considered. Second, the risks and benefits of the application of these procedures should be measured. Lastly, clinicians should ensure appropriate safeguards are in place to protect the client.

The last issue that will be discussed related to ethical considerations in intervention plan components involves the incorporation of empirically unsupported treatments within ABA programming. Although the BACB ethical guidelines clearly state that BCBAs must use scientifically validated treatments, researchers have shown that a small but concerning percentage of professionals reported using unsupported treatments as well (BACB, 2014; Schreck & Mazur, 2008; Schreck & Miller, 2010). Given the increasing number of individuals seeking BCBA credentials and the growing number and popularity of unsupported treatments available for autism, Schreck and Mazur (2008) call for the need to improve education of BCBAs regarding unsupported interventions to encourage more ethical clinical practice.

Additional Factors to Consider

Family strain is an important variable to consider when providing treatment to clients with ASD. Families raising children with ASD report elevated levels of internalizing symptoms, and level of parental stress has been shown to effect behavioral treatment outcomes (Fava & Strauss, 2011; Schwichtenberg & Poehlmann, 2007). Therefore, the incorporation of family-level intervention components may be important for effective and ethical treatment delivery. Further, fewer depressive symptoms have been reported by mothers of children with ASD who receive more hours of ABA therapy per week indicating that ABA programs serve as a resource for families. However, mothers reported more personal strain when they spent more hours per week directly involved in their child's ABA therapy. Therefore, parental involvement in therapy should be individualized, and an open line of communication should exist between behavior analysts and parents to ensure productive and willing caregiver participation in treatment (Schwichtenberg & Poehlmann, 2007).

The financial expense involved in providing quality, optimal intensity ABA services should also be considered. Though ABA has proven cost-effective in the long term for children who receive early and intensive ABA intervention, initial costs are substantial ($40,000–100,000 per year; Chasson, Harris, & Neely, 2007; Kornack, Persicke, Cervantes, Jang, & Dixon, 2014). While funding sources exist and policies regarding autism treatment funding are growing in prevalence, the financial responsibility is often placed on state and federal government bodies, private insurance providers, and families of individuals with ASD. However, acquiring appropriate and sufficient funding is a complex task that often requires great persistence on the part of the individual's caregivers (Kornack et al., 2014). Clinicians should be cognizant of these difficulties and provide assistance when able. According to the BACB ethical guidelines, clinicians are even ethically responsible for advocating for the necessary level of services needed to meet intervention goals. However, when unable to achieve complete funding, the ethics of providing a treatment intensity that matches the availability of financial resources rather than the individual's need should be considered.

Beyond the financial cost, barriers such as long waitlists and a lack of providers in a given geographical region are important to consider. Optimal treatment may not always be accessible, so clinicians are often required to make alternative recommendations. To address the waitlists associated with ABA programs, professionals have highlighted the importance of parent training programs that could support caregivers in acting as intervention agents while waiting for program enrollment (Vismara et al., 2009). Further, we hope that individuals living in rural areas will experience improved access to behavioral interventions given the growth in virtual training opportunities for parents and caregivers as well as the increase in individuals seeking the BCBA certification.

Psychopharmacology

Although there are no approved pharmacological treatments specifically targeting the core symptoms of ASD (Mohiuddin & Ghaziuddin, 2013; Murray et al., 2013; Steckler, Spooren, & Murphy, 2014), pharmacotherapy among individuals with ASD is widespread. Studies of insurance claim databases have revealed that psychotropic drugs are prescribed to the majority of children, adolescents, and adults with ASD (Esbensen, Greenberg, Seltzer, & Aman, 2009; Mandell et al., 2008; Williams et al., 2012). Given the high prevalence of psychotherapeutic drug use, there is a pressing need for practitioners to be aware of the research base, related ethical issues, and practice guidelines for psychopharmacology among this population.

Research Base

Psychotropic medications have been found to be the most commonly prescribed class of medications to individuals with ASD (Esbensen et al., 2009; Rosenberg et al., 2009), with rates of prescription increasing over time (Aman, Lam, & Van Bourgondien, 2005). Older ages, co-occurring psychiatric diagnoses, and greater use of ASD-related services were found to increase the likelihood of the prescription of psychotropic medication (Mandell et al., 2008). The prescription of psychotropic drugs to very young children is also common. A study of 2008 Medicaid claims in the state of Kentucky revealed that psychotropic medications were prescribed to 79% of children with ASD between 1 and 5 years, 92% between 6 and 12 years, and 95% between 13 and 18 years (Williams et al., 2012). Non-psychotropic medications (e.g., anticonvulsants) have also been found to be prescribed at high rates among this population (Witwer & Lecavalier, 2005).

Psychotropic medications, such as antipsychotics, are commonly used to treat challenging behaviors such as aggression and self-injurious behavior among individuals with ASD and other developmental disorders (de Kuijper et al., 2010; Matson & Dempsey, 2008; Mohiuddin & Ghaziuddin, 2013). However, many researchers in the field have noted concerns about the lack of evidence supporting pharmacological treatment for challenging behaviors (Deb, Sohanpal, Soni, Lentre, & Unwin, 2007; Edelsohn, Schuster, Castelnovo, Terhorst, & Parthasarathy, 2014; Matson & Mahan, 2010; Tsiouris, Kim, Brown, Pettinger, & Cohen, 2012). These medications are generally used for their sedative effects rather than their therapeutic effects (Gualtieri & Hawk, 1980; Matson & Mahan, 2010; Sturmey, 2015).

The pro re nata (PRN; as needed) use of psychotropic medications to calm and sedate individuals with developmental disorders is common; however, these medications are also used continuously and as the main form of treatment for behavioral concerns (Sturmey, 2015). The use of psychotropic medications has been considered a form of restraint, as the intention is to control an individual's behavior or movements (Sturmey, 2015); therefore, thoughtful ethical considerations should be made in the decision-making process of prescribing professionals. The rationale behind PRN and routine use of psychotropic drugs to treat challenging behaviors is to increase the safety of the individual and others. However, there is limited research to support this justification as well as emerging contradictory evidence. A study found that eliminating the use of PRN in a psychiatric hospital over a 15-month period resulted in a reduction in injuries to patients and staff, rather than an increase (Smith et al., 2008). Additionally, longitudinal analysis of prescription patterns over 4.5 years revealed that once an individual with ASD is prescribed a medication, it is very unlikely that the prescription will be discontinued (Esbensen et al., 2009). This suggests that pharmacotherapy is seldom used as a temporary treatment option among this population and that the initial decision to treat an individual with medication has lasting effects.

Adverse side effects related to the use of psychotropic medication have been widely noted. These include short-term effects such as irritability and weight gain, as well as long-term side effects, such as tardive dyskinesia (Matson & Hess, 2011). Risperidone, one of the most commonly prescribed medications in this population, has been linked to significant weight gain, drowsiness, dizziness, and tardive dyskinesia in children with ASD (Lemmon, Gregas, & Jeste, 2011; McCracken et al., 2002). Further, it should be noted that the long-term effects of psychotropic medication use begun at young ages and continued through development are still unknown.

Research on the effects of psychotropic medication has several major methodological limitations that must be mentioned. Most notably, as mentioned, the long-term effects of psychotropic medication are still unknown, especially among individuals with ASD. This is particularly concerning given the young ages at which these medications are commonly prescribed. Additionally, very little research has been conducted examining the effects of multiple medications being administered simultaneously. Similarly, there is limited research on the use of pharmacological treatment among individuals with comorbid disorders, which is problematic given the high rates at which ASD co-occurs with other disorders and medical conditions (Matson & Dempsey, 2008). As many studies on pharmacological treatment are funded by pharmaceutical companies, there is also the potential for bias to influence research findings (Matson & Konst, 2015).

Guidelines

Although no professional organizations have formal guidelines regarding pharmacological treatment for individuals with developmental disabilities, several researchers have put forth recommendations. Deb et al. (2009) proposed a set of guidelines for the use of psychotropic medication specifically in relation to managing challenging behaviors in adults with intellectual disabilities; however, we believe that they are useful in relation to individuals with ASD of all ages and level of functioning. Their recommendations are summarized below as well as in Table 3.1:

Table 3.1 Guidelines for use of psychotropic medications to treat challenging behaviors, as adapted from Deb et al. (2009)

1. Challenging behaviors should be clearly identified and functional assessment conducted prior to beginning pharmacological treatment
2. Medication-based treatments should be considered if there is an obvious physical or psychiatric cause to a behavior or if a non-medication-based intervention poses harm or has been unsuccessful
3. The effects of medication should be monitored at regular intervals
4. Communication about the pharmacological treatment should be clear

1. *Challenging behaviors should be clearly identified and functional assessment conducted prior to beginning pharmacological treatment.* Causes and consequences of the behavior should be determined through a functional assessment in order to consider all behavior management options. The benefits and risks of a behavior management intervention should be considered.
2. *Medication-based treatments should be considered if there is an obvious physical or psychiatric cause to a behavior or if a non-medication-based intervention poses harm or has been unsuccessful.* Deb et al. (2009) discuss several situations in which medication might be considered over non-pharmacological treatments, including when a behavior poses a risk of harm to an individual or others; if the behavior occurs at high severity or frequency; if an individual is at risk of losing an educational, vocational, or treatment placement due to the behavior; to help increase responsiveness to another intervention; or if there is evidence that an individual previously responded well to medication. The use of medication should always be in the best interest of the individual.
3. *The effects of medication should be monitored at regular intervals.* Data on both the effectiveness of a medication and its possible negative effects should be collected regularly and monitored. Further, Deb et al. (2009) recommend that medications should be prescribed at the lowest effective dosage within the standard recommended dosage range, that doses should be started low and titrated up, that medication should be used only for the minimum amount of time necessary, and that non-pharmacological treatment options should be considered throughout the medication management process.
4. *Communication about the pharmacological treatment should be clear.* Caregivers and individuals, to the greatest extent possible, should be provided information about the pharmacological treatment and the plan for

medication management. Potential side effects should be discussed and appropriate actions in response to adverse events reviewed. Other professionals working with the individual should receive communications related to the treatment on a "need-to-know" basis.

Given the range and seriousness of potential side effects and the gaps in the literature, it is important that clinicians carefully consider the risk/benefit ratio when considering pharmacological treatment with individuals with ASD. Clinicians and caregivers should be familiar with the research on specific medications and be aware of the potential risks to ensure informed choice. It is recognized that medication management is appropriate and necessary in the treatment of certain presentations of ASD (e.g., when safety is at risk, when challenging behaviors are chronic, severe, and unresponsive to prior treatment; Matson & Dempsey, 2008). Therefore, when pharmacotherapy is deemed an appropriate treatment choice, identifying and continuing to assess the dosage where benefits are maximized while adverse side effects are largely avoided is imperative. Further, a plan for future medication management should be devised proactively. Ultimately, as with all treatment, the aim should be to maintain benefits while minimizing harm to the greatest extent possible.

Popular Treatments with Minimal Empirical Support

Because there are a variety of alternative treatments available, each with varying levels of empirical support, the ethics surrounding the use of these interventions in autism treatment are more complicated. Though all interventions that depart from ABA should not be rejected (e.g., speech and language pathology, physical therapy), many popular treatments are scientifically unsupported and have been shown to have little-to-no efficacy. Some have even caused grave and dangerous side effects for clients with ASD (Poling & Edwards, 2014; Schreck & Miller, 2010). For example, holding therapy, secretin injections, and chelation therapy have all been presented as potential cures for autism but also have no empirical evidence for effectiveness and have been linked to serious and in some cases lethal physical consequences (Metz, Mulick, & Butter, 2005). Obviously, providing these potentially harmful therapies would be considered unethical, as does failing to inform caregivers of the risks of these treatment approaches as a professional working with clients with autism.

However, an ethical dilemma still exists when individuals with ASD are seeking out treatments that are not harmful but are also not effective. Such is the case for many fad treatments now available in the ASD field that are growing in popularity despite having inadequate empirical evidence (e.g., sensory integration training, Floortime; Metz et al., 2005; Poling & Edwards, 2014). When individuals choose to enroll in programs delivering unproven interventions, both time and money are poured into approaches that will likely lead to little improvement. Because time and financial resources are finite, these treatments can be perceived as detrimental as well (Shabani & Lam, 2013). This is particularly true given the research indicating that the largest gains are made in ABA therapy when children are enrolled at younger ages (Smith et al., 2015). Beyond time and financial costs to pursuing scientifically unproven but benign treatments, some treatment methods may hold other potentially negative side effects such as social stigmatization (Poling & Edwards, 2014; Shabani & Lam, 2013). For example, Poling and Edwards (2014) illustrate the use of weighted vests as treatment for autism. Though wearing a weighted vest is not necessarily physically damaging, it is socially aberrant and will likely affect peer interactions. Given these issues, professionals are ethically responsible to inform caregivers seeking these treatments of the likelihood for improvement as well as the financial and opportunity costs involved (Poling & Edwards, 2014).

Another issue is that a majority of caregivers choose an eclectic approach to therapy (i.e., incorporating components from many different intervention models into one treatment program) and/or use a variety of treatments simultaneously for their children with ASD (Foxx, 2008; Goin-Kochel, Mackintosh, & Myers, 2009). In fact, researchers have shown children with ASD are receiving on average between four and six different interventions simultaneously and have tried between seven and nine treatments in the past (Goin-Kochel et al., 2009). The popularity of this approach is most likely due to caregiver desire to provide the best for their child combined with an inaccurate perception that there is utility in every intervention available. However, there are many drawbacks involved in this approach. First, the more treatments employed by families of children with ASD, the more likely an ineffective and potentially harmful intervention will be incorporated. Further, receiving numerous treatments simultaneously may prevent or diminish improvement from an effective intervention because it cannot be provided at the intensity needed to produce the best outcomes. Last, separate intervention approaches may restrict or counteract each other's potential effectiveness. For example, Floortime and ABA may conflict with one another as Floortime emphasizes an unstructured therapeutic environment and certain components of ABA programming value structure in treatment (e.g., visual schedules, DTT; Foxx, 2008).

Given these issues with the implementation of unsupported treatments, it is imperative that professionals in the field are able to assist families in treatment choices and equip caregivers with the skills needed to evaluate intervention options for their children. In fact, both the APA and BACB ethical standards help to guide professionals against unsupported treatments. Both sets of guidelines state that practitioners should remain aware of scientific knowledge regarding treatment options, choose treatments based upon scientific knowledge, and recommend empirically supported and effective treatment approaches; the BACB guidelines go even further to state that behavior analysts should review and appraise likely effects of all alternative treatments that may influence behavior change programs (APA, 2010; BACB, 2014; Schreck & Miller, 2010). However, an interesting point raised by Poling and Edwards (2014) is the conflict between this guideline and the ethical obligation to practice within one's boundaries of competence. With the ever-increasing amount of alternative treatments developed from a variety of different fields (e.g., psychopharmacology, medicine, occupational therapy), an ethical risk exists for guiding parents on and appraising the effects of therapies for which the behavior analyst or psychologist has no training (Poling & Edwards, 2014). This highlights the importance of being both a competent practitioner and a competent scientist. Effective clinicians must be able to accurately evaluate relevant research for quality of methodology and strength of findings and then successfully inform caregivers of key conclusions.

While this can be a daunting task for a given professional, several organizations have sought to promote the use of empirically supported autism treatments by publishing comprehensive assessments of the strength of evidence for various intervention strategies. For example, the National Autism Center has completed two phases of the National Standards Project (NSP) that present the level of research supporting an extensive range of available ASD interventions. Within the NSP, empirical support is evaluated systematically by an expert panel of professionals in the autism field. Interventions are classified into three categories and separated by age of clientele targeted (<22 years old and ≥22 years old). The categories are established interventions (i.e., those treatments that have been thoroughly researched and have sufficient evidence for effectiveness), emerging interventions (i.e., those treatments that have one or more studies suggesting favorable outcomes but additional high quality studies are necessary to indicate effectiveness), and unestablished interventions (i.e., treatments that have little to no research evidence to draw conclusions upon regarding effectiveness; National Autism Center, 2015). These comprehensive appraisals published by expert groups, like the NSP, help practitioners in the task of evaluating treatments most likely to benefit their clients.

When families of children with ASD report already using an unsupported treatment, the best practice would again be to inform caregivers of level of research evidence for effectiveness.

Unsupported treatments are most often chosen due to cost-effectiveness, ease of implementation, and perceived benefits (Schreck & Mazur, 2008; Shabani & Lam, 2013). Further, caregivers and clients may already have strong rapport with current providers; so, recommendations to stop alternative treatments may be met with some resistance. In this case, professionals suggest either offering to take data or creating a data recording system for caregivers to systematically monitor whether the current treatment is leading to improvements (Goin-Kochel et al., 2009; Poling & Edwards, 2014). Concrete evidence from their own child's performance may be more substantial for parents than evidence from published research literature. To further promote the use of evidence-based treatments, researchers must also continue to compare the effectiveness and characteristics of established interventions versus emerging and unsupported interventions, and journals must publish treatment studies with null results (Schreck & Mazur, 2008; Shabani & Lam, 2013).

Informed Choice

Given the large number of treatments marketed for ASD, and the mass of information and misinformation regarding their outcomes, the evaluation of treatment options can be a complex task for parents and caregivers. As previously addressed, professionals can help families with this process by providing information about evidence supporting treatment efficacy, equipping families with the skills necessary to critically evaluate options, and guiding families in the decision-making process to reach an informed choice. Informed choice describes a decision made after full consideration of available information about treatment options along with the family's values (Marteau, Dormandy, & Michie, 2001). This is not only important when selecting treatment approaches and methodologies but also in relation to provider selection and determining treatment goals. Treatment decisions should be continually reassessed as an individual develops; as such, informed choice is a process in which families and professionals should be actively engaging throughout the course of treatment.

Table 3.2 Questions to ask regarding specific treatment, as adapted from Freeman (1997)

1. Will the treatment cause harm?
2. Is the treatment developmentally appropriate?
3. How will failure of the treatment affect the individual and the family?
4. Has the treatment been scientifically validated?
5. How will the treatment be integrated into the individual's current program?

When considering treatment approaches, families and professionals must consider potential risks, potential benefits, scientific support, and the needs of the individual. With so many factors to assess, this process can be daunting to even those who are well-informed. To aid in this process, Freeman (1997) outlined five questions to guide the evaluation a specific treatment (Table 3.2). First: *Will the treatment cause harm*? Potential physical risks should be carefully considered, as well as potential risks of emotional distress or social stigmatization. Beyond these more obvious risks, "harm" can also be conceptualized as the failure to improve outcomes. As discussed earlier, a particular treatment approach that results in failure to provide an individual exposure to another treatment that would be more beneficial can be considered harmful. The potential risks should be carefully weighed against any potential benefits.

The second question proposed by Freeman (1997) concerns the fit between the treatment and the individual: *Is the treatment developmentally appropriate?* This necessitates consideration of what is appropriate at various points in the lifespan as well as what is appropriate for an individual given their social context. For example, a treatment approach may be appropriate for a toddler but inappropriate for a teenager and vice versa. This question is also important to ask throughout the course of treatment as an individual matures.

Thirdly: *How will failure of the treatment affect the individual and the family?* ASD is a disorder that has lifelong implications for individuals. If family resources, whether emotional or financial, are exhausted on a specific treatment that does not deliver the expected results, there will be effects on both family functioning and the future treatment of the individual. As considering treatment choices within this larger framework of family functioning and long-term care may not be the first inclination of many parents, especially after first receiving an ASD diagnosis, clinicians and treatment providers should help families understand this broader context and the accompanying implications.

The fourth question proposed by Freeman (1997) addresses the quality of the evidence supporting a treatment: *Has the treatment been scientifically validated?* As discussed previously, professionals have a responsibility to inform families about the scientific validity of specific treatments. Practitioners should be intentional about helping families navigate and understand the quality and meaning of available evidence. Often, pseudoscientific claims are made about treatment approaches that can be difficult to distinguish from valid scientific evidence. Some "red flags" that may indicate lack of empirical support include treatment efficacy research that is conducted by the same person who founded the treatment approach, research that is not published in peer-reviewed journals, and treatments that promise quick results (Romanczyk & Gillis, 2005). If families are interested in experimental treatments, it is the responsibility of professionals to inform them about potential risks and available evidence, as well as to manage expectations regarding results.

The fifth question proposed by Freeman (1997) for use in evaluating a specific treatment concerns the potential effects on overall programming: *How will the treatment be integrated into the individual's current program?* Families and professionals should consider how a new treatment approach will affect distribution of time and resources for current and future treatment approaches. Freeman (1997) warns against "infatuation" with a specific treatment at the expense of treatments that target functional skills relevant to an individual's developmental level of functioning. Long-term goals of improving outcomes should be balanced against treatments that can provide support for the current needs of an individual.

Treatment decisions should also take into consideration the needs of a family. Interventions are commonly evaluated based on therapeutic outcomes for the individual with ASD while neglecting the overall family context. Each family has different strengths, barriers, values, and resources. Parent and family functioning is often impacted by having a child with ASD, and improvements in these domains have been linked to better therapeutic outcomes (Karst & Hecke, 2012). Decisions about treatment approaches and treatment goals for an individual should be made within the context of family functioning and relationships. Factors to consider include the role of family members within interventions, the effect on allocation of time and resources, the effect on parenting stress and mental health, and the priorities and values of a family. Professionals can help with this process by assessing family strengths and preferences, by discussing the role of the family within treatment approaches, and by monitoring the impact of intervention on family functioning during the course of treatment.

Choices about treatment methodologies and goals should be made based on careful consideration of the empirical evidence and the appropriateness for the individual and family. This is a complex process, as it involves both subjective evaluations (e.g., does the treatment approach align with the family's values?) and objective evaluations (e.g., is the treatment empirically supported?). As such, it may be helpful for both professionals and families to approach informed choice in a methodical manner by systematically identifying the specific needs of an individual, the priorities and preferences of the family, and the state of the evidence supporting a treatment.

Conclusion

Treatment decisions for individuals with ASD should aim to maximize long-term outcomes while minimizing harm. Professionals have an ethical responsibility to provide empirically supported treatments, as emphasized by both the

APA and BACB ethical codes. Currently, ABA is the only evidence-based treatment option for children with ASD. A range of ethical considerations were discussed, including factors impacting treatment effectiveness, use of psychopharmacotherapy, and treatment approaches with minimal empirical support. Professionals should stay abreast of research literature, provide caregivers with information regarding research evidence for treatment effectiveness as well as potential negative effects, and endeavor to support families through the process of informed choice.

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Institutional Review Boards and Standards

4

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History of IRB

Ethics are norms of conduct for distinguishing between right and wrong and between what is acceptable and unacceptable behavior. Given that there are different norms across disciplines, professions, and institutions, it is no surprise that there have been many ethical disputes and issues throughout the history of research. Ethical guidelines are necessary to ensure that researchers and practitioners adhere to the same standards of behavior and that the rights of human subjects are protected. Further, governing bodies are required to enforce ethical guidelines, so that researchers are held accountable for their actions. Without such guidelines, there would be no way to regulate how researchers are designing experiments, recruiting participants, determining risks and benefits, and disseminating findings. Prior to the twentieth century, there were no established ethical guidelines or governing bodies to regulate research ethics. Consequently, the history of research with human subjects has been fraught with injustice and misconduct. This history has contributed to the development of several guidelines for the protection of human subject research and the establishment of institutional review boards (IRBs).

The need for ethical guidelines was formally recognized following the Nuremberg trials, in 1945–1946, in which German physicians were indicted for conducting medical experiments on prisoners of war ("Nürnberg trials," 2015). As documented in the trials, prisoners were subjected to egregious abuses of medical experimentation, without prior consent or free choice to withdraw from experimentation. In 1949, The Nuremberg Code was created to provide a clear standard of ethical principles for research on human subjects (U.S. Department of Health and Human Services [DHHS], 2005). The first point of the Nuremberg Code states that "the voluntary consent of the human subject is absolutely essential" and describes the capacity an individual must possess to consent to research. The other points demand the protection of human subjects, identification of potential benefits and risks, sound experimental design, qualified scientific personnel, and the right of the subject to withdraw from experiment. The Nuremberg Code provided researchers with a comprehensive

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guideline and laid the foundation for ethical experimentation with human subjects.

The Nuremberg Code became an accepted guideline for ethical research practices, but the application of the guidelines was not enforced. The duty and responsibility of implementing the provisions were placed upon the individual(s) engaged with the experiment. That is to say, the researchers were expected to follow the code as a matter of honor. Without an independent governing body to oversee the application of the Nuremberg Code, there was no way to ensure that researchers were adhering to ethical research practices. Multiple studies over the following 20 years demonstrated the need for additional oversight and specific protections.

An example of how the system of self-regulated research ethics failed is seen in the Willowbrook Hepatitis Experiments. The experiments began in 1954 and involved more than 700 mentally disabled children housed in the Willowbrook State School (National Institutes of Health [NIH], 2009; Robinson & Unruh, 2008). Researchers injected subjects with the hepatitis virus to test the effects of the disease and immunity. This study raised several concerns, including the infection of a vulnerable population (i.e., mentally disabled children) and recruitment methods. It was not necessary to study hepatitis in children before studying it in adults. Indeed, researchers could have injected the 1,000 adult staff members of the Willowbrook School, but no adults were included in the study. Instead, it is likely that children were the focus of the study due simply to the ease of access. In addition, parents were unduly influenced to consent for their child to participate in the study, in exchange for admission to the overcrowded school. Though parents gave consent, their willingness to give consent was called into question, for they had no choice but to participate if they wanted care for their child.

Another instance in which a vulnerable population was affected occurred in the late 1950s to early 1960s. Thousands of pregnant women were given an experimental medication called thalidomide (Kim & Scialli, 2011). Thalidomide was used to control sleep and nausea throughout pregnancy, but the drug was later found to cause birth defects in approximately 10,000 babies (Kim & Scialli, 2011). During this time, the use of experimental drugs was not strictly controlled or thoroughly tested for potential side effects. In response to this tragedy, the United States passed the Kefauver-Harris Amendment in 1962 (Clarke, 2012). The Kefauver-Harris Amendment led to stronger US Food and Drug Administration (FDA) regulations and changed the way drugs are approved and regulated.

In 1963, studies were conducted at the Jewish Chronic Disease Hospital to understand the body’s ability to reject cancer cells. Hospitalized patients, with various chronic debilitating diseases, were injected with live cancer cells. Researchers claimed to have obtained oral consent from the patients, but some critics argue that it would not be possible to get proper informed consent from a “senile” population (Hornblum, 2013). Though researchers received consent from study participants, they did not notify the subjects of the injection of cancer cells. The ramifications of these studies were a subsequent review proceeding by the Board of Regents of the State University of New York, in which the researchers were found guilty of fraud, deceit, and personal conduct (Freeze, 2014).

As public awareness of the unethical treatment of human subjects increased, so did the pressure on the medical community to strengthen human research regulations. In 1964, the 18th World Medical Association (WMA) General Assembly met in Helsinki, Finland, and issued the Declaration of Helsinki (1964). The Declaration of Helsinki expanded upon the Nuremberg Code by providing specific ethical guidelines for physicians conducting medical research involving human subjects. The Declaration of Helsinki states that it is the physicians’ mission to “safeguard the health of the people” and to protect the well-being and best interest of patients (1964). The document also addresses the risks, burdens, benefits, scientific requirements and research protocols, vulnerable populations, patient rights, privacy, informed consent, and more. The Declaration of Helsinki has undergone several revisions since its inception and continues to be modified today (WMA, 2013).

As reforms were being made to research ethics, the public became aware of the most notorious example of medical misconduct and human rights, which prompted the US Congress to take further action. The Tuskegee Syphilis Study, which occurred between 1932 and 1972, was conducted by the US Public Health Service and studied the natural progression of untreated syphilis in 600 low-income, African-American men (Centers for Disease Control and Prevention [CDC], 2016). By 1947, penicillin had become a proven cure for syphilis, but for the sake of the research study, treatment was withheld from the study participants and their families. Rather than minimizing risks to human subjects, this study placed the burden of risk on one disadvantaged, vulnerable population.

In response to the Tuskegee tragedy, the US Congress passed the National Research Act of 1974 and formed the National Commission for the Protection of Human Subject of Biomedical and Behavioral Research (DHHS, 1979). In 1979, the commission published the Belmont Report, a statement of ethical guidelines and principles for research involving human subjects. It is a comprehensive set of rules established to protect the rights and welfare of human subjects. The Belmont Report has been widely accepted by federal department and agencies and is the cornerstone reference for IRBs. The Belmont Report established three principles essential to the ethical conduct of research with human subjects: (1) respect for persons, (2) beneficence, and (3) justice.

Respect for persons is divided into two separate requirements: that individuals be treated as autonomous agents and individuals with diminished autonomy are entitled to protection. Respect for persons demands that human subjects must enter research voluntarily (i.e., informed consent), only after being provided with adequate information (e.g., risk and benefits).

Beneficence maximizes the benefits to human subjects, society, and science while reducing potential risk and harm. This principle states that researchers have an obligation to consider the benefits for the individual subject as well as the societal benefits that might be gained from the research.

Justice demands the fair distribution of research benefits and burdens among various populations. Just ways distribute benefits and burdens (1) to each person an equal share, (2) to each person according to individual need, (3) to each person according to individual effort, (4) to each person according to society contributions, and (5) to each person according to merit. This principle ensures that the burdens of research are not placed on vulnerable, disadvantaged populations, while the benefits are disseminated to privileged populations.

The National Research Act and the release of the Belmont Report prompted the establishment of IRBs and required IRB review and approval of all federally funded research involving human subjects.

Current IRB

Institutional review boards are review committees whose purpose is to protect the rights and welfare of human participants in research. IRBs are federally mandated, locally administered groups from different institutions, so the specific guidelines may differ. The guidelines outlined in this chapter are based on the US Department of Health and Human Services (DHHS) Regulations and are specified in Title 45 Code of Federal Regulations (CFR) Part 46 (DHHS, 2009).

IRB approval is required for all research that involves human subjects. Human subjects research encompasses all systematic investigations designed to expand or contribute to generalizable knowledge which involves obtaining identifiable private information or data through intervention or interaction with an individual (§46.101 DHHS, 2009). However, research does not qualify if the information collected is not private or individually identifiable. The DHHS guidelines apply to all human subjects research that is funded, conducted, or regulated by the government. Research that does not fall under the CFR is regulated by federal, state, or local laws and guidelines (see http://www.hhs.gov/ohrp/policy/checklists/decisioncharts.html; §46.101 DHHS, 2009) and must be approved and monitored by the institution's IRB. Given that IRBs are locally administered, the requirements for research at different institutions may vary.

The primary goals of the IRB process are to ensure that risks to subjects are minimized; these risks are reasonable compared to anticipated benefits; participant selection is equitable; each participant gives informed consent; this consent is documented properly; when necessary data is monitored to protect the safety of the participant; and there are sufficient plans to protect the privacy and confidentiality of the participants (§46.111 DHHS, 2009). IRBs have the authority to approve, require modifications in order to approve, disapprove, conduct continuing reviews, suspend or terminate approval, verify changes, and observe the consent process and research procedures of all research activities that fall under the IRB. Each research project is continually reviewed at certain intervals, which are determined based on the degree of risk, but must occur at least once per year (§46.109 DHHS, 2009).

IRB Composition

The composition of the IRB depends on the type of review necessary for the research. The IRB is comprised of a total of five members, and there must be members of both sexes that come from varied professions. These professions should include at least one whose profession is in a scientific field, one whose profession is not in a scientific field, and at least one member who is not affiliated with the institution besides serving on the IRB. The IRB may also invite experts to help review projects when appropriate (§46.107 DHHS, 2009).

IRB Requirements

The IRB requires that researchers identify and assess any risks and anticipated benefits associated with the study. Risk to research participants is classified as physical, psychological, social, or economic and must be minimized and shown to be reasonable when compared to potential benefits (Office for Human Research Protections [OHRP], 1993). Selection of participants must be equitable and take into account any vulnerable populations involved in the research. Additional safeguard should be implemented when participants could be susceptible to coercion or undue influence. Researchers must provide procedures and proper documentation for informed consent, as well as assent if the study involves minors or cognitively impaired individuals (§46.111 DHHS, 2009). The application should also include a plan for collection, storage, analysis, and disclosure of data that ensures that the individuals' safety, privacy, and confidentiality are protected (American Psychological Association [APA], 2002). Privacy refers to issues related to methods used to obtain information about participants, while confidentiality refers to methods used to ensure that the obtained information is not improperly divulged. IRBs should ensure that proper precautions are taken to avoid invading the privacy or breaching the confidentially of the participant (OHRP, 1993).

Types of IRB Review

Full/Convened Committee Review

A full committee review is the standard type of IRB review and must be used for the initial review of all studies that are not eligible for expedited review or exemptions. The research must receive approval from the majority of the members present at the meeting (§46.108 DHHS, 2009). These types of reviews are used for studies that pose more than minimal risk to the participants, with minimal risk is defined as the "probability and magnitude of harm or discomfort anticipated in the research are not greater in and of themselves than those ordinarily encouraged in daily life or during the performance of routine physical or psychological examinations or tests" (§46.303 DHHS, 2009).

Expedited Review

Expedited review is used for either research that involves no more than minimal risk or for minor changes in previously approved research. Rather than convening a full committee for review, the IRB chairperson can complete the expedited review, or the chairperson can designate one or more experienced reviewers to complete the review. The reviewer has the authority to approve, require modifications, or refer the research to a convened IRB meeting. However, a research study cannot be disapproved during an expedited review; it must be referred to a full/convened IRB meeting review before the study can be disapproved (§46.110 DHHS, 2009).

There are nine categories of research that can be reviewed by the IRB through expedited review (from website; OHRP, 1998):

1. Clinical studies.
2. Collection of blood samples.
3. Collection of specimens through noninvasive procedures.
4. Data collection obtained by commonly used noninvasive procedures.
5. Collection information for non-research purposes.
6. Collection of recordings (e.g., voice, video) for research purposes.
7. Involving individual or group characteristics or behavior or "research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methods" (OHRP, 1998).
8. Continuing review or research previously approved by IRB, certain provisions are met, such as when the study is permanently closed to new enrollment, no participants have been enrolled, and the only remaining tasks is data entry.
9. Continuing review of research that has already been deemed to be no more than minimal risk.

Exemption from Review

Some human participant research may be exempt from IRB monitoring when it involves no more than minimal risk and falls into one of the six categories described below. The research must be submitted to the IRB in order to receive exempt status, but following exemption is no longer subject to IRB review. There are six categories of research that are eligible for exemption status (OHRP, 1998):

1. When done in established educational contexts;
2. Use surveys, educational tests, interviews, or observation of behavior in a public setting.
3. Subjects are public officials or candidates who have been elected.
4. Includes openly available de-identified information such as records, specimens, data, or documents.
5. Conducted by officials in government departments or agencies that are involved in the evaluation of public programs.
6. Evaluation of food and consumer reception.

Research involving at-risk populations such as prisoners and children is usually not qualified for exemption.

Reports

Once a research study has received IRB approval, additional reviews may be necessary. The primary investigator (PI) is accountable for the research and for reporting any changes to the approved protocol or unanticipated problems to the IRB. The PI is responsible for understanding IRB requirements for reporting, occurrences in which it is necessary, and the process for submitting the report. The PI must also set up a system that guarantees that any events that result in a deviation from the approved protocol are identified and submitted to the IRB in a timeline manner. Reports are often required if there is an occurrence of adverse events or unanticipated issues involving risk to the participants or others, incidents of noncompliance, complaints, deviations from the approved protocol, and violations of the terms of approval. The IRB may also require reports summarizing data safety and monitoring (§46.103 DHHS, 2009).

Additional Protections for Vulnerable Subjects

Although standard regulations are sufficient for most research, some studies involve participants who are at a higher risk of harm or have questionable ability to consent. In addition to the basic federal regulations under the Common Rule (DHHS regulations, Subpart A), certain populations qualify for additional protections that aim to ensure that all research is conducted in an ethical manner. Many of these populations have been exploited in research in the past, such as the studies mentioned previously in this chapter, so these protections are in place to guard against future unfair treatment. There are several categories of vulnerable subjects that are given special consideration by IRBs, including fetuses, pregnant women, children and minors, cognitively impaired persons, and prisoners. Additional categories include traumatized and comatose patients, terminally ill patients, elderly persons, minorities, and students, employees, and normal volunteers, among others (OHRP, 1993).

Pregnant Women, Human Fetuses, and Neonates

Subpart B of the DHHS regulations set forth additional protections for human fetuses, pregnant women, and neonates involved in research (§46.201–46.207 DHHS, 2009). It is usually required that appropriate studies have been previously conducted on animals and nonpregnant individuals. The risk to the fetus must be minimal if there is no benefit to the health of the fetus or mother and if the purpose of the study is to advance biomedical knowledge. If there is greater than minimal risk, the study may be allowed if there is a potential benefit to the mother or fetus and if there is the least amount of risk to fetus as possible. Additionally, all research that involves in vitro fertilization (IVF) must be reviewed by a national Ethics Advisory Board (§46.204 DHHS, 2009).

The consent process is also slightly different for research involving pregnant women and fetuses. Only the mother's consent is necessary if the research poses minimal risk to the fetus or direct benefit to the mother. However, if the research has the potential to benefit only the fetus, the consent of both the mother and father is required. The only circumstances in which the father's consent is not required are if his identity or whereabouts are unknown, if he is not reasonably available (§46.204 DHHS, 2009), if he does not acknowledge that he is the father of the fetus, or if he does not accept responsibility for the fetus (OHRP; 1993). Additionally, if the pregnancy was the result of rape or incest, paternal consent is not required (§46.204 DHHS, 2009).

A neonate is a newborn fetus, and nonviable neonates and those of uncertain viability may be participants in research under Subpart B (§46.205 DHHS, 2009). Viability is the ability of the fetus to survive and maintain heartbeat and respiration independently. Neonates of uncertain viability can participate in research if there is no additional risk or if the research may enhance the possibility of survival to the point of viability. Nonviable fetuses can be involved in research if the procedures will not cause the vital functions to be artificially maintained or cause the termination of the heartbeat or respiration, if there will not be an additional risk to the neonate, and if the research will add to biomedical knowledge which cannot be attained by other means. If the fetus is viable, research requirements fall under the category of additional protections for children (DHHS, 2009).

Research on fetuses that are not living and fetal material (§46.206 DHHS, 2009) is not regulated by Subpart B and is conducted based on federal, state, or local laws. This usually falls under the Uniform Anatomical Gift Act and requires parental consent.

Prisoners

According to Subpart C (§46.301–46.306 DHHS, 2009) of the DHHS regulations, a prisoner is defined as any individual involuntarily confined or detained in a penal institution. There are additional regulations in place to restrict prisoners from participating in research, since they are under constraints that could affect their ability to make decisions to consent to participation (§46.305 DHHS, 2009). The goal of these limitations is to restrict research with prisoners to research that is related to the prisoner's lives. Therefore researchers cannot recruit prisoners simply because they are more convenient to access; instead, the study must be designed to answer questions about prisoners.

Prisoners can be involved in four different types of research. The first is research that studies the possible causes, effects, and processes of incarceration and criminal behavior. The second is research that studies prisons as institutions or prisoners as incarcerated individuals. Research in both the first and second category must not involve more than minimal risk and disturbance to the participants. The third is research on conditions that impact prisoners as a group that exhibits certain characteristics more than the general population (i.e., research on alcoholism, drug addiction, and sexual assault). Lastly, prisoners can participate in research if the aim is to investigate practices that could improve the health or well-being of the participants (§46.306 DHHS, 2009).

Children

Subpart D (§46.401–46.409 DHHS, 2009) provides additional provisions for children in research. These include restrictions of criteria for exemption when children are participants, classification of four levels of risks/benefits, specifications for parental permission and the child's assent (based on the level), and criteria for waivers of consent and assent. Children are defined as individuals who are not yet of legal age of consent under the applicable laws, which differ by state (§46.402 DHHS, 2009). In most states, the age of majority is 18, so anyone 17 and under is considered a child in regard to research on human subjects.

The consent process is also different for children participating in research. Since children are unable to give informed consent, parents give permission for their children to participate and children provide their assent, which is an agreement to participate. While children are not legally able to give consent, they can assent to participation, especially if the research does not involve treatment that may benefit the participant or if the child can understand what they are agreeing to (§46.408 DHHS, 2009).

All research with children must include appropriate procedures to obtain permission from parents and assent from the child (§46.404 DHHS, 2009). Research that poses more than minimal risk may be approved if it presents a direct benefit to the participant. The potential benefit must be great enough that it justifies any potential risks, and the benefit must be at least equal to those presented by alternative treatments or approaches. If the research does not present a direct benefit to the participant, it may still qualify for approval if the procedure may result in a generalizable knowledge about the participant's disorder or condition. Research in this category must also only pose a minor increase over minimal risk, and the experiences involved must be relatively comparable to experiences encountered in their everyday life (i.e., medical, dental, psychological, social, or educational situations; §46.406 DHHS, 2009). Lastly, research that does not qualify under the previously stated conditions may be considered for approval if the research demonstrates an opportunity to further the understanding, prevention, or treatment of a condition or problem that affects children (§46.407 DHHS, 2009).

Cognitively Impaired Individuals

Although there are no additional DHHS regulations for individuals who are cognitively impaired, researchers should address additional considerations when conducting research that involves these individuals as participants. Since there is no clear consensus on the acceptable amount of risk for this population, IRBs should consider consulting experts in the appropriate field (OHRP, 1993). A primary concern for individuals with psychiatric, cognitive, or developmental disorders is that they may not be able to fully understand the information given about the study and make an informed decision about whether or not to participate. Individuals, who have been determined incompetent or unable to manage their own affairs and make major decisions for themselves, have a court-appointed guardian who is responsible for making all of their legal decisions, including participation in research (OHRP, 1993).

Final Thoughts

Though IRBs oversee studies in an attempt to ensure ethical research practices, researchers also have a moral obligation to protect the rights and safety of participants. Studies that involve individuals with autism spectrum disorder (ASD) require particular consideration as these individuals generally fall under the category of vulnerable populations.

Children with ASD are typically classified as members of vulnerable populations on multiple levels, which make additional protections necessary to safeguard the rights of these individuals. Previous violations of ethical rights of cognitively impaired children, such as the Willowbrook State School studies (Robinson & Unruh, 2008), suggest that parents of children with developmental disabilities may be particularly susceptible to coercion or undue influence. This is a noteworthy concern as there are so many unsubstantiated treatments for ASD (Matson, Adams, Williams, & Rieske, 2013), and parents' decision regarding participation in research may be influenced by their desire for their child to receive treatment. Researchers therefore have a particular responsibility to conduct research that involves children with ASD with the upmost consideration for the well-being of the participants, as well as avoid undue influence over the decision to participate.

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Informed Consent

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Introduction

Within the field of psychology, it is a well-founded practice to obtain informed consent from all individuals who may participate in research or receive therapeutic services. This requires individuals to agree to the terms and conditions through written and/or verbal consent. However, this procedure is rooted in the underlying assumption that individuals clearly comprehend all aspects of the study/treatment such as the associated risks and benefits, rights of participation (e.g., permitted to withdraw at any time), and the purpose of the study/treatment.

While it stands uncontended that this is a fixed and essential (i.e., legal, ethical) aspect of the process, what has received less attention are ways in which informed consent may differ for vulnerable populations (e.g., intellectually disabled). Research has demonstrated impaired decision-making in relation to informed consent in several vulnerable populations. For example, Bruzzese and Fisher (2003) found that seventh grade students struggled to identify their ability to refuse participation when parents gave consent, as well as their right to receive information regarding procedures and to be protected from harm. Fourth grade students struggled to comprehend even the more basic components of the informed consent process and evinced impaired judgments regarding the consent process (Bruzzese & Fisher, 2003). Other examples include impaired judgment in individuals with serious medical conditions due to physical and/or emotional distress (Casarett, Karlawish, & Hirschman, 2003) and impaired understanding of the right to refuse participation for minority members with a history of societal oppression and increased susceptibility for compliance to authoritative entities (Fisher et al., 2002).

Apropos of this literature, individuals with developmental disabilities represent a population that may also present with unique challenges in regard to informed consent due to impaired cognition, thus warranting further attention and greater amounts of recognition and protection. In order to fully assess the benefits, shortcomings, and special considerations of informed consent as it is currently implemented, it is prudent to first understand the development, specifically the long-standing history of maltreatment and exploitation of underprivileged populations.

The evolution of informed consent can be traced back to a series of historical events that evidence disregard and maltreatment of individuals involved

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in empirical investigations. During World War II, experimental science was conducted on susceptible populations. Throughout this significant epoch, atrocious acts were committed on individuals of vulnerable populations (e.g., individuals with mental illness and intellectual disabilities) in the guise of "studies" led by Nazi officials. Emanating from this maltreatment was the Nuremberg Code; established in 1949, this doctrine identified ten principles of acceptable experimentation. While a noteworthy beginning of creating guidelines, the Nuremberg Code was criticized for its firm assertion of "voluntary consent" as a core tenant. Unfortunately, this principle failed to account for individuals with intellectual disabilities who may not have the capacity to (a) fully understand and thus (b) provide voluntary consent as a truly informed decision (Brody, 1998; Sturman, 2005).

Following the Nuremberg Code, ethical guidelines were seemingly halted in the nascent stage, as disquieting experiments were regularly conducted in the United States. One such example is the numerous human radiation experiments that were conducted during the Cold War, the aim of which was to examine the effects of radiation exposure (e.g., atomic radiation, radioactive contamination). In these experiments, thousands of individuals were exposed to the aforementioned hazardous chemicals in attempts to understand their influence on the human body. The majority of the subjects were pooled from underprivileged populations, such as individuals that were ill or impoverished (Loue, 2000). More so, children with intellectual disabilities were also used as test subjects in radiation studies, one example involving these children being fed with items laden with radioactive chemicals. Additional ethical disregard is exemplified by research that specifically exploited individuals with cognitive disabilities. One infamous example is the Willowbrook study, in which intellectually disabled children were injected with hepatitis (Katz, 1972) to understand the course of the disease. Other research has utilized a similar approach with the injection of experimental vaccinations (Rothman & Michels, 1994).

These obsolete practices demonstrate the historical precedency of scientific inquiry, with little regard for the deleterious effects subsequently imposed upon participants; ethical concerns were often of secondary thought, and paramount was the intent to advance innovative science. The injurious effects and lack of concern for general human welfare highlight notable flaws of the scientific approach and necessitated greater acknowledgment of the importance of informed consent. Consequently, the Helsinki Declaration (1964) was implemented in order to modify and extend the principles put forth in the Nuremberg Code. The Helsinki Declaration heavily focused on clinical research, and one of the most notable additions of the Helsinki Declaration was the acknowledgment that individuals with limited capacity to consent should be provided the assistance of a proxy decision-maker. Additionally, it averred the requirement that all study participants be fully informed of diagnostic and/or therapeutic methods (Weiss-Roberts & Roberts, 1999). By 1979, the momentum of protecting human subjects reached its pinnacle with the seminal document known as the Belmont Report. The report defined three imperative principles to ethically guide any and all research endeavors. The overall impact of the Belmont Report was a distinct assertion that informed consent was a foundational component of conducting ethical and sound research on human subjects.

Taken together, the historical components of informed consent clearly demonstrate a long-standing pattern of disregard, maltreatment, and exploitation of many individuals, specifically those with cognitive deficits. More so, it is evident that informed consent is indeed a crucial aspect of conducting ethically sound research and/or therapeutic practices. It is implemented with intention of protecting the legal rights of participants as well as serving as an ethical guideline of fair and just treatment (Hall, Prochazka, & Fink, 2012). Informed consent is a process by which an individual is made aware of the purpose, procedures, and potential risks and benefits associated with involvement. This provides clients with the necessary knowledge for making an informed decision regarding their participation, including their right to decline or withdraw at any point. Given that an individual may not always possess the cognitive capacity to make an informed judgment, assessing the said capacity is an essential aspect of proper informed consent (Iacono & Murray, 2003).

Obtaining informed consent requires an array of cognitive abilities, such as the retention and comprehension of the information provided, understanding the information in relation to personal context, efficiently evaluating multiple pieces of information, and effectively communicating a final decision. These cognitive faculties have a high likelihood of being impaired in individuals diagnosed with an autism spectrum disorder (ASD), given that a significant amount of individuals with ASD are nonverbal and/or intellectually disabled (Jerskey, Correira, & Morrow, 2014). For consent to be considered valid, it is expected that it be given of one's own volition. Individuals with autism do not always possess the communication skills necessary for completing this action, given that difficulties with expression and communication are a common feature in ASD (Mitchell et al., 2006). Furthermore, these individuals may lack the necessary insight for accurately assessing ways in which they may be personally impacted. These special considerations for individuals with ASD, taken in tandem with the long-standing history of unethically treatment of cognitively impaired individuals, emphasize the importance of discussing informed consent in the context of ASD and competency.

Informed consent is a topic that has acquired increased attention over time. It is now well established that clients have a right to consent to participate in, or withdraw from, treatment. For individuals with autism spectrum disorders, many of whom also present with intellectual disabilities, additional unique challenges exist. Many of these individuals may not be able to completely comprehend the terms of agreement for which they are expected to consent to. How these special challenges can be attended to, current professional and legal standards, and standard procedures will be addressed.

Ethical and Legal Considerations

While it is ethically appropriate to allow individuals with ASD to actively participate in the treatment process, it is also important to consider the individual's unique needs and capacity to make informed decisions about treatment modalities that would be most effective. When considering an individual's ability to provide informed consent, numerous factors must be taken into account for psychologists and intervention providers to maintain the balance between the rights of the client, ethical principles, and legal requirements.

Client Rights and Ethical Principles

One important principle to consider when working with individuals with ASD is the level of mental capacity required for the individual to competently make treatment decisions (Fields & Calvert, 2015). The ability of individuals with ASD to make decisions is related to the level of autonomy the individual possesses (Buchanan, 2004). Autonomy is defined as independent action that one takes after deliberating and reflecting on a given situation. When it has been determined that an individual with ASD has a higher level of capacity, others are more likely to endorse that individual's right to determine what type of care they should receive (Rich, 2002; Ryan, 2005).

Shortly before and in the aftermath of World War II, psychologists began exploring ways that they could increase the standards of care in which they operated as a result of increased public awareness of the activities entailed in the field of psychology. The advancement of psychology led to growing concern about how to resolve the moral dilemmas that practitioners face on a daily basis. This concern led to the development of the American Psychological Association's (APA) Ethical Principles of Psychologists and Code of Ethics (APA Ethics Code).

The 2010 APA Ethics Code contains a set of ten Ethical Standards. The purpose of the Ethical Standards is to set forth enforceable rules that guide the work of practicing psychologists. Standards 3.10, 8.02, 9.03, and 10.01 are related to providing informed consent to individual receiving psychological services.

Standard 3.10 specifies that an individual receiving psychological services in person and through electronic or other forms of communication must consent to services provided by a practicing psychologist. Furthermore, the individual providing consent must also have the nature of the services being provided conveyed to them in language that is understandable to them (with the exception being when legislation or the APA Ethics Code otherwise states that consent of the individual receiving services is not required). Examples of when psychologists are not required to obtain consent include when the client is a minor or services are court mandated. When individuals are deemed incapable of providing consent due to minor status or as a result of reduced cognitive capacity, psychologists are nevertheless required to provide an explanation of the services that are being provided. Psychologists must also attempt to obtain assent of the individual participating in the services, take into account actions in the best interest of the individual receiving services, and obtain permission from legal guardians or representatives of the individual.

Unique Standards also exist when considering an individual's right to consent to research (Standard 8.02), assessment (Standard 9.03), and treatment (Standard 10.01). Regardless of the services being offered, psychologists are bound to describe the nature of the therapeutic relationship, the likely course of treatment, anticipated fees, potential involvement of third parties for the purposes of consultation and additional services, and limitations to confidentiality and to allow the client or their legal representatives the opportunity to ask questions and receive answers that adequately address their concerns. When the methods being utilized by the clinician are not well established, psychologists must disclose this information to the client as well as describe the anticipated outcomes, risks, and benefits and any alternative methods that may be available to address the client's presenting concerns. The client must also be informed when a practicing therapist is a trainee and should be provided the name of the trainee's immediate supervisor.

The APA Ethics Code also consists of five general principles (APA, 2010). While the general principles do not represent legal obligations to which psychologists must adhere, they represent aspirational ethical ideals to which psychologists should aspire that would aid them in reaching the highest standards of professional practice (Hobbs, 1948). The general principles (Table 5.1) include beneficence and nonmaleficence (principle A), fidelity and responsibility (principle B), integrity (principle C), justice (principle D), and respect for people's rights and dignity (principle E).

Table 5.1 APA Ethics Code: General principles

	Principle guidelines
Principle A	• Do no harm
Beneficence and nonmaleficence	• Promote welfare of others
	• Uphold professional standards of conduct
Principle B	• Establish trust in professional relationships
Fidelity and responsibility	• Clarify professional roles
	• Concerned about ethical compliance
Principle C	• Promote honesty in practice
Integrity	• Maximize benefits and minimize harm
	• Correct harmful effect
Principle D	• Concern with client equality
Justice	• Consider reasonable precautions
	• Cognizant of personal biases and limitations
Principle E	• Respect for diverse clientele
Respect for people's rights and dignity	• Considerations for vulnerable populations
	• Work to eliminate effects of personal biases

Adapted from APA Ethics code (2010)

The core tenants of principle A (beneficence and nonmaleficence) involve psychologists protecting the rights and welfare of individuals with whom they interact with in a professional capacity. Arguably, one of the most well-known principles of practicing psychologists is the principle of "do no harm." While many consider harm to result from actions taken, it is equally relevant to consider the risks associated with the decision to decline treatment. This being the case, psychologists strive to protect against the potential misuse of their influence that may lead to personal, organizational, or financial gain.

Principle B (fidelity and responsibility) is included to clarify professional relationships and responsibilities toward others. Primarily related to informed consent, psychologists have a responsibility to maintain the best interest of individuals with whom they work. More specifically, psychologists attempt to maintain ethical compliance and hold themselves and their colleagues to the highest standards of professional conduct.

Principle C (integrity) is primarily concerned with psychologists maintaining a standard of care that does not mislead the clients with whom they work. Should psychologists discover that the methods they are using have the potential to harm the client, they have an ethical obligation to reveal this information and consider alternatives that may better benefit the client.

The capability of the clinician to meaningfully contribute toward the advancement of clinical care is covered by principle D (justice). The principle of justice requires that psychologists should maintain awareness of their limitations and biases and share their level of competence with the methods they are utilizing with their clients. This principle is especially important for the informed consent process, given that psychologist are required to disclose information relevant for the treatment and outcomes that the client should reasonably expect based on unique client factors (Siegal, Bonnie, & Appelbaum, 2012).

Finally, principle E (respect for people's rights and dignity) is intended to encapsulate the respect psychology should have for clinical diversity. Psychologists should be aware of vulnerable populations and take reasonable steps to provide the highest level of professional care regardless of a given client's age, religious affiliation, sexual orientation, potential disability, or other factors that may place a client at risk of experiencing difficulty comprehending information regarding the onset, course, or duration of treatment that is presented by the practicing psychologist (Roberts & Roberts, 1999).

Legal Obligations

The concept of consent was written into law in 1914 and was determined to refer to an individual's "right to determine what shall be done with his body" (Schloendorff v. Society of New York Hospital, 1914). By 1975, the American judicial system established that medical professionals are required to reveal information that a "reasonable person" would want to know when seeking treatment (Canterbury v. Spence, 1972). The purpose of consent, therefore, is to educate the client about options available for treatment and to protect individuals from being forced to undergo therapeutic interventions that they may otherwise decline.

One major complication with informed consent procedures and requirements is that they vary from one jurisdiction to the next. Even more problematic is that individual interpretation of the requirements within a jurisdiction often varies from one clinician to the next. Fortunately for psychologists, the standard of proof for individuals providing informed consent typically relies on evidence that the clinicians took reasonable steps to explain therapeutic processes to the individual receiving services and, when the situation requires, the client's legal custodians (Iacono & Murray, 2003). While the amount of time spent reviewing the therapeutic interventions and alternatives that the clinician may offer varies from one provider to the next, rigorous guidelines do not exist that require a specific amount of time be spent on informed consent procedures (Hall, Prochazka, & Fink, 2012).

While the guidelines of informed consent may vary by clinician, empirical studies have been conducted to determine which factors are most relevant to determine when considering whether an individual has been adequately informed (DeRenzo, Conley, & Love, 1998). In the development of a competence screening tool intended to measure an individual's "capacity to consent" in a psychiatric research study, Zayas, Cabassa, and Perez (2005) noted four legal standards (Table 5.2) necessary for demonstrating such capacity including *understanding*, *appreciation*, *reasoning*, *and choice* (also see Appelbaum, Grisso, Frank, O'Donnell, & Kupfer, 1999; Cea & Fisher, 2003; Grisso & Appelbaum, 1995).

Understanding refers to an individual's ability to comprehend information that is presented to them that describes a given treatment method and the procedures associated with that method. This standard requires clinicians to consider the mental capacity of clients to determine whether the client understands the nature and purpose of treatment, the risks, and benefits associated with the proposed treatment modalities and whether they understand the procedures that will occur throughout treatment.

Table 5.2 Four legal standards for demonstrating competence in informed consent for treatment

	Definition	Question
Understanding	Ability to comprehend information that is given about the treatment and its procedures. Consider mental capacity	Does the client show ability to comprehend the information given about the nature and purpose of the treatment and the procedures involved including risks and benefits?
Appreciation	Ability to recognize the value or significance of the treatment as well as potential consequences	Does the client demonstrate the ability to appreciate the significance of treatment?
Reasoning	Ability to manipulate information given about the treatment and the consequences of disclosing information about themselves	Does the client show the ability to reason about the risks and benefits of participating versus not participating?
Choice	Ability to decide to participate or not and then communicate that choice to their provider without fearing loss of services/rights or disappointing others	Does the client show the ability to volunteer freely to participate in treatment or not and without fear or sense of coercion?

Adapted from Grisso and Appelbaum (1995) and Zayas et al. (2005)

The standard of *appreciation* refers to a client's ability to recognize the value or significance of the treatment, as well as the actions the client will be required to take throughout its duration. The clinician must consider whether the client understands the significance of the treatment method and the potential consequences of receiving treatment.

Third, the standard of *reasoning* refers to the capability of the client to consider and manipulate information regarding recommended treatments. Mental health professionals must consider whether the client demonstrates the ability to weigh the risks and benefits of participating in treatment versus abstaining from treatment. Given that reasoning requires a higher level of cognitive functioning in comparison to the other standard, it is often considered the most difficult standard to achieve and assess.

Finally, *choice* is involved when the client is able to actively communicate preferred options based off of provider expertise and guidance, without fear of disappointing others that may be involved in the treatment process. Clinicians must demonstrate that the client made decisions of their own free will and that they were not coerced into selecting a treatment modality based off of the expectations of others. *Choice* is considered the easiest standard for clients of all levels of cognitive functioning to understand (Zayas et al., 2005).

An alternative method of determining whether the risk of treatment is outweighed by the benefits was outlined by Terry (1915). According to Terry (1915), the risk of a given treatment will depend on (1) the likelihood that the individual may be subjected to harm, (2) the magnitude of harm to which they may be subjected, (3) the likelihood that the goals the individual is trying to achieve will be reached, (4) the perceived value of achieving the desired goals, and (5) why the specific treatment is necessary, even when alternative treatments may be available.

As described by Applebaum (2007) and Karlawish (2003), if every suspected case of impaired cognitive capacity resulted in judicial review, the legal system would be unable to keep up with the number of cases that presented for review. Hence, it is imperative that practicing professionals incorporate sound methods for assessing cognitive functioning in their consent processes.

Special considerations must be made when the individual receiving treatment is a minor, given that children lack legal power to provide consent for psychological or medical treatment. Therefore, the responsibility to provide consent becomes the responsibility of the parents or legal guardians of a minor (Bernat, 2001).

Conclusions

Understanding the ethical and legal obligations that psychologists must undertake when seeking informed consent from individuals with ASD is a delicate process under which a variety of factors must be considered. As outlined by Hall et al. (2012), while the balance between legal, ethical, and administrative responsibilities remains a complex procedure that involves consideration of clinician competence, unique client factors, and understanding local, state, federal, and organizational statutes and guidelines, the primary elements that must be considered when seeking client consent include the capacity of the decision-maker to understand the elements of and course of treatment, the steps taken by the psychologist to provide information about the risks and benefits and alternatives to the treatment modality that is selected, the primary decision-maker demonstrating that they comprehend information presented by the psychologist and are able to make an informed decisions, and that the decision-maker selects a modality based on their own will that is not unduly influenced by coercive tactics on the part of the psychologist.

Individuals with ASD are a particularly vulnerable population given the wide array of cognitive differences among individuals with the disorder. This being the case, special care must be taken when considering the capability of individuals with ASD to consent to treatment. Clinicians must be aware of the ethical and legal considerations involved in the informed consent process as well as research regarding the components of informed consent and the need to assess for competency. Additional concerns, as they relate to these ethical and legal considerations, are also discussed below.

Informed Consent for Treatment

There are basic components that should be included in all consents for treatment, and although the content of the consents will vary, the components should not. The goal of informed consent for treatment is to provide clients and their families with all of the information needed to make an informed decision regarding a specific treatment including psychotherapy and behavioral treatments. Basic components of the informed consent process should include a discussion of risks/benefits, clear description of the proposed treatment including empirical support and limitations, alternative treatments as well as prognosis without treatment, and confidentiality including limits to confidentiality. The process of informed consent should answer any and all questions that clients have regarding the treatment options. In the development of informed consent for treatment, clinicians should address the following questions (see Table 5.3).

Risks and Benefits

Within the field of psychology, the clinician's first obligation is to consider the risks for the individual client in the context of the proposed treatment. Risks and benefits of treatment should be communicated to the client/family including discussion of monetary costs, expected time obligations, known risks related to the treatment, direct benefits to the individual and/or family, and any other pertinent information. As discussed by Ahern (2012), discussion of the risks and benefits to be included in informed consent must be based on evidence to support those assumptions. Few studies have completed a post hoc evaluation of perceived harm and benefits, and often those included in informed consents are based on clinician/researcher subjective thoughts. Clinicians and researchers alike should include measurement of perceived risks and benefits from the client or participant's perspective (client subjective ratings) as well as objective and outcome measures. Such research is important given findings that including possible risks, although ethically necessary, can cause what some researchers have termed a "nocebo effect" which has been shown to cause an exacerbation of symptoms after discussion of risks during the informed consent process (Cohen, 2014). Although research regarding the nocebo effect during informed consent is limited, it is an important dilemma to consider in our ethical charge to "do no harm."

Table 5.3 Questions to be addressed through informed consent

	Questions
Risks/benefits	• What are the risks or discomforts associated with this treatment? • What are the personal benefits of this treatment? • Can I stop treatment at any time?
Treatment description	• What are the procedures involved in this treatment? • What results should I expect from treatment? • What are the limitations of this treatment? • What is the evidence base for the effectiveness of this treatment? • What is the cost of treatment? • What is the time commitment for treatment? • Who will be involved in treatment? • What are the qualifications of the provider?
Alternative treatments	• What alternative treatments are available? (Include treatment description for each) • Is not seeking treatment an option? • What is the prognosis without treatment?
Confidentiality	• How will my privacy be protected? • What information will you share and with whom? • What circumstances would you share that information?

Treatment Description

In addition to discussing the risks and benefits of a given treatment, clients need to be made aware of the actual procedures that will be involved when engaging in treatment. This component of the informed consent process includes a detailed description of what treatment sessions will look like, who will be involved in treatment (e.g., individual, family, group), who will be providing specific components, and the qualifications of the provider of treatment. The treatment description also includes some general psychoeducation regarding the modality of the treatment options (e.g., behavior therapy, exposure based, skills building) as well as the evidence base supporting the given treatment. In a treatment capacity, clinicians should only be providing treatment options which have an empirical basis, and, as consumers of treatment, clients and their families have the right to know what evidence is available to support a given treatment. For example, the University of North Carolina at Chapel Hill recently released a report of 27 evidenced-based practices for children, youth, and young adults with ASD covering several aspects of treatment consideration (Wong et al., 2014). This free publication (available at http://autismpdc.fpg.unc.edu/sites/autismpdc.fpg.unc.edu/files/2014-EBP-Report.pdf) includes the evidence base for a wide variety of interventions ranging from Picture Exchange Communication Systems and Functional Behavior Assessment to Discrete Trial and Pivotal Response Training. Use of such resources is important when describing interventions and the evidence base supporting their use.

In addition to the discussion of the treatment procedures and protocols, the intended effect that the intervention will have and the results that clients and their families should expect during the course of treatment should be provided. Along the same lines, clients should also be informed of the limitations of the treatment, and all information provided should be based on empirical evidence when available. When such information is not available (i.e., lack of empirical evidence for a specific treatment) clinicians must carefully describe the justifications for the given treatment, what evidence is available suggesting its effectiveness, as well as any alternative treatments available.

Alternative Treatments

During the informed consent process, clients should also be presented with what alternative treatments are available following many of the same guidelines presented above. The purpose of informed consent for treatment is to provide clients and their families the information needed to make an informed decision for treatment, and that process cannot be completed without providing them with alternative forms of treatment. Clinicians must be careful to not let their personal beliefs or opinions about a given alternative treatment affect the decision of their client as this may be seen as coercive in nature. Instead, clinicians should provide the same level of information based on empirical evidence and the expected outcomes for the alternative treatment. Researchers have found that when making decisions regarding treatment, and when provided with the appropriate information, caregivers place the most weight upon current scientific research followed by the clinicians' experience (Allen & Varela, 2015). The goal is to provide the client with multiple options for treatment and enough information for them to be able to weigh the risks and benefits for each within their own personal context.

Lastly, clients should also be made aware that not seeking treatment is an option and that clients and their families are not obliged to participate in any treatment if they decide against it. There are several reasons that individuals and families may chose not to engage in treatment including cost, time commitment, cultural, and religious considerations. It is not the place of the clinician to put undue pressure on the family to engage in treatment; however, it is the responsibility of the clinician to provide individuals and families with the information needed to make that decision and to make sure the client understands their decision. This would include providing clients with an expected prognosis if no treatment was provided as well as any additional risks or benefits for not engaging in treatment.

Confidentiality

Finally, as a part of the informed consent process, individuals and their families should be provided with information regarding how their personal information is used and protected as a part of the treatment. This includes the standard procedures that are used within the clinic or practice and the safety measures that will be utilized to protect all information. It is also important to discuss with the client the limits of confidentiality before any interview or other procedures take place. This includes informing clients about local laws regarding mandated reporting (e.g., abuse/neglect, threats of harm to self or others) as well as issues related to guardianship. When working with children and individuals with intellectual and developmental disabilities (such as ASD), it is often the case that these individuals may not fully comprehend the limits to confidentiality. It is important for clinicians to provide this information on a level that is developmentally appropriate for the individual, especially for cases that involve custody disputes (Condie & Koocher, 2008). Clinicians should also be especially sensitive and carefully explain limits of confidentiality, when working with children or adolescents who may disclose sexual behavior, substance use, illegal behavior, or suicidal ideation (Duncan, Williams, & Knowles, 2013; Knowles, Duncan, & Hall, 2015). Clinicians should be aware of the varying regulations and statutes which govern such disclosure within their local area, and the same sensitivity should be given when working with adult clients who have a custodial guardian.

Additional Considerations

A further issue that has developed in the process of informed consent for treatment (for both medical and psychological treatments) is the balance between providing the right amount of information for the client in order for them to make an informed decision regarding treatment as well as protecting clinicians legally. Additionally, clinicians struggle with the task of delivering information that is appropriate for the developmental level of the individual and their families while balancing the client's need or desire for information. Many states have vague laws regarding the amount of information that should be disclosed as part of the informed consent process leaving clinicians with the burden of determining what is appropriate for each given individual and treatment.

One option that has been presented to address this issue has been termed "information on demand" and provides the client with the ability to control the amount of information that they wish to know about the given treatment (Siegal et al. 2012). In the initial implementation stage, this process involves providing all clients with a basic level of information (e.g., nature of the treatment, justification, prognosis, etc.) and then providing them with the option to learn more about alternative treatments and risk factors (intermediate information) followed by extensive technical information regarding the treatment, alternatives, and risks (extensive information). This process was proposed as an intermediate step toward fully individualized informed consent in which the client controls the flow of information. This strategy transfers the burden and decision-making of the amount of information to be disclosed to the client which also shifts the legal burdens away from clinicians. This strategy, however, does not come without further questions and disadvantages for individuals and families with intellectual and developmental disabilities and does not adjust the content of the information based on developmental level. A combination of the traditional informed consent process along with the proposed process with consideration of the individual needs of the client and their developmental level will likely prove to be an improvement over the currently used process.

The recurring issue regarding the informed consent process that occurs at every level when working with individuals with ASD, intellectual, or other developmental disabilities is the determination of competency. One cannot ethically complete informed consent if the client does not have the ability to comprehend the information being provided. Discussion and assessment of competency is an important issue to consider within the field of ASD intervention given the host of treatments available to individuals and families.

Competency

Individuals with ASD are often engaged in various treatments; however, their ability to consent to such treatments given that many individual also have comorbid intellectual disabilities should be of concern to various practitioners and professionals providing such services. In order to provide consent to services, an individual must demonstrate the ability to comprehend the information that is being provided, understand the risks and benefits of a given treatment, and be able to communicate their decision effectively to their provider. Given that many individuals with ASD are also nonverbal, assessing their ability to engage in the informed consent process is important. Much of the research evaluating the ability to engage in the informed consent process has been completed in the context of research participation; however, important findings and tools that have been developed are germane to informed consent for treatment.

Rationale for Capacity Assessments

In some treatment centers, the process of obtaining informed consent has, unfortunately, become more of a formality than a thoughtful practice to protect client welfare. Often, informed consent becomes an informal process where the client is simply asked to sign on the appropriate line, with little knowledge as to what they are agreeing to. Similarly, clinicians are not in the habit of assessing capacity to consent, and therefore, capacity is assumed. Generally, this assumption is sound as many clients are more than capable of providing legal consent to treatment. However, valid informed consent requires capacity (see four legal standards for informed consent), and a subset of clients are incapable of consenting to treatment in a meaningful way.

There are many factors that may inhibit a client's capacity to consent (Holzer, Gansier, Moczynski, & Folstein, 1997). Disease and other serious health conditions, emotional disturbances, and cognitive impairments have all been demonstrated to negatively impact one's ability to provide consent. Therefore, it is imperative that clinicians screen for capacity when working with individuals within these populations. For example, individuals with intellectual disabilities are more likely to feel coerced by caregivers (Irvine, 2010) or comply with authority figures

(Zayas et al., 2005), such as clinicians who suggest the client participates in treatment. It is recommended that when working with intellectually disabled individuals, clinicians inquire about the client's rationale for involvement in treatment. This small act can serve as an added protection for a potentially vulnerable client and is in line with the principle of true informed consent.

Informed consent requires capacity. When done properly, informed consent requires that the client understands all relevant information about the treatment, including risks and benefits. Additionally, the client must be able to comprehend that consent is voluntary and can be withdrawn at any time. Therefore, the client must be able to engage in the decision-making process and effectively communicate his/her decision. However, it is not always clear if an individual is capable of providing consent, and thus, it is important to have adequate methods to evaluate cognitive capacity.

Research on Capacity to Consent

Very little research has been conducted regarding capacity to provide consent with individuals who meet criteria for an autism spectrum disorder. However, a larger literature exists involving capacity to consent for individuals with cognitive impairments, such as the intellectually disabled. Therefore, this review and subsequent recommendations are based primarily on literature involving cognitively impaired clients and may or may not be relevant for all individuals with an autism spectrum disorder. Nonetheless, any client who consents to a psychosocial intervention must be deemed capable prior to their entry into treatment.

Morton and Cunningham-Williams (2009) conducted a cross-sectional study with developmentally disabled homeless individuals to determine factors that impede one's ability to provide informed consent. In this study, 62 homeless individuals with a self-reported history of special education completed semi-structured interviews. In order to aid comprehension of the consent document, every odd-numbered participant received a consent brochure, which highlighted important aspects of the study. Further, each participant was required to pass a "capacity-to-consent" screener prior to admission into the study (i.e., participant must correctly answer 8/10 questions about the study). The researchers were particularly interested in how many attempts were required to pass the capacity-to-consent screening measure, as well as factors that impacted capacity to consent. Less than 5% of the sample was unable to pass the capacity-to-consent screener after three attempts, suggesting that the majority of this population possess the cognitive abilities to provide informed consent. Moreover, over half of the sample was successful in passing the screening tool on the first attempt, while roughly 40% required two or three attempts to meet the criterion. Interestingly, the consent brochure was not associated with improved performance on the capacity-to-consent measure. It is unclear why the brochure failed to improve the capacity to consent, although Morton and Cunningham-Williams (2009) hypothesize that boredom and inattention prevented participants from benefitting from this supplemental material. Overall, the results of this study indicate that cognitively impaired individuals were able to provide informed consent; however, these individuals may require multiple attempts to meet the criterion and may benefit from a more comprehensive overview of the treatment (i.e., adequate time for question/answer session about the intervention; Morton & Cunningham-Williams, 2009).

Similarly, Zayas and his colleagues (2005) were interested in evaluating capacity to consent with psychiatric outpatients in a research context. The authors developed a capacity-to-consent screening device for use within an urban community mental health clinic and provided an initial test of their instrument. Sixty-eight adults (aged 21 years and older) with no psychiatric treatment history in the past year agreed to participate in the study. In order to be included in the study, research participants were required to correctly answer at least eight out of ten (score of 80%) questions on the capacity-to-consent screening tool. The 80% criterion was selected by the researchers based on their intent to protect prospective research participants and not on previous literature. As literature in this area is scarce, no conclusive cutoff for capacity determination exists. The vast majority (92.6%, *n* = 63) of the 68 interested participants were successful in demonstrating capacity to consent. Moreover, 59 of the 63 participants passed the capacity-to-consent screener on their first attempt, while the remaining participants were successful on their second attempt. Importantly, the authors state that the individuals who were unable to meet criterion on the capacity-to-consent screener had limited education and suspected to be intellectually disabled or cognitively impaired (e.g., memory impairments). Therefore, this research provides additional support for the regular assessment of capacity to consent. Even with a sample of adult outpatients, nearly 10% were unable to provide valid informed consent based on the researcher's criteria (Zayas et al., 2005).

Clinicians are encouraged to engage in the following "best practices" offered by researchers within the field of informed consent. Several strategies exist for enhancing an individual's capacity to consent to treatment. One such strategy involves direct training. According to Zayas et al. (2005), capacity to consent can be improved through instruction. For example, many clients may benefit from the professional reading the consent document aloud and explaining the more complex or difficult aspects of the document (Irvine, 2010). Likewise, previous research has demonstrated that increased capacity to consent is associated with the professional revisiting components of the consent document that the client has struggled with (presumably based on a capacity-to-consent measure). It may be necessary to review the consent document multiple times (see Morton & Cunningham-Williams, 2009), allowing the client to ask questions and the clinician to assess for adequate client comprehension. Individuals with cognitive impairments may have more difficulty navigating a written consent form (Iacono & Murray, 2003). Therefore, it is important that the consent be available in other mediums (e.g., read aloud to the participant or supplemented with visual aids). This may enhance the client's ability to comprehend the consent document. Further, the consent document must be written in clear language. As a general rule, it is recommended that informed consent documents should not exceed the reading level of an average eighth grader (Fields & Calvert, 2015; Iacono & Murray, 2003). Similarly, Iacono and Murray (2003) offer additional methods to facilitate the consent process when working with individuals with an intellectual disability, such as utilizing augmentative and alternative communication (AAC) devices, developing videotapes and pictures, and training clinicians/researchers to assess the individual's understanding of the material covered in the consent form. Taken together, these recommended strategies may increase a client's abilityInformed consent:capacity to consent

to consent to treatment and should be put into practice when appropriate.

Assessment of Capacity to Consent

There are a number of competency scales available for assessing client capacity to consent to treatment. Fields and Calvert (2015) recommend using measures such as the Mini-Mental State Examination (MMSE), MacArthur Competence Assessment Tool for Treatment (MacCAT-T), Hopemont Capacity Assessment Interview (HCAI), or Capacity to Consent to Treatment Instrument (CCTI). While several instruments exist, many have been developed for use in cognitively impaired populations (i.e., severe mental illness, Alzheimer's/Parkinson's disease, and intellectually disabled), and no instruments have been specifically designed for estimating capacity with individuals with ASD. The following list of assessment tools is not exhaustive, but provides a good starting place for interested clinicians.

Hopkins Competency Assessment Test (HCAT; Janofsky, McCarthy, & Folstein, 1992) The HCAT is a six-item tool that requires the client to answer questions in true/false and sentence completion format. The client is provided with a short document that outlines the informed consent process. After reading the document, the client is asked to respond to the six questions. Lower scores (i.e., a score of 3 or less out of a possible 10) on the HCAT indicate impaired understanding, which suggests the client is incapable of providing informed consent. According to Sturman (2005), using this threshold the HCAT has perfect (100%) sensitivity and specificity in determining incompetence. This test has also been shown to have high interobserver reliability (Sturman, 2005) and criterion validity (Holzer et al. 1997). The HCAT takes approximately 10 min to administer.

Competency Interview Schedule (CIS; Bean, Nishisato, Rector, & Glancy, 1994) The CIS is a structured interview developed for assessing competency in psychiatric inpatients. Client responses are rated on a seven-point Likert scale. Lower scores on the CIS suggest competency, while higher item scores indicate impairment. The CIS is said to measure all four legal principles of capacity (choice, understanding, appreciation, and reasoning) and has adequate psychometric properties. The CIS has good internal consistency (Chronbach's $\alpha = 0.96$), interrater reliability, and criterion validity. Notable limitations include mixed test-retest reliability data over a period of 24 h, no specified cutoff criteria, and unpredictable administration time. As the CIS is a structured interview, administration time may significantly differ across clients (Sturman, 2005).

MacArthur Competency Assessment Tool for Treatment (MacCAT-T) The MacCAT-T was developed by Appelbaum, Grisso, and Hill-Fotouhi (1997). Like the CIS, the MacCAT-T measures each of the four legal standards of informed consent in a structured interview format (Applebaum, 2007). The MacCAT-T is thought to be more comprehensive than comparative tools (e.g., HCAT or CIS) as it yields scores for understanding, reasoning, and appreciation. However, there are no recommended cutoff scores available. The MacCAT-T interview consists of 21 items which requires the test administrator must make "inadequate," "partial," or "adequate" ratings. According to Applebaum (2007), the MacCAT-T requires about 20 min to administer and should be supplemented by examining the client's file/medical chart (Sturman, 2005). Psychometrically, the MacCAT-T has arguably the most empirical support of any competency measure, demonstrating good reliability and validity across multiple samples. Further, The MacCAT-T is one of few capacity instruments with an accompanying training manual and training video.

Structured Interview for Competency/Incompetency Assessment Testing and Ranking Inventory (SICIATRI; Tomoda et al., 1997) The SICIATRI was developed by Tomoda and colleagues to assess capacity to provide informed consent to treatment. This measure was initially tested with both psychiatric and medical inpatients. The SICIATRI is a 12-item structured interview. Clients are rated on a 1-to-3 scale for each item with lower scores (i.e., score = 1) evidencing poor performance and higher scores (i.e., score = 3) indicating adequate performance. Scoring for this measure includes a "Ranking Inventory for Competency" where the evaluator must rank the client's competency into one of five levels (lower levels indicate impairment). During its initial test, the SICIATRI displayed good interrater reliability and concurrent validity. According to Tomoda et al. (1997), the SICIATRI possesses good sensitivity (0.83) and specificity (0.67).

Capacity to Consent to Treatment Instrument (CCTI; Marson, Ingram, Cody, & Harrell, 1995) The CCTI was developed for use with cognitively impaired clients (individuals with Alzheimer's disease). The format of the CCTI is an interactive interview where clients are presented with vignettes that require hypothetical medical decisions. This measure assesses all four legal competency standards and also examines the client's ability to reason about two comparative treatments. The CCTI is well validated and requires roughly 25 min to administer (Fields & Calvert, 2015; Marson et al., 1995; Sturman, 2005).

The Mini-Mental State Examination (MMSE; Folstein, Folstein, & McHugh, 1975) The MMSE is a brief screening tool (11 items) designed to assess mental status. While not originally developed for estimating a client's capacity to consent to treatment, it is often used as a proxy measure of competency. Scores on the MMSE range from 0 to 30 with higher scores (i.e., scores = 23–26+) indicating increased capacity to consent (Applebaum, 2007). Like many measures of its kind, the MMSE does not have recommended cutoffs for capacity determinations; however, clients who score below 19 merit further assessment and additional safeguards. Finally, the MMSE has been known to correlate with clinician judgments of capacity (Applebaum, 2007; Sturman, 2005).

Other Competency Measures Additional capacity measures include the Evaluation to Sign Consent (ESC, Moser et al., 2002) and the Informed Consent Survey (ICS; Wirshing, Wirshing, Marder, Liberman, & Mintz, 1998).

Limitations of Capacity to Consent to Treatment Instruments

All of the abovementioned scales were developed for geriatric psychiatry populations (e.g., Alzheimer's disease, Parkinson's disease, dementia) or severe mental illness populations (e.g., schizophrenia, depression); however, few tools have been studied or validated for use with ASD or intellectual disability populations. Moreover, many standardized capacity measures lack adequate testing, and what little empirical support exists for these measures is based on relatively small sample sizes (Sturman, 2005).

Legally Authorized Representatives

When a client has been deemed to lack the capacity to consent to treatment, the clinician then is tasked with determining who is the most appropriate person to provide a proxy decision on behalf of the client. Different locales have differing laws or regulations regarding what is often termed as a "legally authorized representative," and many areas have vague or nonexistent guidelines for determining who is best equipped to serve in this role unless the client has a legal guardian. While some states have laws or regulations which define the relational order in which this individual should be considered (e.g., spouse, adult child, etc.), it is also important to consider the most ethically responsible person for that specific individual (Karlawish, 2003). When states do not have legally designated representatives, the responsibility often falls on various family members; however, this practice assumes that family members will always act in the individual's best interest, which is not always the case (Iacono & Murray, 2003).

Little research or regulations have addressed the issue of designating a legally authorized representative to provide informed consent for those individuals found to not be capable. Some states have adopted the following in helping clinicians decide who can give informed consent in order of preference: guardian, spouse, adult son/daughter, parent, adult sibling, adult grandchild or other close relative, close friend, and guardian of estate. Although not always consistent, it has been argued that medical professionals, providers, or employees of a provider should never serve as a legally authorized representative due to conflicts of interest. In locales where no regulations exist, clinicians are urged to determine who is the most ethically appropriate person to provide informed consent for each individual client based on their own personal situation within the context of the treatment being offered.

Conclusions

Informed consent has been demonstrated as an essential component in both research and therapeutic settings. Research has sufficiently demonstrated several examples of how the process of informed consent may be impacted by impaired decision-making in a subset of populations, such as children (Bruzzesse & Fisher, 2003), those with medical/physical conditions (Casarett et al., 2003), and minority members (Fisher et al., 2002). Such findings elucidate rudimentary differences across varying populations of how individuals may form decisions in response to informed consent. Furthermore, the importance of this process has been demonstrated by many historical events in which vulnerable individuals were exploited and mistreated for the sake of empirical investigations. These infamous accounts of maltreatment are representative of a plethora of accounts in which individuals with cognitive deficits were not only denied the opportunity to provide informed consent but were significantly exploited. Interspersed between these studies was the evolution of informed consent. The Nuremberg Code first identified ten core principles for acceptable treatments (Brody, 1998); this led to the Helsinki Declaration, which focused on clinical research and identified that persons with impaired cognitive abilities be allowed a proxy decision-maker (Roberts & Roberts, 1999). Eventually, the Belmont report recognized informed consent as a core component for conducting ethically sound investigations on human subjects.

The historical context illustrates the importance of understanding informed consent in regard to specific populations, such ASD. Persons diagnosed with ASD may present with unique challenges that impact their ability to give proper informed consent due to cognitive deficits and/or impaired communication skills (Mitchell et al., 2006). Thus, rights of client, professional and legal standards, and standard procedures were reviewed to foster a more detailed understanding of the informed consent process in persons with ASD.

The APA Ethics Code is founded on five general principles, which are intended to guide ethical decision-making of the provider. These principles are applicable to all potential clients, and include doing no harm (beneficence and nonmaleficence), maintaining the best interest of the client (fidelity and responsibility), maintaining a standard of care that does not misinform the client (integrity), being aware of personal limitations (justice), and embracing a diverse array of clients (respect for people's rights and dignity). As mentioned, these principles guide the ethical practice of all mental health professionals, but notably, principle E highlights an ethical responsibility to be thoughtful about individual differences (e.g., vulnerable populations, ASD). More specifically, for persons with ASD, the capacity to consent is largely related to the individual's level of autonomy. This must be taken into account in conjunction with the ethical guidelines to most accurately obtain informed consent in individuals with ASD.

Additionally, legal obligations also inform consent procedures. The American judicial system has written into law that individuals have the right to choose how they are treated and are entitled access to any relevant information regarding a given treatment. This led to an understanding of informed consent as the process of educating clients about treatment options and protecting clients from engaging in therapeutic interventions as a result of coercion. Worth noting, legal standards associated with the process of informed consent may vary by jurisdictions and are further confounded by individual interpretation. Currently, there are no specific criteria that guide the interpretation and implementation of informed consent (Hall et al. 2012). However, research has examined factors most pertinent for determining whether or not a client has been sufficiently informed. Research by Zayas et al. (2005) identified *understanding*, *appreciation*, *reasoning*, and *choice* as the four legal standards for demonstrating capacity to consent. While it has been demonstrated that legal obligations engender clinician's thoughtfulness of client rights, the amount of cases that could be presented for review would present an insurmountable task for the judicial system (Appelbaum, 2007; Karlawish, 2003). Therefore, while legality offers many safeguards, the onus should remain on the clinician to utilize empirically validated measures for evaluating competency during the consent process.

These ethical and legal obligations create an even more complex procedure when taken into consideration with ASD. To help control for this complexity, four primary elements should be considered when requesting client consent. For review, these are (1) the capacity of the decision-maker, (2) sufficient explanation of risks and benefits, (3) established competency of the decision-maker, and (4) decision-maker's choice as a result of their own free will (Hall et al. 2012). Overall, it is expected that consideration of competency for individuals with ASD is done cautiously and with care. Clinicians are expected to be familiar with, and find the balance between, ethical obligations, legal standards, and special considerations (e.g., competency) in individuals with ASD.

While the content included in informed consent documents may vary by clinician, setting, and purpose, the components remain the same. In order to provide clients with necessary information, five basic areas should be covered: communication of risks and benefits (e.g., monetary costs, known outcomes), treatment description (procedures entailed), alternative treatment options, rights and limitations of confidentiality, and additional considerations (delivering the appropriate amount of information).

Ultimately, the discussion of ASD and informed consents revolves around the issue of competency. The communication deficits and high rates of comorbid intellectual disabilities in clients with ASD confound the capacity to consent. Potential complications include feeling coerced by caregivers (Irvine, 2010) or reluctantly complying with authority figures (Zayas et al., 2005). Therefore, clinicians should query the client's rationale for pursuing treatment to provide an additional safeguard for a potentially vulnerable population. While little research has been done in regard to capacity to consent for individuals with ASD, extant literature has closely examined capacity to consent for individuals with cognitive deficits. This research has demonstrated that, for this population, the majority of individuals do possess some capacity to give informed consent; however, they may need to have materials reviewed with them multiple times to ensure they understand the presented content (Morton & Cunningham-Williams, 2009). When considering proper informed consent, certain strategies should be utilized for improving individuals' capacity to consent to treatment. Strategies supported by research include having the document read aloud, detailed explanation of more complex components, and spending additional time on areas that were more challenging for the client (Irvine, 2010). More so, the document may need to be reviewed more than once (Morton & Cunningham-Williams, 2009), and the client should be encouraged to ask questions. All the while, clinicians should employ clinical judgment to continually assess the client's comprehension. The presentation of the document should be considered as well, possibly including the use of visual aids or, alternatively, ensuring the document is constructed in clear, comprehensible language. Overall, these strategies outline many feasible options for improving a client's capacity for consenting to treatment. It is recommended that these strategies be implemented at all appropriate opportunities. When it is clear that clients lack the needed competency to engage in the informed consent process, clinicians should utilize local regulations or guidelines for determining who is the most ethically appropriate individual to serve as a legally authorized representative for proxy decisions.

Historical components, ethical and legal obligations, and competency all lend valuable insight toward understanding informed consent in ASD. While an issue of great complexity, these core components provide structure that can inform ethical and effective practice of the informed consent process for mental health professionals working with ASD clients. Given the ethical mandate for psychologists to consider unique characteristics of any client, it is of upmost importance that the field continues to refine and improve the approaches that are routinely utilized.

Unfortunately, interventions in ASD have become a hotbed for predatory treatments with a lack of empirical support or evidence of possible harm (e.g., facilitated communication, chelation therapy, specialized diets). Because of such invalidated and harmful treatments, the informed consent process is even more crucial to the ASD population. Providing clients and their families with the necessary information to make informed decisions regarding treatments and interventions is paramount. Given the heterogeneous nature of the ASD spectrum, special considerations need to be made regarding the informed consent process and assessment of competency. Due to the paucity of research in this area as it relates to individuals with ASD or other developmental disabilities in the context of treatment, researchers and clinicians are urged to further the field in this area to help support and protect those clients which we serve.

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The History, Pitfalls, and Promise of Licensure in the Field of Behavior Analysis

6

Julie Kornack

A confluence of laws, public policies, professional societies, and scholarly research has propelled the field of behavior analysis to the forefront of the effort to treat the deficits and behaviors associated with autism spectrum disorder (ASD). Although behavior analysts often emphasize the broad utility of behavior analysis in addressing a variety of conditions, this chapter addresses the licensure of behavior analysts, which, for now, is inextricably tied to the wealth of research that demonstrates the effectiveness of applied behavior analysis (ABA) in treating ASD (Granpeesheh, Tarbox, & Dixon, 2009; Matson & Smith, 2008). As the field of behavior analysis has grown and ABA has gained acceptance as a health-care service, the licensing of behavior analysts has gained momentum at a time when licensure laws have come under fire for the potential barriers they may create, both for the consumers they are meant to protect and the professionals they aim to regulate. As the field of behavior analysis joins the regulatory fray of state licensure, this chapter examines the impetus of such laws, the elements of an effective law, the features of a disruptive law, and when and whether licensing of behavior analysts makes sense.

History of Occupational Licensing

The history of occupational licensing is – perhaps surprisingly – fraught with drama arising from professional and ideological partisanship. Along with the professionals targeted for regulation, economists have strong opinions about the purpose of regulation and the effect of regulation on the economy. As one might imagine, many elements of occupational regulation are either great or horrible, depending on whom you ask, and a few variables are not quite so simply black or white.

Occupational regulation arose in the late nineteenth century as the United States transitioned from a service-oriented economy to a manufacturing-based economy, and legislators, consumers, and professionals sought to establish mechanisms that would ensure quality and consumer safety (Kleiner & Krueger, 2010). In its earliest form, licensure of an occupation acted as a resource for consumers who sought to identify a professional's minimal qualifications. Qualifications – or standards – for a given occupation are typically developed by members of that occupation, who then often act as the gatekeepers to new members of the field in the form of a regulatory or licensure board. For this reason, some would argue that occupational licensing is not solely intended to ensure consumer protection and act as a mechanism by which to set and preserve standards. Renowned economist Milton Friedman characterized

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occupational regulation as an effort to impose the monopoly that is anathema to capitalist economies, asserting that regulation of professions was intended to limit those who could join the profession and thereby drive up the cost for consumers of the professionals' services (Friedman, 1962).

The number of licensing laws across the United States has grown considerably, with 4.5% of the workforce holding at least one occupational license in the 1950s and approximately 29% of the workforce holding some sort of occupational license in 2009 (Kleiner & Park, 2014). As recently as July of 2015, President Obama's administration weighed in on the practice of occupational licensing, acknowledging potential benefits to consumer health and safety but cautioning states to weigh the costs and benefits of licensing to both the profession and its consumers and urging state regulators to identify best practices and evaluate whether their state licensing practices warrant reform (Department of the Treasury Office of Economic Policy, the Council of Economic Advisers, and the Department of Labor, 2015).

Authority of States to License

While federal labor laws typically supersede state law, this is not true for occupational licensing. In the late 1800s, the US Supreme Court issued a decision in Dent v. West Virginia (1988) that "took away the federal right of preemption in the arena of occupational licensing and gave it to the states" (Kleiner, 2006, p. 21). That is, Dent v. West (1988) empowered states to enact licensing laws without federal oversight. As a result, occupational licensing varies widely from state to state, both in terms of the occupations that are regulated and the regulatory framework that underpins those licensing laws. Additionally, because professional licenses are granted at the state level, professionals who practice in more than one state are often required to attain and maintain multiple licenses. This aspect of licensure is becoming more relevant as health-care systems increasingly rely on telehealth to deliver health care to underserved and rural areas (Thomas & Capistrant, 2016).

Forms of Occupational Regulation

Occupational regulation may take the form of registration, certification, or licensure. Registration is the least restrictive form of regulation, with states typically requiring minimal information, such as an individual's name, address, and qualifications. Certification may require the same basic information but likely incorporates an exam or some other applicant assessment in order for the government to *certify* an applicant's qualifications. Licensure imposes the greatest amount of regulation and – barring exclusions – makes it illegal to practice the profession without a license (Kleiner & Park, 2014).

Emergence of Licensing of Behavior Analysts

Licensure of behavior analysts has arisen for different reasons in different states. As a wealth of research studies have demonstrated the effectiveness of ABA in treating autism, ensuing legislation and regulatory guidance have increased access to ABA (Granpeesheh et al., 2009; Matson & Smith, 2008). Insurance reform (i.e., autism mandates), the Affordable Care Act (ACA), clarification that autism treatment is a covered benefit under Medicaid for beneficiaries under 21 years of age (Centers for Medicare and Medicaid Services, 2014), and a stronger federal mental health parity law (Paul Wellstone and Pete Domenici Mental Health Parity and Addiction Equity Act of 2008) have collectively paved the way for reimbursement of ABA in the health-care field. As a result, the field of behavior analysis has grown considerably since the first study demonstrating the effectiveness of ABA in treating ASD (Lovaas, 1987).

States have responded to this growth in many instances by legislating standards, enacting licensure laws, and/or creating registries in an effort to regulate behavior analysts, safeguard consumers, and – in some instances – comply with a state's legal or regulatory framework for insurance reimbursement. In states where licensure is required for delivery of health-care services or a perception exists that licensure is required, either for reimbursement by a third-party payer (e.g., insurance carrier, health plan, state agency, etc.) or as a general requirement of state insurance laws and regulations, passage of a bill to license behavior analysts has often accompanied or shortly followed the passage of the state's autism mandate (i.e., a law requiring some or all state-regulated insurance policies to include coverage of autism treatment) or implementation of an autism treatment benefit under Medicaid.

Some states have sought licensure in response to successful campaigns for licensure by prominent members of the field of behavior analysis who view licensure of behavior analysts as an opportunity to protect both consumers and the field of behavior analysis from unqualified practitioners; codify educational, training, and experiential standards; and ensure that behavior analysts have the right to practice ABA independently without the supervision of another licensed professional, such as a psychologist (Dorsey, Weinberg, Zane, & Guidi, 2009; Hassert, Kelly, Pritchard, & Cautilli, 2008). Whereas some states have enacted licensure laws without much controversy, other states have encountered opposition, ranging in intensity from mild to fierce. In states with active resistance to licensure, the effort to license behavior analysts likely requires a combination of political will, professional consensus, and consumer support.

Political Will Political will plays an important role in efforts to expand licensure of behavior analysts. Beyond the fundamental need for a legislator to be motivated to sponsor a licensing bill, the legislative committees through which a bill passes scrutinize a wide-ranging variety of elements, including potential revenue from license fees, costs associated with a new licensing board, the support or opposition of special interest groups, and the impact of licensure on constituents. In general, political will arises when a problem exists that has produced widespread concern which, in turn, engenders widespread support for potential solutions. Political will is fragile, though, and fades quickly amidst controversy. Green and Johnston (2009) called the political process "perhaps the greatest challenge" in the effort to license behavior analysts and stated that "Some professions are well-equipped to participate in the political process. Behavior analysis is not one of them at present" (p. 61).

Professional Consensus For better or worse, professional organizations typically play a critical role in developing a state's licensure framework, from engendering the political will to pass a licensure law and drafting the text of that law to influencing the selection of the first members of the licensing board. As the prevalence of ASD has increased and the framework for autism treatment has evolved, professional consensus on whether to license behavior analysts has been elusive. As recently as 2009, dueling articles appeared in *Behavior Analysis in Practice* offering two different perspectives on the licensure of behavior analysts. In their article *Licensing Behavior Analysts: Risks and Alternatives*, Green and Johnston (2009) assert that pursuit of licensure for behavior analysts is premature and that the role of the Behavior Analyst Certification Board (BACB) as a certifying entity is sufficient, whereas Dorsey et al. (2009) make the case that licensure is overdue and that "continued dependence on a board certification process will not be adequate to protect consumers" (p. 53).

Green and Johnston (2009) ask a critical question that may foreshadow the problems that arise as licensing of behavior analysts begins to proliferate: "Are there enough practitioners eligible for licensure to provide easy access to services for consumers?" This question lies at the heart of the struggle to find professional consensus in the effort to enact licensure laws. On the one hand, legislators and consumers are loathe to support a licensing bill that could hinder access to ABA by prohibiting individuals who currently provide ABA services from practicing. On the other hand, many behavior analysts worry that the quality of ABA services will be diminished if the scope of a licensure act encompasses other licensed professionals, making the point that "competence in behavior analysis cannot be assumed" of psychologists and other licensed professionals (Shook, 1993). Consequently, as some behavior analysts seek to limit licensure to BACB certificants, others work to ensure the ability of other licensed professionals (e.g., psychologists, marriage and family therapists, etc.) to practice ABA, either by exempting them from the licensure act or by allowing such professionals to qualify for licensure as behavior analysts. Wrongly or rightly, the effort to strike a balance between expanding access to treatment without diluting treatment quality is inevitably influenced by the insufficient number of BACB certificants in light of the rate of ASD.

Consumer Support Although consumer protection is a primary impetus for most state licensing laws, consumers in the autism community may be wary of the potential for licensure to limit access to treatment by imposing requirements that proscribe some providers from practicing ABA. Consumers who are accustomed to ABA may be confident in their ability to choose a provider and hesitant to have that choice limited by a licensure requirement. Consumers for whom ABA is uncharted territory may, in turn, be more supportive of a licensure law that gives ABA treatment the regulatory structure of most other health-care services. Certainly, consumer support – or, at a minimum, lack of vocal consumer opposition – plays a role in the effort to pass any licensure bill, including those that would license behavior analysts (Kleiner, 2006).

To BACB or Not to BACB

In 2007, the credentialing programs of the Behavior Analyst Certification Board (BACB), in use since the 1990s (Kazemi & Shapiro, 2013), were accredited by the National Commission for Certifying Agencies (NCCA), demonstrating that the credentialing programs for the Board Certified Behavior Analyst (BCBA) and the Board Certified Assistant Behavior Analyst (BCaBA) met the rigorous standards of the NCCA and, therefore, effectively assessed professional competency. With its credentialing process, the BACB has established a certification for behavior analysts and assistant behavior analysts that identifies the education, training, and experience requirements that make an individual eligible to sit for the BCBA or BCaBA exam. As of 2016, 20,000 professionals had secured the BCBA or Board Certified Behavior Analyst-Doctoral (BCBA-D) credential, and 2,315 professionals held a BCaBA (Behavior Analyst Certification Board [BACB], 2016b). Through its certification programs, the BACB has created a valuable framework for practitioners of behavior analysis. In fact, Dixon et al. (2016) found that “supervisors with BCBA certifications produce 73.7% greater mastery of learning objective per hour as compared to supervisors without a BCBA.”

The *Model Act for Licensing/Regulating Behavior Analysts, Revised September 2012* (BACB, 2012), offered by the BACB to states contemplating licensure of behavior analysts, seeks to codify the BACB’s BCBA and BCaBA credentials as the primary paths to licensure. As a result of the effective dissemination of the BACB’s Model Act, many state licensure requirements mirror the BACB’s certification requirements. Given the effectiveness of BCBAs in producing a higher rate of skill mastery in children with ASD, the BACB’s Model Act contains important education, training, and experience requirements that have demonstrated their effectiveness (Dixon et al., 2016). The drawbacks created by relying solely on the BACB Model Act, however, echo the challenges experienced in the effort to reach professional consensus. One recurring issue in licensure initiatives is that not all behavior analysts have pursued BACB certification; most often, the careers of these behavior analysts predate the establishment of the BACB and its credentials. That is, prominent behavior analysts have chosen not to add the BCBA credential to their existing degrees, having worked for decades without any such credential. While the BACB Model Act exempts some professionals from the license requirement, it precludes all but psychologists from calling themselves behavior analysts.

Notably, the BACB is careful to ensure that the BCBA and BCaBA credentials are not autism specific but, rather, pertain to the entire field of behavior analysis as a whole. Therefore, it is relevant to note that an individual can complete the extensive education, training, and experience requirements and pass the BCBA or BCaBA exam without having any knowledge of or experience with people affected by ASD. In that context, behavior analysts whose education, training, and careers predate the founding of the BACB may be hard-pressed to understand why they find themselves struggling to preserve their right to practice when a licensure law is implemented that gives the only path to licensure to BCBAs and BCaBAs.

Oregon's recent experience with its effort to license behavior analysts is illustrative of the controversy that may arise between BCBAs and non-BCBAs. In many states, such as Oregon, coverage of autism treatment by a third-party payer is relatively new, and the number of BCBAs with clinical practices specializing in autism is quite small. When Oregonians first had access to autism treatment through health insurance, Oregon likely had an autism population numbering over 12,000[1] but fewer than 50 BCBAs (BACB, 2016a), and only about half of those were autism treatment providers. Despite the daunting gulf between demand and supply, prominent behavior analysts led the charge to impose a licensing structure that would limit licensure to BACB certificants. Although other professionals may have been able to continue *practicing* ABA, they would likely have been unsuccessful in any effort to be reimbursed by insurance entities.

Another controversial component of the BACB Model Act may be that it contains language that technically makes it illegal for family members to use ABA outside of the home, only exempting family members from licensure "within the home" as long as they are acting "under the extended authority and direction of a Licensed Behavior Analyst or a Licensed Assistant Behavior Analyst" (BACB, 2012, p. 7). This restrictive language has prompted consumers to oppose licensing bills in the past. The BACB Model Act also incorporates "compliance with the BACB Professional Disciplinary and Ethical Standards and the BACB Guidelines for Responsible Conduct for Behavior Analysts" (BACB, 2012, p.4). States may be reluctant to link a state license to an ethical code whose content is not controlled by the state and whose causes for disciplinary action may include proprietary matters that do not reflect the state's interests.

Licensure Boards

When a licensure law is enacted, oversight of the license may fall to a state agency or may be delegated to a licensing board. These boards typically promulgate rules to implement the licensure law. Behavior analysts are regulated by their own board in just under one-third of the states that require behavior analysts to be licensed (Association of Professional Behavior Analysts, 2015). Depending on the language in the licensure act, an existing board (e.g., psychology) may be directed to incorporate oversight of behavior analysts. The composition of a board varies but typically includes members of the profession, members of related professions, and consumers who are served by the profession. The BACB Model Act recommends that "An overwhelming majority of the members of the Regulatory Authority should be Board Certified Behavior Analysts with additional membership of at least one Board Certified Assistant Behavior Analyst and at least one Consumer/Public Member" (BACB, 2012, p. 2–3). A recent decision by the US Supreme Court in North Carolina State Board of Dental Examiners v. Federal Trade Commission (2015) may cause state licensing boards, including those that regulate behavior analysts, to rethink their board composition and licensure regulations. In its decision, the Supreme Court held that "State licensing boards are not automatically exempted from antitrust scrutiny…if a controlling number of board members are themselves 'active market participants'" (Department of the Treasury Office of Economic Policy, the Council of Economic Advisers, and the Department of Labor, 2015). That is, if a majority of the members of a licensing board that regulates behavior analysts earn income as practitioners of behavior

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[1] Based on US Census Bureau Population Estimate for 2013 of Individuals Under 18 and CDC Prevalence Rate of 1:68.

analysis, then behavior analysts whose market participation (i.e., income) is adversely affected by the rules promulgated by that board may have cause to pursue antitrust litigation. This decision seems to be in harmony with Milton Friedman's view that occupational regulation can produce monopolies (Friedman, 1962). State boards are less vulnerable to antitrust allegations when states play a greater role in the supervision of their regulatory boards and if the majority of board members are not "active market participants" (Department of the Treasury Office of Economic Policy, the Council of Economic Advisers, and the Department of Labor, 2015, p. 52).

Guest Licensure and Reciprocity Provisions

Since licensure laws are enacted at the state level, guest licensure provisions are common. Without a guest licensure provision, a licensed professional in one state is not allowed to practice in another state that requires licensure until s/he secures that state's license. Guest licensure enables a behavior analyst who is licensed in State "A" to practice in State "B" for a specified period of time before being subject to the licensure requirements of State "B." Guest licensure provisions are important for a number of reasons. Such provisions act as de facto grace periods when a behavior analyst moves from one state to another, so the behavior analyst can work as a behavior analyst on his/her first day in a new state. Guest licensure provisions also facilitate the use of telehealth, so a behavior analyst living in State "A" can occasionally or temporarily provide services in State "B." This is especially useful in bridging gaps created by provider shortages, which are systemic in the field of autism treatment.

Nearly all states include a guest licensure provision in their licensure laws for psychologists. For example, Arizona allows psychologists who are licensed in another state to practice in Arizona without an Arizona license up to 20 days per year. California allows out-of-state psychologists to practice up to 30 days annually without obtaining a California license. Guest licensure provisions are uncommon in licensing acts for behavior analysts, however, and this missing element in the licensure of behavior analysts is likely to exacerbate delays and provider shortages, especially if additional states decide to license behavior analysts.

Often in licensure laws, states grant *reciprocity* or *license by endorsement* to a person who is licensed in another state that "imposes comparable licensure requirements" (BACB, 2012, p. 9). Unlike guest licensure provisions, reciprocity provisions offer temporary or permanent licensure in the state granting the reciprocity. Although the BACB includes a provision for reciprocity in its Model Act (BACB 2012, p. 9), it does not appear to be a provision that has been adopted frequently, possibly because reciprocity in behavior analyst licensure is less relevant when states rely on the BCBA and BCaBA certifications, which do not vary from one state to the next.

Conclusion

As the field of behavior analysis continues to grow and ABA is increasingly recognized as a medically necessary treatment, licensure seems to be a natural next-step, especially in states that require health-care providers to be licensed. While occupational regulation has the potential to legitimize a field, elevate its standards, and protect consumers, it also has the potential to act as an impediment to growth and access to medically necessary treatment.

Despite the significant growth of the field of behavior analysis, the field has not been able to keep pace with the extraordinary demand for its services. As long as the number of behavior analysts is insufficient to meet the demand for behavior analytic services, efforts to exempt other licensed professionals from a license act that would otherwise proscribe them from practicing ABA are likely to be regarded as in the best interests of the public. To this point, consider that 1:68

children in the United States are diagnosed with ASD (Christensen et al., 2016) and that the number of BCBAs and BCaBAs in the United States totaled under 25,000 in 2016 (BACB, 2016a). If we relied solely on BCBAs and BCaBAs to treat the autism population under 18 [US CENSUS Bureau Population Estimate for 2013 of individuals under 18], every BACB certificant in the United States would need to maintain a caseload of nearly 50 children for supply to meet demand. Then, consider that this scenario omits the number of adults who need ABA and overlooks the many BACB certificants who do not work as autism treatment providers, and any proliferation of licensure laws that hinders access to ABA may very well be the source of a public health emergency, not only depriving individuals with ASD of the treatment they need but, also, shifting the cost of caring for these individuals from insurance entities to state and local governments whose budgets grow more strained each year.

Common justification for licensure is the assertion that it preserves or increases the quality of service, thus protecting consumers from the harm of receiving services from a less qualified or unqualified person. Such consumer protection is in a state's interests to ensure the well-being of its citizens and insulate the state from the likely financial consequences of a consumer's poor decision, i.e., providing long-term services and supports to consumers who may not have required them had they been prevented – or protected – from receiving services from an unqualified person. If licensure substantially narrows the field of available behavior analysts, though, family members may be relegated to implementing "do-it-yourself remedies," the consequences of which are unlikely to be captured in any assessment of a license law's effectiveness (Svorny, 2000, p. 297). Recent guidance from the federal government suggests that additional scrutiny of all licensure laws is warranted to ensure that the benefits do, in fact, outweigh the cost and that the laws function effectively for the consumers they seek to protect and the professionals they seek to regulate.

When consumers, behavior analysts, and legislators agree on the need to license behavior analysts, the details of the licensing bill may be divisive as legislators consider the educational, training, and experience requirements, as well as which professionals to exempt from the license law. In addition to exacerbating a pervasive shortage of autism treatment providers, license laws that limit the practice of ABA to BCBAs draw the ire of psychologists, social workers, and other licensed professionals for whom ABA may be in their scope of practice. On the other hand, licensure efforts that place oversight of behavior analysts under a board of psychology, such as the license bill that failed in California,[2] are viewed by some behavior analysts as diluting the effort to assert behavior analysis as its own profession, worthy of its own regulatory board. Often, a regulatory board promulgates the rules that have the greatest impact on access to ABA, so the composition of the board is critical. Additionally, board composition that creates a majority of active market participants may be vulnerable to antitrust allegations.

Currently, licensure of behavior analysts is in its early days, so we can only hypothesize about effective elements of licensure laws governing behavior analysts. (See Table 6.1 for *Considerations in Evaluating Effectiveness of Licensure Laws & Regulations for Behavior Analysts.*) Going forward, states should solicit and provide data to demonstrate the effectiveness of these laws. Additionally, states – or professional organizations acting on behalf of the states – should survey practitioners and consumers of behavior analysis to identify challenges that may have been inadvertently created by licensure laws, recognizing, in the face of the prevalence of ASD, that it is in the best interests of the state to facilitate liberal access to behavior analysis to ensure that consumers do not encounter unnecessary barriers to critical treatment.

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[2] California Assembly Bill (2016) is an act to amend Sections 27 and 2920 of; to amend, repeal, and add Sections 2922, 2923, and 2927 of; to add Chapter 6.7 (commencing with Section 2999.10) to Division 2 of; and to repeal Sections 2999.20, 2999.26, 2999.31, and 2999.33 of the Business and Professions Code, relating to healing arts.

Table 6.1 Considerations in evaluating effectiveness of licensure laws and regulations for behavior analysts

Inquiry	Consideration(s)
Will current practitioners of ABA be able to continue practicing once the law takes effect?	Given the current rate of ASD and the limited number of BACB certificants, states should examine whether it is helpful to ensure that the licensure law allows non-BACB certificants to practice.
Are behavior analysts able to practice independently?	Master's and doctoral-level behavior analysts should be allowed to practice without supervision from another licensed professional as long as they are acting within the scope of their competency.
Do education, training, and experience requirements reflect the standard of care?	Setting aside the BACB certification, licensure acts should incorporate education, training, and experience requirements that reflect the standard of care.
Does the licensure act support the tiered-delivery model of ABA?	Licensure acts should incorporate all three levels of ABA treatment delivery: (1) a master's or doctoral-level supervisor, (2) a bachelor's level assistant supervisor, and (3) a behavior technician who meets minimal education and training requirements.
Do the behavior technician requirements, if addressed, reflect the standard of care?	The position of behavior technician is an entry-level position, and requirements should be minimal (i.e., a high school diploma or equivalent or higher, 40 h of training, and 15 h of practicum).
Are family members, teachers, and other caregivers able to implement ABA across all environments?	Outcomes are likely to be optimized when caregivers have the opportunity to support treatment by implementing ABA to the best of their ability. While training caregivers is important, a licensure act should not prohibit family members and others from implementing ABA as long as they do not call themselves behavior analysts or seek reimbursement.
Does the composition of the board adequately represent all stakeholders while protecting the interests of the state?	To avoid scrutiny for potential antitrust violations, a majority of board members should not be active market participants. Consideration should be given to individuals who do not earn income as practitioners of behavior analysis. All stakeholders should be represented.
Is consumer safety adequately addressed?	Consumer safety is greatest when every member of the treatment team is required to submit proof of an active (ongoing) background check. Ideally, the state should offer public access to a registry through which credentials and active background checks can be confirmed. A mechanism should be in place to receive and evaluate complaints and, when necessary, impose disciplinary action.
Does the licensure act include a guest licensure provision?	To avoid unnecessary barriers to ABA, a licensure act should include a guest licensure provision that allows behavior analysts who are licensed in another state to practice a specified number of days each year without a license.
Is the ethics code culturally sensitive?	Ethics codes should accommodate efforts of licensees to be culturally sensitive; e.g., a rule that prohibits the licensee from accepting gifts from the patient should incorporate professional discretion that allows a licensee to accept, for example, a plate of cookies from a parent who may be offended if the offering is declined.

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Staff Training

7

Karola Dillenburger

Introduction

Staff training is important to ensure competent delivery of services, regardless of the industry or the target audience. In addition, staff training has been identified as the most important factor in the reduction of the 'revolving door' of unwanted staff turnover; other factors include supervision, pay and job satisfaction (Kazemi, Shapiro, & Kavner, 2015). A comprehensive behavioural systems analysis (BSA) of workplace practices goes beyond this chapter (cf. Diener, McGee, & Miguel, 2009; Malott, Vunovich, Boettcher, & Groeger, 1995; Strouse, Carroll-Hernandez, Sherman, & Sheldon, 2004), although it is important to note that satisfaction with pay does not depend on the amount paid but rather on the control over income (Abernathy, 2011).

In monetary terms, staff training is more economic than staff turnover, which can cost between 15% and 200% the annual salary of the member of staff who leaves (Sundberg, 2016). In human terms, staff training is even more valuable, not only for staff career prospects but, more importantly, for the service user, because the skill and performance and the retention of good staff obviously play a key role in the delivery of good and consistent services.

As with other professionals, behaviour analysts undergo extensive qualifying level training, with both theory and practice components. Those who aim to become Board Certified Behavior Analysts (BCBA) undertake an approved Masters-level course sequence at a university, as well as 1500 h of supervised practice, after which they have to pass the Behavior Analyst Certification Board's (BACB) exam. Subsequently, they have to engage in substantive approved continuous education to maintain their certification. Those who take their training to doctoral levels can be designated as Board Certified Behavior Analysts-Doctoral (BCBA-D). The process required to achieving and maintaining these certifications and designations is described in more detail in Chap. 7 of this book.

BCBAs and BCBA-Ds commonly supervise programmes that are delivered by Board Certified Assistant Behavior Analysts (BCaBA) and/or Registered Behavior Technicians (RBT) or other social or health-care professionals or paraprofessionals. Staff training and supervision for all of these professionals are central to their practice. The Behavior Analyst Certification Board specifies clear requirements for the minimum additional training of BCBA who engage in supervision of trainee behaviour analysts (Sellers, Valentino, & LeBlanc, 2016); however, there are few guidelines as to evidence-based behaviour analytic methods to train staff.

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In an overview of staff training, Reid, O'Kane and Macurik, (2011) note the following:

> Staff training and management represent a longstanding area of focus in applied behavior analysis. Soon after initial demonstrations of the efficacy of behavior analysis for improving the behavior of people with special needs in the 1960s, attention was directed to disseminating the emerging technology among human service personnel. Concern first centered on training service providers in basic behavioral procedures to apply with people who had developmental and related disabilities. Shortly thereafter it became apparent that the same principles underlying behavior change procedures for people with developmental disabilities were applicable with staff work performance. Concern over training human service staff to use behavioral procedures and applying behavioral strategies to manage staff performance continues today. (p. 281)

Effective high-quality staff training and supervision are crucial to the quality of services available to vulnerable service users. The current chapter focusses on training staff who work mainly in the areas of education, social and health care, and/or residential settings with individuals with various kinds of disabilities or psychiatric diagnosis.

First up, it is important to note that behaviour analysts do not work in isolation. More often than not, they work in, or lead, multidisciplinary teams or teams of paraprofessionals. Most multidisciplinary professionals working with children with autism, for example, will have received very little training in autism and virtually no training in behaviour analysis during their qualifying training. This is true for teachers, educational psychologists and other education staff. It is also the case for social workers, family therapists, counsellors, cognitive behaviour therapists and other social care staff and for medical professionals, including paediatricians and psychiatrists. Equally, allied health professionals, such as occupational therapists, clinical psychologists and speech and language pathologists, receive very limited training in autism or behaviour analysis (Dillenburger et al., 2014b). Therefore, these professionals cannot be expected to fully grasp the complex concepts and basic scientific underpinnings that inform the practice of behaviour analysis. Clearly there is a need for post-qualifying training.

Most multidisciplinary teams also include service users, and although some service users, especially some adults with autism, have spoken or written about ABA, usually they are not trained in behaviour analysis, and therefore they are unlikely to be au fait with the history and the accurate application of the science (e.g. Milton, 2012).

Despite the identified need for post-qualifying training, most health, social care, medical and education professionals receive very little training in autism or behaviour analysis after they qualify. Subsequently, their understanding and knowledge in these areas remain very limited, unless they have personally invested in further training. In fact, frequently, self-reported knowledge of autism and behaviour analysis overestimates actual knowledge significantly (Dillenburger, McKerr, & Jordan, 2016; Fennell & Dillenburger, 2016). Parents are often better informed about behaviour analysis and autism and more willing to learn than professionals (Dillenburger, Keenan, Doherty, Byrne, & Gallagher, 2012). Consequently, much depends on post-qualifying and in-service training for staff.

The need to focus on staff training methodologies became apparent in the early 1960s, soon after evidence emerged of the effectiveness of behaviour analysis-based interventions, especially in terms of improving the quality of lives of people with intellectual disabilities and their families. It became obvious that the behaviour analytic technology was not only effective in helping clients or service users but that the same principles also were relevant for training staff to deliver these interventions. Obvious to a behaviour analyst is that client outcomes are a function of a number of contingencies, including staff training, maintenance of staff skills, and transfer of staff skills across settings, clients, and programmes (Jahr, 1998). Despite this realisation, staff training has not received the same attention in behaviour analytic literature, as have interventions for users of behaviour analytic services (Macurik, O'Kane, Malanga, & Reid, 2008).

There is much more research in the area of parent training in behaviour analysis (Bearss et al., 2015; Dillenburger et al., 2004; Green et al., 2010). This is relevant here, because while there are important differences between staff training and parent training, for example, for parents of young children with developmental disabilities including autism, both are linked by the common focus on the use of behaviour analytic principles to teach behaviour analytic skills sets.

Given that traditional didactic methods of staff training have shown to be not particularly effective, behaviour analysts who are charged with staff training have developed new and innovative training methods (Parsons, Rollyson, & Reid, 2012; Reid et al., 2011). This research has identified a number of factors that are important, including:

1. Working collaboratively
2. Identifying necessary competences
3. Establishing performance measures
4. Designing and applying staff training procedures
5. Using technology in staff training
6. Implementing performance management, generalisation and maintenance

Working Collaboratively

Regardless of where they work, behaviour analysts are unlikely to work in isolation. It is much more likely that they are collaborating with other professionals, not only in the area of autism but also in education and other areas of application. Therefore, behaviour analysts need to be prepared to work and train in multidisciplinary teams, and, in turn, other professionals may require some behaviour analytic training.

It is important to note here the distinction between multidisciplinary work and specific methods of interventions, such as those used in an ‘eclectic approach’ (Dillenburger, 2011; Howard, Stanislaw, Green, Sparkman, & Cohen, 2014). The eclectic approach is popular in autism services across Europe, despite the lack of evidence in its favour and the fact that evidence-based behaviour analytic services are now considered gold standard across most of North America (Autism Speaks, 2014; Perry & Condillac, 2003). Typically, the eclectic approach resembles traditional special education, where various intervention procedures are implemented concurrently or consecutively without a common theoretical framework. This kind of approach harbours a number of problems, not least because it can become very disjointed. For many reasons, true eclecticism is impossible, i.e. staff cannot be trained in all possible procedures, and as such selection of intervention procedures necessarily remains limited. In addition, there is ample evidence that the eclectic approach is less effective than procedures that are based on behaviour analysis (Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Howard et al., 2014). In effect, eclecticism has been exposed as pseudoscience (Gardner, 1957), yet it remains supported in some countries (Dillenburger, McKerr, & Jordan, 2014a; Dillenburger, 2011), for reasons defined by Tavis (2003):

> Pseudoscience is particularly attractive because, by definition, [it] promises certainty, whereas science gives us probability and doubt. Pseudoscience is popular because it confirms what we believe; science is unpopular because it makes us question what we believe. (pp. xv–xvi)

As a result, the eclectic approach has been considered a ‘postcode lottery’ (Unumb, 2014) and likened to a ‘haphazard pick and mix’ approach (Cumine, Dunlop, & Stevenson, 2009; Dillenburger, 2011; Howard et al., 2005, 2014; Stanton, 2000).

It is important, however, to distinguish between the eclectic approach and multidisciplinary work. Multidisciplinary work is usually highly valued by professionals and service users. In fact, there are various ways in which professionals trained in different disciplines can work together. Generally, when collaborating with different disciplines in health, social care or education, each profession aims to address different aspects of the same situation or diagnosis. Given different training histories, at times, it is not easy to explain the concepts of one discipline in terms that are comprehensible to professionals from other disciplines. Nevertheless, collaborations can be valuable as they may have the potential to expand the scope of an existing discipline. Ultimately, a range of professionals from different disciplines working together to the benefit of the service user can take various forms:

- *Multidisciplinary work,* where different disciplines deal with different aspects of the same problem which has the potential to address more complex issues and realise efficiencies.
- *Interdisciplinary work* intends to address a problem which requires knowledge from varied and multiple sources. Thus, interdisciplinary work has the potentially to lead to the development of an entirely new discipline.
- *Cross-disciplinary work* means that aspects of one discipline are explained in terms of the concepts and language of another. Cross-disciplinary work thus has the potential to expand the scope of existing disciplines.
- *Transdisciplinary work* occurs when different disciplines retain their individual knowledge base but have a common theoretical basis. The key advantage of transdisciplinary work is that professionals use a common language, and it therefore allows for a consistent and joint-up approach to the problem (Dillenburger et al., 2014b).

The discipline of behaviour analysis can have beneficial impact in all of these settings, especially with regard to developing clear and transparent procedures for identifying target behaviours (including the necessary staff competences) and for developing and implementing behavioural measurement systems, effective interventions, as well as generalisation and maintenance procedures.

Identifying Necessary Competences

While there are clear and relatively well-defined staff competencies in relation to autism and behaviour analysis, which are identified and regularly reviewed in the task lists for BCBAs, BCaBAs and RBTs (BACB, 2015), staff competences, performance and outcome measures are less clear for paraprofessionals or other staff who therefore require training or supervision by behaviour analysts. The BACB autism competency list (BACB, 2015) focusses mainly on ethical practice, current best evidence-based interventions, and staff accountability. However, the autism competency list is only useful for staff working in autism services and has limited application to other service areas. Other competency frameworks generally refer to specific disciplines, such as nursing or social work (BASW, 2016), or specific methodologies, such as positive behaviour support (PBS Coalition UK, 2015).

Employers commonly specify their expectations of newly appointed staff in job specifications and internal policies and procedures outlining how staff are to behave in relation to service users and co-workers, e.g. physical restraint procedures for persons who engage in challenging or injurious behaviours. Employers expect that, subsequently, staff are fluent in these management procedures. However, oftentimes, these training courses are brief and do not allow for enough practice time to properly assess, generalise and maintain fluency.

Didactic teaching per se is not sufficient and, given the frequent overuse of basic technology, may lead to ‘death by PowerPoint’ (Taylor, 2007), and ultimately, of course, staff training and competence lists are only as useful as their application in practice.

Establishing Performance Measures

Detailed training and assessments are needed before staff acquire the necessary competencies. As with any behavioural interventions, staff skills require repeated measurement, through direct observation, video analysis, and/or written examination or testing. For example, the York Measure of Quality of Intensive Behavioural Intervention (YMQI) was used by Denne, Thomas, Hastings and Hughes (2015) to assess competence according to the UK Society of Behaviour Analysis (UK-SBA) Autism Education Competence Framework (Level 1) for experienced and inexperienced staff working with children on the autism spectrum. They found that, while the instrument was able to differentiate between these two groups, '[t]here were few associations between the different methods of assessing competence' (p. 67). Therefore, they concluded that one measure, when used in isolation, could not reliably assess all necessary competencies.

Thus, traditional questionnaire evaluations are not sufficient for measuring acceptability of staff training systems. When staff were asked about their preference between familiar and unfamiliar staff training systems, they did not report any specific preference; however, when they were given a choice, they generally chose the familiar format (Reid & Parsons, 1995).

Designing Staff Training Procedures

There are a variety of training procedures, including didactic teaching, in vivo and video modelling, programmed instruction, peer tutoring, written instruction, and on-the-job feedback. In most cases, staff training includes a combination of these procedures, but there are only a few studies who offer a component analysis.

Delamater et al. (1984) explored three different staff management procedures to determine which would be more effective: (a) in-service training, (b) direct feedback of actual staff performance, and (c) role playing. Eight members of staff of an inpatient psychiatric unit took part, including nurses and aides, and their interactions with children were observed directly in naturalistic settings for 21 weeks. They found that the in-service training was not very effective in terms of changing staff behaviour, while direct feedback led to temporary increases in appropriate staff responding. However, these changes were not maintained across time. The largest effect on staff behaviour was observed subsequent to the use of role playing that involved instruction, modelling, behavioural rehearsal, feedback, and reinforcement of appropriate staff responses.

A number of studies focussed on shorter staff training courses in residential or other care settings. For example, McDonnell et al. (2008) ran a short 3-day staff training course that focussed on the management of aggressive behaviour of service users on the autism spectrum. The training for the intervention group was followed up over 10 months, while the control group received training before this study but was not followed up. While the staff training itself increased staff confidence, with regard to staff coping, support or perceived control of challenging behaviours, no training effects were observed, although reports of difficulties in the management of challenging behaviour reduced in both target groups.

Others have applied staff training procedures in the classroom. For example, Schmidt, Urban, Luiselli, White and Harrington (2013) trained educational staff to implement behaviour analysis-based interventions, especially those related to antecedent manipulations, e.g. appearance, organisation and safety in the classrooms. They used task directives, daily supervision and graphic performance feedback and showed that favourable classroom environments were maintained at a school for children with intellectual and developmental disabilities over a two-week period after completion of the intervention.

Few studies have focussed on staff training for those who are working with high-functioning adolescents on the spectrum autism in naturalistic settings. A study by Palmen, Didden and Korzilius (2010) describes behavioural skills training that was conducted via group instruction and supervisory feedback. The focus of this study was on staff (a) providing positive reinforcement, (b) providing error correction and (c) initiating opportunities for students to show the target response (i.e. asking for help). Data on student target behaviours showed that the intervention effect was limited; however, staff performance specifically in relation to accurate use of error correction procedures improved significantly, and improvements were maintained across time. Generalisation of staff skills was limited, although the intervention was considered effective in staff self-reported evaluations. Similar staff reports of high social validity were found in studies that focussed on teaching staff-specific procedures, e.g. discrete-trial teaching (DTT) (Sarokoff & Sturmey, 2008).

Staff skills are particularly important when it comes to dealing with aberrant and challenging behaviours, such as self-injurious behaviour (SIB). Courtemanche et al. (2014) evaluated the effectiveness of staff training that included role playing, in vivo training, feedback paired with contingent money and an escape contingency on treatment fidelity of three frontline care staff, who were monitored, both remotely and in person. They found that intervention fidelity was high, both in role play and in vivo situations contingent on ongoing feedback and money. Nigro-Bruzzi and Sturmey (2010) confirmed the importance of instructions, modelling, rehearsal, and feedback, for staff training resulting in increases in staff performance across a range of settings.

While much of the staff training literature reports research conducted in the context of intellectual disability services, less is known about staff training in dementia care settings despite the evidence of the effectiveness of staff training in these settings (Spector, Orrell, & Goyder, 2013). Here, on-the-job feedback is a popular staff training procedure especially when used after conventional analogue staff training. Arco and du Toit (2006) explored the effectiveness of staff feedback in nursing staff subsequent to conventional staff training group workshops and showed that workshops alone did not increase staff performance sufficiently; however, with on-the-job feedback, all staff participants achieved and maintained competency and the procedures were considered socially valid. When verbal feedback alone and verbal feedback with approval statements were compared, findings showed that, not surprisingly, the former was less effective than the latter in decreasing off-task and increasing on-task staff behaviour (Brown, Willis, & Reid, 1981). In another study, a multipurpose job aid and feedback training package were used to improve skills of supervisors and animal trainers in a nongovernmental organisation in resource-poor area of East Africa, showing high levels of skills maintenance and generalisation as well as social validity (Durgin, Mahoney, Cox, Weetjens, & Poling, 2014).

Feedback from peers was effective as a staff training method in a vocational programme for adults with intellectual disabilities. Working in pairs, peers were trained to monitor, record and graph data, provide feedback and set goals with the other staff member (Fleming & Sulzer-Azaroff, 1992). Public verbal feedback delivered at staff meetings was effective in increasing staff performance of training clients in self-help skills; however, improvements were limited as the only behaviours that increased were those for which staff received feedback (Wilson, Reid, & Korabek-Pinkowski, 1991).

Self-management procedures have also been used in staff training. A self-management Acceptance and Commitment Therapy-based training intervention (ACTr) was compared with psychoeducation training (PETr) in terms of staff attitudes towards patients diagnosed with personality disorder (PD), staff-patient relations, and staff well-being. While attitudes and staff-patient relations improved up to 6 months after training, staff well-being did not improve for either group (Clarke, Taylor, Lancaster, & Remington, 2015).

Acceptability of immediate versus delayed verbal (spoken) feedback was assessed for staff working with people with severe disabilities, following classroom-based instruction (Reid & Parsons, 1995). Similarly, abbreviated performance feedback was assessed as a training strategy for paraprofessional staff, including verbal praise for accurate skills and clarification/redirection for incorrect performance. Staff skills improved rapidly and were maintained post-training. The procedures showed high social validity and acceptance (Leblanc, Ricciardi, & Luiselli, 2005).

The relative importance of performance feedback in the acquisition and maintenance of skills is related to discriminative and/or reinforcing functions. Roscoe, Fisher, Glover and Volkert (2006) evaluated the relative contributions of these two functions and found that performance-specific instructions were more important to skill acquisition than contingent reinforcement (i.e. money).

However, these findings are in contrast to Brackett, Reid and Green (2007), who explored reactivity of staff behaviour to observations of their work performance. They found that intervention fidelity was higher when performance observations were inconspicuous rather than when observations were conspicuous, even after staff (in this case job coaches) were taught to record their own job performances. These findings are in line with those from a 7-day intensive Mindfulness-Based Positive Behaviour Support (MBPBS) training that was provided for group home staff who were regularly exposed to severely challenging service user behaviours. Results showed significant reductions of verbal redirection, disuse of physical restraints, cessation of injuries and reduction in staff stress and turnover, as well as substantial financial savings (Singh et al., 2015). Thus, self-generated feedback can be effective and socially valid (Arco, 2008).

In other contexts, group instruction and supervisory feedback was effective in behavioural skills training on providing positive reinforcement and error correction and initiating opportunities for adolescents with autism to ask for help in naturalistic training settings. Skills generalisation and maintenance were achieved for staff performance (Palmen et al., 2010). Use of most-to-least prompting within teaching procedures and use of manual signs have also been used in staff training (Parsons et al., 2012).

Very brief staff training seems to achieve mixed outcomes. A one-session staff training procedure was assessed in Hong Kong regarding its effectiveness in reducing challenging behaviour in children with autism. A large group of frontline staff (n = 311) either received psychoeducation (PE), training about functional behaviour analysis (FBA) and about emotional management (EM), or were allocated to the control group. While training workshop appeared to increase knowledge of autism, it actually decreased behavioural intention (Ling & Mak, 2012). On the other hand, classroom-based instruction, role playing, feedback and brief on-the-job training lead to enhanced intervention fidelity and improved child behaviours (Schepis, Reid, Ownbey, & Parsons, 2001).

Using Technology in Staff Training

A key development in staff training relates to the use of technology, most frequently video-based procedures. For example, Macurik et al. (2008) compared video versus live staff training procedures and found that, according to knowledge quizzes and on-the-job observations, both training methods were effective, although video training had the edge in terms of direct-contact time with staff, if the time to make the videos was not included in the calculations, while live training had slightly better social validity.

With regard to specific staff skills, for example, functional behavioural assessment (FBA), training is frequently conducted using video modelling, lectures, feedback, and written protocols (NcCahill, Healy, & Ramey, 2014). Williams and Gallinat (2011) compared the use of videotaped feedback and video modelling, while Huskens, Reijers and Didden (2012) developed a training package regarding Pivotal Response Treatment (PRT) for young children with autism that was delivered across a 2-day training workshop, followed up with live feedback and video feedback for 3 months after training workshop. In addition to staff training, they also included parent training across eight group sessions and two individual sessions (see also Huskens & Verburg, 2011). In the case of training for the use of a Picture Exchange and Communication System (PECS), verbal instructions in addition to an instructional video did not result in much improvement in staff skill (Barnes, Dunning, & Rehfeldt, 2011).

Some basic applied behaviour analysis-based procedures can be trained very quickly and effectively. For example, brief instruction, a video model, and rehearsal with verbal feedback were effective in training staff to conduct stimulus preference assessments using a paired stimulus and other formats (Lavie & Sturmey, 2002; Roscoe & Fisher, 2008). Equally, procedural integrity in discrete trial has been successfully increased following staff training using video modelling (Catania, Almeida, Liu-Constant, & DiGennaro Reed, 2009).

More general training in basic teaching skills was conducted in a 1-day, classroom-based training event using verbal and video instruction, followed by practice and on-the-job feedback to train undergraduate interns, teacher aides, and residential staff. Results showed social validity and improved skill levels (Parsons, Reid, & Green, 1996). Video feedback used in addition to instruction has been shown to lead to substantial increases in correct trainer behaviour as well as staff's correct response prompting and child's correct responses (van Vonderen, de Swart, & Didden, 2010).

While direct staff training (i.e. in vivo) is the most often used staff training setting, virtual training (e.g. videoconferencing) is utilised increasingly. Hay-Hansson and Eldevik (2013) compared brief (3 × 15 min) in vivo and video-based training in matching, receptive and expressive labelling and found no significant differences between the groups. However, it is important to note that behaviour skills training (BST) that included instructions, modelling, rehearsal, and feedback has been found to be more effective than computer-based training in staff skills development of implementing DTT (Nosik, Williams, Garrido, & Lee, 2013).

More advanced use of technology, for example, data collection via Bluetooth®, in combination with immediate feedback, self-monitoring and delayed positive feedback using video clips and graphs, has been used effectively for staff training, for example, in a setting for young adults with autism (Nepo, 2010).

Implementing Performance Management, Generalisation and Maintenance

In order to achieve generalisation and maintenance of staff behaviour change, performance management procedures need to be developed and implemented. Without good performance management, Embregts (2002) showed that although appropriate staff responses may be increased, the behaviour of the residents may not improve exponentially. They included direct-care staff training (i.e. video and graphic feedback) in a residential setting for children with intellectual disabilities and attention deficit hyperactivity disorder (ADHD). Staff training occurred on an individual basis; feedback to staff was presented during routine staff meetings, yet generalisation and maintenance was not achieved. Other procedures that did not lead to generalised or maintained gains in staff skills include, for example, communication training, which if used alone was not sufficient to maintain staff skill of fostering appropriate communicative interactions with adults with challenging behaviour (Schmidt et al., 2013). Equally, while daily feedback led to improved staff implementation of instructions, prompts and consequences, and staff knowledge in certain content areas (communication and gross motor skills), this learning did not generalise across content areas, e.g. training in communication skills development did not generalise to gross motor skills (Page, Iwata, & Reid, 1982).

When attention is paid to the importance of generalisation and maintenance as part of a training package, through instructions, feedback, rehearsal, and modelling, this can lead to rapid and large improvements in treatment fidelity of teachers, for example, in using discrete-trial teaching (Sarokoff & Sturmey, 2004). Similarly, improvements in appearance, organisation, and safety of classrooms for children with disabilities were achieved and maintained by combining task directives, daily supervision, and graphic performance feedback (Schmidt et al., 2013). In-service and in-service plus feedback training also lead to improved data collection accuracy that generalised to other service users and times (Jerome, Kaplan, & Sturmey, 2014).

Even more complex service user behaviours, such as prompted voiding to gain improvements in continence, can be achieved and maintained but may require more elaborate staff training procedures. Hawkins, Burgio, Langford and Engel (1993) successfully used periodic supervisory monitoring and verbal and graphic feedback, biweekly letters of praise or disapproval and three monthly letters summarising performance during this period, which were used in annual performance evaluations.

In order to assess methods to achieve generalisation of staff skills, Ducharme and Feldman (1992) trained residential care staff in (a) the provision of written instructions, (b) performance-based training using a single client programme exemplar and simulated clients (single case training), (c) performance-based training using developmentally delayed clients as trainees (common stimuli training), and (d) performance-based training using multiple client programme exemplars with simulated clients (general case training). They found that not all generalisation criteria were met until general case training was provided, even when they controlled for potential sequence effects of the training procedure.

Prompting and self-monitoring have been used with persons with disabilities to teach many skills; however, these procedures also have been successful in maintaining staff skills, for example, in the application of token economies (Cullen, 1988). Accuracy feedback adds to the effectiveness of these methods (Petscher & Bailey, 2006).

Untargeted, collateral behaviour change is a common occurrence when behaviour change plans are implemented. The same is true for staff training. King, Lange and Errickson (1982) tested the effect of public and individualised feedback on staff behaviour in terms of giving verbal praise to hospital residents with intellectual disabilities. Along with increases in targeted behaviours, positive changes occurred in verbal instructions and manual guidance instructions and resident on-task behaviour.

Conclusion

Training staff may not only improve staff and service user well-being, it may also prove to be cost-efficient for service providers (Test, Flowers, Hewitt, & Solow, 2004). Most commonly, a tiered training approach is used, where experienced members of staff train less experienced staff. This has shown to be effective in achieving and maintaining basic as well as more complex staff skills, such as safety-related skills and managing aggressive behaviours and convulsive seizures. As a welcome collateral, the tiered-peer training procedures can be effective in ensuring maintenance of skills in the trainers as well as showing high social validity (Pol, Reid, & Fuqua, 1983). Such tiered training procedures are now widely used in settings that employ behaviour analysts (Ducharme, Williams, Cummings, Murray, & Spencer, 2001; Fleming, Oliver, & Bolton, 1996).

However, while there is much research using a combination of staff training procedures, oftentimes it remains unclear exactly which of the components are effective. A notable meta-analysis established the active ingredients in staff training (i.e. goals, format, and techniques) over a 20-year period. The 55 studies that were included reported 502 single-subject designs and 13 studies with larger samples and provided evidence that the combination of in-service training with coaching on the job was most effective in terms of staff skills development and retention. The findings also showed that multiple techniques can be used effectively but that verbal feedback, in the form of praise and correction, was recommended. The identification of training goals, training format and training techniques was key to successful staff training programmes (van Oorsouw, Embregts, Bosman, & Jahoda, 2009).

While most staff training research evidences the effectiveness of certain procedures in training staff to carry out specific tasks or procedures, less is known about teaching staff in more general knowledge in applied behaviour analysis. Luiselli, Bass and Whitcomb (2010) looked at three distinct content areas, including measurement, behaviour support, and skill acquisition. They used basic group format didactic teaching procedures using PowerPoint® presentations, practice exercises, and video demonstrations. Knowledge tests before and after training showed consistent improvement between pre- and post-training. However, Fennell and Dillenburger (2016) found that didactic group training delivered by statutory training agencies (staff attending half-day or full-day workshops) was not effective in achieving knowledge in content areas such as autism, behaviour analysis, functional assessment, and challenging behaviours. They found that, post-training, self-perceived knowledge in these areas far exceeded actual knowledge. Clearly, a didactic lecture that lasts a few hours is not the same as properly supervised on-the-job staff training (Dillenburger, Kerr, & Jordan, 2016). Trainers and employers should heed these data, as overconfident, poorly trained staff can fall pray to the Dunning-Kruger effect and thus constitute a liability to employers and service users (BPS, 2015).

In sum, most key staff in multidisciplinary teams receive little or no training in applied behaviour analysis during their qualifying training (Dillenburger et al., 2014b), and didactic post-qualifying staff training shows very mixed results. However, when in-service staff training procedures are based on applied behaviour analytic principles, which include clear target setting, in vivo modelling or video modelling, and consistent positive performance feedback, staff skills improvements can be generalised and maintained, even in quite complex areas of interventions. Tiered staff training and performance management procedures can lead to improvements in staff as well as trainer skills.

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8

Parent Training for Parents of Individuals Diagnosed with Autism Spectrum Disorder

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Introduction to Parent Training and ASD

Per the Center for Disease Control and Prevention (2012), it is now reported that 1 out of every 68 children living in the United States are diagnosed with autism spectrum disorder (ASD). The high prevalence has also been reported globally (Christensen, Baio, & Braun, 2012). For individuals diagnosed with ASD to make meaningful progress, they require early, intensive, and comprehensive intervention (Smith, Groen, & Wynn, 2000), with general consensus that interventions should be based upon the principles of applied behavior analysis (Smith & Iadarola, 2015). One recommended and empirically validated component of comprehensive intervention is parent training (National Autism Center, 2009, 2015).

There are many different varieties of parent training within the literature (Bearss, Burrell, Stewart, & Scahill, 2015) with a number of corresponding labels. “Parent support” often consists of several parents gathering together to discuss ideas, stories, experiences, and information about ASD and intervention, usually with the facilitation of professionals (Bearss et al., 2015a). “Parent education” is a form of parent training in which a professional provides didactic or manual instruction on concepts related to ASD and/or intervention (Bearss et al., 2015a). Parent training can also consist of counseling sessions, during which a therapist works with parents on issues related to stress, family functioning, and daily living. Another approach to parent training includes parent-mediated intervention, which consists of hands-on training during which parents are taught specific techniques that can be used to develop and improve their own child’s skills (Kasari, Gulsrud, Paparella, Hellemann, & Berry, 2015). The goal of parent-mediated intervention is “… that parents may become co-facilitators in the intervention process” (Radley, Jeson, Clark, & O’Neill, 2014, p. 241). It is common for the aforementioned varieties of parent training to occur in isolation or as a combination with other formats. Although the term “parent training” can represent multiple forms, the primary focus of this chapter will be parent-mediated interventions, parent support groups, and parent education.

The purpose of this chapter is to (1) discuss the importance of parent training, (2) provide a historical perspective of parent training within the field of

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applied behavior analysis (ABA) as it relates to autism intervention, (3) provide a general overview of the research on parent training, and (4) discuss future research and clinical implications.

Benefits of Parent Training

There are many reasons why parent training should be included as part of a comprehensive intervention model. First, given the high prevalence of individuals receiving an ASD diagnosis, it may often be difficult for families to access the intensity of intervention required for best outcomes (Symon, 2005). Research has demonstrated that training parents to implement some or all of the intervention can help optimize the intensity of intervention (Wainer & Ingersoll, 2013a). Second, research has demonstrated that parent training can improve the quality of parent-child interactions (Koegel, Bimbela, & Schreibman, 1996), as well as improve upon desirable behaviors (e.g., language, imitation, and social behavior) and ameliorate less desirable behaviors (e.g., tantrums, self-injury, and stereotypy; Charlop & Trasowech, 1991; Moes & Frea, 2002). Third, when parents are trained to provide intervention, treatment effects can generalize and maintain over time (e.g., Koegel, Schreibman, Britten, Burke, O'Neill, 1982). Parent training may result in better generalization and maintenance as individuals diagnosed with ASD can receive more hours of intervention, through parent-mediated intervention, and in settings which may lead to longer-lasting changes. Fourth, research has demonstrated that parent training can reduce the stress and depression often reported by parents of children with a disability (e.g., Estes et al., 2009). Finally, research has shown that parents who are trained to provide intervention often demonstrate an increased optimism about their child's future, as well as more positive feelings about influencing their children's development (e.g., Koegel et al., 1982).

As this chapter will show, and other professionals and organizations have documented, parent training meets the criteria to be considered an evidence-based practice (National Autism Center, 2009, 2015). Therefore, given the many benefits parent training can have for the family and the individual diagnosed with ASD, training for parents and the family as a whole should be included as part of a comprehensive intervention program.

Seminal and Early Research on Parent Training

In one of the first empirical investigations of behavioral intervention for individuals diagnosed with ASD, Wolf, Risley, and Mees (1963) implemented operant conditioning procedures (e.g., extinction and shaping) to decrease the frequency of tantrums, improve bedtime behavior, and increase the duration of wearing glasses for a 3.5-year-old boy named Dickey. The results of this study demonstrated that operant conditioning procedures were responsible for improved behavior and provided the first empirical demonstration of ABA techniques as a treatment for an individual diagnosed with ASD. One component of this study was training for the mother and father on providing intervention for the target goal areas while at home. Although the specific details of the parent training were not described, the inclusion of parents within the study lends credence to the importance of parent training throughout the course of intervention for individuals diagnosed with ASD.

In 1973, Lovaas et al. were the first to evaluate a comprehensive behavioral intervention program for individuals diagnosed with ASD. The study consisted of 20 participants between 3 and 10 years old. All participants received intervention for 12–14 months in an inpatient setting. The intervention consisted of the implementation of behavior analytic principles (e.g., reinforcement, shaping, and punishment) to improve desired behaviors (e.g., appropriate speech, play, and social nonverbal behavior) and to eliminate undesired behaviors (i.e., self-stimulation and echolalia). Some of the participants' parents were trained (group 2), while others did not receive training (group 1). The researchers used standardized measures (i.e., Stanford Binet IQ Test and Vineland Social Maturity Scores) and various response measures to evaluate the effectiveness of the intervention. Overall, the results indicated meaningful improvements for the participants. With respect to the effects of parent training, the authors stated "…follow-up measures recorded 1 to 4 years after treatment indicated that large differences between groups of children were related to the post-treatment environment (those groups whose parents were trained to carry out behavior therapy continued to improve; while children who were institutionalized regressed)" (Lovaas, Koegel, Simmons, & Long, 1973, p. 156). Thus, the results suggested the importance of including parent training as part of a comprehensive treatment model to ensure maintenance of skills acquired throughout the course of treatment.

The Lovaas et al. (1973) study was a catalyst for other seminal research in the behavioral treatment of ASD (e.g., Lovaas, 1987). Lovaas (1987) evaluated the effects of intensive, comprehensive behavioral treatment compared to a non-intensive, eclectic approach. Thirty-eight children were quasi-randomly assigned into 2 groups, 19 in the intensive group and 19 children in the control group. Within the study, Lovaas (1987) stated, "The parents worked as part of the treatment team throughout the intervention; they were extensively trained in the treatment procedures so that treatment could take place for almost all of the subjects' waking hours, 365 days a year." (p. 5). Those involved in the study have stated that parents became experts in ABA and ASD and in some cases were the best behavior analyst(s) on the child's team (Leaf, McEachin, & Taubman, 2008). The results of the study not only showed the need for intensive and comprehensive intervention but also illustrated the benefits of including parent training in an intensive, comprehensive model.

These seminal studies and other early investigations on ABA-based treatment for individuals diagnosed with ASD, as well as the work of other professionals/researchers evaluating the effects of parent training for parents of children with or without ASD (e.g., Baker, Heifetz, & Murphy, 1980; Forehand, Middlebrook, Rogers, & Steffe, 1983; Harris, Wolchik, & Weitz, 1981; Patterson & Fleischman, 1979), have served as a springboard for a plethora of research studies evaluating the effects of parent training, using a variety of methods for a variety of skills for their children diagnosed with ASD.

Parent Demographics

The plethora of research on parent training has resulted in many parent participants with varying demographics. Researcher typically provides varying degrees of information on these demographics when discussing their participants. Age is one demographic frequently noted. Within the parent training literature, there is a wide age range of the parent participants, with the youngest parent noted at 21 years old (Anan, Warner, McGillivary, Chong, & Hines, 2008) and the oldest at 52 years old (Poslawsky et al., 2015). Gender is another commonly noted demographic within the literature. The majority of studies on parent training have reported training only mothers (Koegel, Glahn, & Nieminen, 1978; Park, Alver-Morgran, Canella-Malone, 2011; Reagon & Higbee, 2009); however, there have been a few studies in which both mothers and fathers are included (e.g., Estes et al., 2014; Rocha, Schreibman, & Stahmer, 2007; Vismara et al., 2013). Some less commonly reported, and often not reported, demographics within the parent training literature are socioeconomic status (SES), education, nationality, and culture.

Training Methods

Several methods have been utilized for training parents. Some common methods include, but are not limited to, (1) demonstration and role-play (e.g., behavioral skills training or the teaching interaction procedure; Ingersoll & Wainer, 2013a; Rocha et al. 2007), (2) video modeling (e.g., Harris et al. 1981), (3) didactic instruction (e.g., Farmer & Reupert, 2013), and (4) active coaching (Kasari et al., 2015). What follows is a general overview of these methods with illustrated examples of each. However, each of these techniques has additional benefits and limitations, and clinicians should examine the literature on each when selecting a method for parent training.

Demonstration and Role-Play

One common method used to train parents occurs when the trainer demonstrates the targeted behavior and the parent participates in role-plays. Demonstration and role-play commonly take two different forms within the literature: (1) behavioral skills training (BST) that involves the trainer describing and demonstrating the skill, providing opportunities for the learner to practice the skill, and the trainer providing feedback (e.g., Seiverling, Williams, Sturmey, & Hart, 2012) and (2) the teaching interaction procedure (TIP) in which the teacher describes the skill, discusses rationales for why the skill is important, demonstrates the skill, role-plays the skill, and provides feedback (e.g., Rocha et al., 2007).

There are numerous benefits for the use of demonstration and role-playing during the course of training. For one, demonstrations provide an opportunity for the trainer to model examples and non-examples of the targeted skill. As such, modeling sets the occasion for observational learning of the targeted skill(s). Second, role-plays can lead to increased opportunities to provide positive reinforcement for approximations in a non-threatening, structured environment, therefore potentially decreasing stress and increasing the parent's confidence to display the skill in the criterion context. This method also allows the trainer to train loosely and program common stimuli and for training to align closely with the natural contingencies, all of which are important in promoting generalization across environments (Stokes & Baer, 1977). Finally, the inclusion of rationales (a component of TIPs) may lead to better understanding of the importance of the skill and may result in longer maintenance of the skill in the absence of the trainer and in the natural environment. That is, rationales can put the skill into context for the trainee (e.g., it is important to have the environment appropriately arranged before working on a skill, such as requesting, to allow for many prepared learning opportunities to be captured efficiently) which may lead to more generalized skills that maintain for longer periods of time.

Ingersoll and Wainer (2013b) provide an example of the use of BST during parent training. Within this study, the researchers demonstrated the effectiveness of BST in a group and a one-to-one instructional format to teach parents how to implement components of Project Impact. Project Impact is a teaching procedure that uses a combination of naturalistic behavioral intervention with a developmental approach to teach students various social behaviors and to improve language development. In this study, parents attended six group training sessions and six individual training sessions. The researchers evaluated improvement via formal standardized assessments for the children (e.g., Social Responsiveness Scale) as well as treatment fidelity evaluations. The results showed that parents improved their delivery of the intervention components and that the children showed improvements on the targeted skills.

TIPs have also been demonstrated as a successful method to train parents in the implementation of various behavior analytic techniques. For example, Rocha et al. (2007) implemented a TIP to teach three parents how to implement Pivotal Response Training (PRT) and Discrete Trial Teaching (DTT) to increase joint attention for his or her child. Parents were taught various procedures associated with DTT (e.g., providing an appropriate instruction, providing feedback, and completing the trial) and PRT (e.g., using choice, motivation, and following his/her child's lead). Training consisted of the researcher providing information about the procedures and rationales, (e.g., why joint attention is important) followed by a teacher modeling the behavior, the parent implementing the procedure, and receiving feedback on their implementation. Results of the study showed that parents increased the amount of joint attention bids provided, and children demonstrated improvement in joint attention.

Video Modeling

Another common training method explored within the parent training literature is video modeling (e.g., Berquist & Charlop, 2014). Video modeling has many benefits as a training tool. For one, similar to role-playing, video modeling provides examples and non-examples of the targeted skill.

Also, when video models contain multiple exemplars, they increase the likelihood of generalization of the skill (Stokes & Baer, 1977). Unlike role-plays, video modeling provides parents with a permanent product that they can reference in the absence of the trainer. Video modeling is commonly included as a component of other training methods.

Harris et al. (1981) taught 11 parents how to implement a variety of behavior analytic techniques (e.g., shaping, data collection, chaining, and prompting) focusing on the language development of their children. The intervention was conducted within a group instructional format and consisted of BST with the addition of video models. Although the authors of the study stated that videos were included, no description was provided as to what was specifically shown on the videos. At the conclusion of the study, improvements were observed in the children's language skills.

More recently, Berquist and Charlop (2014) taught six parents how to evaluate an intervention that consisted of multiple components, including video modeling. Training consisted of a combination of a manual and training sessions using BST. A video was used in conjunction with the manual and contained a variety of information for evaluating interventions (e.g., operationally defining targeted behavior, how data collection can be determined to be effective, and identifying the claim of the intervention). Parents were taught how to evaluate a treatment across 14 different dimensions (e.g., graphed results, identifying question of interest, and identifying target behavior). The results of a multiple baseline design showed an increase in the parents displaying the dimensions of evaluative behaviors.

Didactic Instruction

Didactic instruction, as applied to parent training, provides parents with information on how to implement various procedures and increase their general understanding of those procedures. Although didactic instruction can be implemented in isolation, it is commonly implemented with other procedures within the parent training literature (e.g., Farmer & Reupert, 2013).

Didactic instruction offers several benefits for parents and trainers. It can provide parents foundational information which may lead to a better understanding of the importance of the various procedures that they are taught. When didactic instruction is provided in a group instructional format, it provides parents the opportunity to learn from each other, develop support networks, and solve problem with other parents. With respect to the trainer, didactic instruction allows for training large numbers of parents, which may result in more efficient training.

Farmer and Reupert (2013) provide an example of a study that used didactic instruction as part of a parent training intervention. The researchers conducted a 6-week parent education program for 86 parents living in rural Australia. The program was implemented in a group instructional format with each group lasting 6 h. Each week's session covered a new topic (e.g., what is autism, social understanding, and sensory processing). At the conclusion of the 6 weeks, parents self-reported (i.e., parents filled out a Likert scale across 15 different questions) an increase in knowledge of the various topics.

Active Coaching

Another form of parent training is known as active coaching. Active coaching consists of the trainer providing in vivo feedback, while the trainee attempts to demonstrate the targeted skill. Typically, active coaching is implemented simultaneously with other procedures, such as didactic instruction (e.g., Kasari et al., 2015) and/or modeling (e.g., Radley et al., 2014).

Active coaching has many benefits as a method to train parents. For instance, active coaching sets the occasion for trainers to provide immediate feedback. Immediate feedback may be more desired than delayed feedback when targeting new skills (Cooper, Heron, & Heward, 2007) to prevent incorrect implementation of the intervention for an extended period of time. Also, active coaching is conducive to training in the environment in which the skill is to occur as opposed to an analogue setting. Targeting a skill in the environment in which it is to be used increases the likelihood of the behavior coming under control of the naturally occuring stimulus conditions (Stokes & Baer, 1977).

In an example of active coaching, Kasari, Gulsrud, Paparella, Hellemann, and Berry (2015) compared the JASPER parent-mediated model to a psychoeducational intervention (PEI) for 86 parents. The parents were randomly assigned to the PEI or JASPER condition. The JASPER model consisted of 10 h of active coaching targeting joint engagement through a combination of developmental and behavioral procedures. Parents were taught to recognize their child's developmental level of play, how to jointly engage in an activity, and how to keep their child engaged. The PEI model consisted of 10 h of didactic instruction during which parents were taught about autism, improving social behavior, and managing parental stress. The primary measure was joint engagement between the parent and child. Additional measures included child play skills, standardized assessments of the child's skill level (e.g., Reynell receptive language test), and measures of parental stress (e.g., Parental Stress Index). The results of the study indicated that parents assigned to the JASPER model showed higher levels of joint engagement, but there were mixed results on the other child-specific measures. Although in regard to stress measures, the parents in the PEI condition showed lower levels post-intervention when compared to parents in the JASPER condition.

Although there are many benefits to active coaching, there are some disadvantages found within the literature. First of all, in many studies, the procedures associated with active coaching are not thoroughly described which may make it difficult to replicate. Second, active coaching may be labor intensive as it requires one-on-one intervention with the parent and child and, therefore, less efficient than other methods of parent training. Third, since it is usually combined with other training procedures, it is often difficult to determine if active coaching itself or another component of the training package is responsible for the behavior change.

Instructional Formats

The aforementioned training methods are commonly implemented in three different instructional formats. The first, and most common, instructional format within the literature is a one-to-one instructional format. One-to-one instructional formats provide the opportunity for the trainer to work directly with the parents on an individual basis. Researchers have demonstrated the effectiveness of a one-to-one format for training parents using a variety of training methods, including video modeling (e.g., Berquist & Charlop, 2014) and demonstration and role-play (e.g., Rocha et al., 2007).

A second instructional format in which various training techniques can be implemented is group instruction. Group instruction consists of two or more parents participating in the intervention simultaneously. Group instruction sets the occasion for observational learning which may result in more efficient training targeted (e.g., Leaf et al., 2013) as parents can acquire skills not directly. Group instruction has been used within the literature with video modeling (e.g., Harris et al., 1981), demonstration and role-play (e.g., Laugeson, Frankel, Mogil, & Dillon, 2009), and didactic instruction (e.g., Farmer & Reupert, 2013). The PEERS model of social skills groups (for a detailed description of the PEERS Model see, Laugeson et al., 2009; Yoo et al., 2014) is a prime example of parent training that occurs in a group instructional format. For example, Laugeson et al. (2009) utilized BST within a group instructional format to teach 33 parents to improve their child's friendships with peers. After 12 sessions of intervention, parents more effectively facilitated relationships using the procedures taught.

Group instruction and one-to-one instruction can also occur in combination (e.g., Anan et al., 2008). For example, Harris, Wolchik, and Milch (1983) conducted and evaluated the effects of training 11 parents of children diagnosed with ASD. The authors targeted a variety of skills (e.g., data collection, shaping, promoting generalization) using BST. The researchers conducted training in a group instructional format and conducted home visits to provide one-to-one training. The researchers measured the parents' speech-oriented language toward their respective child and found an improvement following intervention.

An increasingly common instructional format for parent training is telehealth (e.g., Suess et al., 2014; Vismara et al., 2013), which involves the use of telecommunication technologies (e.g., video conferencing) to provide training to parents remotely. This format is often used due to large geographical distances between the family and the trainer (Vismara et al., 2013). Telehealth has advantages over more traditional instructional formats (i.e., in person). For instance, telehealth can be used to provide training for parents who otherwise would not be able to access training due to distance or limited services. Additionally, depending on the nature of the training, telehealth can be accessed at the parents' leisure, minimizing scheduling conflicts. Telehealth is also amenable to training occurring in multiple environments, which can be individualized and selected based on parent responding. For example, a more structured environment can be selected when necessary and systematically transferred to the natural environment.

In an example of the use of parent training via telehealth, Vismara et al. (2013) trained eight parents in the principles of the Early Start Denver Model (ESDM; for detailed description of ESDM, see Estes et al., 2014; Vismara et al., 2009; Vismara, McCormick, Young, Nadhan, & Monlux, 2013). The intervention occurred across 12 sessions, each lasting 1.5 h, within a one-to-one instructional format. The sessions consisted of the parent discussing the child behaviors that had occurred in the last week, followed by a 10 min observation of the child and parent interacting, and then discussing the skill topics from previous sessions, new skill topics, and how to implement these in generalized environments. The main dependent variables for the parents were parent-child interaction, parent satisfaction, and fidelity of treatment. After treatment had concluded, the parents implemented the procedures with higher levels of treatment fidelity and higher levels of engagement and reported that they had a better understanding and appreciation of how to help their child.

Although there are advantages to telehealth, there are some disadvantages as well. For one, the trainer can only observe what is occurring on the screen, which makes it difficult to assess what other events may be influencing the parent's behavior. Second, telehealth does not allow the trainer to model the correct behavior/procedure directly with the individual diagnosed with ASD. Finally, telehealth has to be implemented with extreme caution to protect the client's rights and to avoid HIPPA violations.

Parent Targets

Within the literature on parent training, parents have been trained to implement a variety of teaching procedures. Some of these procedures have included, but are not limited to, DTT (e.g., Neef, 1995), PRT (e.g., Buckley, Ente, & Ruef, 2014), ESDM (e.g., Vismara, Colombi, & Rogers, 2009), the Picture Exchange Communication System (PECS; e.g., Park, Alber-Morgan, & Cannella-Malone, 2011), and Functional Communication Training (FCT; e.g., Suess et al., 2014).

Discrete Trial Teaching DTT is a commonly implemented procedure during the course of treatment for many individuals diagnosed with ASD. DTT consists of three primary components: the teacher delivering an instruction, a response made from the learner, and a teacher-delivered consequence (Lovaas, 1987). Lovaas et al. (1973) and Lovaas (1987) included parent training on the implementation of DTT. Since these publications, there have been numerous studies which have also involved the training of parents on the implementation of DTT (e.g., Crockett, Fleming, Doepke, & Stevens, 2007; Koegel et al., 1978; Lafaskis & Sturmey, 2007; Rocha et al., 2007; Schreibman, Kaneko, & Koegel, 1991).

For example, Neef (1995) investigated the use of a pyramidal training approach (i.e., trainees becoming trainers) compared to professional-led training with 26 parents (20 mothers, 6 fathers).

Training involved how to select and arrange stimuli, provide instructions and prompts, deliver contingent consequences, record data, and structure the teaching session (all of which are components of DTT). The pyramidal approach involved training five parents, referred to as Tier 1 parents, until mastery. Those parents then conducted the training for additional parents, referred to as Tier 2 parents, and were matched based on demographics and child skill level. The Tier 2 parents then provided the training for the next group of parents, and this pattern was continued until all of the parents were trained, thus the term "pyramidal training." All parents in the professional-led training group were trained exclusively by professionals rather than previously trained parents. The percentage of steps demonstrated correctly across both groups improved from baseline to intervention; however, parents who received the pyramidal training performed better on generalization probes.

Pivotal Response Training PRT is a naturalistic treatment intervention that focuses on teaching pivotal behaviors for children diagnosed with autism spectrum disorder. These behaviors are considered to be pivotal as they lead to widespread behavioral gains. PRT focuses on increasing motivation, responsivity to multiple cues, self-management, and social initiations. Several studies have explored training parents in the PRT model. For example, Buckley, Ente, and Ruef (2014) provided training to a parent of a child with an ASD at the family's home, which consisted of providing instructional materials on PRT, video models, reviewing videos of the parent implementing the intervention, and role-playing. Targeted skills included, but were not limited to, letting the child select the activities/materials, interspersing mastered and acquisition tasks, and providing choices (Buckley et al., 2014). Data was collected on the child's rate of compliance and the parent's target skills, and both showed an increase in the rate of correct responding following training. Measures of improved quality of life (i.e., interviews following the intervention) also indicated that the parent enjoyed the training and felt the quality of life improved for herself and her child.

Early Start Denver Model ESDM is a comprehensive treatment approach for children under 4 years of age (Estes et al., 2014; Vismara et al., 2009, 2013). ESDM incorporates a developmental and naturalistic behavioral approach and includes parent involvement as a core concept within the treatment process.

In an example of training parents in the ESDM, Vismara et al. (2009) evaluated the effects of parent training with eight parents who received 12 weeks of training with each training session lasting 1 h. Vismara and colleagues utilized BST and provided parents with a manual on ESDM principles to teach parents to implement 14 different components of ESDM. Additionally, the researchers evaluated child progress across numerous behaviors (e.g., verbal utterances, imitative behaviors, and attentiveness). The training resulted in improved implementation of ESDM components by the parent participants, which also corresponded with improvement across the child measures.

Picture Exchange Communication System It has been reported that approximately 25% of children diagnosed with ASD will not develop functional vocal language (Tager-Flusberg, Paul, & Lord, 2005). To help children communicate, the use of augmentative and alternative communication systems, such as the PECS (Bondy & Frost, 1994), is sometimes required. PECS is a systematic teaching approach that uses pictures to help children communicate. Researchers have demonstrated the effectiveness of PECS to improve communication skills (e.g., Park, Alber-Morgran, & Cannella-Malone, 2011) and increase spontaneous speech (e.g., Anderson, Moore, & Bournce, 2007) with individuals diagnosed with ASD. However, there have been relatively few studies that have evaluated parents' roles in PECS implementation (Ben Chaabane Alber-Morgan, & DeBar, 2009; Park et al., 2011).

Park et al. (2011) provided an example of one of the few studies that included parents within the PECS implementation. Park and colleagues trained three mothers of 2-year-old children with an ASD to implement Phase 1, Phase 2, Phase 3A, and Phase 3B of PECS (for detailed description of the Phases of PECS see; Bondy & Frost, 1994).

Training was conducted utilizing BST. The results showed an increase in the percentage of independent picture exchanges and a high level of treatment integrity across each of the three mothers.

Functional Communication Training When attempting to ameliorate aberrant behavior, it is important to find a socially appropriate, functional alternative behavior. One procedure which has demonstrated effectiveness in teaching such behaviors is FCT (Carr & Durand, 1985). FCT has been used to teach responses that produce the same consequence that the less desirable behavior would have produced (e.g., requesting a break to escape a task as opposed to engaging in physical aggression). FCT is a commonly implemented technique to address aberrant behavior (Tiger, Hanley, & Bruzek, 2008), and researchers have demonstrated that parents can be trained in its implementation (Wacker et al., 2005, 2013).

Suess et al. (2014) provided an example of training parents to implement FCT via telehealth. The training involved didactic instruction and coaching for three parents to conduct FCT with their respective child following a functional behavior assessment (FBA). The FBA was conducted to determine the likely function of the aberrant behavior so an appropriate replacement behavior could be selected. The researchers measured the percentage of steps completed correctly by the parents from a dyad-specific task analysis. Suess and colleagues' results indicated an increase in the percentage of correct steps completed by the parents and a corresponding decrease in the children's aberrant behavior.

Multiple Component Quality behavioral intervention requires a therapist to not only implement one procedure but a variety of procedures and to implement these procedures accurately (Leaf et al., 2016). Thus, a therapist should be fluent in the implementation of procedures such as DTT, shaping, behavior reduction programs, social skills interventions, etc. (Leaf et al., 2016). Given the amount of time parents spend with their children, some of which may involve providing intervention, it is equally important for parents to be fluent in a number of behavior change techniques. As such, there have been several studies that have explored training parents on a variety of procedures (e.g., Cordisco, Strain, & Depew, 1988; Harris et al., 1983; Heitzman-Powell, Buzhardt, Rusinko, Miller, 2014; Koegel et al., 1978; Sallows & Graupner, 2005).

Lerman, Swiezy, Perkins-Parks, and Roane (2000) provide an example of training three parents on a variety of behavior change techniques based upon the principles of ABA. The behavior change techniques included the use of differential reinforcement, instructional and communication prompts, as well as how to respond to inappropriate behavior, increase compliance, and provide instructions. Training consisted of written instructions outlining various concepts and techniques, as well as in situ feedback. The results of a multiple baseline design showed that the parents implemented the techniques with greater accuracy following intervention and child measures indicated the techniques were effective.

Child Targets

Many of the studies evaluating parent training involve measures of child behavior as the primary dependent variable. These measures provide an opportunity to determine if the technique(s) on which the parents are trained were effective for their children. Many of the child skills targeted within the parent training literature fall within the core deficit areas of the ASD diagnosis, but there are additional skills outside of the core deficits that are frequently targeted as well.

Language One of the diagnostic criteria for individuals diagnosed with ASD is an impairment in language, which can range from mild (e.g., difficulties with complex social language) to severe (e.g., having no appropriate vocal language; American Psychiatric Association, 2013). Behavioral interventions frequently address language skills for individuals diagnosed with ASD. Therefore, it is not surprising that many parent training programs have focused on training parents to implement techniques to improve language. As such, child measures within the parent training research have shown that, following training, parents were effective in increasing sound production (e.g., Harris et al., 1983), word production (e.g., Harris et al., 1983), requesting (e.g., Suess et al., 2014), spontaneous language (e.g., Charlop & Trasowech 1991; Ingersoll & Wainer, 2013a), social exchanges (e.g., Park et al., 2011), and social communication (e.g., Ingersoll & Wainer, 2013b; Reagon & Higbee, 2009; Vismara et al., 2009). For instance, Charlop and Trasowech (1991) evaluated parent training focused on language development for three parents of children diagnosed with ASD using BST. Parents were taught to implement a progressive time delay prompt (i.e., gradually increasing the amount of time before a prompt is provided) to help increase spontaneous speech from their respective child. Using a multiple baseline design, the results showed that there was an increase in the children's spontaneous speech and generalization to other people and locations following parent training.

Social Skills Another core deficit for individuals diagnosed with ASD is a qualitative impairment in social behavior (American Psychiatric Association, 2013). As such, comprehensive, quality intervention should address deficits in social behavior (Leaf et al., 2016). Much of the research involving parents has focused on training techniques to increase specific social behaviors and/or to facilitate pro-social relationships (Crockett et al., 2007; Kashinath, Woods, & Goldstein, 2006; Laugeson et al., 2009; Radley, Jenson, Clark, & O'Neill, 2014; Yoo et al., 2014). One example of parent training targeting social behavior was a study conducted by Kashinath et al. (2006) in which the researchers used BST to teach five parents how to implement a variety of behavioral procedures (e.g., cuing, time delay, and modeling). One of the targeted skills was improving the child's indoor play, and the results showed that parent training led to improvements with this skill. Laugeson et al. (2009) provide another example in which parents were trained how to help facilitate and foster relationships (e.g., friendships) within the PEERS model. After training occurred, participants who were included in the PEERS model demonstrated an improvement in their social behavior and interactions with peers.

Reduction of Aberrant Behavior Individuals diagnosed with ASD can display a variety of aberrant behaviors (e.g., stereotypic behavior, self-injury, aggression, sleeping challenges, etc.), all of which can interfere with learning and decrease their overall quality of life (Bearss et al., 2015). As such, there are many techniques that can decrease the frequency, intensity, and duration of aberrant behavior. Decreasing the likelihood of aberrant behavior can also decrease stress and anxiety for parents and the rest of the family (Durand, Hieneman, Clarke, Wang, & Rinaldi, 2013). Therefore, research on parent training has explored training parents in techniques to ameliorate these challenges. Within the parent training literature, child measures have helped show that parents who successfully implemented techniques on which they were trained resulted in a decrease in aggression displayed by their child (e.g., Lerman et al., 2000; Powers, Singer, Stevens, 1992), as well as decreases in whining (Powers et al., 1992), noncompliance (Lerman et al., 2000; Powers et al., 1992), stereotypy (e.g., Bearss et al., 2015), irritability (e.g., Bearss et al., 2015), self-injury (e.g., Learman et al., 2000), sleeping issues (e.g., Malow et al., 2014), and mealtime challenges (e.g., Najdowski et al., 2010; Seiverling et al., 2012; Sharp, Bureel, & Jaquess, 2014).

In an example of parent training to decrease aberrant behavior, Bearss and colleagues (2015) conducted a comparison investigation consisting of randomly placing 91 parents in a parent training program and 89 parents in a parent education program across six different centers in the United States. The parent training program consisted of BST, while the parent education program consisted of providing parents with didactic information. Using the Aberrant Behavior Checklist as their main measure, both treatments led to a decrease in aberrant behavior, but the results showed that parent training was superior to parent education for reducing aberrant behavior according to the parents across both groups.

Other Skills Parent training research has also examined child behaviors that do not fall within the core deficit categories of ASD. Additional parent training interventions have resulted in improvements of child skills within the areas of self-help skills (e.g., Cordisico et al., 1988), joint attention (e.g., Kasari et al., 2015, Rocha et al., 2007), receptive instructions (e.g., Lafasakis & Sturmey, 2007), discrimination (e.g., Koegel et al., 1978), and cognitive development (e.g., Anan et al., 2008). Researchers have also used parent training to help parents improve their stress levels (e.g., Al-Khalaf, Dempsey, & Dally, 2014; Ali Samadi & Mahmoodizadeh, 2014), increase their self-efficacy (e.g., Poslawsky et al., 2015), increase general knowledge of autism (e.g., Farmer & Reupert, 2013), and increase their ability to record behavior (e.g., Herbert & Baer, 1972).

Types of Measurement

Researchers have used a variety of measures to evaluate the effects of parent training. Numerous studies have used direct measures (i.e., objective data) of the behavior of the parents (e.g., implementing FCT, implementing shaping, implementing DTT) who participated (e.g., Berquist & Charlop, 2014; Corsidico et al., 1988; Crockett, Fleming, Doepke, Stevens, 2007; Harris et al., 1981, 1983; Herbet & Baer, 1972; Lafasakis & Sturmey, 2007). Other studies have used subjective, rather than objective, measures to demonstrate improvements in parent behavior (e.g., Cordisco et al. 1988; Farmer & Reupert, 2013; Heitzman-Powell et al., 2014). There have also been several studies that have used formal and/or standardized assessments to measure progress (Anan et al., 2008; Bearss et al., 2015b; Estes et al., 2014).

While parent behavior is generally the primary focus of parent training, the desired outcome of training parents is to produce positive behavior change with their children. Therefore, measures of the child's behavior change are commonly taken and, in some cases, are the primary dependent variables (e.g., Charlop & Trasowech, 1991; Cordisco et al., 1988; Harris et al., 1983; Herbert & Baer, 1972; Ingersoll & Wainer, 2013). There also have been several studies that have combined various measures (e.g., Cordisco et al., 1988; Harris et al., 1983; Herbert & Baer, 1972; Ingersoll & Wainer, 2013a).

Future Directions

The research on parent training is robust. Researchers have shown that parent training can be effective in changing the behavior of parents of individuals diagnosed with an ASD using multiple methods (e.g., behavioral skills training, coaching, video modeling, etc.). Researchers have also demonstrated that parents who receive training can implement a variety of procedures (e.g., shaping, discrete trial teaching, ESDM, etc.) that result in meaningful changes for them and their children. Despite the extensive parent training literature base, there are several areas in which future research and clinical practice could focus.

Parent Demographics

One potential area future researchers should address involves expanding the descriptions of parent participants. Researchers should make a concerted effort to provide a complete description of the demographics of the parents who are participating in the training. There are demographics that could potentially affect the effectiveness of an intervention, including, but not limited to, the parents' age and gender, education level, socioeconomic status (SES), and cultural characteristics. It is common for researchers to provide information regarding age and gender; however, there are examples in which little to no demographic information is reported, and demographics, such as culture and SES, are typically never reported. Without providing demographic information, it would be difficult, if not impossible, to identify any relationship between parent variables and response to training.

Reporting demographic information to help identify the conditions under which certain training methods can lead to better skill acquisition is crucial. For example, researchers have shown that parent training may be less effective for parents of lower SES (e.g., Clark & Baker, 1983; Knapp & Deluty, 1989). Some associated challenges with this demographic, such as working multiple jobs, may result in less effective training for reasons such as time limitations or scheduling challenges.

As such, future researchers should strive to provide a complete description of the parents participating in training to allow researchers to analyze their results with respect to these demographics. As a result, researchers and clinicians could attempt to identify which demographics result in better skill acquisition with respect to certain training procedures. This would also allow for future research to investigate the best training procedures to use for different demographics to allow for all parents to better access effective parent training.

Gender is another important demographic that may influence the effectiveness of parent training. It has been reported that mothers and fathers of individuals diagnosed with ASD have different roles within the family context (Pleck & Masciadrelli, 2004), have varying levels of stress (Flippin & Crais, 2011), and interact with their children in different manners (Flippin & Crais, 2011). If gender is part of the conditions under which a certain method of parent training is effective, reporting information on parents' gender within the research is critical. Furthermore, researchers should make an effort to evaluate parent training for fathers of individuals diagnosed with an ASD because, while there have been some studies which have included fathers, it is far more common for mothers to participate thus leaving father participation vastly underrepresented (Flippin & Crais, 2011). A father's involvement, interaction styles, and stress may be different than a mother's and may influence the selection of the training procedure, format, and targets.

The culture of the parent who participates in the training is another demographic that is not commonly reported. Culture plays a large role in how a family may interact with each other and other families, handle having a child with a diagnosis, prioritize training targets, and view their role in intervention. It is difficult to examine research findings with respect to cultural aspects when information on culture is not reported. More importantly, if culture is not reported, it is a possibility that cultural characteristics were not taken into account when designing the parent training features that are under examination. Ignoring cultural characteristics, even if unintentional, could lead to failures to replicate, ineffective training, cultural insensitivity, and reduced consumer acceptability.

Measurement

The parent training literature includes a variety of ways in which researchers measure the effects of parent training. These measures include direct objective measurement of parent behavior (e.g., Neef, 1995), direct objective measurement of child behavior (e.g., Rocha et al., 2007), subjective data (e.g., Farmer & Reupert, 2013), standardized assessments (e.g., Ingersoll & Wainer, 2013b), and/or a combination (e.g., Rocha et al. 2007). One of the hallmarks of behavior analysis (and science in general) is the reliance on objective data (Cooper et al., 2007). Therefore, subjective measurement can provide valuable information regarding the parent training program (e.g., social validity) but should not be relied upon as the main measure of effectiveness.

Social Validity

An additional measurement that should be found in clinical practice is social validity (Wolf, 1978). Although social validity was not originally identified as one of the seven dimensions of ABA (Baer, Wolf, & Risley, 1968, 1987), Wolf (1978) stated that measures of social validity is how ABA would find its "heart," so that our consumers would find an opportunity to provide us with feedback. Parents should be involved from the onset of training in selection of goals and procedures to be implemented. Additionally, researchers should measure satisfaction with the results of the training with the parents and, when possible, the individuals diagnosed with ASD. Although social validity has been included in some parent training research, there are many studies in which it has not. Future researchers should make an effort to include social validity in every future study that evaluates parent training. Clinicians should also measure social validity as part of a comprehensive evaluation of their training program to ensure satisfaction by those involved in the training and to inform clinicians of any modifications to the training that may make it more socially valid for future use.

Training the Trainers

Both in future research and in clinical practice, behavior analysts must discover the most effective and efficient ways to train professionals who will be providing parent training. As mentioned earlier, the most appropriate method may differ from trainee to trainee so this is also an important area to consider to ensure that training is as effective and efficient as possible.

An important area to consider when teaching professionals to train parents is how to do so with clinical sensitivity, that is, to do so with an understanding of the struggles that parents of individuals diagnosed with ASD go through on a daily basis. It is important to teach the trainers to train parents with compassion and empathy, as well as maintaining balance between the child's individual needs and the needs of the entire family unit. These skills are critical if professionals are going to work effectively with parents. If behavior analysts are to focus on training in the absence of these skills, parents may be less likely to feel comfortable participating in training. In other words, ignoring the contingencies under which parents are operating and paying sole attention to the contingencies affecting the child's behavior may lead to ineffective or short-term changes in parent behavior. For example, identifying that a child's challenging behavior is maintained by social positive reinforcement (e.g., parent attention) and training the parent to ignore the behavior without understanding the contingencies operating for the parents may result in teaching the parent a "skill" that he/she cannot use in the natural environment. So when in a grocery store, if the child engages in challenging behavior, ignoring the child's behavior may not be the most ideal approach for the parent if providing attention to the child serves a negatively reinforcing effect for the parent.

Although these "soft skills" may be hard to conceptualize and may not be as simple to define as a more concrete procedure, such as prompting, they are critical skills that need to be taught to future parent trainers. A first step would be for future researchers to identify and operationally define all of the soft skills that are needed for trainers to effectively work with parents of children with ASD. Additionally, future researchers should evaluate ways to train soft skills to the individuals who will be providing the parent training. Finally, future researchers should evaluate if the parent trainers who were taught soft skills provided training that resulted in quicker rates of learning for the parent trainees, higher levels of parent satisfaction, and greater parental utilization of skills taught.

Training future behavior analysts how to work with parents is critical to providing a higher quality of intervention leading to better outcomes for individuals diagnosed with autism. Therefore, how to provide effective parent training should be included as a component of a behavior analysts training (e.g., undergraduate programs, graduate programs, and service providers). Pertinent parent training skills should also be required as part of certification/licensure. Thus, training the trainers is not only an important component of future research but also an important component of clinical practice.

A Progressive Model

The majority of research on parent training has focused on a professional-led training program for parents to implement a single procedure (e.g., Suess et al., 2014), a few procedures (e.g., Barton & Lissman, 2015), or how to implement a comprehensive intervention (e.g., Buckley et al., 2014). Although parent training has been used to teach parents to implement a variety of procedures, the majority of these studies presumably have taught parents to implement the procedures in a way that requires strict adherence to specific protocols. Furthermore, the underlying conceptual basis for the technique is often not trained which may lead to training parents to implement the techniques inflexibly. Training parents to follow a protocol may be easier to train, measure, and is often the current model of the field (Leaf et al. 2016); however, this type of training could be considered a prescriptive model (i.e., parents are taught to implement specific procedures under specific contextual variables) rather than a flexible model in which the parents can make in-the-moment changes based on the child's behavior (i.e., a progressive model; Leaf et al., 2016).

Training in a progressive model consists of training the parents on the principles underlying the procedures and rationales for their use as well as on the procedures themselves. This may allow for greater overarching impact, longer maintenance, and generalization of skills (e.g., Leaf et al., 2016). Additionally, this could be considered more of a psychoeducational model in which parents develop a broader understanding of behavioral principles. Training in this model contrasts with training that is solely focused on following a specific, strict protocol (e.g., a prescriptive model).

While several studies have evaluated components of a progressive model (Leaf et al., 2016), none have specifically evaluated the model with respect to parent training. However, components of the progressive model were utilized as part of Lovaas et al. (1973) and Lovaas (1987). Within a progressive model, as applied to parent training, the parent would be trained to use clinical judgment, in-the-moment assessment and decision-making, and flexible teaching while implementing a variety of behaviorally based techniques. When parents are trained in this model, instead of adhering to a strict protocol, they would be trained to understand the principles of ABA, as well as when and how to adjust teaching and make in-the-moment assessments. Future researchers should investigate the use of this model for parent training and focus on measures of parents' clinical judgments, in-the-moment assessments and decision-making, flexibility in teaching and prompt fading, and implementation of multiple procedures simultaneously. Additional measures could include comprehension of guiding principles as opposed to learning specific, isolated procedures. Training in this way may result in long-term success for both the parent and the individual diagnosed with ASD.

Conclusion

For over 50 years, the principles of ABA have been utilized to implement interventions for individuals diagnosed with ASD (Smith, 2012). From the beginning of the applied research and clinical implementation of ABA-based procedures for individuals diagnosed with ASD, professionals have demonstrated the advantages and importance of parent training. Today, parent training has support as an evidence-based procedure (Smith & Iadarola, 2015) which can be used to instruct parents how to implement a variety of procedures (e.g., BST, DTT) to teach a wide assortment of skills (e.g., language, social, self-help). Although there are several areas that should be evaluated by future researchers and explored by clinicians, there is a breadth of evidence supporting parent training as part of a comprehensive treatment program. Providing parent training can result in better outcomes for individuals diagnosed with ASD and an improved quality of life for parents, children, and all members of the family unit.

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Treatment of Core Symptoms of Autism Spectrum Disorder

9

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Introduction

ASD is comprised of core deficits in social and communication skills and high levels of engagement in restrictive, repetitive behaviors and interests. To date, treatments based on the science of behavior analysis have been shown to be the most effective treatment of core symptoms of ASD (Odom, Boyd, Hall, & Hume, 2009). Further, the earlier these behavioral interventions are initiated, the better the treatment outcomes (Smith, Klorman, & Mruzek, 2015). This chapter provides an overview of treatment options for social skills, communication skills, and restrictive, repetitive behaviors and interests.

Social Skills

Deficits in social interaction and social communication are a core deficit of ASD (American Psychiatric Association, 2013). To meet the DSM-V diagnostic criteria for ASD, an individual must present with or have a history of deficits in (a) social-emotional reciprocity, (b) deficits in nonverbal communicative behaviors used for social interaction, and (c) deficits in developing, maintaining, and understanding relationships (American Psychiatric Association, 2013). This section surveys representative treatment options for a range of social interaction skills, starting from basic (i.e., eye contact and joint attention), intermediate (i.e., play skills), and advanced (i.e., perspective taking and lying). The following section details strategies for teaching communicative social skills in additional detail.

Basic Social Skills

One of the core deficits – that is identified as an early indicator – for individuals with ASD is lack of eye contact. Many individuals with ASD do not develop eye contact without specific training. Thus, eye contact is one of the first skills taught to learners in an early intensive behavior intervention (EIBI) program. Eye contact with both an instructor and instructional materials is a pivotal behavior in order to learn new skills and interact socially.

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Several techniques have been developed to teach eye contact. Early behavior analysts used a verbal cue (e.g., "Look at me") and a differential reinforcement and prompting procedures to bring eye contact under instructional control of the verbal cue (Foxx, 1977; Greer & Ross, 2007; Lovaas, 1981). Although eye contact can be successfully taught through this procedure, it is rather contrived and may not come under control of the appropriate antecedents and consequences, thus having little generality outside of the instructional activity. More recently, behavior analysts have shifted to teaching eye contact under natural contexts, such as embedded within discrete trial instruction (e.g., imitation, matching, etc.), mand training, and play.

Mand training, which takes advantage of a learner's motivation, is one contextually appropriate context that can be used to increase eye contact and social initiations. Charlop-Christy, Carpenter, Le, LeBlanc, and Kellet (2002) taught three children with ASD to mand using the Picture Exchange Communication System (PECS; Frost & Bondy, 1994) and evaluated potential collateral effects related to social behaviors, such as eye contact and joint attention (JA). Following mand training, an increase in eye contact and JA, from 25% in baseline to 54% in intervention, was observed across all three participants. However, eye contact was not required during the mand to receive access to the requested item. More recently, Carbone, O'Brien, Sweeney-Kerwin, and Albert (2013) assessed the effectiveness of differential reinforcement to increase mands made with eye contact for a child with ASD. During baseline, all vocal mands were reinforced regardless of eye contact. Throughout baseline, the participant rarely made eye contact with the researcher while requesting. During treatment, the researcher withheld reinforcement (i.e., access to the item) until the participant made eye contact. Following the differential reinforcement procedure, percentage of mands with eye contact increased from a mean of 10% in baseline to a mean of 77%.

Ninci et al. (2013) also investigated the effects of a differential reinforcement with the addition of a prompting procedure to increase mands made with eye contact during play. The therapist attempted to manipulate the motivating operation for specific items/activities (e.g., catching the ball and waiting for the student to request the ball before returning it) in order to contrive opportunities for the participant to make requests. The intervention was effective in increasing requests made with eye contact for the participants and maintained at varying degrees following 3 months after the intervention. On the other hand, acquisition of mands made with eye contact increased at a quicker rate following the intervention with each therapist, thus demonstrating some evidence of generalization. The results of these studies demonstrate the possible utility of using natural social contexts combined with differential reinforcement and prompting procedures to increase eye contact.

More recently, O'Handley, Radley, and Whipple (2015) compared the effects of an intervention package, which consisted of social stories and video modeling, on the eye contact of six adolescents with ASD. Findings of this study indicated that using only social stories led to moderated improvements, but after video modeling was combined to social stories, participants demonstrated further improvements. Applying video modeling in isolation showed strong intervention effects, and combining social stories to video modeling contributed to minimal additional improvements.

The acquisition of eye contact may also be a prerequisite skill for teaching more advanced social skills such as joint attention (Ninci et al., 2013; Taylor & Hoch, 2008). Joint attention refers to a set of behaviors that involve the shared attention between a social partner and a stimulus, and attention could be shared by using various topographies. Some of the topographies may include shift in eye gaze, gestures, vocal or verbal communication using one or more words, or any combination of those (Rudy, Betz, Malone, Henry, & Chong, 2014). Joint attention skills are considered a pivotal skill in a child's social and communication development (Adamson & Bakeman, 1984). Thus, joint attention should be one of the earliest social skills taught in a child's EIBI curriculum.

There are two forms of joint attention, responding to joint attention bids and initiating joint attention bids. Responding to other's joint attention bids could include changes in gaze direction or verbal responses. Initiating joint attention bids could include asking some else's attention by pointing an item or emitting verbal words (e.g., saying "Look!"). Both forms of joint attention can be taught together as one complete joint attention skill or each form separately. Several techniques have been used to teach joint attention skills including differential reinforcement and prompting procedures (Taylor & Hoch, 2008), video modeling (Rudy et al., 2014), and social scripts with fading (Pollard, Betz, & Higbee, 2012).

The earliest form of joint attention, which emerges between 9 and 18 months for typically developing children, is nonverbal joint attention. Nonverbal join attention involves shifting eye contact between a stimulus and a familiar person (Adamson & Bakeman, 1984). Krstovska-Guerrero and Jones (2015) investigated the effects of a differential reinforcement and prompting procedure to teach young children (20–29 months) with ASD early forms of responding to joint attention bids and initiating joint attention bids. Joint attention skills can be generalized to similar conditions with the child's mother and in novel contexts (e.g., responding to name). Appropriate initiations and responses to bids for joint attention continued 3 months following the intervention.

Taylor and Hoch (2008) used a least-to-most prompting procedure and natural consequences (i.e., social attention) to teach three children with ASD how to engage in three components of joint attention: (a) gaze shift from an object to an adult, (b) vocal response to joint attention bids, and (c) vocal initiations of joint attention bids. Following training on responding to joint attention bids, increase in gaze shift and vocal responses were observed, but vocal initiations did not increase until explicitly taught. Thus, teaching responding to joint attention bids does not guarantee generalization to initiating joint attention bids. Due to the complexity of joint attention, it may be important to break down the component skills (e.g., pointing and/or orienting, eye gaze shift, vocal and nonvocal comments/initiations) and teach each skill individually. In summary, teaching these pivotal skills, eye contact and joint attention, are of upmost importance to interventionists working with individuals with ASD. The way in which interventionists teach eye contact and JA can impact the generality of these skills.

Recently, Rudy et al. (2014) investigated the effects of video modeling on initiate bids for joint attention in children with ASD. Video model consisted of a 5-year-old girl and an adult dyad, and they demonstrate three components of joint attention bids: (a) pointing and/or orienting toward the object, (b) emitting a vocal statement (e.g., "Look, tree"), and (c) shifting eye gaze from the object to the therapist and back to the object. Results of this study implied that using video modeling alone was effective in teaching three components of joint attention bids to two participants, whereas the one student was required both video modeling and in vivo prompts to learn joint attention bids.

Intermediate Social Skills

Play is important for several aspects of child development, including gross motor skills, coordination, and language development (Garvey, 1990). Typically, children first explore and contact their environment through play. However, children with ASD often engage in repetitive and ritualistic behaviors (Harrop, McConachie, Emsley, Leadbitter, & Green, 2014) that can impede naturalistic play. Moreover, children with ASD could show difficulties in play activities due to the lack of motivation or understanding the basic rule of play (e.g., taking turns). They may not frequently initiate conversations or socially respond to others during play. Based on this necessity, three research-based teaching strategies were generally used to promote play skills in children with ASD: (a) video modeling, (b) visual activity schedules, and (c) social scripts and script fading.

In a recent study, MacManus, MacDonald, and Ahearn (2015) taught three children with

ASD to engage in a variety of play responses with three different toy sets. The primary purpose of this study was to evaluate the effectiveness of video modeling and matrix training as a treatment package for increasing the generalized play behaviors of children with ASD. Researchers found that the percentage of scripted and recombined actions and vocalizations increased for all three participants after video modeling was introduced. Additionally, they found that generalization across toy sets occurred to some degree for all participants.

Visual activity schedules are considered as an evidence-based practice for individuals with ASD (Kight, Sartini, & Spriggs, 2015) that include a series of photos, images, and pictures, which can describe a sequence of skills or behaviors. Initially, adults physically guide schedule following and rapidly fade prompts until the child can independently complete the schedule (MacDuff, Krantz, & McClannahan, 1993). Activity schedules have been used to promote not only solitary play (Morrison, Sainato, Benchaaban, & Endo, 2002) but also peer play. For example, Brodhead, Higbee, Pollard, Akers, and Gerencser (2014) taught children with ASD to play hide-and-seek with peers using joint activity schedules. Participants successfully engaged in both hider and seeker roles and also generalized hiding and seeking locations.

Children with ASD often struggle with initiating and maintaining back-and-forth conversations (American Psychiatric Association [APA], 2013). Social scripting is another technology that specifically targets increasing spontaneous vocalizations (Krantz & McClannahan, 1993). Children with ASD are taught to engage in scripted phrases that fit a specific context. Once the child can readily engage in the scripted responses, the scripts are systematically faded until the child's behavior comes under the control of stimuli in the natural environment. The broader goal of this intervention is for the child to engage in novel phrases in addition to those that were directly taught.

Across two studies, researchers taught three children with ASD to initiate conversation with peers and to respond to peer initiations. In the initial study, Wichnick, Vener, Keating, and Poulson (2010b) taught three children with ASD to initiate play and conversation. Participants were provided with ten plastic bags filled with two small toys. During treatment, seven of the bags also contained auditory scripts to prompt play initiations (e.g., "Let's share toys"). Participants opened one of the bags, removed both toys, and handed the second toy to a play partner. If the bag contained a script, he/she also engaged in the scripted initiation. Before treatment, participants rarely made initiations during play; however, once treatment was introduced, the number of initiations increased and remained elevated after scripts were faded.

In a follow-up study, Wichnick, Vener, Pyrtek, and Poulson (2010a) taught participants to respond to the initiations made by peers. The participants and procedures were the same as those employed in the initial study. Participants were taught to engage in an appropriate response when another peer initiated play (e.g., "This is fun"). Before treatment, participants rarely responded to peer initiations; however, after treatment, the number of responses greatly increased. These responses were not limited to those specifically taught but also included novel responses.

Other researchers have also investigated the usefulness of a script training procedure to promote play-based conversations (Groskreutz, Peters, Groskreutz, & Higbee, 2015). Three children with ASD were directly taught three script frames to facilitate commenting about various play activities. The script frames were "I found the ____," "I'm playing with the ____," and "Look at this ____." During treatment sessions, 15 scripts (five of each type of script frame) were placed on various components of the toy set. If 30 s elapsed and the participant did not make a comment, the researcher prompted a scripted response. After script training was introduced, the number of unique play comments increased for participants.

In summary, targeting conversation and play skills with children with ASD is extremely important, as one of the defining features of ASD is the deficit in social communication (APA, 2013). Video modeling, visual activity schedules, and social scripting are relatively simple interventions that can be employed to address these skill deficits. These interventions promote independence and generalization to novel responses, which can lead to more naturalistic social interactions.

Complex Social Skills

Despite the support for behavioral interventions in the treatment of social behaviors, there is much less support for the use of such interventions in teaching complex social behaviors (Ranick, Persicke, Tarbox, & Kornack, 2013). However, support for the use of behavioral principles in teaching complex social skills is emerging through the application of relational frame theory (RFT), a post-Skinnerian approach to language and cognition development. RFT proposes that an individual's ability to "derive stimulus relations is learned behavior" (Hayes et al., 2001, p. 22). That is, RFT advocates that the ability to relate things to one another is learned behavior. Though most research on RFT has been conducted on typically developing populations (Dymond, May, Munnelly, & Hoon, 2010), there is emerging support for the use of RFT to teach complex social behaviors to individuals with autism. For example, given that individuals with autism have deficits in the ability to understand verbal irony, Pexman et al. (2011) and Persicke, Tarbox, Ranick, and St. Clair (2013) evaluated the effects of a training package to teach children with autism to detect and respond to sarcasm. The training package included multiple exemplar training (MET). MET involves training a behavior in the presence of multiple stimulus conditions in order to promote the generalization of behavior (Rosales, Rehfeldt, & Lovett, 2011). In this case, MET involves exposing the individual with autism to multiple opportunities to recognize and detect sarcasm. Instructor feedback was provided on the correctness of each opportunity to respond to sarcasm. Following the study, all three participants demonstrated mastery and maintenance of the skill of responding to sarcasm for up to 3 months after treatment.

A similar approach was used to teach children with autism to detect to and respond to deceptive statements. Ranick, Persicke, Tarbox, and Kornack (2013) argued that responding to deceptive statements is important because it may reduce the likelihood that individuals with autism fall victim to bullying. Using MET in a treatment package that also included rules, modeling, role-play, and feedback, Ranick et al. taught three children with autism to question deceptive statements that occurred during play situations. Following training, all three participants demonstrated mastery of responding to deceptive statements and were able to generalize that skill to novel examples of deception and their peers.

Using behavioral skills training (BST), which involves instruction through modeling, instructions, rehearsal, and feedback in order to improve the skills of a learner in a given situation, Miltenberger (2012) and Bergstrom, Najdowski, Alvarado, and Tarbox (2016) taught three children to tell socially appropriate lies. The social skill of teaching appropriate lies is important because they allow an individual to avoid giving away a surprise, keep a secret during a game, and provide praise or support for a physical appearance that may be less than flattering (Bergstrom et al.). This intervention serves as another example of an effective strategy to teach complex social skills to individuals with autism.

Communication

Communication deficits are characterized by delayed or atypical development in the area of communication. Sturmey and Sevin (1994) observed that poor communication skills are at the core of most autism definitions. Indeed, current diagnostic criteria for ASD emphasize a profound impairment in verbal and nonverbal communication used for social interaction (American Psychiatric Association, 2013). The degree of this communication disorder can vary widely in individuals with ASD. Some children acquire speech and language slowly during the preschool years; estimates are that up to 50% can use phrased speech by the time they enter primary school (see Howlin, Magiati, & Charman, 2009). Another portion of about 30–50% experience a severe lack in the development of speech and language by the time they enter kindergarten (National Research Council, 2001; Tager-Flusberg & Kasari, 2013). These individuals are often described as "nonverbal" or only "minimally verbal" (Tager-Flusberg & Kasari, 2013). Interventions to promote communication, and speech and language in particular, therefore span a wider range of approaches including verbal and nonverbal communication modalities. The following is an outline of the most common contemporary communication interventions that are consistent with a behavioral paradigm of communication training and based on empirically validated principles of learning.

Behavioral Intervention Principles Across Communication Modalities

To have the greatest benefit on the developmental trajectory, speech and language intervention should be started as early as the child is identified as having a difficulty; in addition, speech and language training should be integrated into any other type of intervention program that the individual is receiving.

Contemporary ABA-based approaches to speech and language intervention originated from Skinner's (1957) analysis of verbal behavior (Sigafoos, O'Reilly, Schlosser, & Lancioni, 2007). According to Skinner, verbal behavior is reinforced by other people. For example, one can think of the direct act of opening a window (operant behavior) to breathe fresh air (reinforcement); the verbal behavior equivalent (saying, "open the window") is only meaningful in the presence of a communication partner willing and able to react to and reinforce this communicative act. Verbal behavior includes any type of response form that will effectively modify a communication partner's behavior. Natural speech is not always equivalent with verbal behavior, because speech is not automatically tied to the behavior of a listener. Echolalia, as an example, often results from automatic positive reinforcement (Sigafoos et al., 2009). On the other hand, any indirectly operated behavior that necessitates another person to mediate reinforcement is considered "verbal." Therefore, verbal behavior can take many forms of communicative modalities such as vocalizations, writing, gestures, manual signs, exchanging pictures, or using a speech-generating device. In more depth, verbal behavior consists of several classes of verbal operants (see Sigafoos et al., 2009, for more information).

Based on the verbal behavior framework, communicative intervention aims at establishing a growing repertoire of proper communicative forms that will be used as mands, tacts, echoics, intraverbals, and autoclitics. Each of these verbal operants should be taught through direct instruction (Sundberg & Michael, 2001). Language interventions derived from Skinner's analysis of verbal behavior show strong effectiveness for teaching the verbal operants outlined above. Skinner's model emphasizes the function rather than the form of spoken language and underscores the importance of context (LaFrance & Miguel, 2014). By stressing function and context, this model provides clinicians with a viable tool to teach and shape speech and language, especially in cases where communicative repertoires are severely limited.

Interventions for the Verbal Individual

Behaviorally oriented speech and language programs for children that have communicative speech typically target four major aspects of speech-language development (Sigafoos et al. 2009). First, intervention often aims at increasing vocalizations and establishing imitative speech. Second, a general objective is to enlarge the learner's vocabulary by (a) establishing new words and phrases, (b) enhancing the complexity of grammatical structures, and (c) developing the learner's conversational skills. Third, intervention typically targets using the newly acquired speech forms in more functional and spontaneous ways; related content goals may include (a) establishing the spontaneous and generalized abilities to mand and tact, (b) transforming echolalic utterances into more meaningful functional speech, and (c) sustaining verbal behavior in general. Fourth, intervention aims to facilitate the various pragmatic aspects of verbal behavior, such as developing better articulation, expanding length of utterance, and fine-tuning prosody. It is critical to note that these four general intervention objectives are not mutually exclusive, and they are also not bound to any particular instructional sequence. Examples for evidence-based communication intervention programs that are firmly grounded in behavioral principles include the following examples.

Applied Verbal Behavior Applied verbal behavior (AVB) programs (e.g., Greer & Ross 2008) incorporate behavioral procedures to teach verbal operants. AVB programs have proven to be effective in teaching children with ASD to acquire spoken words, produce questions, generate four-term sentences (verbs+colors+shape/size+labels), and respond to “what,” “how,” and “why” questions (Williams & Marra, 2011).

Pivotal Response Training Another intervention program that has been used successfully to teach language to children on the autism spectrum is pivotal response training (PRT) (Koegel, Koegel, Harrower, & Carter, 1999). A “pivotal behavior” is considered one from which other behaviors originate. Based on principles of ABA blended with developmental approaches, PRT targets pivotal behaviors related to motivation, responsivity to multiple cues, self-management, and self-initiations. Creating a focus on these pivotal skills leads to ancillary gains in untargeted areas and ideally to generalized long-lasting improvements in language, behavior, and social outcomes. The comprehensive PRT program emphasizes consistent and coordinated programming across the child’s environments, including parents as much as possible (Park, 2013). Parents take on a major role in the treatment process and receive in-depth PRT training. This partnership model has parents outline clinically important treatment goals and intervention strategies that can be easily infused into their daily family schedule. During the treatment sessions, certain variables are manipulated in a natural language teaching context; for example, the clinician may use stimulus items that are functional and vary these, employ natural reinforcers, and reinforce any communicative attempt. The major use of PRT has been for the acquisition of early, very specific language skills; PRT has also been applied for increasing the frequency and spontaneity of utterances (Williams & Marra, 2011).

Interventions for the Minimally Verbal Individual: Augmentative and Alternative Communication

Individuals with ASD who do not develop sufficient natural speech or writing to meet their daily communication needs are candidates for intervention in the area of augmentative and alternative communication (AAC). Such individuals may show only pre-intentional communication, such as reaching for a desired item, or communication may show intent through behaviors such as pointing (Yoder, McCathren, Warren, & Watson, 2001). When speech does develop, it is often limited to unusual or echolalic verbalizations (Paul, 2005).

AAC is defined as the supplementation or replacement of natural speech and/or writing using aided and/or unaided strategies. Blissymbols, pictographs, Sigsymbols, tangible symbols, and electronically produced speech are examples of aided AAC. Manual signs, gestures, and body language are examples of unaided AAC. The use of aided symbols requires a transmission device, whereas the use of unaided symbols requires only the body (Lloyd, Fuller, & Arvidson, 1997). Major types of AAC intervention for individuals on the autism spectrum include the following approaches.

Manual Signs, Gestures, and Total Communication Manual signing was one of the first AAC strategies used with minimally verbal individuals with autism (Schlosser & Wendt, 2008). It was first trialed in the 1970s and has been applied successfully with this population for over 30 years. The term manual signs can indicate a natural sign language (e.g., American Sign Language aka ASL) or refer to the generation of manual signs as a code for a spoken language (Blischak, Lloyd, & Fuller, 1997).

Gestures are body movements or coordinated sequences of motor responses to represent an object, idea, action, or relationship omitting the linguistic features of manual signs. Examples for gestures include pointing or yes-no headshakes. Using gestures is a nonlinguistic form of unaided communication that develops early in life. Before the start of linguistic development, infants typically use gestures in symbol formation when communicating and interacting with communication partners (Loncke & Bos, 1997). Consequently, gestural development is an important precursor to later development of language skills (Morford & Goldin-Meadow, 1992). Individuals with ASD, however, rarely develop gestural use as an alternative communication strategy by themselves and need concerted intervention to acquire this skill (Loveland, Landry, Hughes, Hall, & McEvoy, 1988).

By the mid-1980s, an AAC approach emerged that combined manual signing with speech. This procedure is labeled as "total" or "simultaneous" communication (Mirenda & Erickson, 2000). Total communication emphasizes the use of the most appropriate communication strategy for the individual and is typically an adaptation of ASL. Research reports indicate increases in initiating communicative acts after manual sign training in children with ASD (Goldstein, 2002). Other studies showed improvements in early vocalizations or spoken words, while some research suggests limited productive use of manuals signs when taught to individuals with ASD. The majority of research does not support language progress beyond a few words when implementing manual signs; however, the total communication approach shows promising effects particularly for those children with autism who are minimally verbal and have poor verbal imitation (Williams & Marra, 2011). When implementing manual sign training, clinicians should be cautious about motor skill requirements on the individual with ASD. Possible motor apraxia may impede acquisition and production of a manual sign repertoire (Hilton, Zhang, White, Klohr, & Constantino, 2012; Isenhower et al., 2012). Related research suggests that manual signing can be part of a multimodal AAC system for individuals with ASD but that it should not be the only means of communication. A combination with other forms of AAC seems more beneficial (Williams & Marra).

Graphic Symbol Sets and Systems Compared to manual signing, graphic symbols are a somewhat newer AAC mode for individuals with ASD. During the 1980s clinicians started to embrace the potential benefits of graphic symbols because of their non-transient nature (e.g., Mirenda & Schuler, 1988). Graphic symbols can be organized as sets or systems. Sets represent collections of symbols that do not have defined rules for their creation and expansion, while systems have an established rule repertoire (see Lloyd et al., 1997). Graphic symbols most often used in ASD include PCS, line drawings, colored photographs, and Premack (all sets) and blissymbols, orthography, and rebus (all systems) (Schlosser & Wendt, 2008). Graphic symbol sets and systems that are more iconic in nature (i.e., they demonstrate greater visual resemblance between symbol and referent) appear to be easier to learn (Kozleski, 1991).

Research suggests that graphic symbols are most effective for targeting mand skills (Schlosser & Wendt, 2008). Beyond manding, graphic symbols may be helpful as visual supports to facilitate transitioning activities (Dettmer, Simpson, Myles, & Ganz, 2000). Yet, the research base on graphic symbols has not reached a critical mass to draw conclusions whether one graphic symbol set/system may be preferable over others.

Speech-Generating Devices (SGDs) SGDs are another viable option for minimally verbal individuals with autism. SGDs include dedicated electronic communication devices, talking word processors, and handheld multipurpose mobile devices (e.g., iPad®, iPod®, Android® tablets) equipped with AAC applications (apps). All of these have built-in technology that allows a user to communicate via digitized and/or synthetic speech. Digitized speech is generated by recording a human voice and converting it into an electronic waveform. The quality of digitized speech depends on the sampling rate used during the conversion process. SGDs and apps that apply higher sampling rates in general generate higher-quality speech output compared to those that rely on lower sampling rates. Recording quality may also be impeded by noisy environments, equipment quality, speaker age, and quality of the speaker's natural voice (Drager & Finke, 2012).

Synthetic speech is generated by a text-to-speech algorithm built within the device that allows to produce an unlimited amount of spontaneous speech by converting alphabets, digits, words, and sentences into speech output. Intelligibility of high-quality text-to-speech engines can approach that of natural speech. Variables that influence synthetic speech quality include listening conditions, experience, and adjustment to the nature of synthetic speech and the particular listening tasks (Schlosser & Koul, 2015).

Research into the effects of SGDs for minimally verbal individuals with ASD has evolved much later than for other AAC options (e.g., manual signing). Recently there has been increased research activity in this area, especially on the use of mobile technologies with AAC-specific apps; this is not an unsurprising trend in light of the current impact of mobile technologies on the AAC field (e.g., McNaughton & Light, 2013). The majority of studies document benefits from SGDs when these are used as part of treatment packages to target requesting skills or challenging behaviors (Schlosser & Koul, 2015). Some research has started to document effects on natural speech production and social-communicative behaviors in individuals with ASD (Kasari et al., 2014; Boesch, Wendt, Subramanian, & Hsu, 2013), but further investigations are warranted to draw more definite conclusions for clinical practice.

Instructional Approaches for Augmentative and Alternative Communication in Autism

To maximize the effects of AAC intervention, it is critical to put an effective instructional approach around the provision of AAC technology. Merely equipping the learner with AAC materials or devices will not automatically lead to improved communication. Incorporating behavioral learning principles into AAC intervention can be a powerful tool to create a proper instructional framework. Examples for evidence-based approaches are the picture exchange communication system and matrix training.

Picture Exchange Communication System (PECS) The PECS has attained widespread use and popularity in the autism field during the last 20 years (Bondy & Frost, 1994). PECS is a manualized treatment for beginning communicators that uses behavioral strategies and a series of training phases to teach the use of graphic symbol cards for spontaneous communication with others. PECS involves six phases. In phase I: physical exchange, learners are taught to exchange a graphic symbol for a desired object. In phase II: expanding spontaneity, learners are taught to exchange a symbol with different communication partner across increasing distances. In phase III: picture discrimination, the task for the learner is to discriminate among symbols for requesting. Consequently, in phase IV: sentence structure, the learner is instructed to attach an "I want" symbol to a blank sentence strip, followed by the symbol for a desired item, and to exchange the sentence strip with a communication partner. In phase V: responding to "What do you want?," the learner is required to respond immediately to a question prompt. Finally, phase VI: responsive and spontaneous commenting uses the acquired skills to develop responses to further questions (i.e., "What do you see?") and spontaneous commenting (Bondy & Frost, 2001). Reviews of the PECS intervention literature indicate that the approach is successful in teaching initial communication skills and in some cases facilitated spoken language acquisition (Ganz, Davis, Lund, Goodwyn, & Simpson, 2012; Williams & Marra, 2011). For example, in a sample of 66 participants who received PECS intervention for over a year, 39 (59%) developed natural speech as a primary communication mode (Brunner & Seung, 2009).

Matrix Training Matrix training is a proper choice of instruction when learners possess an initial core lexicon of 40–50 symbols and begin to create symbol combinations. Matrix training can be implemented by using symbols in an AAC context (e.g., manual signs or graphic symbols) or by using spoken words. Matrix strategies use linguistic elements (e.g., nouns, verbs, etc.) presented in systematic combination matrices, which are arranged to induce generalized rule-like behavior. The learner is taught to combine a limited set of symbols in one semantic category with another set in a related semantic category to facilitate the acquisition of generalized combining of lexical items (Nelson, 1993). For example, a 2×2 matrix can be designed with two colors on one axis and two objects on the other axis, allowing four different color-object combinations. If two of the four combinations are taught, the learner may be able to generalize the skill to the untaught combinations. For example, if a child is taught to label "yellow apple" and "red pear," the combinations "yellow pear" and "red apple" may emerge without direct instruction, a process that is known as "recombinative generalization" (Goldstein, 1983). Clinical research indicates that matrix training is effective in teaching action-object, graphic symbol combinations on a communication board for individuals with developmental disabilities including ASD (Nigam, Schlosser, & Lloyd, 2006). Successful intervention results have also been reported for teaching spelling, play-based behaviors, and enhanced expressive and receptive communication skills, although mostly for participants with developmental delay and/or intellectual disability (Chae & Wendt, 2012).

Restricted, Repetitive Behaviors and Interests

The final core symptom of ASD is restricted or repetitive behaviors, interests, or activities (American Psychiatric Association, 2013). To meet the DSM-V diagnostic criteria for ASD, an individual must present with or have a history of at least two categories of restricted, repetitive behaviors and interests (RRBI). RRBI categories include (a) stereotyped or repetitive motor movements, use of objects, or vocalizations (e.g., hand flapping, body rocking, lining up objects, echolalia or repetitive speech); (b) insistence on sameness, strict adherence to routines, or ritualistic verbal or nonverbal behavior (e.g., major distress related to changes in routines, transitions); (c) highly circumscribed or perseverative interests (e.g., intense focus or attachment to unusual objects, topics, or interests); or (d) hyper- or hyposensitivity to sensory input (e.g., indifference to pain, excessive sniffing of objects, licking objects, covering ears) (American Psychiatric Association, 2013). RRBI in individuals with ASD is heterogeneous and can take the form of a variety of motor, vocal, and ritualistic behaviors, which vary greatly in terms of form, frequency, and intensity. To assist in examining the etiology, trajectory, and treatment of RRBI, researchers have factored RRBI into two subgroups: lower-order and higher-order RRBI (Turner, 1999).

Lower-order RRBI are characterized by repetitive motor movements, vocalizations, or object manipulation, while higher-order RRBI relates to insistence on sameness, circumscribed perseverative interests, and rigid adherence to rules or rituals (Boyd, McDonough, , & Bodfish, 2012; Patterson, Smith, & Jelen, 2010).

RRBI Treatment Overview

RRBI have been reported to be the most difficult aspect of ASD for parents to manage (Bishop, Richler, Cain, & Lord, 2007) and present unique challenges for treatment. RRBI can negatively impact socialization (Watt et al., 2008), reduce access to and benefit from instruction, lead to stigmatization (Cunningham & Shriebman, 2008), and contribute to placement in restrictive settings (Boyd et al., 2012; Green et al., 2007; Honey, Rodgers, & McConachie, 2012). Not only do RRBI interfere with learning and social development, but interruption or blocking of RRBI has been shown to evoke additional challenging behaviors including tantrums, aggression, and self-injury (e.g., Hagopian & Adelinis, 2001). The best treatment outcomes for RRBI result from behavioral treatments based on the principles of operant conditioning (e.g., Boyd et al., 2012; Patterson, Smith, & Jelen, 2010). Behavioral treatments can be classified as antecedent interventions, consequence interventions, or combinations of antecedent and consequence interventions.

Antecedent Treatments

Antecedent treatments prevent RRBI through altering the environment, providing competing sources of stimulation and reinforcement, and reducing of motivation to engage in RRBI. Antecedent interventions often consist of focused intervention practices (Odom et al., 2009) which can be implemented in isolation or as part of a larger, comprehensive treatment package. Focused antecedent interventions for lower-order RRBI include teaching new skills or behaviors, noncontingent reinforcement (NCR), environmental enrichment, antecedent exercise, presession access to RRBI, and discrimination training.

Teaching New Skills It has been posited that one reason individuals engage in RRBI is because they lack adaptive behaviors to access reinforcement (Boyd et al., 2012). By teaching appropriate leisure, play, and social interaction skills, researchers have shown that RRBI can decrease (Lanovaz, Robertson, Soerono, & Watkins, 2013). Loftin, Odom, and Lantz (2008) taught social interaction skills to three children with ASD. Intervention involved peer training, social initiation instruction, and self-monitoring. As social interaction skills improved, motor stereotypy decreased.

Noncontingent Reinforcement (NCR) NCR involves systematically providing access to the maintaining consequence of challenging behavior on a fixed time-based schedule. For lower-order RRBI maintained by automatic reinforcement, NCR often involves access to stimulation matched to the properties of the RRBI (Piazza et al., 2000). For example, Rapp (2007) provided two boys with ASD who engaged in repetitive vocalizations noncontingent access to music and found repetitive language decreased. Ahearn, Clark, DeBar, and Florentino (2005) found that access to highly preferred toys that did not match the properties of the children's RRBI also decreased RRBI. This suggests that if the properties of RRBI are not able to be identified or matched to the sources of stimulation (toys, music, etc.), then noncontingent access to highly preferred toys may be effective in reducing lower-order RRBI. Other research has shown that NCR is more effective in reducing lower-order RRBI when paired with consequence-based interventions (e.g., blocking RRBI) (Patterson et al., 2010).

Environmental Enrichment (EE) EE is similar to NCR in that access to stimulation is provided irrespective of the individual's engagement in RRBI (e.g., Vollmer, Marcus & LeBlanc, 1994). EE involves increasing the quantity or quality of reinforces within a setting. EE is effective at reducing RRBI when the reinforcing properties of the environment successfully compete with and become more valued than the automatic reinforcement obtained through RRBI (Rapp & Vollmer, 2005). For example, a teacher could conduct a preference assessment to identify a child's preferred toys and activities (see Karsten, Carr, & Lapper, 2011, for guidelines for selecting an appropriate preference assessment). He or she could then identify times during the day when the child is likely to engage in lower-order RRBI and present the preferred toys and activities to the child during those times. Vollmer et al. (1994) found that when children with ASD were given access to their preferred items, lower-order RRBI decreased. However, for some individuals, EE may actually lead to an increase in vocal stereotypy. Van Camp et al. (2000) observed rates of hand flapping in a young boy and found that hand flapping was higher in the presence of preferred toys than when the child was alone without environmental stimulation. Given this variability in outcomes, it is important to evaluate the effects of environmental enrichment on RRBI for the individual prior to adopting the intervention whole scale.

Presession Access Presession access to RRBI may also function to reduce the value of automatic reinforcement (e.g., Rapp & Vollmer, 2005; Rispoli et al., 2011). Lang et al. (2010) evaluated presession access as a treatment for repetitive object manipulation in four young children with ASD. When the children were given unrestricted access to engage in object manipulation immediately prior to a play intervention, they engaged in lower levels of object manipulation and increased levels of functional play during the subsequent play intervention session. Practitioners interested in preventing subsequent engagement in lower-order RRBI may schedule periods of unrestricted access to engage in RRBI prior to target tasks or activities.

Stimulus Control Related to scheduling opportunities for individuals with ASD to engage in RRBI, research has shown that the use of visual and verbal cues can assist in signaling to the individual when it is appropriate to engage in RRBI and when it is inappropriate (Conroy, Asmus & Sellers, 2005). Such an intervention involves bringing RRBI under the control of a specific stimulus and then only presenting that stimulus when it is acceptable to engage in RRBI. For example, O'Connor, Prieto, Hoffmann, DeQuinzio, and Taylor (2011) evaluated a stimulus control procedure on repetitive motor and vocal behaviors in an 11-year-old boy with ASD. Through discrimination training, they taught the child that in the presence of a green card, he could engage freely in RRBI. However in the presence of a red card, RRBI was physically interrupted (e.g., manual guidance of his hands back to his lap, removal of preferred stimuli in the presence of repetitive vocalizations). When the child did not engage in RRBI in the presence of the red card, the researchers presented the green card, signaling that the RRBI would not be interrupted. Thus, this intervention involved a stimulus control procedure and reinforcement of the absence of RRBI with subsequent access to RRBI. This procedure was then generalized to the child's school and community environments.

Embedding Interests Higher-order RRBI involve perseverative or circumscribed interests and insistence on sameness. As such, antecedent interventions are designed to expand interests and enhance flexibility. One approach with emerging research support is to capitalize on perseverative interests through a strength-based approach. Perseverative interests have been embedded into instruction via instructional materials (Adams, 1998), social interaction topics (Baker, Koegel, & Koegel, 1998), and play (Boyd, Conroy, Mancil, Nakao, & Alter, 2007). For example, Baker et al. compared the effects of perseverative interest embedded in social games on the social interactions with three children with ASD. The children's restricted interests included facts about the United States, Disney characters, and children's movies. When the socially appropriate games were centered on the child's perseverative interest (such as playing tag on a giant map of the outline of the United States), social interaction increased for all three participants and generalized to social interactions with topics outside of perseverative interests.

Functional Communication Training (FCT) FCT has shown promise in the treatment of challenging behavior associated with ritual interruption (e.g., Kuhn, Hardesty, & Sweeney, 2009). Rispoli et al. (2014) evaluated FCT to teach three young boys with ASD and higher-order RRBI to appropriately request access to their preferred ritual. When the children requested appropriately, they were permitted to engage in the ritual. When they engaged in challenging behavior, the ritual was terminated. To reduce the time spent engaged in the ritual, the participants were taught to only request access to the ritual once a visual timer had elapsed. Using this signaled delay to reinforcement, the children were able to tolerate interruption of rituals for up to 1 min. For one child, results generalized occurred across rituals.

Consequence-Based Treatments

Differential Reinforcement (DR) DR procedures involve providing poorer quality or less quantity of reinforcement for RRBI and greater quality and quantity of reinforcement for either appropriate behaviors or the absence of RRBI. A target criterion for RRBI or a replacement response is established and systematically reinforced. Taylor, Hoch, and Weissman (2005) implemented a differential reinforcement procedure with a 6-year-old girl with ASD who engaged in vocal stereotypy. The teacher told the child that if she played quietly until the timer rang, she could have access to musical toys (toys matched to the reinforcing properties of vocal stereotypy). A card with the word “Quiet” and a digital timer set and placed in view of the child. Results showed that when the differential reinforcement procedure was in place, vocal stereotypy decreased. Differential reinforcement can also be used to increase variability of behaviors (Miller & Neuringer, 2000). For example, a child who engages with toys in the same manner each day would be reinforced for engaging with toys in different ways (Boyd, McDonough, Rupp, Khan, & Bodfish, 2011).

Punishment Procedures Punishment procedures for RRBI include response cost, response interruption and redirection, and sensory extinction. Response cost involves removing access to a desired object or activity contingent upon RRBI. For example, a child who is earning tokens to exchange for a preferred activity may lose a token each time she engages in RRBI (Lapime & Dittcher, 2014). Response interruption and redirection involves manually preventing repetitive motor movements or verbally interrupting repetitive vocalizations (Ahearn et al., 2007). Response blocking is related to response interruption, but rather than blocking the RRBI itself, access to reinforcement obtained by the RRBI is prevented (Rapp & Vollmer, 2005). This is referred to as sensory extinction. Rincover, Newsom, and Carr (1979) hypothesized that a child who spun plates on hard surfaces was doing so to hear the sound the plate made when it clattered against the table. The researchers covered the table with a soft material to block the sound of the plate spinning. With this sensory extinction procedure, plate spinning decreased, and the authors were able to introduce new appropriate play skills which allowed the child to access similar auditory reinforcement.

Although punishment procedures for RRBI are common in practice, they have not been shown to be effective in maintaining reductions over RRBI over time (Cunningham & Schreibman, 2008) and may serve to increase RRBI when punishment procedures are not in place (Rapp & Vollmer, 2005). There are also ethical concerns that arise when implementing punishment procedures, and such procedures can lead to aggressive behaviors or instructional environments taking on aversive characteristics (Rapp & Vollmer). It is recommended that punishment procedure be incorporated into treatment packages that include antecedent and reinforcement procedures.

Summary

The above sections outline strategies for the treatment of core symptoms of ASD. Though the type of treatment differs depending on the needs of each learner, one commonality between treatment options is that effective treatments are based on the principles of behavior analysis. To date, no other forms of treatment have reported the positive results obtained by behavioral interventions for individuals with ASD. Because there are a number of alternative treatments for ASD (see

Foxx & Mulick, 2016), it is important for consumers to appraise alternative treatments, as some treatments may be harmful or counterproductive to treatment goals (Brodhead, 2015). Finally, when implementing behavior-analytic treatments for individuals with ASD, it is of great importance that treatment is designed, implemented, and supervised by qualified professionals. In some cases, the input of multiple professionals may be necessary, as treatment of social skills, communication, and repetitive behaviors are separate areas of expertise. Failure to provide proper oversight of the implementation of behavioral procedures may result in less than adequate treatment of core symptoms of ASD.

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Comorbid Challenging Behaviors

10

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Introduction

Researchers have shown that individuals with autism spectrum disorders (ASD) engage in higher levels of challenging behaviors than individuals with other developmental disabilities (Arron, Oliver, Moss, Berg, & Burbidge, 2011; Dominick, Davis, Lainhart, Tager-Flusberg, & Folstein, 2007; McClintock, Hall, & Oliver, 2003; Rojahn, Wilkins, Matson, & Boisjoli, 2010). Individuals with ASD also present the highest prevalences for specific forms of challenging behaviors including self-injury, aggression, and stereotypy (Chebli, Martin, & Lanovaz, 2016; Emerson et al., 2001; Farmer & Aman, 2011; Matson & Shoemaker, 2009; Rojahn et al., 2009). These results indicate that challenging behaviors are clearly a significant issue in children, adolescents, and adults with ASD that practitioners must take into consideration when developing treatment plans.

Characteristics of Challenging Behaviors

Although the research literature contains multiple definitions of challenging behaviors, researchers generally agree that a behavior is challenging when it poses a threat to the development, health, or security of the individual with ASD or others (e.g., caregivers, educators, siblings) and when functional abilities are compromised (Dunlap et al., 2006; Minshawi, Hurwitz, Morris, & McDougle, 2014; Rojahn, Matson, Lott, Esbensen, & Smalls, 2001). As part of the current chapter, we will use this broad definition when referring to challenging behaviors. Usually described by their observable properties, challenging behaviors vary in terms of nature, frequency, duration, and intensity (McGill, Hughes, Teer, & Rye, 2001). Frequently reported topographies of challenging behaviors are self-injurious behaviors (SIB), aggression and destruction, and stereotypy (Baghdadli, Pascal, Grisi, & Aussilloux, 2003; Chebli et al. 2016; Emerson et al., 2001; Matson & Nebel-Schwalm, 2007; McTiernan, Leader, Healy, & Mannion, 2011; Rojahn et al., 2001). The occurrence of each topography is not mutually exclusive: the behavioral profiles of individuals with ASD often include occurrences of multiple different forms of challenging behaviors (Mazurek, Kanne, & Wodka, 2013; McClintock et al., 2003).

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Researchers typically define SIB as self-directed behaviors that may inflict physical harm to one's own body (Carr, 1977; Iwata, Dorsey, Slifer, & Bauman, 1982/1994). Commonly observed forms of SIB include head banging, hair pulling, biting, eye poking, scratching, self-punching, self-slapping, and self-pinching (Baghdadli, et al., 2003; Carr, 1977; Iwata et al., 1994; Matson & LoVullo, 2008). Cases involving intake of inedible items (pica) or fluids and the use of objects or furniture to harm one's self have also been reported in the research literature (Kahng, Hausman, & Jann, 2011; Luiselli, Cochran, & Huber, 2005; Mitter, Romani, Greer, & Fisher, 2015).

A second common category of challenging behaviors is aggression and destruction, which are often associated with high risks of injuries to one's self and others (Matson, Boisjoli, Rojahn, & Hess, 2009). Aggression is a challenging behavior that is directed toward somebody else that causes, or has the potential to cause, physical or psychological harm. Some prevailing topographies of aggression are shouting, cursing, insulting, threatening, hitting, pinching, biting, kicking, and hair pulling (Roane & Kadey, 2011). On the other hand, destruction is the act of damaging property by throwing, breaking, knocking over, or tearing objects or furniture apart (Mitter et al., 2015; Roane & Kadey, 2011). Destruction is similar in form to aggression, but it is directed toward objects rather than other individuals.

A third common category of challenging behaviors is stereotypy, which is generally defined as repetitive and invariant behaviors, activities, or interests that have no apparent social function (MacDonald et al., 2007; Rapp & Vollmer, 2005). At a young age, stereotypy is common among typically developing children (Thelen, 1979). Its frequency tends to stay stable or to decrease between the ages of 2 and 4 in children without disabilities, while it generally increases in children with ASD (MacDonald et al., 2007). Manifestations of stereotypy can include motor or vocal behaviors that vary across individuals, time, and settings. Examples of repetitive motor movements include hand flapping, body rocking, pacing, head rolling or weaving, object spinning, and twirling (Chebli et al., 2016; Crosland, Zarcone, Schroeder, Zarcone, & Fowler, 2005). Examples of vocal stereotypy involve any repetitive sounds and non-contextual phrases that happen without apparent intention to interact such as unrecognizable words or vocalizations, non-contextual laughing, giggling, and repetition of words or phrases (Lanovaz & Sladeczek, 2012; MacDonald et al., 2007).

Challenging behaviors can take other forms that have not been discussed previously such as noncompliance (Plumet & Veneziano, 2014; Wilder, Harris, Reagan, & Rasey, 2007). Noncompliance can be generalized to all people and environments, or it can be specific to one person, a type of demand, or a location. Other examples of challenging behaviors reported in the research literature include elopement or running away, stripping, inappropriate touching, and food stealing (Luiselli et al., 1999; Newman, Summerhill, Mosley, & Tooth, 2003; Olive, Lang, & Davis, 2008; O'Reilly, Edrisinha, Sigafoos, Lancioni, & Andrews, 2006; Schmidt, Drasgow, Halle, Martin, & Bliss, 2014; Vaughn, Wilson, & Dunlap, 2002).

Prevalence of Challenging Behaviors

Identifying the exact prevalence of challenging behaviors in individuals with ASD is problematic due to the diverse methodologies used across studies. These differences in methodologies include the use of small or heterogeneous samples in respect to diagnosis (i.e., ASD, autism, PDD-NOS), sex and age, and variations in operational definitions of challenging behaviors. Other issues are the adoption of a single data collection method or of a single informant as well as the use of non-psychometrically validated data collection instruments. That said, we will offer a general overview of prevalence using specific studies to provide an estimate for each topography.

Multiple studies have evaluated the overall prevalence of challenging behaviors in individuals with ASD. Parents and caregivers have reported prevalences of challenging behaviors ranging from 36% to 94% in multiple samples of individuals with ASD (Baghdadli, et al., 2003; Bodfish, Symons, Parker, & Lewis, 2000; Murphy, Healy, & Leader, 2009). In a more recent study, McTiernan et al. (2011) reported that 94% of their sample presented one or more topographies of challenging behaviors using staff members as informants. Some authors have studied the risk factors associated with high prevalences of challenging behaviors within clinical populations. High levels of impulsivity, low levels of communication skills, and high severity of ASD characteristics were found to predict higher prevalences and severity of challenging behaviors (Arron et al., 2011; Matson & Shoemaker, 2009; Mazurek et al., 2013; Rojahn et al., 2009).

Regarding more specific forms of challenging behaviors, studies of SIB have reported prevalences from 20% to 69% in individuals with ASD (Baghdadli et al., 2003; Bodfish et al., 2000; Matson & Rivet, 2008; Mazurek et al., 2013; McTiernan et al., 2011; Richards, Oliver, Nelson, & Moss, 2012; Rojahn et al., 2009). In a recent study by Rattaz, Michelon, and Baghdadli (2015), parents of 152 adolescents with ASD completed the Aberrant Behavior Checklist. The analysis of the results indicated that 36% of the sample engaged in at least one form of SIB. The severity of autistic symptomatology was found to be the most important risk factor for displaying SIB. As with other studies, low levels of communication skills and impulsivity were also identified as predictors for engagement in the behavior.

Prevalence estimates for aggression and destruction also vary considerably across studies. Tyrer et al. (2006) found that 29% of the adults with autism presented aggressive behaviors, while Mazurek et al. (2013) reported prevalence of 54% in their sample of 1584 of children aged 2–17 years old. The latter study also noted age as being significantly associated with aggression. In fact, the researchers found that the highest prevalence was in children aged from 5 to 7 years old. McTiernan et al. (2011) reported a prevalence similar to the one found by Mazurek et al. (2013). According to their results, 56% of their sample of 174 participants with ASD aged from 3 to 14 years exhibited aggressive or destructive behaviors. When considering destruction alone, Matson and Rivet (2008) indicated that at least 29% of their sample of adults with ASD engaged in this type of behavior.

Finally, stereotypy appears to have the highest prevalence, which is expected given that it is a defining feature of ASD. In a recent systematic review, Chebli et al. (2016) reported that 88% of individuals with ASD engaged in at least one form of stereotypy. Chebli et al. found that sensory stereotypy (e.g., gazing at lights, rubbing, or sniffing objects) was the highest recorded type of stereotypy, followed by object stereotypy (e.g., spinning toys), locomotion (e.g., pacing), hand/finger movement (e.g., hand flapping), and vocal stereotypy (e.g., echolalia).

Impact of Challenging Behaviors

Engagement in challenging behaviors may have serious consequences on individuals with ASD and those around them (e.g., caregivers, instructors). This section highlights some of the potential impacts of untreated challenging behaviors. Regardless of form, one of the main collateral effects of engaging in challenging behaviors is increased levels of parental stress (Lecavalier, Leone, & Wiltz, 2006). A study conducted by Tomanik, Harris, and Hawkins (2004) found that communication difficulties, limited interaction with others, and restricted abilities to care for one's self were also highly correlated with maternal stress. Increased levels of stress may result in higher psychological distress, more mental health issues, and marital conflicts.

The topography of challenging behaviors with the most obvious impact on the individual is SIB. Engaging in SIB may produce bruises, swelling, lacerations, fractures, induced blindness, physical malformations, and infections (Carr, 1977; Luiselli et al., 2005; Minshawi, Hurwitz, Morris, & McDougle, 2014; Underwood, Figueroa, Thyer, & Nzeocha, 1989). In extreme cases, self-injury can lead to medical interventions, hospitalization, and even death (Baghdadli et al., 2003; Mandell, 2008; Minshawi, Hurwitz, Morris, & McDougle, 2014). In addition to physical harm, SIB reduces an individual's well-being as it negatively affects social skills, leads to social stigmatization, increases isolation, limits educational and vocational opportunities, and restricts one's access to community-based activities (Luiselli et al., 2005; Minshawi, Hurwitz, Morris, & McDougle, 2014).

Given their consequences for others, aggression and destructive behaviors may also interfere with opportunities to be included in learning environments and community activities. Moreover, individuals who exhibit aggression and their caregivers are at risk of suffering from physical and emotional distress (Matson et al., 2009; Roane & Kadey, 2011). For individuals with ASD, untreated aggressive behaviors may result in their removal from school settings, residential settings, and work environments (Marcus, Vollmer, Swanson, Roane, & Ringdahl, 2001). Mandell (2008) also found that aggressiveness toward others poses a considerable risk of hospitalization in psychiatric facilities for children diagnosed with ASD. Additionally, aggression and destruction can induce social impairments, high financial costs, and exposure to harmful substances (Roane & Kadey, 2011).

Stereotypy is a time-consuming and invasive behavior that typically interferes with engagement in functional activities. As a result, engaging in stereotypy may compromise interactions with peers, adaptive functioning, and learning (Cunningham & Schreibman, 2008; Lanovaz, Robertson, Soerono, & Watkins, 2013). The individual's abilities to execute daily living tasks, to communicate appropriately, and to engage in functional activities may also be affected (Matson, Kiely, & Bamburg, 1997). Furthermore, individuals who engage in stereotypy may suffer from prejudices, restricted learning opportunities, and limited social integration (Jones, Wint, & Ellis, 1990). Cunningham and Schreibman (2008) also noted that social stigmatization is associated with a feeling of discomfort in parents of children who engage in stereotypy in public environments. Consistent with studies on other forms of challenging behaviors displayed by individuals with ASD, Harrop, McBee, and Boyd (2016) found that preschoolers' engagement in restricted and repetitive behaviors was correlated with increased caregiver stress.

Assessment

When aiming to reduce engagement in challenging behaviors in individuals with ASD, the first step is to identify the stimuli that evoke and maintain the behavior in the individual's environment. That is, the practitioner should identify antecedent events that may trigger or evoke engagement in the challenging behaviors as well as the reinforcers that maintain their occurrence. The following sections examine common antecedent and consequent events associated with challenging behaviors and methods to identify them.

Antecedent Events

Antecedents are generally defined as events or stimuli that immediately precede the occurrence of a behavior (Smith & Iwata, 1997). Various environmental and intrinsic stimuli such as objects, settings, time, type of activities, persons, and sensations can function as setting events for challenging behaviors (McGill, Teer, Rye, & Hughes, 2003; Simó-Pinatella et al., 2013). Their identification is an important step in the reduction of challenging behaviors as it emphasizes the circumstances in which the behaviors occur. With this in mind, two types of antecedent events should be acknowledged when analyzing challenging behaviors: discriminative stimuli and motivating operations (MO).

Discriminative stimuli are precise events or stimulus changes that signal the availability or non-availability of reinforcement (Langthorne & McGill, 2009; Simó-Pinatella et al., 2013). This differential availability of the reinforcer results from the relationship between a stimulus condition, a given behavior, and the subsequent outcome (Michael, 1993). To be considered discriminative, the presence of the stimulus condition must have previously preceded a specific behavior that resulted in reinforcement. Second, in the absence of the stimulus condition, the same behavior must not have produced reinforcement (Michael, 2000). As a result, the frequency of the behavior is modified according to the availability of reinforcement. The behavior is more frequent in the presence of the discriminative stimuli because of the concomitant possibility of reinforcement, while the frequency of the behavior is decreased in the absence of the discriminative stimuli since no reinforcement is expected (Langthorne & McGill, 2009; Michael, 1982). Several variables can serve as discriminative stimuli for challenging behaviors such as the characteristics of the environmental context, the presence or absence of a preferred item, and the presence of a specific individual (e.g., Conners et al., 2000; Kang et al., 2010; O'Reilly et al., 2000).

A second type of antecedent events is the MO. The presence of MO sets the capacity of an event to serve as reinforcer or punisher by triggering two interrelated phenomena termed value-altering and behavior-altering effects (Langthorne, McGill, & Oliver, 2014; Laraway, Snycerski, Michael, & Poling, 2003; Laraway, Snycerksi, Olson, Becker, & Poling, 2014). The value-altering effect alters the effectiveness of reinforcers or punishers (Langthorne et al., 2014). The value of reinforcement or punishment is either increased (i.e., established) or decreased (i.e., abolished) in the presence of the MO. In contrast, the behavior-altering effect involves the impact of the MO on the actual behavior. The latter is either encouraged (evoked) or discouraged (abated; Laraway et al., 2003). Taken together, value-altering and behavior-altering effects have considerable impact on the frequency of challenging behaviors. Some potential MO for challenging behaviors include sleep deprivation (Horner, Day, & Day, 1997; O'Reilly, 1995; Reed, Dolezal, Cooper-Brown, & Wacker, 2005), menstrual discomfort (Carr & Smith, 1995; Carr, Smith, Giacin, Whelan, & Pancari, 2003; Douglas, 2004; Hamilton, Marshal, & Murray, 2011), as well as certain drugs and illnesses (Kennedy & Meyer, 1996; Luiselli, et al., 2005; Mello, Mendelson, & Kuehnle, 1982; Nickels et al., 2009; O'Reilly, 1997; Rapp, Swanson, & Dornbush, 2007; Valdovinos & Kennedy, 2004). For practitioners, identifying both discriminative stimuli and MO is important as they will have an impact on the selection of an intervention and its effect on challenging behaviors.

Functions of Challenging Behaviors

The development of challenging behaviors can be fully appreciated through the observation of their function, which is described as the reinforcement contingency maintaining the behaviors (Hanley, Iwata, & McCord, 2003). Challenging behaviors are generally followed by environmental and internal consequences. These consequences maintain, reinforce, or discourage the reoccurrence of challenging behaviors. If an individual's response to the antecedent is followed by desirable consequences, the probability of this behavior reoccurring increases. Therefore, the function of the behavior is to access the targeted consequence. A behavior can either occur in order to gain access to something desirable or to terminate an unwanted situation or stimulus event (Horner & Carr, 1997; Iwata et al., 1982/1994). These two effects, embodied by social positive, social negative, and automatic reinforcement, serve as a description for the maintenance of challenging behaviors.

Positive social reinforcement is a type of reinforcement that is mediated by another person and is associated with the addition of a stimulus event. In practical settings, challenging behaviors maintained by social positive reinforcement are generally categorized within one of two functions: attention and tangible. Attention-maintained challenging behaviors are reinforced by the social response of others to the behavior. This response may be either motor (e.g., facial expressions, physical contact) or verbal (e.g., comforting words, maintenance of conversation). Forms of attention that may seem less desirable (e.g., reprimands) may also maintain engagement in challenging behaviors (Olive et al., 2008). A common indicator of the attention function is that an individual will seek eye contact while engaging in challenging behaviors. The individual may also react when attention of others is diverted or provided to someone else. As an example, Schmidt et al. (2014) showed that the aggression, inappropriate touching, and cursing of an adolescent with ASD occurred most often when an adult entered the room and began a conversation with the therapist.

Access to tangible items is also a type of social reinforcement that maintains challenging behaviors (Vollmer, Marcus, Ringdahl, & Roane, 1995). When a challenging behavior has a tangible function, engaging in the behavior results in the delivery of a tangible item, an edible, or an activity (e.g., watching a movie). In these cases, challenging behaviors may occur when access to a preferred item or activity is restricted, refused, or withdrawn. For example, researchers have shown that children with ASD who exhibit ritualistic behavior might engage in challenging behaviors if their routine is interrupted or blocked (e.g., Rispoli, Camargo, Machalicek, Lang, & Sigafoos, 2014).

Negative social reinforcement involves the removal of a stimulus by another individual. It is generally associated with the escape (termination or attenuation of a putatively unpleasant stimulus event) or avoidance function (prevention of a putatively unpleasant stimulus event). Challenging behaviors maintained by negative social reinforcement are followed by escape or avoidance of an aversive event (Carr, 1977) such as the termination of an instruction, task, demand, or routine or the withdrawal of an individual or stimulus (e.g., loud sounds, bright lights). Schindler and Horner (2005) provide an example of challenging behaviors maintained by escape. The researchers found that the high pitch and frequent screaming of a young girl with ASD was maintained by escaping components of an activity, which were subjectively rated as difficult.

Finally, automatic reinforcement, also referred to as nonsocial reinforcement, involves contingencies that are independent from the social environment (Vollmer, 1994). Researchers hypothesize that challenging behaviors maintained by nonsocial reinforcement generate their own sensory consequences, such as visual stimulation, vestibular stimulation, tactile input, and auditory stimulation (Lovaas, Newsom, & Hickman, 1987; Rapp, 2008). As for behavior maintained by social consequences, challenging behaviors serving a nonsocial function can be described as positively or negatively reinforced, but the technology to differentiate between the two is not well developed (Minshawi, Hurwitz, Fodstad et al., 2014; Rapp & Vollmer, 2005). A behavior is considered as nonsocially reinforced when it persists in the absence of social reinforcement (Querim et al., 2013). For example, Dominguez, Wilder, Cheung, and Rey (2014) found that engagement in rumination was independent of social consequences in a child with ASD. Researchers have also shown that various forms of stereotypy are generally, albeit not always, maintained by nonsocial reinforcement (Beavers, Iwata, & Lerman, 2013; Matson, Bamburg, Cherry, & Paclawskyj, 1999; Rapp & Vollmer, 2005; Wilke et al., 2012).

Functional Assessment

Assessment of challenging behaviors should be viewed as a generative, multiple-step process. The first step often involves the use of indirect or anecdotal assessment to gather general information about the conditions during which the challenging behavior occurs. The second step is for trained practitioners to conduct direct observations of the challenging behavior during “high-probability” conditions (presumably identified via indirect or informant assessment) in order to (a) determine the baseline rate or level of the challenging behavior and (b) identify antecedents (i.e., potential MO or discriminative stimuli) and consequent (i.e., potential reinforcers) events for the challenging behavior. Results of recent survey studies suggest that many practitioners often rely, perhaps to a fault, on the findings from basic descriptive assessments to develop behavioral interventions for challenging behaviors (Oliver, Pratt, & Normand, 2015; Roscoe, Phillips, Kelly, Farber, & Dube, 2015). The third step of the assessment process should involve a functional analysis (FA) of one or more probable operant functions of the challenging behavior. At a minimum, the FA should involve direct, systematic manipulation of one or more antecedent events, consequent events, or both (Hanley et al., 2003).

Indirect or Anecdotal Assessment Informant-based assessments typically involve structured questionnaires that are delivered by a practitioner to a caregiver of the individual referred for the treatment of challenging behaviors. Two structured questionnaires with varying degrees of empirical support are the Questions About Behavior Function (QABF), which is a 25-item questionnaire (Matson & Vollmer, 1995), and the Functional Analysis Screening Tool (FAST), which is a 16-item questionnaire (Iwata, DeLeon, & Roscoe, 2013). In general, the QABF has been evaluated in studies with a wider range of participants and challenging behaviors (e.g., Applegate, Matson, & Cherry, 1999; Lanovaz, Argumedes, Roy, Duquette, & Watkins, 2013; Paclawskyj, Matson, Rush, Smalls, & Vollmer, 2000, 2001; Smith, Smith, Dracobly, & Peterson-Pace, 2012; Watkins & Rapp, 2013) than the FAST. Nevertheless, the results of either assessment should be used primarily to develop one or more hypotheses about the operant function of challenging behaviors. Practitioners can also acquire qualitative information about events surrounding challenging behavior via parent-conducted ABC narratives; however, the reliability and validity of those observations have been mixed (e.g., Lanovaz et al., 2013; Lerman, Hovanetz, Strobel, & Tetreault, 2009).

Direct Assessment On the continuum of direct assessment tools, practitioners can utilize a low-effort descriptive assessment or a high-effort structured descriptive assessment. At the most basic level, a practitioner conducting a descriptive assessment may simply collect data on common consequent events for engaging in challenging behaviors. At a more complex level, a descriptive assessment may include data collection on various antecedent events (e.g., demands, tangibles restricted) and consequent events (e.g., escape provided, tangible provided). This intensive data collection allows the practitioner to calculate conditional and unconditional (sometimes referred to as background probabilities) probabilities of challenging behaviors in relation to various antecedent and consequent events; however, the intensive analysis does not necessarily increase the probability of identifying the correct function of challenging behaviors (e.g., Pence, Roscoe, Bourret, & Ahearn, 2009). Except in cases when relations between antecedent events, consequent events, and challenging behaviors are evident, results from this level of assessment should be used primarily to further develop specific conditions to be tested in a FA.

Structured descriptive assessments are conducted in a manner that is similar to descriptive assessments with conditional and unconditional probabilities with the exception that practitioner directly manipulates the antecedent events (consequences are left to vary). Because the antecedent conditions are controlled by the practitioner, the observations can be organized into sessions with equivalent durations (e.g., 10 min) containing specific antecedent changes (e.g., demands provided or attention withheld). The results from each session can then be plotted into multielement design graphs and visually inspected for elevated data paths (e.g., Anderson & Long, 2002; English & Anderson, 2006). Even though structured descriptive assessments do not offer a clear time saving compared to a typical FA, this approach may be better suited to evaluating the stimulus events that evoke challenging behaviors in classroom settings or other contexts that are difficult to simulate with a standard or modified FA.

Functional Analysis Functional analytic procedures (Iwata et al., 1982/1994) have been used to assess the operant function of a wide range of challenging behaviors by individuals with ASD and other neurodevelopmental disorders (Beavers et al., 2013; Hanley et al., 2003). As previously noted, standard FA procedures involve conditions that test for (a) social positive reinforcement in the form of contingent attention, contingent access to activities or items, or both, (b) social negative reinforcement in the form of escape or termination of subjectively unpleasant environmental events such as academic or vocational demands, and (c) nonsocial reinforcement whereby challenging behaviors persist without changes to the individual's external environment. The standard FA with multiple test conditions provided during 10-min sessions are generally recognized as the gold standard for assessing the operant function of challenging behaviors, but many practitioners lack the resources needed to conduct the standard conditions (e.g., Oliver et al., 2015; Roscoe et al., 2015). As alternatives, practitioners may opt to use a brief FA or alternative methodologies.

In general, practitioners should use the results of the indirect assessment and direct observations to develop a hypothesis that can be directly evaluated with a brief FA methodology. Some of these brief FA variations have been used widely in the treatment literature, whereas others have only preliminary support. It is important to recognize that specific types of challenging behaviors lend themselves to one or more of these FA approaches. Iwata and Dozier (2008) outlined the relative merits of brief FA variations and illustrated hypothetical results for each variation. As outlined by Iwata and Dozier, each approach can be fit to one or more single-case experimental designs (with minor exceptions), and each has relative advantages (e.g., time saving, good contextual fit) and disadvantages (e.g., limited scope of function).

Consecutive No-Interaction Sessions This FA variation should be used when the practitioner suspects that the challenging behavior in question is nonsocially reinforced (Iwata & Dozier, 2008; Querim et al., 2013). This practice was initially part of the third phase of a progressive model proposed by Vollmer et al. (1995) to verify the persistence of behavior in the absence of social consequences. When applied, a practitioner may verify that an individual's challenging behavior is maintained by a nonsocial consequence by showing that the behavior persists across three or more consecutive no-interaction 10-min sessions. Challenging behaviors that decrease markedly across sessions are presumed to be socially reinforced and should be subjected to further assessment with other FA variations. The primary advantage of this approach is the substantial time savings for practitioners. By contrast, the primary limitation is that the outcome does not directly inform practitioners of indicated interventions. That is, behaviors that persist across such conditions are likely to be maintained by automatic positive reinforcement (Rapp & Vollmer, 2005), but more refined analyses are required to develop a functionally matched intervention. Descriptions of such analyses are beyond the scope of this section, but we refer readers to Lanovaz, Rapp, and Fletcher (2010) and Rapp and Lanovaz (2016) for one comprehensive option.

Single-Function Test For this FA format, the practitioner consolidates information obtained from the indirect and descriptive assessments to develop a specific hypothesis about the operant function of the challenging behavior. Based on the hypothesis, the practitioner develops a specific test condition to assess the effects of one specific antecedent or consequent event. The control condition is then developed to control the event that is manipulated in the test condition. The practitioner then conducts three or more sessions for each condition in an alternating format.

Latency Analysis of Standard Conditions Using this format, practitioners arrange to conduct standard FA conditions of 5 min or 10 min in duration; however, the dependent variable is the latency to engagement in the challenging behavior, and the respective session is terminated following an occurrence of the said behavior. Because the dependent variable differs from a standard FA, the visual analysis differs slightly as well. The practitioner identifies the stimulus event maintaining the challenging behavior based on the data path with the shortest latency to engagement. When aptly implemented, the control condition yields an elevated data path (indicating the absence of the target behavior for the duration of the session), and the test condition that contains the functional reinforcer for the challenging behavior produces a lower-level data path. The primary advantages of using this method are the potential time savings and its suitability for specific forms of challenging behaviors such as elopement or pica (Neidert, Iwata, Dempsey, & Thomason-Sassi, 2013; Thomason-Sassi, Iwata, Neidert, & Roscoe, 2011). A potential disadvantage of this FA variation is that it may produce false negatives (i.e., failure to detect a true function for the challenging behavior) due to the heavy reliance on antecedent control.

Trial-Based Conditions This FA format shares features of the latency analysis (i.e., a trial ends with engagement in the challenging behavior) and single-function pairwise analyses (i.e., specific control trials are designed for each individual test trial condition). The dependent measure is the percentage of trials with challenging behaviors across control and test trials for each potential function. The primary advantage of this FA variation is that it is well-suited to classroom and other instructional formats (Bloom, Iwata, Fritz, Roscoe, & Carreau, 2011; Rispoli et al., 2014; Sigafoos & Saggers, 1995). Nonetheless, due to the number of trials that must be conducted for each test-specific control condition, this FA variation is unlikely to save time for practitioners.

Analysis of Precursor Behaviors This FA variation, which is not intended to be a briefer iteration, can be particularly useful for practitioners when (1) provided consequences for high-intensity challenging behaviors (e.g., some forms of SIB) are undesirable and (2) the target behavior is consistently preceded by less-intensive behavior (Dracobly & Smith, 2012; Fritz, Iwata, Hammond, & Bloom, 2013; Herscovitch, Roscoe, Libby, Bourret, & Ahearn, 2009; Najdowski, Wallace, Ellsworth, MacAleese, & Cleveland, 2008; Smith & Churchill, 2002). Because this analysis requires a detailed descriptive assessment with conditional and unconditional probabilities to identify a behavior that reliably precedes more intensive challenging behavior, it may actually require more time than a standard FA that is based only on the primary topography of challenging behaviors. This approach does allow practitioners to evaluate the function of potentially harmful challenging behaviors without having to directly reinforce instances of such behavior.

Empirically Supported Treatments

When developing treatment plans to reduce challenging behaviors in individuals with ASD, practitioners must identify empirically supported treatments. Multiple criteria have been developed to define the quality and quantity of research support necessary to consider an intervention as empirically supported (e.g., Briss et al., 2000; Chambless et al., 1998; Kratochwill et al., 2010). The current chapter will focus on criteria for single-case experiments because most published studies on reducing challenging behaviors in ASD have made use of single-case experimental designs (Brosnan & Healy, 2011; Carr, Severtson, & Lepper, 2009; DiGennaro Reed, Hirst, & Hyman, 2012). Chambless et al. (1998) propose a minimum of nine well-designed single-case experiments in their definition of empirically supported, whereas Kratochwill et al. (2010) recommend a minimum of 20 single-case studies fitting specific criteria. To address this discrepancy, Lanovaz and Rapp (2016) recently proposed reporting the success rate of a treatment to determine whether it is empirically supported. Specifically, a treatment is considered as empirically supported when the success rate can be estimated within a range of 40% or less and the treatment produces an acceptable success rate, which we set at 50% or more for the current chapter. The number of successful experiments necessary is thus dependent on the success rate; treatments with higher success rates necessitate fewer replications than treatments with success rates closer to 50% when identifying those with empirical support.

To identify empirically supported treatments for the chapter, we first conducted a literature search of PsycInfo® using the following search terms (keywords: autis* OR asd OR pdd or Asperg* OR “pervasive development*”) AND (keywords: agress* OR “problem behav*” OR “challenging behav*” OR “self-injur*” OR “repetitive behave* OR opposition OR noncompliance OR stereotyp*) AND (any field: treatment OR intervention). We also hand searched the references of a series of systematic reviews on challenging behaviors in individuals with developmental disabilities (Brosnan & Healy, 2011; Carr et al., 2009; Chowdhury & Benson, 2011; Kurtz, Boelter, Jarmolowicz, Chin, & Hagopian, 2011; Lanovaz et al., 2013; Petscher, Rey, & Bailey, 2009). Then, the last three authors read the titles and abstracts (and article if necessary) to identify those that tested the effects of a treatment for reducing challenging behaviors in individuals with ASD.

For each study, we collected data for each participant individually (i.e., design, function, treatment, and effect). For our analyses, we excluded datasets that used quasi-experimental designs (e.g., AB, ABC) or that did not specify the function of challenging behaviors. Furthermore, we only included datasets that tested the effects of interventions individually. Multicomponent treatments were not included in our analyses with the following exceptions. First, the interventions could include an extinction component. Second, we included self-management treatments that involved a differential reinforcement component as the former were rarely implemented without the latter. Similarly, response interruption and redirection (RIRD) was included in punishment-based procedures even though it included a reinforcement component. Finally, we did not exclude studies that involved minor additions (e.g., fading, prompting, schedule thinning).

We considered a treatment effective (i.e., a success) when (a) engagement in the challenging behavior decreased and (b) the researchers demonstrated experimental control over the challenging behavior (based on our visual analysis or the visual analysis of the authors when the graphs were unavailable). If an individual was subjected to minor variations of an intervention (e.g., with different reinforcers, with varied schedules), we only included the participant once in the analysis of the target intervention, and we counted the experiment as a success if reductions and experimental control were demonstrated with at least one treatment parameter. As discussed previously, one of the main factors that guide practitioners in selecting a treatment is the function of the challenging behavior. Thus, we separately identified treatments that met the single-case design criteria for empirically supported treatments for socially reinforced challenging behaviors and nonsocially reinforced challenging behaviors. In the following sections, we describe the treatments that met the criteria to be considered empirically supported based on the number of studies that we found for each broad function category.

Socially Reinforced Challenging Behaviors

Functional Communication Training (FCT) According to our search and our analysis, FCT is the treatment with the most empirical support for reducing socially reinforced challenging behaviors. The treatment consists of teaching the individual who engages in challenging behaviors an alternative communicative response that serves the same function (Tiger, Hanley, & Bruzek, 2008). This response can involve exchanging a picture, signing, activating a microswitch, using a speech enhancement device, or vocally requesting (Heath, Ganz, Parker, Burke, & Ninci, 2015). Regardless of the form of the communicative response, researchers generally agree that FCT is most effective when combined with extinction, which involves the withholding of reinforcement when challenging behaviors occur (Hagopian, Fisher, Sullivan, Acquisto, & LeBlanc, 1998; Shirley, Iwata, Kahng, Mazaleski, & Lerman, 1997; Wacker et al., 1990). When conducting our literature search, we found a total of 29 studies, including 54 participants with ASD, for a success rate of 98% CI [90%, 99%] when using FCT to reduce socially reinforced challenging behaviors.

In an example of FCT, Hanley, Jin, Vanselow, and Hanratty (2014) reduced challenging behaviors in four children with ASD by teaching a communicative response while implementing an extinction component. Interestingly, the researchers also conducted a denial and delay tolerance procedure to facilitate the implementation of the treatment in practical settings. Schmidt et al. (2014) taught three boys with ASD to sign for the reinforcer maintaining challenging behaviors (i.e., edible or attention), which produced reductions in aggression and increases in appropriate demands in all participants. Two of the participants also showed subsequent generalization and maintenance of the learned responses.

The main advantage of using FCT is that the practitioner teaches the individual a novel communicative response, which can be pivotal in the reduction of other challenging behaviors with the same function and in the development of prosocial behaviors. The implementation of FCT also has its challenges. Notably, the individual may engage in the communicative responses (a) when the parent or staff is unavailable to provide the reinforcer or (b) at high frequencies which make the communicative behavior as disruptive to the routine as the initial challenging behavior. To address these concerns, researchers have recommended using a multiple schedule wherein a FCT condition is alternated with an extinction condition (Hanley, Iwata, & Thomson, 2001; Jarmolowicz, DeLeon, & Kuhn, 2009; Kuhn, Chirighin, & Zelenka, 2010). Initially, the FCT condition is longer than the extinction condition, but the duration of each is modified until the FCT is implemented for durations that are realistic within the applied setting. Another limitation is that teaching the initial communicative response may be time consuming, especially for individuals with severe to profound intellectual disability. As such, the treatment may fail to produce short-term changes.

Differential Reinforcement of Alternative Behavior (DRA) Another reinforcement-based procedure with empirical support for reducing engagement in socially reinforced challenging behaviors is DRA. During DRA, the individual receives a reinforcer contingent on engaging in an alternative appropriate behavior (Petscher et al., 2009). This alternative behavior may take on many forms such as playing, following instructions, or being on task (McClean & Grey, 2012; Piazza, Moes, & Fisher, 1996; Ringdahl et al., 2002). As with FCT, research suggests that DRA is typically more effective when combined with extinction (Richman, Wacker, Asmus, & Casey, 1998). The main difference with FCT is that the appropriate behavior is not necessarily a communicative response. Based on 14 studies with 20 participants with ASD, the success rate of DRA for reducing challenging behaviors maintained by social reinforcement was 100% CI [84%, 100%].

In a recent example of DRA, Slocum and Vollmer (2015) found that providing access to preferred edible items contingent on compliance reduced aggression behaviors in four children with ASD. The results also indicated that using 30-s breaks as reinforcers was only effective in reducing challenging behaviors in two of these four participants, underlining the importance of identifying potent reinforcers prior to treatment. Similarly, Piazza et al. (1996) reduced multiply controlled destructive behaviors in an 11-year-old boy with ASD by implementing DRA for compliance with instructions. The intervention reduced challenging behaviors to near-zero levels while maintaining increasingly higher expectations for task completion.

In the same vein as FCT, the main advantage of DRA is that the intervention simultaneously strengthens an appropriate behavior. The individuals may thus benefit from learning new responses (e.g., play, compliance, on task) that could improve their adaptive functioning. On the other hand, one concern with DRA is that the alternative response may not necessarily be incompatible with engagement in challenging behaviors. Therefore, there is the risk that the individual may access reinforcement following both the alternative behavior and the challenging behavior if an extinction component is not implemented concurrently. Practitioners may also face challenges when attempting to identify an alternative behavior, especially if the challenging behavior occurs in multiple settings.

Noncontingent Reinforcement (NCR) Noncontingent reinforcement consists of providing access to a preferred stimulus on a regular or continuous basis, independently of the occurrence of challenging behaviors (Carr et al., 2009). Generally, the preferred stimulus is matched to the function of the challenging behavior and is provided on a schedule equal or more frequent than that received for engaging in challenging behaviors (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). However, stimuli unrelated to function have also been shown to be effective at reducing socially reinforced challenging behaviors (Fischer, Iwata, & Mazaleski, 1997; Fisher, DeLeon, Rodriguez-Catter, & Keeney, 2004; Lalli, Casey, & Kates, 1997). In a recent meta-analysis, Richman, Barnard-Brak, Grubb, Bosch, and Abby (2015) showed that unrelated stimuli are less effective than functional stimuli and that thinning the schedule reduces the effectiveness of

NCR. Furthermore, NCR can be effective even when reinforcement remains available for engagement in challenging behaviors (Hagopian, Crockett, Stone, Deleon, & Bowman, 2000). Our literature search indicates that NCR was effective at reducing socially reinforced challenging behavior in 100% CI [77%, 100%] of 13 individuals with ASD from ten studies with whom the procedures were implemented.

Hagopian, Fisher, and Legacy (1994) provide an interesting example of NCR to reduce attention-maintained challenging behaviors. Specifically, they provided access to noncontingent social interactions to 5-year-old quadruplets with ASD and showed that the intervention was effective at the reducing destructive behaviors in all four participants. The researchers also showed that denser schedules produced larger reductions than leaner schedules. In a study on multiply controlled challenging behaviors (i.e., tangible and escape function), Ingvarsson, Kahng, and Hausman (2008) found that providing access to edible items on a fixed-time schedule reduced engagement in aggression, disruption, and SIB. Notably, the study also showed that the implementation of NCR was associated with an increase in compliance in the participant.

From a practical standpoint, NCR has the advantage of being easy to implement; the parent or trainer only has to provide the stimuli on a time-based or continuous schedule. This ease of use makes it possible to implement the procedures with multiple individuals who engage in challenging behaviors in group settings (Hagopian et al., 1994). Another benefit of NCR is that it generally produces immediate reductions in engagement in challenging behaviors. The treatment may also produce some negative side effects. The implementation of NCR may occasionally result in a temporary increase in the frequency or intensity of the challenging behaviors, and the delivery of stimuli on a time-based schedule may adventitiously reinforce challenging behaviors (Vollmer, Ringdahl, Roane, & Marcus, 1997). To address this issue, one simple solution is to implement a hold, wherein the stimulus is never delivered within a certain period of time (e.g., 5 s) following engagement in challenging behaviors.

Nonsocially Reinforced Challenging Behaviors

Punishment Contingencies Punishment involves the addition of an aversive stimulus or the removal of a preferred stimulus (or reinforcer) contingent on the occurrence of challenging behaviors. The use of punishment has been the topic of the most studies for reducing engagement in nonsocially reinforced challenging behaviors (e.g., Ahearn, Clark, MacDonald, & Chung, 2007; Anderson & Le, 2011; Cook, Rapp, Gomes, Frazer, & Lindblad, 2014; Doughty, Anderson, Doughty, Williams, & Saunders, 2007; Peters & Thompson, 2013). The punishment contingencies that have been implemented for nonsocially reinforced behaviors include reprimands, overcorrection, response blocking, and RIRD. The success rate for punishment-based procedures for treating nonsocially reinforced behaviors currently stands at 87% [77%, 93%] for 63 individuals with ASD who participated in 27 different studies.

Ahearn et al. (2007) examined the effects of RIRD on engagement in vocal stereotypy in four children with ASD. The intervention consisted of presenting three consecutive demands contingent on engagement in challenging behaviors. In their initial study, RIRD reduced vocal stereotypy to near-zero levels in all four participants and increased appropriate vocalizations in three of them. In a study of positive practice overcorrection, Peters and Thomson (2013) examined its effects on the stereotypy of three individuals with ASD. During overcorrection, the trainer prompted the individual to stop and practice appropriate engagement for 30 s contingent on the occurrence of stereotypy. Their results indicated that the procedures reduced motor stereotypy for the three participants while increasing engagement for two of three participants.

Punishment contingencies are often used in applied settings as the intervention produces rapid reductions in challenging behaviors. However, clinicians should be wary of the challenges associated with the implementation of punishment-based interventions as well as of its multiple side effects (see Lerman & Vorndran, 2002 for detailed discussion). First, punishment contingencies must be applied on a continuous schedule in order to be effective in reducing engagement in challenging behaviors. Second, all topographies must be targeted by the punishment contingency; if not, engagement in other forms of challenging behaviors may continue or increase (Lanovaz et al., 2013; Rapp, Vollmer, St. Peter, Dozier, & Cotnoir, 2004). Third, the implementation of punishment-based interventions may produce an escalation of the target behavior or the emergence of aggressive behaviors, which can be counterproductive. Given the side effects of punishment and its aversive nature, professionals have an ethical obligation to limit its use and prioritize the least restrictive intervention procedures (Vollmer et al., 2011). Punishment-based procedures should always be combined with other interventions and be used only when alternatives are unavailable or ineffective. An additional limitation specific to RIRD should also be noted. In two recent studies, researchers have shown that the success of punishment-based RIRD may be an artifact of the measurement procedures (Carroll & Kodak, 2014; Wunderlich & Vollmer, 2015). That is, uninterrupted measurement of stereotypy suggests that RIRD does not necessarily reduce overall levels of stereotypy. Thus, practitioners should carefully monitor its effects or consider other types of punishment contingencies to reduce engagement in nonsocially reinforced challenging behaviors.

NCR Based on our literature search, NCR is one of the treatments with the most empirical support for the treatment of nonsocially reinforced challenging behaviors in individuals with ASD (e.g., Britton, Carr, Landaburu, & Romick, 2002; Luiselli, Ricciardi, Zubow, & Laster, 2004; Rapp et al., 2013; Reid, Parsons, & Lattimore, 2010; Saylor, Sidener, Reeve, Fetherston, & Progar, 2012). For nonsocially reinforced behaviors, a preferred item is generally provided on a continuous basis. This preferred stimulus may either be matched or unmatched to the stimulation generated by the nonsocially reinforced behavior (Rapp, 2007). An example of matched stimulus for vocal stereotypy is music as both the challenging behavior and music produce auditory stimulation. In contrast, an unmatched stimulus using the same example would be a toy that produces visual and tactile stimulation. The success rate of NCR for nonsocially reinforced behaviors for 66 individuals from 25 different studies is 74% [63%, 83%].

Britton et al. (2002) examined the effects of introducing prompting within a NCR treatment for a 26-year-old woman with ASD and intellectual disability. The results indicated that the prompting produced higher rates of engagement with a preferred stimulus during treatment while being associated with lower levels of nonsocially reinforced face touching. In a comprehensive study of NCR, Rapp et al. (2013) compared the effects of matched and unmatched stimuli on the vocal stereotypy of 21 children with ASD. In their sample, providing matched stimuli noncontingently reduced vocal stereotypy in 8 of 11 participants whereas unmatched stimuli produced reductions in only 1 of 10 participants. Moreover, NCR produced increases in collateral forms of motor stereotypy in 8 of 14 participants.

The implementation of NCR with nonsocially reinforced challenging behaviors has similar advantages to those maintained by social reinforcement: the treatment produces rapid reductions in the target behavior and is easy to implement. The intervention also has some different disadvantages when it comes to challenging behaviors maintained by nonsocial reinforcement. The preferred stimulus is generally provided on a continuous basis, which may interfere or be incompatible with engagement in other important behaviors (e.g., completing tasks). As indicated previously, even when NCR reduces one form of nonsocially reinforced challenging behaviors, it may be replaced by other untargeted forms (Rapp et al., 2013). To address this limitation while also increasing interactions with the preferred stimulus, some researchers recommend combining the intervention with a prompting procedure for appropriate behaviors (Britton et al., 2002; Lanovaz et al., 2014).

Self-management Individuals with ASD may also manage their own intervention to reduce engagement in challenging behaviors. Self-management procedures generally consist of a combination of awareness training, self-recording of the challenging behaviors, and delivery of reinforcement for meeting preset goals (e.g., Crutchfield, Mason, Chambers, Wills, & Mason, 2015; Fritz, Iwata, Rolider, Camp, & Neidert, 2012; Shabani, Wilder, & Flood, 2001; Stahmer & Schreibman, 1992; Tiger, Fisher, & Bouxsein, 2009). For the differential reinforcement component, a preferred stimulus is typically provided for not engaging in challenging behaviors for specific periods of time (as in a DRO schedule) or for accurate recording (as in a DRA schedule). The reinforcer may be self-managed (i.e., self-delivered by the individual with ASD) or delivered by someone else. Based on data from 19 individuals with ASD from 11 different studies, self-management was effective with 95% [75%, 99%] of individuals with ASD with whom it was attempted.

Fritz et al. (2012) compared the effects of differential reinforcement for self-recording and for not engaging in nonsocially reinforced stereotypy in two adults and one boy with ASD. Their results indicated that the reinforcement of self-recording was effective for only one participant whereas reinforcement needed to be provided for not engaging in challenging behaviors for the remaining two participants to produce reductions to near-zero levels. In a recent study, Crutchfield et al. (2015) used the I-Connect, a self-monitoring app, to reduce stereotypy in two adolescents with ASD in a school setting. The use of the app produced reductions in stereotypy despite the absence of planned reinforcement. It should be noted that albeit less frequent, the challenging behaviors still occurred on a regular basis.

One of the strengths of self-management is that the practitioner is encouraging the individual to manage his or her own behavior, which promotes independence and self-determination for individuals with ASD. The intervention does not always require a trainer, which may facilitate and increase the frequency of its implementation. In contrast, one of the limitations of the treatment is that some studies suggest that the delivery of reinforcers by an external individual may be necessary (Fritz et al., 2012). A second limitation is that most studies have been conducted with individuals with a mild or no intellectual disability. Given the complexity of teaching the recording procedures, self-management may not be an option for most individuals with an associated moderate, severe, or profound intellectual disability.

Differential Reinforcement of Other Behavior (DRO) Researchers have repeatedly shown that DRO may be an effective treatment for reducing engagement in nonsocially reinforced challenging behaviors (e.g., Lanovaz & Argumedes, 2010; Rozenblat, Brown, Brown, Reeve, & Reeve, 2009; Taylor, Hoch, & Weisman, 2005; Vollmer et al., 1995). In general, DRO consists of providing a reinforcer contingent on the absence of challenging behaviors. The schedule can be either momentary or based on an interval. During momentary DRO, the reinforcer is provided if the challenging behavior is not occurring at a specific point in time, whereas, during interval-based DRO, the behavior must not occur during an entire interval of a specified duration in order to provide the reinforcer. If the behavior occurs during the latter, the time interval is reset by the trainer. Minimally, the interval of the reinforcement schedule must be equal or shorter than the average time between two occurrences of the challenging behavior. The success rate of DRO in the research literature currently stands at 81% [57%, 93%] for 16 participants with ASD, but the ten studies used varied interval durations.

Taylor et al. (2005) provided access to a preferred musical toy in the absence of vocal stereotypy to a 6-year-old girl with ASD within a classroom setting. The intervention reduced the challenging behaviors to near-zero levels even when the interval schedule was gradually increased to 5 min. In another study, Rozenblat et al. (2009) compared two DRO schedules on the nonsocially reinforced repetitive vocalizations of three children with ASD. Their results indicated that the denser schedule reduced challenging behavior to near-zero levels in all three participants and that it was systematically more effective than the leaner schedule.

Although DRO is a relevant option when other treatments (e.g., NCR) have failed to produce reductions in the target behavior, practitioners should remain aware of two challenges when implementing the intervention in applied settings with individuals with ASD. First, the DRO schedule may need to be very dense (e.g., 5 s or less) for the treatment to initially reduce challenging behaviors with high frequencies (Rozenblat et al. 2009); the treatment may thus be too time consuming, complex, or impractical to implement. Second, the implementation of DRO for challenging behaviors that do not have a high frequency may be a challenge with individuals who also have an intellectual disability. As an example, if the reinforcer is only provided once every 5 min and the trainer cannot explain the contingency through the use of rules, the DRO schedule may have no impact on the behavior targeted for reduction.

Physical Exercise An antecedent-based procedure with support to reduce engagement in nonsocially reinforced challenging behaviors is physical exercise. Researchers have examined the effects of multiple forms of physical exercise including walking, jogging, swinging, cycling, and jumping on a trampoline (Celiberti, Bobo, Kelly, Harris, & Handleman, 1997; Cuvo, May, & Post, 2001; Morrison, Roscoe, & Atwell, 2011; Neely, Rispoli, Gerow, & Ninci, 2015). Vigorous exercises (e.g., jogging) may produce larger reductions than less rigorous exercises (e.g., walking; Celiberti et al., 1997). Our review identified five studies with 14 participants with ASD using exercise for reducing nonsocially reinforced challenging behaviors; the success rate was 93% [69%, 99%].

For example, Morrison et al. (2011) examined the effects of engaging in preferred exercises for 10 min in four individuals with ASD. The results of their study indicated that the intervention reduced both immediate and subsequent levels of challenging behaviors in three of the four participants. In a more recent study, Neely et al. (2015) compared the effects of jumping on a trampoline for brief periods of time or until indicators of behavioral satiation were observed. The longer periods of exercises (i.e., until satiation) not only reduced engagement in stereotypy but also increased academic engagement for the two participants. The results of both these studies suggest that physical exercise can maintain some of its suppressive effect following its termination.

Engaging in physical exercises produces multiple benefits beyond the reduction of challenging behaviors, which makes it an interesting option to consider (Bremer, Crozier, & Lloyd, 2016; Sorensen & Zarrett, 2014). Notably, the intervention may improve both the physical and mental health of individuals who engage in moderate-to-vigorous exercises. From a practical standpoint, one of the main challenges is finding extra time to implement the intervention prior to other activities. The intervention generally reduces nonsocially reinforced challenging behaviors to near-zero levels during the exercises, but practitioners should note that the subsequent reductions are not generally as large (e.g., Celiberti et al., 1997; Cuvo et al., 2001; Morrison et al., 2011). Combining physical exercise with other empirically supported interventions may address this concern.

Practical Considerations

To improve the effectiveness and maintenance of behavior changes, practitioners should consider multiple factors when planning interventions to reduce engagement in challenging behaviors. Specifically, preference assessment, stimulus control, thinning the reinforcement schedule, and combining interventions are factors that practitioners should keep in mind when implementing most behavioral interventions. Thus, the current section outlines important points to consider when practitioners design their treatment plans.

Prior to implementing any intervention that involves a preferred stimulus or reinforcer (e.g., NCR, DRA, DRO), practitioners should first conduct a preference assessment. The purpose of a preference assessment is to identify the preferred stimuli that will be used as part of treatment. Researchers have shown that experimentally identified preferred stimuli produced better outcomes than less preferred stimuli (Kang et al., 2013). Providing a full description of the multiple preference assessment procedures is beyond the scope of this chapter. Nonetheless, practitioners should note that the most popular methods, according to a survey conducted by

Graff and Karsten (2012), are the paired-choice method (Fisher et al., 1992), the multiple stimulus with replacement method (DeLeon & Iwata, 1996), and the free-operant method (Roane, Vollmer, Ringdahl, & Marcus, 1998). These methods have also been adapted to assess preference for stimuli other than edible and tangible items such as music (Horrocks & Higbee, 2008), video recordings (Chebli & Lanovaz, 2016), and social interactions (Nuernberger, Smith, Czapar, & Klatt, 2012; Smaby, MacDonald, Ahearn, & Dube, 2007).

In certain settings, it may not be possible for practitioners to implement interventions that require dense schedules of reinforcement or punishment across the entire day. A solution to this issue is implementing the intervention for only short periods of time during the day. In these cases, the intervention should include a stimulus that signals that the intervention contingencies are currently in place (i.e., a discriminative stimulus). For individuals with an associated intellectual disability, this signal is typically a visual cue (e.g., a colored poster or card, a bracelet) that the intervention is or is not being implemented. Practitioners should consider including such cues within any intervention that they recommend as these may make the intervention more effective at maintaining lower levels of challenging behaviors (Doughty et al., 2007; Hanley et al., 2001). These stimuli can be gradually faded, which can facilitate the maintenance and generalization of behavior changes (Cooper, Heron, & Heward, 2007).

To make an intervention easier to maintain in the long term, practitioners generally aim to reduce the amount of reinforcement provided once an intervention has been shown to be effective. To this end, researchers have showed that practitioners may gradually delay reinforcement or thin the reinforcement schedule to make the intervention more manageable (Hanley et al., 2014; Taylor et al., 2005). Delaying reinforcement involves waiting for increasingly longer periods of time prior to providing the reinforcer contingent on an appropriate behavior, whereas schedule thinning consists of providing the reinforcer on a leaner schedule as the clients make progress. Practitioners should consider these options when attempting to facilitate the implementation of their interventions in applied settings.

As part of the chapter, we reviewed each empirically supported intervention individually for clarity. That said, treatments consisting of multiple interventions are among the most reported in the research literature (DiGennaro Reed et al., 2012). We encourage practitioners to consider implementing multicomponent treatments when planning and designing interventions to reduce engagement in challenging behaviors in individuals with ASD. Practitioners should remember that adding components may also make the treatment more complex and time consuming and should thus carefully weigh the benefits and drawbacks.

Conclusions

Multiple treatments can be considered as empirically supported for the reduction of challenging behaviors in individuals with ASD. We provided a description and a value of success rate for each intervention in the current chapter. Interestingly, we identified more empirically supported interventions for nonsocially reinforced challenging behaviors than for socially reinforced behaviors. One potential explanation for this discrepancy is that the presence of repetitive behaviors, which are generally nonsocially reinforced, is a diagnostic criterion for ASD. Therefore, it should not be surprising that researchers have conducted more studies on this topic within the ASD population. Another noteworthy observation is that success rates for interventions for socially reinforced challenging behaviors were on average higher than those for nonsocially reinforced behaviors. The lack of direct control over the maintaining consequence may explain part of the lower success rates for challenging behaviors maintained by nonsocial reinforcement. Our literature search also underlines the importance of conducting additional research on standardized treatments for reducing challenging behaviors using controlled trials.

Our success rates should be considered as estimates rather than absolute values. Our search was limited to the PsycInfo database and to a handful of systematic reviews; a search of other databases or using the specific names of intervention may have yielded more studies. It should also be noted that we did not assess the quality of the single-case designs as proposed by Kratochwill et al. (2013). Instead, we considered all studies that used a single-case experimental design. Finally, our definition of success was based on the demonstration of experimental control; however, some treatments may have produced relatively small changes. Nevertheless, we believe that our results should serve as general guidelines to support practitioners in the selection of treatments to reduce engagement in challenging behaviors in individuals with ASD. As importantly, we emphasize that a systematic, rigorous, and functional approach to treatment is key to success in the reduction of challenging behaviors in this population.

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11

Treatment of Socially Reinforced Problem Behavior

Brian D. Greer and Wayne W. Fisher

When the reinforcer for problem behavior is mediated by the behavior of another individual, problem behavior is said to be socially reinforced. For example, a child may learn that disrupting in a classroom produces valuable social interactions (e.g., attention in the form of laughing) from his peers, or the child may come to learn that aggression results in the teacher suspending him from school, which then allows him to escape difficult class assignments. Both attention and escape from nonpreferred demands are common social reinforcers for problem behavior (Beavers, Iwata, & Lerman, 2013; Hanley, Iwata, McCord, 2003; Iwata et al., 1994). However, any behavior of another individual can come to reinforce and maintain problem behavior, and these relations are often demonstrated experimentally through a functional analysis (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994). Once the function of problem behavior has been identified via a functional analysis, behavior analysts can use that information to develop effective treatment strategies. In this chapter, we will discuss the operant mechanisms involved in the maintenance and treatment of socially reinforced problem behavior, as well as treatment options and strategies that can be used to improve the efficacy and practicality of treatment.

Analyzing the Operant Mechanisms Involved in the Maintenance of Problem Behavior

When treatment strategies are based on the results of a functional analysis, the behavior analyst is better equipped to treat problem behavior because the behavior analyst has identified important variables that control the occurrence of the problem behavior. Functional-analysis methodology emphasizes three operant mechanisms that frequently determine whether problem behavior will or will not occur. Each condition of the functional analysis specifically alters these operant mechanisms in unique ways to produce or mitigate the occurrence of problem behavior (Iwata, Pace, Cowdery, & Miltenberger, 1994; Iwata et al., 1994). Careful attention to and manipulation of these same operant mechanisms following the completion of the functional analysis enables the behavior analyst to develop maximally effective treatments for problem behavior.

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Discriminative Stimuli

The first operant mechanism programmed within each condition of a functional analysis is the *discriminative stimulus*, which signals the availability of the putative reinforcer evaluated in that condition. For example, the therapist signals the availability of her attention by reading a magazine only in the attention condition. This procedural detail is designed to facilitate attention-maintained problem behavior within session. Research on discriminative stimuli by Conners et al. (2000) showed that programming additional, condition-specific discriminative stimuli (i.e., a specific therapist in a specific room color) can facilitate discriminated responding between conditions of the functional analysis, leading to clearer functional-analysis outcomes. Extending these findings to treatment suggests that progressing from assessment to treatment should also be signaled using discriminative stimuli, such as by introducing treatment in a unique stimulus context (e.g., with a novel therapist and in a therapy room separate from the one used for the functional analysis). These discriminative stimuli should later be faded to encourage generalization of the treatment effects.

Research by Mace et al. (2010) found evidence to support the use of unique discriminative stimuli when initiating treatment. In Experiment 3 of that study, Mace et al. conducted baseline sessions in three contexts with two males who engaged in socially reinforced problem behavior. Each context differed based on its location, the reinforcement schedules in effect, and the color of the clothing that the therapist wore. Once rates of problem behavior stabilized within each baseline condition, extinction began, while the therapist wore either the same colored clothing as the one used in baseline or a novel color. Both participants displayed considerably lower rates of problem behavior when the therapist wore the novel clothing color, even though the same contingencies remained in place across both conditions. These results suggest that problem behavior treated in a unique stimulus context may lessen the persistence of problem behavior and produce more rapid reductions in rates of problem behavior.

Motivating Operations

The second operant mechanism programmed within a functional analysis is the *motivating operation*, which alters the value of a particular consequence as a reinforcer and changes the momentary probability of responses that have historically resulted in that consequence (Laraway, Snycerski, Michael, & Poling, 2003). The reinforcer-test conditions of the functional analysis specifically program an *establishing operation* (i.e., an increase in motivation for the putative reinforcer), whereas the control condition programs an *abolishing operation* (i.e., a decrease in motivation for the putative reinforcers arranged to follow problem behavior in the test conditions). For example, the therapist issues demands in the escape (test) condition, which increases the child's motivation to escape those demands by engaging in problem behavior. In contrast, the therapist issues no demands in the toy-play (control) condition, which then decreases the child's motivation for escape. Treatments that abolish the child's motivation for the identified reinforcer (e.g., by arranging a dense schedule of noncontingent or differential reinforcement) have been researched extensively (Carr et al., 2000; Tiger, Hanley, & Bruzek, 2008) and have been shown to be highly effective at decreasing rates of problem behavior (Carr, Severtson, Lepper, 2009; Kurtz, Boelter, Jarmolowicz, Chin, & Hagopian, 2011; Richman, Barnard-Brak, Grubb, Bosch, & Abby, 2015). Recent research by DeRosa, Fisher, and Steege (2015) and by Fisher, Greer, Mitteer, Fuhrman, Romani, and Zangrillo (in press) suggest that it is imperative to maintain minimal exposure to the establishing operation for problem behavior during the early stages of treatment.

The study by DeRosa et al. (2015) compared the efficacy of two forms of a differential-reinforcement-of-alternative-behavior (DRA) procedure called *functional communication training (FCT)* as treatment for the social functions of two boys' problem behavior. In one version of FCT, the therapist physically guided each boy to touch a picture card to access the reinforcer maintaining problem behavior. The therapist then inserted a delay to the prompt to encourage independent communication responses. However, all communication responses (prompted and independent) resulted in immediate access to the reinforcer for problem behavior. In the other version of FCT, the therapist used the same general teaching procedures to teach each boy to use a vocal communication response; however, although the therapist could model the vocal response, she could not ensure that the child would imitate the communication response. This procedural difference between the two forms of FCT led to important disparities in the amount of time in which the participants were exposed to the establishing operation for problem behavior. That is, the card condition produced much shorter durations of exposure to the establishing operation relative to the vocal condition because the therapist could quickly and reliably prompt, and then immediately reinforce, the communication response in the card condition but not in the vocal condition. Results for both participants showed less bursting and more rapid and larger reductions in problem behavior when the therapist controlled the establishing operation for problem behavior (i.e., when the picture card was used).

A recent study by Fisher et al. (in press) provided a more direct comparison of the effects of differential exposure to the establishing operation for problem behavior when treating socially reinforced problem behavior. Researchers in that study compared limited and extended exposures to the establishing operation for two boys' self-injury and/or aggression by withholding access to the communication materials for a fixed period of time or by waiting a set period of time to physically guide the communication response. Unlike the participants in the DeRosa et al. (2015) study, both participants in the Fisher et al. study learned only to touch or exchange a picture card (and not to emit a vocal communication response), which allowed for a more direct comparison of differential exposures to the establishing operation. Results of that study closely replicated those of the study by DeRosa et al. and provided further evidence of the importance of maintaining precise control over the establishing operation for problem behavior during the initial stages of treatment.

Consequences

The third operant mechanism programmed within each functional-analysis condition is the *consequence* that follows the target response. A brief break occurs only following problem behavior during the escape condition, whereas the therapist delivers attention only after problem behavior in the attention condition. These putative reinforcers are typically delivered immediately after the target response and, according to a dense, often continuous schedule (i.e., fixed ratio [FR] 1), during the functional analysis. The immediacy and consistency with which the therapist implements the programmed consequences for problem behavior often promote stability in responding within the test conditions of the functional analysis. In addition, in cases in which the initial functional analysis produces inconclusive findings, researchers have shown that idiosyncratic variables may influence whether or to what extent a given consequence functions as reinforcement for problem behavior (e.g., certain forms of attention may reinforce problem behavior more so than others; Fisher, Ninness, Piazza, & Owen-DeSchryver, 1996; Kodak, Northup, & Kelley, 2007; Piazza, Bowman, Contrucci, Delia, Adelinis, & Goh, 1999).

As mentioned above, the same consequences delivered following problem behavior in the reinforcer-test conditions of the functional analysis are delivered noncontingently in the control condition. The use of a *changeover delay* (Herrnstein, 1961) helps to ensure that problem behavior is not adventitiously reinforced by delaying the scheduled delivery of the time-based reinforcer until problem behavior has ceased for a requisite period of time (e.g., 3 or 5 s).

General Approaches to the Function-Based Treatment of Problem Behavior

Iwata, Vollmer, Zarcone, and Rodgers (1993) described three general function-based approaches to treating problem behavior that involve manipulating its maintaining consequence. Those approaches included:

(a) Providing the functional reinforcer according to a noncontingent reinforcement (NCR) schedule
(b) Preventing the response from producing the functional reinforcer (i.e., extinction)
(c) Reassigning the reinforcement contingency to an alternative, more appropriate response (i.e., DRA) while also suspending the reinforcement contingency for problem behavior

The first approach (NCR) typically produces a large and rapid reduction in problem behavior because the functional reinforcer is delivered on a dense (often continuous) schedule and thereby functions as an abolishing operation for problem behavior (Hagopian, Fisher, & Legacy, 1994; Pace, Iwata, Cowdery, Andree, & McIntyre, 1993; Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993). That is, delivering the functional reinforcer according to a dense, noncontingent schedule lessens the value of that stimulus as reinforcement and reduces the probability of behavior (e.g., problem behavior) that has produced that stimulus in the past.

The second approach discussed by Iwata et al. (1993) involves extinction or termination of the response-reinforcer relation, thereby decreasing the probability of problem behavior. Although extinction is an empirically supported function-based treatment for problem behavior when implemented in isolation (Iwata et al., 1994), extinction is often combined with other reinforcement-based procedures (e.g., DRA, NCR) to reduce rates of problem behavior while continuing to allow the individual access to the functional reinforcer. Additionally, Lerman, Iwata, and Wallace (1999) found fewer instances of response bursting (i.e., increased rates of problem behavior during treatment) and less extinction-induced aggression when extinction was combined with other treatment procedures, including DRA or NCR, than when extinction was used alone. The research described earlier by DeRosa et al. (2015) and Fisher et al. (in press) shows that the duration of exposure to the establishing operation during DRA and NCR is a primary determinant as to whether an extinction burst will occur when these reinforcement-based treatments are initiated.

The final approach (DRA) arranges reinforcer deliveries contingent upon an alternative response and can be implemented either with or without extinction and punishment (Fisher et al., 1993; Hagopian, Fisher, Thibault-Sullivan, Acquisto, & LeBlanc, 1998). As noted above, FCT is a common type of DRA procedure that involves using the functional reinforcer for problem behavior to establish an appropriate form of communication that can be recognized and then reinforced by other individuals. We now turn to more detailed discussion of these approaches to treatment, as well as strategies that have been shown to improve treatment efficacy and practicality.

Developing Specific Function-Based Treatments for Problem Behavior

The most commonly prescribed function-based interventions for problem behavior involve one or more of the following elements: (a) removal of the establishing operation for problem behavior by programming a dense NCR schedule, (b) discontinuation of the reinforcement contingency for problem behavior (i.e., extinction), (c) provision of the functional reinforcer for an appropriate alternative response (i.e., DRA/FCT), (d) provision of a competing reinforcer, and (e) removal of the functional reinforcer contingent on problem behavior (i.e., punishment). In practice, many of these elements are combined, often producing large reductions in rates of problem behavior.

Noncontingent Reinforcement

Scholars have noted that the term “noncontingent reinforcement” is a misnomer because reinforcement strengthens target responding, whereas NCR schedules often weaken the target response (Poling & Normand, 1999). Similar issues arise with terms such as “time-based” and “response-independent" reinforcement schedules, which do not acknowledge the historical contingency between problem behavior and the reinforcing stimulus or that the stimulus was identified via a functional analysis (Fisher, Greer, & Bouxsein, under review). We use the term "NCR" to describe the time-based delivery of the functional reinforcer for problem behavior while also acknowledging these terminological difficulties.

Vollmer et al. (1993) first applied NCR to the treatment of attention-maintained problem behavior. In baseline of that study, self-injurious behavior resulted in 10-s access to vocal attention (i.e., statements of disproval and concern), as well as light touches to the client's arm or shoulder. NCR began following baseline and consisted of the therapist providing continuous attention in the form of general conversation and praise. The investigators later thinned the NCR schedule of attention by delivering attention according to a fixed-time (FT) schedule every 5 min. Applications of NCR to treat problem behavior should also begin with similarly dense NCR schedules before attempting reinforcer-schedule thinning (Hagopian et al., 1994) and should, when possible, involve the delivery of a large magnitude of the NCR stimulus (Roscoe, Iwata, & Rand, 2003).

Setting the Initial NCR Schedule Researchers have established two general methods for setting the initial NCR schedule used to treat problem behavior, and both approaches involve within-session data analysis of previously collected data that is then used to tailor the initial NCR schedule for each individual. Lalli, Casey, and Kates (1997) calculated the mean latency to the first instance of problem behavior that occurred in the corresponding test condition of the functional analysis and then used this duration as the initial NCR schedule (e.g., FT 90 s for the participant named Donny). Kahng, Iwata, DeLeon, and Wallace (2000) used a different type and source of data to determine their initial NCR schedules. Researchers in that study calculated mean interresponse times for problem behavior that occurred in the final three baseline sessions and then set the initial NCR schedule to be equal to the mean interresponse time. To our knowledge, no study has yet to compare the efficacy of these two approaches when selecting the initial NCR schedule. However, in a recent study by Fisher et al. (in press), researchers made post-hoc comparisons of these two approaches to that of a third approach that consisted of collecting additional data during a progressive-interval schedule in which problem behavior resulted in reinforcement according to an escalating (interval) schedule of reinforcement. This progressive-interval schedule terminated following the first instance of problem behavior. Based on these results, Fisher et al. showed that the interval at which problem behavior occurred in the progressive-interval schedule reliably occasioned problem behavior with one participant when the reinforcer was later withheld repeatedly for the same amount of time, whereas little to no problem behavior occurred with a relatively dense schedule of reinforcement. Post-hoc comparisons between the three approaches to selecting an initial reinforcement schedule indicated that mean latencies to problem behavior and mean interresponse times would have suggested an even leaner schedule of reinforcement than did the progressive-interval assessment. Regardless of the approach, it is paramount to ensure that the initial NCR schedule is sufficiently dense so as to not occasion problem behavior.

Differential Reinforcement Differential reinforcement involves the delivery of reinforcers after some prespecified criterion has been met, and there exist multiple forms of differential reinforcement that are applicable to treating socially reinforced problem behavior (e.g., DRA, differential reinforcement of low rates of behavior [DRL], differential reinforcement of other behavior [DRO]). Of these procedures, DRA offers the behavior analyst possibilities that the other differential-reinforcement procedures do not. First, DRA has the capacity to teach individuals with socially reinforced problem behavior a new form of communication (i.e., FCT), which may be a goal within the individual's education plan, irrespective of treating problem behavior. Second, once the individual is reliably emitting the alternative response, DRA often results in the delivery of a large portion of the available reinforcer deliveries. Third, some researchers have argued that DRA procedures (e.g., FCT) allow the individual to "control" his or her access to the reinforcer (Carr & Durand, 1985), which allows the individual to enjoy some degree of autonomy. In addition, these authors suggested that "control over reinforcement" contributes to the effectiveness of FCT. However, two investigations found that NCR, which does not allow the client to control the schedule of reinforcement, and FCT, which does, produced equivalent reductions in problem behavior (Hanley, Piazza, Fisher, Contrucci, & Maglieri, 1997; Kahng, Iwata, DeLeon, & Worsdell, 1997). Nevertheless, Hanley et al. found that participants preferred FCT over NCR when given a choice between the interventions. Finally, Durand and Carr (1991) found that FCT promotes generalization and maintenance of treatment effects because the communication response may prompt both trained and untrained caregivers to deliver DRA appropriately. These are a few of the reasons why interventions that include a DRA component have been studied and used extensively.

Functional Communication Training FCT has all of the benefits discussed above in regard to DRA, but it also contains other elements that make it particularly appealing for use in treating socially reinforced problem behavior. As mentioned previously, FCT reassigns the functional reinforcer for problem behavior (as identified via a functional analysis) to an alternative and more appropriate form of communication. For example, if the functional-analysis results suggest that escape from nonpreferred tasks reinforces problem behavior, the behavior analyst would then teach that individual to use an alternative form of communication (e.g., saying "Break, please") to request breaks. Using the functional reinforcer for problem behavior (rather than an arbitrary reinforcer) likely ensures a sustained establishing operation is present, which may prove beneficial when teaching the alternative communication response. Another benefit of FCT is that emphasis is placed on identifying, and then teaching, the alternative form of communication. Because this alternative form of communication is established by delivering the functional reinforcer contingent on its occurrence, the response is often referred to as a *functional communication response* (FCR).

Selecting and Teaching the FCR Tiger et al. (2008) reviewed the extant literature on FCT and offered practical advice regarding how to select and teach the FCR during FCT. These authors recommended selecting an initial FCR that is of low effort for the individual (Horner & Day, 1991) and easy for other individuals to identify before considering a higher-effort response (Hernandez, Hanley, Ingvarsson, & Tiger, 2007). Responses that already exist in the individual's repertoire can be a good starting point in helping to identify a low-effort FCR. For example, if the individual mands for preferred items using the vocal response, "Toys" outside of FCT sessions, this same vocal response could be targeted as the FCR during FCT, provided the individual's problem behavior is maintained by access to preferred tangibles. However, the behavior analyst should carefully attend to whether he or she can quickly and reliably occasion the response before selecting it as the FCR for use in FCT. The initial stages of FCT involve presenting, and then immediately removing, the establishing operation for the individual's problem behavior, and the results of the DeRosa et al. (2015) study described above highlight the importance of maintaining precise control over the establishing operation for problem behavior by presenting a prompt that ensures that the response occurs reliably (i.e., a controlling prompt). For this reason, we tend to target FCRs that involve gross- or fine-motor movements (e.g., exchanging or touching a card that depicts a picture of the individual consuming the functional reinforcer), rather than a vocal FCR, which cannot be guided.

Once the FCR deemed appropriate for use in FCT is identified, the behavior analyst must then ensure its reliable occurrence in the presence of the establishing operation for the individual's problem behavior. To accomplish this, the behavior analyst should program multiple opportunities to teach the FCR under the stimulus conditions that evoke problem behavior by presenting the establishing operation, immediately prompting the FCR, and then immediately thereafter providing the functional reinforcer following each instance of the FCR (i.e., FR-1 schedule; Tiger et al., 2008). Although there are a variety of prompting strategies that can be used to teach the FCR (e.g., most-to-least, least-to-most, prompt delay), behavior analysts in our clinic tend to use a form of errorless learning to teach the FCR that involves a progressive prompt-delay procedure (Charlop, Schreibman, & Thibodeau, 1985). Following two consecutive ten-trial sessions with near-zero rates of problem behavior in which the behavior analyst presents the establishing operation, immediately delivers the controlling prompt for the FCR (e.g., by guiding a picture-card exchange), and then immediately thereafter delivers the functional reinforcer, the behavior analyst then systematically increases the time between presenting the establishing operation and then delivering the controlling prompt for the FCR. We often increase this delay for every two consecutive sessions with low rates of problem behavior using the following delay progression: 2 s, 5 s, 10 s, and 20 s. FCRs that occur prior to the controlling prompt are scored as independent FCRs and immediately terminate the establishing operation for problem behavior by producing the functional reinforcer. These pretraining procedures that involve presenting the establishing operation and then systematically delaying the presentation of the controlling prompt for the FCR encourage rapid acquisition of independent FCRs by transferring stimulus control from the controlling prompt to the presentation of the establishing operation. Our pretraining procedures typically terminate following two consecutive sessions with low rates of problem behavior and independent FCRs occurring on 90% or more of opportunities.

Choosing Between DRA and NCR The decision whether to use DRA or NCR to treat socially reinforced problem behavior can be facilitated by addressing four general questions: (a) *How dangerous is the problem behavior?* (b) *Is establishing communication an important goal for the individual?* (c) *Is establishing compliance an important goal for the individual?* and (d) *What if the previous recommendations contradict one another?* To address the first question (*How dangerous is the problem behavior?*), behavior analysts should consider reviewing the *Self-Injury Trauma (SIT) Scale* developed by Iwata, Pace, Kissel, Nau, and Farber (1990) or the *UNMC-MMI's Center for Autism Spectrum Disorders' Destructive Behavior Severity Scale* (DBSS; Fisher, Rodriguez, Luczynski, & Kelley, 2013) to help quantify the frequency, severity, and risk associated with self-injurious or other destructive behavior. Although the SIT Scale was designed to assess self-injurious behavior, it may also prove helpful in quantifying the extent to which aggression is harmful to other individuals, as aggression can produce similar types of surface tissue damage as self-injury. SIT Scale or DBBS results indicating a high frequency, severity, or risk associated with self-injury or other destructive behavior suggest the behavior analyst should:

(a) Ensure the safety of all parties who interact with the referred individual, especially during the assessment and treatment process (e.g., by participating in trainings on assaultive behavior-management procedures, wearing protective equipment, padding hard surfaces, removing potentially dangerous or destructible materials)
(b) Modify functional-analysis conditions to ensure safety while maintaining accurate and valid functional-analysis results (see Iwata & Dozier, 2008 for helpful recommendations)
(c) Develop a function-based treatment that rapidly reduces the problem behavior

In such cases, it may be better to deliver the functional reinforcer for problem behavior according to a dense NCR schedule, rather than contingent upon some alternative response (i.e., DRA, FCT) or following the omission of the target response (i.e., DRO). However, another reasonable alternative would be to implement the procedures designed to limit exposure to the establishing operation for problem behavior developed by Fisher and colleagues (DeRosa et al., 2015; Fisher et al., in press).

Vollmer et al. (1993) suggested three reasons why NCR may prove superior to DRO when treating problem behavior. First, in two of their three participants, NCR better attenuated extinction-induced problem behavior than did DRO. Second, NCR resulted in a richer schedule of reinforcer deliveries when compared to DRO at similar interval durations. Third, NCR does not require the caregiver's constant vigilance, as does DRO. For these reasons, function-based treatments that consist of arranging a dense NCR schedule are often a good starting point when treating severe or dangerous problem behavior.

A second question that should be considered when deciding between DRA and NCR is whether establishing communication is an important goal for the individual. DRA procedures (e.g., FCT) have the capacity to teach new forms of communication that then replace problem behavior, whereas NCR may discourage the acquisition of appropriate mands for the functional reinforcer (Goh, Iwata, & DeLeon, 2000). If establishing communication is an important goal for the individual, FCT may be an appropriate initial treatment strategy. However, behavior analysts may consider using DRA, even if establishing communication is not a priority for the individual.

A third question that should be considered is whether establishing compliance is an important goal for the individual. Problem behavior maintained by social-negative reinforcement in the form of escape from nonpreferred demands often necessitates teaching the individual to comply with those same nonpreferred demands that occasion problem behavior. In other words, some caregiver-delivered demands (e.g., "Do not touch the hot stove") must result in compliance, irrespective of problem behavior. NCR as applied to escape-maintained problem behavior is sometimes referred to as *noncontingent escape* (NCE) and has been shown to be an effective intervention for treating escape-maintained problem behavior (Vollmer, Marcus, & Ringdahl, 1995). However, NCE alone is unlikely to establish or promote compliance unless the behavior analyst explicitly arranges reinforcement for compliance (cf. Lomas-Mevers, Fisher, Kelley, & Fredricks, 2014).

DRA as applied to escape-maintained problem behavior often targets compliance directly by providing the functional reinforcer (i.e., escape) only following instances of compliance. FCT as applied to this situation often consists of providing escape only after the individual has (a) complied with the current demand and then (b) emitted the FCR (e.g., saying, "Break, please"). Thus, FCT used to treat social-negatively reinforced problem behavior is often described as a *chained schedule of reinforcement* because the individual is required to first comply with the demand and then to emit the FCR before the reinforcer is delivered. When establishing compliance is important, behavior analysts should consider providing reinforcement directly for this response by using DRA or FCT.

A fourth question that may arise when deciding between DRA and NCR is what to do if the previous recommendations contradict one another. For example, extremely severe problem behavior (e.g., eye gouging) warrants the use of NCR procedures, whereas communication may also be an important goal for the same individual, which would necessitate the use of DRA procedures. Luckily, researchers have explored the combination of DRA with NCR as treatment for problem behavior (Fritz, Iwata, Hammond, & Bloom, 2013; Goh et al., 2000; Marcus & Vollmer, 1996). Results from those studies have generally shown reductions in rates of problem behavior with this unique combination of treatment components (Carr et al., 2000), but these studies have also shown that alternative responding may not occur reliably until the NCR schedule is sufficiently thin (Goh et al., 2000).

As discussed previously, a dense schedule of NCR reduces motivation for the functional reinforcer, which causes a reduction in rates of problem behavior but also decreases motivation to emit the alternative response. NCR-schedule thinning gradually reintroduces the establishing operation for the functional reinforcer, which then increases the likelihood of the alternative response. However, NCR-schedule thinning may have the unintended effect of also increasing the likelihood of problem behavior. Behavior analysts may find it helpful to occasionally prompt the alternative response while completing NCR-schedule thinning, at least until independent alternative responses are well established (Goh et al., 2000). Behavior analysts may consider replicating these procedures with individuals who would benefit from the immediate reduction in problem behavior while also teaching an alternative form of communication.

Improving the Efficacy of DRA and NCR Interventions

There are a number of strategies for improving the efficacy of DRA and NCR interventions. Three of the most common strategies include: (a) providing alternative reinforcers along with the functional reinforcer or during times in which the functional reinforcer is unavailable, (b) terminating the response-reinforcer relation that maintains problem behavior (i.e., extinction), and (c) arranging a mild punisher to follow problem behavior. In the following sections, we describe these strategies in greater detail.

Alternative Reinforcers One question that often arises when treating socially reinforced problem behavior is whether there will be times in which it will be impossible or impractical to deliver the functional reinforcer. For example, if access to preferred video games on a child's electronic tablet device maintains problem behavior, the device may periodically become inoperative (e.g., when the Internet connection is lost or when the batteries drain and child is away from an electrical outlet), a situation which may then occasion problem behavior. Anticipating situations like this require the behavior analyst to identify alternative reinforcers that are substitutable for the functional reinforcer and that compete with the occurrence problem behavior. In the example above, attention from a caregiver may substitute for the video games on the tablet device and thus may compete with problem behavior when the device is inoperative or otherwise unavailable. Providing alternative reinforcers when the functional reinforcer is unavailable has shown to be an effective strategy for maintaining low rates of problem behavior (Austin & Tiger, 2015; Hagopian, Contrucci Kuhn, Long, & Rush, 2005; Hanley, Piazza, & Fisher, 1997; Rooker, Jessel, Kurtz, & Hagopian, 2013).

Alternatively, some individuals benefit from the combined delivery of the functional reinforcer along with an alternative reinforcer (Zangrillo, Fisher, Greer, Owen, & DeSouza, 2016). Zangrillo et al. recently showed lower rates of two boys' negatively reinforced problem behavior, and higher levels of compliance, when escape coincided with access to preferred toys than when compliance produced escape alone. Researchers have shown similar results when treatment involved the delivery of multiple functional reinforcers than when treatment targeted only one of the functional reinforcers (Piazza et al., 1997; Piazza, Moes, & Fisher, 1996).

Given the advantages of incorporating alternative reinforcers when treating socially reinforced problem behavior, behavior analysts should consider identifying alternative reinforcers early on in the assessment and treatment process and should do so using a systematic and empirical approach. Fortunately, the competing-stimulus assessment (Piazza et al. 1998; Shore, Iwata, DeLeon, Kahng, & Smith, 1997), which is often used to identify stimuli that compete with automatically reinforced problem behavior (i.e., by producing reinforcers that are substitutable for the reinforcers automatically produced by problem behavior), can be easily adapted to identify alternative reinforcers for socially reinforced problem behavior. When used with automatically reinforced problem behavior, the competing-stimulus assessment involves the brief delivery of preferred stimuli singly while data collectors measure rates of problem behavior and levels of item interaction. Stimuli that result in low rates of problem behavior and high levels of item interaction suggest suitable competing stimuli for automatically reinforced problem behavior.

Fisher, O'Conner, Kurtz, DeLeon, and Gotjen (2000) extended the competing-stimulus assessment by adapting it for use with individuals with socially reinforced problem behavior. In the adapted version of the competing-stimulus assessment, attention-maintained problem behavior continued to produce attention (similar to the reinforcers that would be produced automatically in the traditional competing-stimulus assessment), while therapists delivered stimuli (e.g., toys, music, edibles) singly and measured problem behavior and item interaction. Stimuli that compete with socially reinforced problem behavior during this adapted competing-stimulus assessment have been shown to reduce rates of problem behavior when those stimuli are delivered continuously with (Hanley, Piazza, & Fisher, 1997) and without extinction (Fisher et al., 2000).

Extinction Perhaps the most common strategy for improving the efficacy of DRA and NCR interventions is to terminate the response-reinforcer relation by withholding the functional reinforcer following problem behavior, which then results in a weakening of the operant response, a procedure and process termed extinction (Iwata et al., 1994). In many cases, extinction may be a necessary component of treatment (Fisher et al., 1993; Hagopian et al., 1998; Mazaleski, Iwata, Vollmer, Zarcone, & Smith, 1993; Zarcone, Iwata, Hughes, & Vollmer, 1993). Hagopian et al. (1998) conducted a medical record (chart) review of 21 inpatients whose problem behavior was treated using FCT procedures that were implemented with or without the use of extinction and punishment. FCT with extinction was effective for the majority of individuals, producing at least an 80% reduction in baseline rates of problem behavior in 60% of applications (15 of 25), whereas only 9% of applications (1 of 11) met this reduction criterion without the use of extinction.

Although extinction can constitute an effective intervention for automatically and socially reinforced problem behavior when implemented in isolation (Iwata et al., 1994; Iwata, Pace, Kalsher, Cowdery, & Cataldo, 1990), the abovementioned results of Lerman et al. (1999), as well as those of an earlier review on extinction by Lerman and Iwata (1996b), suggest that behavior analysts should continue to deliver reinforcement (e.g., according to a DRA or NCR schedule) throughout treatment to reduce the likelihood of response bursting, extinction-induced aggression, and, more generally, resistance to extinction. For example, research has shown that extinction implemented with NCR results in greater and more immediate reductions in problem behavior than extinction alone (Fisher, DeLeon, Rodriguez-Catter, & Keeney, 2004).

Idiosyncratic characteristics of the individual (e.g., those large in stature or exceedingly strong), the topography of problem behavior (e.g., particularly dangerous behaviors that must be terminated for safety), or limitations in the individual's home or school environment (e.g., sick or elderly caregivers) may make the use of extinction impractical in some cases and may preclude its use as a viable intervention component. For these cases, the behavior analyst should consider conceptualizing problem behavior and adaptive behavior as concurrent operants that are maintained by the same functional reinforcer (Fisher & Mazur, 1997). That is, parameters shown to affect response allocation among response alternatives within a concurrent-operants arrangement (e.g., response effort, reinforcement rate, immediacy, magnitude, and quality) may suggest practical modifications to the treatment plan that encourage adaptive behavior and discourage problem behavior even when problem behavior continues to produce the functional reinforcer. Response and reinforcement parameters have proven important predictors of the overall efficacy of treatment when interventions have not included an extinction component (Horner & Day, 1991; Peck et al., 1996; Piazza et al., 1997).

When treating negatively reinforced problem behavior, multiple research studies have demonstrated another intervention possibility that also does not involve severing the response-reinforcer relation maintaining problem behavior. Lalli et al. (1999) was the first to clearly show that providing positive reinforcers (i.e., edible items) following compliance can be an effective (albeit nonfunction-based) treatment for negatively reinforced problem behavior, even though problem behavior continued to produce escape. These findings have been replicated by subsequent studies, often with better treatment outcomes than when compliance produced the functional reinforcer (escape; see Payne & Dozier, 2013 for a recent review). For example, Piazza et al. (1997) found that extinction was unnecessary for two of three participants when compliance produced a tangible item. Lalli et al. postulated that these findings may be due to a stronger preference for positive reinforcers than negative reinforcers; however, this remains speculative (Payne & Dozier, 2013). Other studies have demonstrated that noncontingent delivery of positive reinforcement (e.g., food) can produce clinically significant reductions in problem behavior (Ingvarsson, Kahng, & Hausman, 2008; Lomas, Fisher, & Kelley, 2010; Mevers et al., 2014), which suggests that positive reinforcement in a demand context can also produce an abolishing effect on negatively reinforced problem behavior. Regardless of the specific mechanism involved, it is clear that providing positive reinforcers (alone or in combination with escape) for compliance or on a time-based schedule may be a practical solution when escape cannot be withheld following negatively reinforced problem behavior.

Punishment Individuals have a right to the most effective treatment procedures available (Van Houten et al., 1988), but occasionally the abovementioned treatment modifications fail to suppress socially reinforced problem behavior to clinically significant levels. In these situations, arranging a mild punisher to follow problem behavior may be necessary (Fisher et al., 1993; Hagopian et al., 1998). However, in many cases the punishing stimulus need not be intense or contacted often by the individual to remain effective. Lerman and Iwata (1996a) showed that procedures even as mild as response blocking (i.e., physically preventing the completion of the response) may decrease problem behavior through the process of punishment (cf. Smith, Russo, & Le, 1999).

When punishment is warranted, its effects are often robust, consistent, and quickly observed. In the study by Hagopian et al. (1998), 17 of the 27 total applications of FCT reported in that paper (63%) required some form of punishment to treat socially reinforced problem behavior. These 17 applications of punishment produced a 90% or greater reduction in baseline rates of problem behavior in all 17 applications (100%), with the schedule of reinforcement being successfully thinned in 13 of those 17 applications (76%). In contrast, FCT with extinction produced at least a 90% reduction in baseline rates of problem behavior in only 11 of 25 applications (44%). Fisher et al. (1993) compared FCT alone to FCT with and without extinction and punishment and found similarly robust and consistent reductions in rates of problem behavior when using FCT with punishment. These promising results often occasion questions regarding how to identify an effective punishing stimulus for use in treatment.

One approach to selecting punishment procedures is to base the punisher on the results of the functional analysis. For example, if the functional analysis indicates that problem behavior is reinforced by contingent attention, then a logical punishment procedure would be to deliver a brief time-out from attention contingent on problem behavior (Greer, Neidert, Dozier, Payne, Zonneveld, & Harper, 2013; Hagopian et al., 1998). Similarly, a brief time-out from tangible items is often an effective punishment procedure for problem behavior reinforced by access to the same tangible items (Greer et al., 2013). Finally, guiding the individual to complete a series of three to five additional demands contingent on problem behavior (sometimes called contingent demands) can be an effective punisher for problem behavior reinforced by escape (Fisher et al., 1993).

Another method to empirically identify punishers is based on the stimulus-avoidance assessment and the brief punisher assessment described by Fisher, Piazza, Bowman, Hagopian, and Langdon (1994) and Fisher, Piazza, Bowman, Kurtz, Sherer, and Lachman (1994). The stimulus-avoidance assessment involves the noncontingent application of stimuli suspected of having aversive properties (e.g., guiding the individual's hands down, providing demands, issuing a time-out from reinforcement) one at a time while measuring behaviors suggestive of nonpreference for the procedure (i.e., negative vocalizations, avoidance movements) and preference for the procedure (i.e., positive vocalizations) and while also measuring treatment integrity (i.e., successful escapes from the procedure). An avoidance index is then calculated by summing the rates of negative vocalizations and avoidance movements and subtracting the rate of positive vocalizations. Procedures that correlate with high avoidance indices are more likely to function as punishment in a brief punisher assessment (Fisher et al. 1994; Fisher, Piazza, Bowman, Kurtz, et al., 1994).

During the brief punisher assessment, Fisher and colleagues compared a subset of punishment procedures, using a multielement design, to determine the extent to which each procedure reduced problem behavior when delivered contingent on that response. This process of empirically deriving punishers should always be considered when including punishment to treat socially reinforced problem behavior. Additionally, behavior analysts should continue to deliver reinforcement (e.g., according to a DRA or NCR schedule) throughout treatments that include a punishment component (Lerman & Vorndran, 2002).

Improving the Practicality of FCT

In addition to ensuring that treatments developed for socially reinforced problem behavior are effective across contexts, behavior analysts must also consider the practicality of the intervention when implemented by caregivers in the home, school, and community settings. These terminal treatments for socially reinforced problem behavior often involve aspects of FCT (Tiger et al., 2008). As such, we now highlight general strategies for improving the practicality of this common intervention while also discussing recent research that has evaluated ways of further enhancing the practicality of FCT-based interventions.

Reinforcement Schedule Thinning with FCT

Once problem behavior has decreased to manageable rates and the individual has displayed high rates of the FCR during FCT, behavior analysts typically proceed to reinforcement schedule thinning. For example, Hanley, Iwata, and Thompson (2001) gradually thinned the schedule of reinforcement for the FCR over the course of seven steps, reaching a terminal schedule that consisted of 1 min of reinforcement alternated with 4 min of extinction. The final schedule decreased reinforcer deliveries by about 80%, making the treatment much more practical for implementation in the natural environment because it regularly allowed caregivers periods of 4–8 min during which they could attend to other matters (e.g., talk on the phone, change a diaper).

Chained and multiple schedules can be used to increase the practicality of FCT procedures and teach individuals to tolerate periods in which the functional reinforcer is unavailable without increasing problem behavior by bringing the FCR under stimulus control. Once acquired, the stimulus control afforded by these compound reinforcement schedules can then be used to help facilitate the transfer of treatment effects to novel therapists and settings, as well as to primary caregivers.

Steps Involved in Chained-Schedule Thinning

Chained schedules are often used to thin reinforcement schedules during FCT when treating negatively reinforced problem behavior (Fisher et al., 1993; Lalli, Casey, & Kates, 1995). Periods in which the FCR will and will not produce the functional reinforcer in a chained schedule are signaled by discriminative stimuli. The stimulus used to signal the period in which reinforcement is available for the FCR is typically called the S^D (pronounced “S-dee”), and the stimulus used to signal the period in which reinforcement for the FCR is unavailable is typically called the S^Δ (pronounced “S-delta”). These stimuli also are sometimes called S+ and S-, respectively.

With chained schedules, the change from extinction (S^Δ) to the reinforcement (S^D) component is response dependent, and the change from reinforcement (S^D) to extinction (S^Δ) is typically time based. That is, after the FCR has been well established in the child's repertoire, schedule thinning begins by presenting the S^D and delivering the functional reinforcer immediately following the first FCR. After the child consumes the reinforcer (usually escape from work activities), the S^D is replaced by the S^Δ, and the FCR remains on extinction until the individual has completed one instructional demand. Compliance results in replacement of the S^Δ with the S^D, and the first FCR emitted in the presence of the S^D produces the functional reinforcer. After one or a few sessions with low levels of problem behavior, the work requirement for switching from the S^Δ to the S^D component increases. Typically, the therapist requires the individual to complete one additional instructional demand (i.e., two demands) before the S^Δ is replaced by the S^D. Over time, the work requirement (or the number of instructional demands the individual must complete in the S^Δ component) increases gradually until the work and break intervals are similar to what is expected of the child in his or her natural environment (e.g., completing two math worksheets followed by a 5-min S^D or break interval). In our program, we typically increase the duration of the S^D component as the individual is exposed to longer and longer periods of the S^Δ, which keeps constant the work-to-reinforcement ratio (or unit price in behavioral-economics terms; Roane, Falcomata, & Fisher, 2007).

One important question that often arises during reinforcement schedule thinning is, "Will it be disruptive to the social environment if the individual emits the FCR when reinforcement is unavailable?" Individuals who undergo reinforcement schedule thinning may continue to request reinforcement at times when it cannot be delivered (i.e., during the S^Δ component; Fisher, Greer, Querim, & DeRosa, 2014). For example, a child using an FCR card to request breaks from instructional activities may repeatedly attempt to exchange the card rather than comply with instructions. If continued requests for reinforcement are disruptive to caregivers or others (e.g., peers in a classroom), one common modification to FCT involves preventing access to the FCR by removing the response materials during times when reinforcement is unavailable through a procedure called *response restriction* (Fyffe, Kahng, Fittro, & Russell, 2004; Roane, Fisher, Sgro, Falcomata, & Pabico, 2004). When response restriction is used, the individual retains access to the FCR so long as the reinforcer can be delivered (e.g., when the child has completed the necessary work assignment), and it is removed when reinforcement is unavailable (e.g., while the child is expected to complete the assignment). When the individual's access to the FCR can be manipulated, this procedure can reduce excessive FCRs that may occur during schedule thinning (Fisher et al., 2014). In the Fisher et al. study, we reduced FCRs during the S^Δ component using response restriction for four children while maintaining high FCR rates in the presence of the S^D and low overall rates of problem behavior. Response restriction can be used in both chained- and multiple-schedule thinning.

Steps Involved in Multiple-Schedule Thinning Hanley et al. (2001) evaluated reinforcement schedule thinning using a multiple schedule. Multiple schedules are similar to chained schedules in that discriminative stimuli are used to signal the availability and unavailability of reinforcement. In multiple schedules, the alternation between these components is time-based rather than response-based. With the Hanley et al. procedure, the initial reinforcement component lasted 45 s, and the extinction component lasted 15 s. Thus, initially the individual had to tolerate only brief periods in which reinforcement for the FCR was unavailable. Hanley et al. alternated the reinforcement and extinction components in a quasi-random fashion, and they correlated each component with a unique discriminative stimulus, using different colored cards to signal the reinforcement and extinction components of the multiple schedule. In our program, we typically begin with a two-sided card with unique colors on each side (e.g., yellow on one side, blue on the other). The card is attached to a swivel on a lanyard that the therapist wears around his or her neck, which makes it easy to quickly switch the card from one side to the other. Once reinforcement schedule thinning is complete, we typically switch to a brightly colored rubber wristband, which is worn as the S^D, and we use a different colored wristband or the absence of the wristband (i.e., therapist places the wristband in a pocket) as the S^Δ. We often switch to a wristband because parents tend to find it more socially acceptable for use in public (i.e., it is less likely to call attention to the child and family).

Overall Effectiveness of Chained and Multiple Schedules Greer, Fisher, Saini, Owen, and Jones (2016) recently summarized the results of 25 consecutive applications of chained or multiple schedules during treatment of problem behavior with FCT. When these signaled, compound schedules were used to thin the schedule of reinforcement for the FCR (without alternative reinforcement or punishment), they resulted in a mean reduction in problem behavior of 96% relative to baseline rates. This percentage exceeded reductions in problem behavior reported in previous large studies that used delayed reinforcement schedules in at least some schedule-thinning applications (Hagopian et al. 1998; Rooker et al. 2013). Moreover, the chained and multiple schedules used in the Greer et al. study produced at least a 90% reduction in problem behavior without or before alternative reinforcement or punishment in 73% of applications and at least an 80% reduction in 91% of applications. In addition, we added a punishment component in only 1 of the 25 applications (4%), a smaller amount than the percentages reported by both Rooker et al. (16%) and Hagopian et al. (68%). Finally, in 88% of applications of these compound schedules, we were able to successfully thin the reinforcement schedule for the FCR to a point where participants tolerated periods of at least 4–8 min without accessing the functional reinforcer (i.e., two back-to-back 4-min S^Δ periods produced an 8-min block in which reinforcement was unavailable). It should be noted, however, that the participants in the Greer et al. study consisted of intensive outpatients, whereas Rooker et al. included a mix of inpatients and intensive outpatients, and Hagopian et al. included only inpatients. Thus, more research is needed to replicate these findings with individuals who may present with higher levels or more severe types of problem behavior.

Rapid Schedule Thinning with Multiple Schedules Our research group recently showed that for at least some individuals it might not be necessary to gradually thin the relative durations of the reinforcement and extinction components of a multiple schedule (Betz, Fisher, Roane, Mintz, & Owen, 2013). In Experiment 3 of the Betz et al. study, we rapidly transitioned from a relatively rich to a relatively lean multiple schedule (i.e., from a multiple 60–60 to a multiple 60–240 with two cases) without proceeding though any of the intermediate steps used by Hanley et al. (2001). With two additional cases, we removed the discriminative stimuli from the multiple schedule (producing a mixed-schedule baseline) and rapidly transitioned from a rich mixed schedule (i.e., mixed 60–60) to a lean multiple schedule of reinforcement (i.e., multiple 60–240). In all four of these cases, we obtained comparable results to those produced by the gradual-fading procedure evaluated by Hanley et al. That is, we reduced reinforcer deliveries by about 80% in a single step while maintaining the strength of the FCR in the presence of the S^D. In addition, the rapid switch to the lean schedule was not associated with an increase in problem behavior. It should be noted, however, that the participants in the Betz et al. study displayed instruction-following behavior, and Betz et al. included contingency-specifying rules during the multiple schedule (i.e., telling the participants what would happen if they displayed the FCR in the presence of the S^D and S^Δ). Thus, it remains uncertain whether rapid shifts from rich to lean multiple schedules would produce equivalent results with participants who do not have relatively well-developed instruction-following repertoires or without the inclusion of contingency-specifying rules.

Facilitating the Transfer of Treatment Effects with Multiple Schedules One commonly recommended method of promoting generalization of treatment effects involves *programming com-*

mon stimuli in both the initial treatment context and the generalization context (Stokes & Baer, 1977), and the stimuli used in a multiple schedule may be uniquely suited for this method of promoting generalization. Therefore, we also recently conducted a study to evaluate the extent to which multiple schedules could be used to facilitate the transfer of FCT treatment effects from one setting to another or from one therapist to another (Fisher, Greer, Fuhrman, & Querim, 2015). Fisher et al. conducted baselines using mixed schedules of reinforcement for the FCR with novel therapists or in novel settings, and levels of the FCR were low and undifferentiated in both the reinforcement and extinction components. We then introduced multiple schedules that were identical to the mixed schedules except that discriminative stimuli were used to signal periods in which the FCR would and would not produce reinforcement. We introduced the multiple schedules across settings or therapists in accordance with a multiple-baseline design. After exposure to the multiple schedule in one setting (or with one therapist), treatment effects rapidly transferred to the subsequent settings (or therapists) for all participants.

The transfer of an intervention's treatment effects from the initial therapist to the primary caregivers presents a unique challenge. That is, parents and other caregivers typically have a long history of delivering reinforcement for problem behavior and little or no history of reinforcing the child's newly learned FCR. Thus, primary caregivers may often function as discriminative stimuli that exert counter-therapeutic stimulus control (occasioning problem behavior rather than the FCR). Therefore, we recently initiated a research project to determine whether multiple schedules could be used to facilitate transfer of FCT treatment effects to primary caregivers. Thus far, we have evaluated this possibility with one primary caregiver using a multiple-baseline-across-behavioral-function design (Greer, Fisher, Lichtblau, Mitteer, & Briggs, under review). These preliminary results replicated the findings described above for Fisher et al. (2015). That is, when the multiple-schedule FCT treatment was introduced with the child's mother, treatment effects immediately and fully transferred to her in both a low-attention and high-demand context.

Mitigating Resurgence of Problem Behavior Using Multiple Schedules A number of conceptual, review, and research papers published recently have identified a major limitation of DRA interventions like FCT, a limitation that is predicted by quantitative models of behavioral momentum theory (BMT; Nevin & Shahan, 2011). This limitation involves an increase in problem behavior when the FCR contacts a disrupter, such as the FCR failing to produce reinforcement for a period of time, which is sometimes called an extinction challenge. For example, Volkert, Lerman, Call, and Trosclair-Lasserre (2009) found that problem behavior increased substantially for five of six participants during periods in which the FCR failed to produce reinforcement (i.e., during an extinction challenge) or when the density of reinforcement for the FCR decreased precipitously (i.e., from an FR 1 to an FR 12). An increase in problem behavior when a disruptor is introduced following treatment with alternative reinforcement and extinction (e.g., FCT) is referred to as resurgence (Greer, Fisher, Romani, & Saini, 2016; Pritchard, Hoerger, & Mace, 2014).

The phenomenon of resurgence is robust and has been observed in basic, translational, and clinical research, and a number of researchers have hypothesized that resurgence represents a major contributor to treatment relapse for a variety of behavior disorders (Leitenberg, Rawson, & Bath, 1970; Lieving, Hagopian, Long, & O'Connor, 2004; Lieving & Lattal, 2003; Mace et al., 2010; Pritchard et al., 2014; Volkert et al., 2009; Winterbauer & Bouton, 2010). In basic research, resurgence is a temporary phenomenon. That is, the target response increases shortly after the disruptor is introduced, but responding typically decreases thereafter, often returning to the previous low or near-zero levels. However, with clinical populations in natural settings (e.g., home, school), when resurgence of problem behavior occurs, there is a strong risk that caregivers will view the treatment as ineffective, resort to old habits, and deliver the consequence that previously reinforced problem behavior (e.g., providing escape following problem behavior rather than the FCR). Under such a scenario, problem behavior is likely to increase and maintain at unacceptable levels (St. Peter Pipkin, Vollmer, & Sloman, 2010).

The alternative reinforcement delivered for the FCR during FCT increases treatment efficacy relative to implementation of extinction alone (Lerman et al., 1999), as long as the treatment is implemented with fidelity. However, when treatment is disrupted (e.g., the parent fails to deliver reinforcement for the FCR while tending to an infant sibling), the alternative reinforcers delivered during FCT actually increase the probability that problem behavior will resurge (cf. Mace et al., 2010). BMT predicts that any additional reinforcers delivered in the stimulus context in which problem behavior historically produced reinforcement (e.g., via FCT or NCR) contributes to the momentum of problem behavior and increases the likelihood of resurgence when treatment disruption occurs. Mace et al. provided data showing that training the FCR in a different stimulus context can help to circumvent this problem. Fuhrman, Fisher, and Greer (2016) similarly showed that bringing the FCR and problem behavior under the stimulus control of a multiple schedule also has the potential to mitigate or prevent resurgence of problem behavior when treatment with FCT is disrupted.

Fuhrman et al. (2016) trained two participants to emit the FCR in the presence of an S^D and not in the presence of an S^Δ and then thinned the reinforcement schedule by lengthening the duration of the S^Δ relative to that of the S^D. They then introduced an extinction challenge with the S^Δ in place to determine whether this preparation of FCT would better mitigate resurgence of problem behavior when compared to that of a traditional form of FCT that did not include discriminative stimuli either during training or during the extinction challenge. Results for both participants suggested FCT implemented with the multiple schedule mitigated the resurgence of problem behavior relative to traditional FCT. However, additional research is needed on the long-term efficacy of programing discriminative stimuli during FCT in order to mitigate relapse.

Concluding Comments

Functional-analysis research has shown that most forms of problem behavior are reinforced by social consequences. Three operant variables that are critical to the maintenance of problem behavior are the discriminative stimuli that occasion such behavior, the establishing operations that motivate and evoke the behavior, and the consequences that reinforce the behavior. Understanding how these variables influence problem behavior is critical to the development of effective interventions. Behavior analysts should consider a number of issues when selecting the most appropriate function-based intervention for a given patient. It is also important to adjust the treatment over time to ensure that it can be implemented in a practical manner by caregivers in the natural environment. One such approach that has considerable empirical support is implementing FCT and then bringing the FCR under the stimulus control of a multiple schedule while placing problem behavior on extinction. This approach can facilitate the rapid transfer of treatment effects across settings and therapists and may mitigate treatment relapse in the form of resurgence. However, the long-term efficacy of this approach, and all function-based interventions, for that matter, should be the focus of future research.

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Philosophy and Common Components of Early Intensive Behavioral Interventions

12

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Introduction

Over the past three decades, an expansive body of empirical research has amassed documenting the impact that Early Intensive Behavioral Intervention (EIBI) can have on the lives of children with autism and their families. Using the principles of applied behavior analysis, EIBI programs can produce large gains in language, cognitive, and social behavior resulting in remediation of the core deficits in children with autism. Lovaas's (1987) seminal study first documented that young children who received 40 h of intensive behavioral treatment for 2 years made substantially greater gains than children who received less intensive services. More recently Howard, Stanislaw, Green, Cohen, and Sparkman (2014) again substantiated the powerful impact of behaviorally based interventions compared to more eclectic, community-based treatment models. The goal of this chapter will be to review the evidence supporting EIBI, to identify its critical elements, and to describe the implementation of these elements in the EIBI literature.

There is an established body of literature focusing on early identification markers present in very young children who later receive a diagnosis of autism. The early work of Berry Brazelton indicates that infants are born with a phylogenetic tendency to orient to and follow social stimuli such as a face and a voice (Brazelton, Koslowski, & Main, 1974). At around 5 months old, infants are able to detect changes in eye gaze during social interactions. They smile more when adults look at them and less when adults' eyes are averted (Symons, Hains, & Muir, 1998); furthermore, they respond differentially to adult affective behaviors such as smiling or frowning (Rochat & Striano, 1999; Trevarthen, 1979). As early as 6 months of age, infants follow their mothers' gaze shifts to objects in the environment (Morales, Mundy, & Rojas, 1998). At 9–12 months of age, infants start to engage in joint attention and social referencing, which involves turning to look at the adult's face when presented with something novel in their environment (Feinman, 1982; Moore & Corkum, 1994). By 1 year of age, typically developing children are fully engaged in their social surroundings. They orient to their name and engage in eye contact, referential pointing, and social referencing (Osterling & Dawson, 1994) – these social behaviors occur with adults and peers alike. The relevant experimental question which remains is that concerning the point at which this pattern of responding starts to deviate in children who are later diagnosed with autism. One way to evaluate this change in trajectory is to conduct prospective

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studies of patterns of behavior from birth through the third year of life. Researchers who are part of the Baby Siblings Research Consortium have examined the developmental course of an autism diagnosis (Landa & Garrett-Mayer, 2006; Landa, Gross, Stuart, & Faherty, 2013; Ozonoff et al., 2010, 2015; Zwaigenbaum et al., 2005). Siblings are used in these prospective studies because evidence suggests that the reoccurrence risk for autism in siblings is 18.7% at 3 years old (Ozonoff et al., 2011).

Early ASD Markers

Early screening and detection tools have allowed children as young as 12–18 months to receive an ASD diagnosis and thus begin treatment. The Autism Observation Scale for Infants (AOSI; Bryson, Zwaigenbaum, McDermott, Rombough, & Brian, 2008) is a semi-structured play-based evaluation in which 18 risk facts are assessed using a 0–3 rating scale; Zwaigenbaum et al. (2005) found that as early as 12 months of age the autism spectrum disorder (ASD) group was distinguishable from those children who would not receive a diagnosis by 3 years of age. These atypicalities fell into three major categories: social/language, visual attention, and early temperament. Specifically, children showed reduced eye contact, failure to orient to name, lack of imitation and smiling, and delayed receptive and expressive language. In addition, they showed prolonged latency to disengage their visual attention. Their temperament was more passive, and they showed an extreme distress reaction to environmental changes as well as visual fixation on objects. Landa and Garrett-Mayer (2006) evaluated 60 siblings at ages 6, 14, and 24 months, using the Mullen Scales of Early Learning, Autism Diagnostic Observation Schedule (ADOS), and clinical judgment to evaluate trajectory deviations. They categorized children as either autism spectrum disorder, language delayed, or unimpaired at age 3. They found that at 6 months there were no differences between groups, but by 14 months, there were clear deviations in developmental trajectories. The children who were later diagnosed with ASD showed lower scores on language, visual discrimination, and fine motor tasks. More recently Landa et al. (2013) evaluated the social language and social development of children who were diagnosed early (by 18 months) versus children who received a later diagnosis (by 36 months). Again, at 6 months the children were undifferentiated, but the early-diagnosed children began to show clinically deviant language development at 14 months, while the later-diagnosed children showed only subclinical speech and motor delays at 14–18 months of age. By 36 months both groups showed impairments in language and social behavior. Of concern is the fact that while 41% of the early-diagnosed children entered early intervention prior to 18 months, only 12% of the later-diagnosed children received early intervention. Considering that both the early- and later-diagnosed groups would have seemingly benefitted from early intervention, additional research has continued to look for reliable early markers of ASD which would allow for early, confident diagnosis and subsequent intervention.

While most studies using IQ and autism-specific diagnostic tools show undifferentiated development before 12 months, Jones and Klin (2013) have documented earlier differences in patterns of eye fixation. Using eye tracking measurements, they found that 4- to 6-month-old infants showed differences in percentages of eye fixation while viewing a video of a person talking. The children later diagnosed with ASD were more likely to visually fixate on the mouth and hands of the speaker, while children who were not diagnosed were more likely to focus on the speaker's eyes. These are the first data suggesting that this restricted pattern of visual fixation is present at such an early age, although these results stand in contrast to previous research in which decreased eye contact at 6 months was not predictive of an ASD diagnosis for at-risk siblings (Young, Merin, Rogers, & Ozonoff, 2009). Though these differences appear to be subclinical, meaning they are not observable in daily interactions with these children, they may suggest very early emergence of some of the markers of autism.

The preponderance of evidence, however, suggests that motor, cognition, and prelinguistic language development are intact at 6 months old and that autism symptomatology emerges during the latter half of the first year of life. This could suggest an environmental influence in the development of autism. Infants at risk for autism spend less time interacting socially with adults and other children in their environment. If a child fails to initiate eye contact with others, is less responsive to the social initiations of others, and engages in less language and play, they are less likely to engage in sustained social interactions. If a child does not reciprocate a parent's social initiations, there is an increased risk that these social initiations on the part of the adult will be extinguished, resulting in a reduced number of daily social interactions provided by the adult (Adamson, McArthur, Markov, Dunbar, & Bakeman, 2001). A central goal of EIBI is active learning in the context of others. The content of programming focuses on both the cognitive/language and social areas of development by requiring language and play-based interaction on the part of the child, first with adults and then with peers. Evidence suggests that environmental enrichment can play a role in the developing brain (Dawson, 2008). While there is some evidence for this in animal models (Loupe, Schroeder, & Tessel, 1995), any evidence using humans is in its infancy. That being said, evaluating the impact of EIBI on the remediation of atypical patterns of behavior in children who are diagnosed with autism is an exciting venture for behavior analysts. If the environment can play a role in the development of autism symptomatology, then harnessing the power of environmental arrangements using the principles of applied behavior analysis has the potential for reversing this deviant developmental pattern.

Seminal Research

A review of early EIBI research highlights several integral components of successful EIBI treatment. Lovaas's seminal 1987 study examining the effects of EIBI on the IQ and subsequent educational placement of children with autism (CWA) laid the groundwork for the large-scale use of applied behavior analytic techniques in autism education. In this study, 19 CWA were assigned to the EIBI group receiving 40 h per week of 1:1 behavioral treatment, and 19 CWA were assigned to a minimal treatment group receiving 10 h per week of 1:1 behavioral treatment. Children included in the study were less than 40 months of age. Assignment to groups was based on availability of therapists. A second control group of 21 CWA receiving minimal eclectic intervention in a different facility was also included. After 2 years of treatment, the experimental group demonstrated statistically significant increases in IQ over the control groups, and differences in placement between the groups were also statistically significant. In the experimental group, nine children were considered *recovered*, meaning they entered a regular education class by first grade and had an IQ within normal range. Eight children were considered *aphasic*, meaning they were placed in a first grade class but continued to receive additional support for a language delay and had an IQ demonstrating mild impairment. Two children were considered *autistic*, meaning they were placed in a substantially separate class and demonstrated an IQ in the severely impaired range. Using the same categories for the control groups, one child was considered recovered, 18 were considered aphasic, and 21 remained in the autistic group following 2 years of treatment. Significant differences in functioning level and IQ remained present for these groups in a follow-up study conducted 6 years later (McEachin, Smith, & Lovaas, 1993). The original nine *best outcome* participants in the EIBI group continued to demonstrate IQs within the normal range and had reduced levels of maladaptive behavior, aside from one participant who returned to the special education setting. Lovaas's study continues to serve as a landmark example of the potential of EIBI treatment to produce and maintain levels of typical functioning in CWA.

Although Lovaas's (1987) study demonstrated significant gains for its participants receiving EIBI, participants were not randomly assigned to groups. Smith, Groen, and Wynn (2000) completed a randomized controlled trial (RCT) involving 28 CWA (mean age of 36 months) who were randomly assigned in matched pairs to either an experimental group or a parent-training group. The experimental group (comprised of 15 children) received 30 h per week of center-based EIBI, and the parent-training group (comprised of 14 children) received 5 h per week of parent training in EIBI, along with their regular public education program, which provided 10–15 h of eclectic treatment per week. At follow-up, children who participated in the experimental group showed significant gains in IQ, receptive and expressive language, and visual spatial skills over the control group. Additionally, four children from the experimental group were placed in regular education with no support at follow-up, compared to none from the control group. These results provide a final requisite piece, randomization of groups, to show that EIBI is a superior model to eclectic treatment when attempting to improve functioning in young CWA.

Few studies rival Lovaas's in the percentage of treatment group reaching a level of typical functioning, an exception being a study by Sallows and Graupner (2005). These researchers randomly assigned 23 CWAs (aged 24–42 months, IQ 35 or higher) to a parent-managed or clinic-managed treatment group. Both groups received EIBI treatment, with the parent-managed group receiving 6–7 fewer hours per week of services than the clinic-managed group, which averaged 39 h per week of treatment during the first year. The parent-managed group received approximately 6 h per month of in-home supervision by a trained EIBI therapist, compared to the clinic-managed group, which received 6–10 h per week of supervision. In a pre-/posttreatment comparison, significant changes in IQ were seen for several children in both groups. After 1 year of treatment, five children in the clinic-managed group and three children in the parent-managed group achieved IQ scores within the normal functioning range (at least 85), and after 3–4 years of treatment, three additional children in the parent-managed group also reached this level. In total, 11 of 23 (48%) of the participants in the study achieved a normal IQ posttreatment. Significant differences were not seen between the two treatment groups, but both demonstrated a positive outcome in favor of EIBI. Sallows and Graupner extended Lovaas's finding, demonstrating that, independent of setting and level of therapist supervision, a high percentage of CWAs receiving EIBI can achieve a normal IQ.

Howard, Sparkman, Cohen, Green, and Stanis-law (2005) compared EIBI treatment group of 29 children (receiving 1:1 treatment, 25–40 h per week) with two treatment groups, one receiving intensive eclectic treatment (receiving 1:1 or 1:2 instruction for 30 h per week) and one receiving non-intensive early intervention provided by the public school (receiving small group instruction for 15 h per week). Pre- and posttreatment assessments included measures for IQ, language, nonverbal intelligence, and adaptive behavior. No differences were seen at intake between groups, but after 14 months of treatment, the EIBI group showed statistically significant gains over both control groups in all areas. The EIBI group scored, on average, in the normal range on cognitive, nonverbal, and communication skills. In addition, the EIBI group showed a higher learning rate for receptive and expressive language than did the control groups following treatment. The authors suggest that the quality of treatment as measured by learning opportunities was more instrumental in producing large gains for children with autism than merely length of time per week in treatment. In a recent follow-up report of these children, the original findings still remain (Howard et al., 2014): children from the EIBI treatment group, now in elementary school, continue to show greater gains than the children in other treatment groups.

Recently, MacDonald, Parry-Cruwys, Dupere, and Ahearn (2014) evaluated the effects of EIBI on 83 toddlers with autism who entered treatment before the age of 3. All children participated in 20–30 h per week of EIBI. Data from these children was compared to 58 same-aged peers using a direct measurement tool called the Early Skills Assessment Tool (ESAT; MacDonald et al., 2006), which assessed cognitive/language, joint attention, play, and stereotypy. Children were categorized into three groups by age at entry into treatment. These groups included children 18–23 months old

(1-year-olds), 24–29 months old (early 2-year-olds), 30–36 months old (late 2-year-olds), and 36–48 months old (3-year-olds). While they found significant gains in all groups, the greatest gains were seen in the youngest group. Over 90% of the 1-year-olds were close to their typical age-matched peers after 13 months of treatment, while the percentage of children achieving similar gains was reduced as age of entry increased. Seven of the eight children who entered treatment at 1 year of age and were available for follow-up were performing at grade level (grades 3–7), had lost their diagnosis, and were full members of their school and community. These findings suggest that beginning treatment before the second birthday results in the best outcome.

Common Elements of Early Intensive Behavioral Treatment

The question remains: What exactly is EIBI and how does it differ from other early intervention treatment models? Early Intensive Behavioral Intervention (EIBI) is based in the principles of applied behavior analysis (ABA). While all EIBI programs are not the same, there are a number of features that are commonly reported in research programs. Several authors have identified key elements that are common in most EIBI programs (Green, 2011; Green, Brennan, & Fein, 2002; Lovaas, 2003). An analysis of the literature reveals striking similarities in delivery of services across studies. Table 12.1 summarizes the 12 most cited articles in which EIBI procedures were implemented with young children with ASD. We will reference these studies as we review the common elements of EIBI.

Begin Treatment Early

As you can see from the data, the earlier treatment begins, the better the outcomes. In the 1980s, Lovaas established the Young Autism Project at UCLA. The focus of the project was to begin intensive behavioral treatment before 40 months of age. His 1987 study was the culmination of this early work. In reviewing the literature since that time, seven of the studies had a lower age limit of 24 months at the beginning of treatment, and six of the studies began working with children who were 1 year old. It is difficult to determine the actual number of children of each age group in these studies, as age is often not a factor in evaluating the efficacy of the procedure. However, there are two studies that clearly show the effects of beginning treatment before the child's second birthday. Green et al. (2002) demonstrated in a single-case analysis that EIBI resulted in rapid learning and eventual loss of diagnosis for a child who began treatment at 14 months old. MacDonald et al. (2014) compared data from children who began treatment prior to their second birthday versus children who began after their second birthday and found that 90% of the children who began treatment at 1 year old were performing within two standard deviations of their typical same age peers on direct measures of cognition, joint attention, and play a year later; children who began treatment at 30–48 months later made less dramatic gains. These data suggest that treatment should begin as early as possible, underscoring the need for early screening and diagnosis.

Age at intake seems to be inversely correlated with better outcomes (Makrygianni & Reed, 2010; Perry et al., 2011). All but 1 of the 12 studies summarized in Table 12.1 worked with a population whose mean age was between 30 and 36 months; however only three studies actually started with groups of children who were all under 3 years of age (Green et al., 2002; MacDonald et al., 2014; Zachor, Ben-Itzchak, Rabinovich, & Lahat, 2007). EIBI requires careful systematic building of skills, and the earlier the treatment can begin, the better the chances of changing the trajectory of the ASD condition. In this chapter we will focus on those programs beginning treatment before 3 years of age.

Behavioral Conceptual Framework

Early Intensive Behavioral Intervention is a treatment model that is based on the principles of applied behavior analysis. Beginning with the Lovaas UCLA treatment model, a behavioral

Table 12.1 Summary of treatment components

Study	Ages start	Behavioral framework	Family participation	Instruction/ setting	Inclusion	Curriculum	Intensity and duration	Quality assurance
Lovaas (1987)[c]	34–40 months Mean 34 months	Behavioral techniques[a] Punishment[b]	Parents trained in ABA, extend treatment to all waking hours	1:1 home based	Supported preschool setting	Lovaas "The ME Book" (1981)	40 h for 2–6 years	ABA-trained student therapists
Smith et al. (1997)	<46 months Mean 36 months	Behavioral techniques[a]	Parents trained in ABA, worked with therapist 5–10 h/week; team meetings	1:1 home based	Supported school setting when prerequisites acquired	Lovaas "The ME Book" (1981)	30 h per week, 2 years	Supervisors participated in UCLA internship, ABA trained student therapists
Sheinkopf and Siegel (1998)	23–47 months Mean 33.8	Behavioral techniques[a]	Parents received manual (Lovaas, 1981) of ABA treatment	1:1 in school setting	All placed in special education settings, moved to supported classroom	Lovaas "The ME Book" (1981)	27 h per week, 16 months	Paraprofessionals and parents served as therapists, supervised by behaviorally trained clinicians
Smith et al. (2000)	18–42 months Mean 36 months	Behavioral techniques[a]	5 h/week of direct teaching alongside therapist for 1st 3 months	1:1 home based	Supported in general education setting when prerequisites acquired	Lovaas "The ME Book" (1981)	25 h per week first year, 2–3 years	
Green et al. (2002)	14 months	Behavioral techniques[a] Incidental teaching[b]	Mother provided 3–8 h per week, collected data, attended ABA workshops	1:1 home based	Supported preschool setting, prerequisite required	Matching, imitation, language, play, social, generalization	25–33 h per week, 3+ years	Behavioral psychologist: staff training and supervise program 2–4 h every other week
Eikeseth et al. (2002, 2007)	4–7 years old	Behavioral techniques[a]	Worked with therapist for 4 h a week for first 3 months	1:1 center based	Supported mainstream preschool setting outside of 1:1 sessions; playdates	Lovaas "The ME Book" (1981)	28 h first year, 31 months	Behavioral psychologist provide 10 h per week of staff supervision Weekly 2-h team meeting
Sallows and Graupner (2005)	24–42 months Mean 33.23 months	Behavioral techniques[a] Video modeling	Parents trained in ABA, participation in weekly team meetings	1:1 home based	Supported preschool setting 1–2 half days a week	Lovaas "The ME Book" (1981)	39 h per week, 48 months	Supervised by senior behavior therapist with 2000 h of training. ABA-trained student therapists

Howard et al. (2005, 2014)	Mean 30 months	Behavioral techniques[a]	Parents trained in ABA, assist with data collection, participation in team meeting 2 times a month	1:1 home, school, and community	Supported school and playdates	ABA treatment manuals: Maurice et al. (1996) and Maurice et al. (2001)	25–40 h per week, 13–14 months	Behavioral psychologist provides training and staff supervision
		Naturalistic teaching[b]						
		General case instruction						
Cohen et al. (2006)	18–42 months	Behavioral techniques[a]	Parents attended 12–18 h workshop, participated in weekly training session, no requirement for direct intervention	1:1 home based	Supported preschool setting outside of 1:1 sessions; playdates	UCLA curriculum	35–40 h per week, 36+ months	BCBA supervised cases and trained tutors. Tutors passed observation assessment and oral test of UCLS manual
	Mean 30 months	Incidental teaching[b]						
Zachor et al. (2007)	22–34 months	Behavioral techniques[a]	No information	1:1 center based preschool setting	Participation in supported inclusion setting when prerequisites acquired; playdates	Maurice et al. (1996)	35 h a week	Therapists supervised by a trained behavior analyst
	Mean 27.7 months							
Remington et al. (2007)	26–42 months	Behavioral techniques[a]	Parents delivered 1:1 treatment; reviewed and practiced modifications with clinicians	1:1 homebased and preschool	Supported preschool setting; playdates	Green et al. (2002)	26 h per week, 24 months	Supervised by senior behavior therapist trained in ABA. They trained therapists
		Natural environment						
		Teaching[b]						
MacDonald et al. (2014)	18–36 months	Behavioral techniques[a]	Parent trained in ABA and offered weekly coaching by therapist	1:1 homebased and preschool	Supported preschool or daycare setting	Maurice et al. (1996) ACE © curriculum	20–30 h per week, avg. 13 months	BCBA provided training and staff supervision
	Mean: 20.23 months	Naturalistic teaching[b]						
	26.68 months							
	30.94 months							
	42.00 months							

[a] Behavioral techniques: discrete trial instruction, discrimination learning, shaping behavior, prompting and fading, task analysis, reinforcement, and generalization of data

[b] Incidental/naturalistic teaching: providing instruction in the context of the natural setting and reinforcement matches behavior not arbitrary

[c] Punishment: contingent use of loud “no” paired with a slap on the thigh

treatment relies on the use of operant teaching techniques. These include shaping successive approximations of the target behavior using positive reinforcement, systematic use of prompting and fading procedures, and the design of structured discrete trial instruction to teach language and cognitive skills. The focus is on the establishment of stimulus control over imitation and other discrimination performances. Direct and conditioned reinforcers are determined through a variety of preference assessments. Self-help skills are taught using task analysis and chaining procedures. Special attention is given to programming for the generalization of these skills across stimuli, people, and contexts as children with autism often fail to demonstrate generalization of skills on their own. Behavioral protocols are also integral to the reduction of behavioral excesses, like tantrums, aggression, and stereotypy. More recently, these protocols have involved a functional analysis of the target behavior. Finally, data analysis is integral to an EIBI program as acquisition data are used to evaluate progress and make decisions regarding treatment.

A review of the 12 studies that used EIBI reveals a remarkable consistency in the implementation of behavioral programming. All studies reported using discrete trial instruction to establish discrimination learning, from beginning imitation training to more advanced language concepts. They all report using both direct and conditioned reinforcers in establishing skills and shaping behavior. Prompting and fading are integral to instruction, and data are used to make program decisions. A few exceptions exist, however, beginning with Lovaas's use of contingent punishment in the form of a loud "no" or a slap on the thigh. Only one other study reported use of any aversive stimuli (Smith et al., 2000), and these procedures were discontinued early in treatment.

Another departure from the initial Lovaas model is the introduction of more naturalistic teaching. Incidental teaching, more recently referred to as naturalistic teaching, is a less structured alternative to traditional discrete trial training (DTT). These methods allow the behavior-change agent to take advantage of opportunities that arise naturally within the child's environment. Due to looser stimulus control and the use of functional reinforcers, naturalistic methods of instruction may promote increased generalization and maintenance of skills compared to a strictly discrete trial approach (McGee, Krantz, & McClannahan, 1985). While only five of the articles reviewed specified naturalistic teaching as part of their protocol (Cohen, Amerine-Dickens, & Smith, 2006; Green et al., 2002; Howard et al., 2005; MacDonald et al., 2014; Remington et al., 2007), a closer examination of the Young Autism Project protocol reveals the systematic transfer of control from a very restricted discrete trial setting to performance in a community setting. The behavioral principles remain the same, but the literature shows how the language that we use describing some of the same concepts has evolved over the years. The goal all along has been for EIBI to result in functional life skills in the natural community for every child.

Family Participation

Active parent participation in treatment was a hallmark of Lovaas's (1987) study. Parents were required to learn the behavioral teaching techniques and expected to use these during interactions with their child during all waking hours of the day. Gains made during treatment sessions are likely to be displayed only with the therapist under very specific conditions unless they are practiced with family members in their home. No other studies have made these stringent requirements of parents; however, all have required some level of parent participation. The degree of parent participation varies widely across studies with respect to several aspects of intervention, including attendance at team meetings or workshops, direct implementation of EIBI programming, and the collection of data. Across several studies, the minimum requirement is the parents' active participation in team meetings on a weekly or monthly basis with other members of the treatment team, including therapists and supervising clinicians (Eikeseth et al. 2007;

Howard et al., 2005; MacDonald et al., 2014: Sallows & Graupner, 2005). Parents are often encouraged to acquire the relevant skills in order to effectively implement behavioral techniques and are considered an integral part of the child's treatment team. To further the generalization and maintenance of skills taught by trained clinicians, as well as the provision of intervention outside of therapist intervention hours, several studies have included parent-training components. Green et al. (2002) and Cohen et al. (2006) required parents of participants to attend quarterly and weekly workshops, respectively, providing information pertaining to the use of techniques of applied behavior analysis and intensive intervention. In addition to parent participation in workshops, many parents participated in didactic instruction with a behavior therapist who then provided feedback for the parent. Smith and colleagues conducted two studies in which parents were asked to set aside at least 5 h a week during which time they worked alongside the behavior therapist in order to attain proficiency in the use of behavioral techniques and were required to provide a number of one-to-one, direct instruction hours (Smith, Eikeseth, Klevstrand, & Lovaas, 1997; Smith et al., 2000).

Requirements for provision of direct instruction by parents varied widely, with some studies involving parental delivery of instruction for a minimum number of hours, while others outline no requirement for instruction (Cohen et al., 2006; Eikeseth et al., 2002; Green, 2011; Remington et al., 2007; Smith et al., 1997; Smith et al., 2000). Sheinkopf and Siegel (1998) conducted a retrospective analysis in which it was noted that it was the parents who almost exclusively delivered behavioral treatment (based on Lovaas's 1981 manual). Similarly, Smith et al. (2000) included a parent-training comparison group in which parents delivered the majority of behavioral treatment (compared to a treatment group who received more intensive intervention provided by both professionals and parents). Besides direct instruction, parents may also take part in the collection of data both in home and across settings and may observe or provide instruction alongside the behavioral therapist as the child moves into more naturalistic environments, such as supported inclusion settings (Green et al., 2002; Howard et al., 2005). While parent participation differed in quality and quantity across the majority of reviewed studies, all studies acknowledged the parent's role as a part of the treatment team and noted the function of parental implementation of behavioral techniques with respect to the generalization of acquired skills across environments.

Instructional Format

Across all studies reviewed, instruction is provided initially in a one-on-one format for at least the first 12 months. Nine of the 12 studies provided this instruction in a home-based setting initially, while the remaining studies provided instruction in a center-based or school setting. The protocol described by Cohen et al. (2006) best illustrates the teaching format of most EIBI programs through the course of treatment. They identify three primary stages: in home 1:1 instruction, peer play groups, and school inclusion.

In the beginning, much of the instructional programming occurs in discrete trials. Therapists work individually with the child in a distraction-free environment to establish stimulus control over responding. For some children, they may start with a ratio of 6–8 trials to a 1- to 2-min break, with a longer play break at the end of each hour. These play breaks should include opportunities for children to practice the skills they are learning in discrete trial sessions, for example, requesting a toy out of reach or imitating actions during a song. Cohen and colleagues define *skill acquisition* as 90% accuracy with target stimuli and *concept mastery* as 90% accuracy with novel items. This is an important distinction when so much early 1:1 instruction is provided in a discrete trial format where all variables can be controlled.

While discrete trial methods of instruction have been empirically proven to be effective in teaching skills to young children with autism, the highly structured approach does introduce concern with respect to the generalization and maintenance of said skills. The use of mass trials within a structured session with a limited number of therapists and the delivery of somewhat arbitrary reinforcers introduce contingencies that may not exist in the child's day-to-day environment. As a result, skills acquired in the more structured environment may fail to generalize to different settings and individuals, and may fail to maintain over time (Lovaas, Koegel, Simmons, & Long, 1973; McGee et al., 1985). Given these concerns, researchers implementing EIBI protocols are careful to move quickly from discrete trial to more natural and complex learning environments to practice newly acquired skills and generalize them across people and stimuli.

One-to-one instruction allows for individualized interventions to maximize success during learning. Once children acquire spoken phrases, verbal requests, appropriate play, and self-help skills like dressing, Smith et al. (2000) suggest they are ready for more naturalistic instruction in group settings such as preschools. Skills acquired through 1:1 instruction need to be practiced and reinforced across a variety of novel settings, stimuli, and people. This notion of the need for prerequisite skills to be mastered prior to a reduction in the intensity of instruction is common in EIBI programs (Johnson, Meyer, & Taylor, 1996).

Green et al. (2002), in their program for a 14-month-old, reported beginning with 1:1 instruction for 25–33 h and increasing the number of hours during their second year of intervention to 30 h of 1:1 and 6–8 h of play and school-based time. An analysis of the skills acquired during the first year suggests progression was made in accordance with Cohen and Smith's recommendations.

Three studies began treatment in center-based programs. Eikeseth et al. (2002) began treatment with school-aged children (ages 4–7 years) using 1:1 instruction in a center-based setting in Norway, while Zachor et al. (2007) began treatment in a center-based preschool setting with children under 3 years of age in Israel. MacDonald et al. (2014) began services for children 3 years and older in a center-based program primarily due to age-related funding source requirements, while younger children were serviced in their home. Regardless of the setting in which treatment was started, the nature of instruction in center-based programs was similar to the home-based teaching described in other studies. In summary, most of the EIBI programs reviewed began treatment using 1:1 instruction in the child's home.

Integration and Generalization

As the child shows progress, skills are generalized across settings. A generalization criterion of the performance of skills across teachers and settings is included in acquisition, and incidental teaching is used to address skill acquisition across the day, in both the home and community. As previously mentioned, parent involvement in treatment and the use of behavioral techniques by parents are considered essential to the generalization of skills. The majority of studies focusing on the delivery of intensive behavioral treatment to young children with autism focus on skill acquisition within the home setting during the first year of treatment. During this time, treatment may be delivered in the home or community settings, and siblings or similarly aged peers may join the child in "playdates" during which the therapist or parent facilitates social skills, such as waiting, turn-taking, peer imitation, initiations of play, verbal and nonverbal interactions, and responses to such peer-initiated interactions (Cohen et al., 2006; Green et al., 2002; Howard et al., 2005; Sallows & Graupner, 2005). Peers or siblings were also taught to provide prompts and reinforcement for the aforementioned skills in order to further facilitate acquisition. Across several studies, these skills were seen as the basis for successful systematic integration into more naturalistic settings, such as mainstream or inclusion preschool settings; in fact, Johnson et al. (1996) proposed specific behavioral criteria for moving from 1:1 individualized instruction to an integrated setting. Proficiency in the areas of language (e.g., following directions, answering questions, and communicating needs), social skills (e.g., turn-taking, waiting quietly, imitation of peers, and initiations of play with peer), academic skills (e.g., observational learning, raising hand), and behavior skills (e.g., responding to delayed contingencies) are suggested as prerequisites for placement in an inclusion setting. Three of the studies reviewed withheld students from such settings until the relevant skills had been acquired (Smith et al., 1997, 2000; Zachor et al., 2007).

Following acquisition of necessary prerequisite skills, or upon clinician suggestion, children were introduced into a mainstream or inclusion setting with a therapist acting as a “shadow” or aide, who prompted appropriate social interactions, as well as the following of group instructions or participation in group activities. Across studies, as the child progressed within the educational setting, the therapist faded her own participation within the classroom, and the number of one-to-one intervention hours provided outside of the classroom decreased, unless inspection of data indicated that the child would benefit from continued home-based intervention (Green et al., 2002; Lovaas, 1987; Smith et al., 2000). In addition to prior preparation for an integrated setting, Green et al. (2002) and Sallows and Graupner (2005) observed participating children in the integrated setting and incorporated modifications to treatment that targeted areas of deficiency related to effective functioning in the inclusive setting.

Several studies have assessed the effectiveness of community-based programs (Cohen et al., 2006; Eikeseth et al., 2002, 2007). Children participating in these studies received one-to-one instruction by a trained behavior therapist; when the child was not receiving one-to-one instruction, they were mainstreamed in a classroom with typically developing peers with the therapist as a shadow. Sheinkopf and Siegel (1998) initially placed all participating children within a special education classroom at the outset of treatment and subsequently moved participants to inclusion or mainstream settings based on assessment of relevant skills. Across all studies, integration into an inclusion or mainstream setting with same-age typical peers was included as a part of the intensive treatment sequence (Remington et al., 2007). Level of integration is often used a measure of treatment outcome (i.e., placement within a general education setting, special education setting, with or without professional support).

Comprehensive Curriculum

An EIBI curriculum blends a combination of behavior analysis and typical child development to teach across a variety of skill areas (i.e., eye contact, imitation, communication, self-care, etc.). In general, skills are broken down into teachable units and arranged hierarchically from simple to more complex performances. Children are engaged in active learning with an emphasis on positive reinforcement. A hallmark of EIBI is the use of direct observation and measurement to both identify target behaviors to teach and regularly evaluate progress in learning. Skills are targeted across skill domains, including functional language and other communication skills (e.g., receptive and expressive language, following instructions), discrimination skills (e.g., session behavior, attending, matching, higher-order reading, and math skills), social skills (e.g., eye contact in response to name, greetings, waiting, imitation, joint attention, play skills, peer interaction), self-help skills (e.g., hand washing, dressing, safety skills), and occupational therapy (e.g., gross and fine motor skills, utensil and cup use). These skills are common teaching targets in an EIBI program, mimicking typical child development, and recommended by several sources (Leaf & McEachin, 1999; Maurice, Green, & Luce, 1996). These skills also largely mirror those on Dickson, MacDonald, Mansfield, Guilhardi, and Ahearn’s (2014) New England Center for Children Core Skills Assessment, a sequence of basic skills needed for independence. The skills on the Core Skills Assessment were socially validated as relevant skills for CWA to learn by a group of parents of children with autism and educators.

A review of the studies using EIBI with young children revealed that in seven of the studies therapists used the seminal book *Teaching Developmentally Disabled Children: The Me Book* written by Ivar Lovaas in 1981. This book was written to document the behavioral techniques and curriculum being used in the UCLA Young Autism Project. The content of this manual includes how to teach readiness skills, imitation and early language, self-help skills, and advanced language skills. The targeted first skills emphasize the importance of good session behavior and compliance. Reduction of stereotypy and other disruptive behavior is seen as imperative to providing effective teaching. The manual prescribes using overcorrection and punishment to expedite this process. When Lovaas published this paper in 1987, the use of punishment was very controversial. The majority of studies reviewed since that time have not used punishment in their treatment. Another procedure described throughout the manual is the use of a contingent loud "no" when the child made an error. Again, this procedure is not widely used in EIBI programming, neither experimental nor clinical.

Once the child has mastered the readiness skills of session behavior and compliance, instruction can begin. Since the 1981 publication, there have been numerous iterations of this original manual (Leaf & McEachin, 1999; Lovaas, 2003). All provide comprehensive and clear descriptions of teaching procedures for establishing early imitative and social behavior in young children with autism. Green et al. (2002) also provide a nice description of the curriculum sequence they used with a 14-month-old child. The first year of instruction involved the development of imitative and communication repertoires, gradually increasing in complexity over the year. Establishing these foundational skills allowed for the rapid acquisition of more complex skills during the second and third years of treatment.

The other most commonly used EIBI curriculum resources include *Behavioral Intervention for Young Children with Autism: A Manual for Parents and Professionals* by Maurice et al. (1996) and *Making a Difference: Behavioral Intervention for Autism* by Maurice, Green, and Foxx (2001). The first manual offers a comprehensive curriculum by Taylor and McDonough (1996) in which they outline beginning, intermediate, and advanced skills to target in an EIBI program. Using the principles of behavior analysis reviewed earlier, skills are targeted and taught in a progression that allows for the development of more complex behavioral repertoires. Combined, these manuals provide a comprehensive scope and sequence of skills to teach, guidance on how to teach these skills, as well as strategies for generalization and maintenance. In addition, Maurice et al. (2001) described other common challenges professionals face when working with individuals with ASD, including feeding difficulties and interactions with peers.

Joint attention and play are two other core deficits that are critical curriculum areas for autism treatment (Adamson, Bakeman, Deckner, & Romski, 2009; Carpenter, Pennington, & Rogers, 2002; Kasari, 2002). Joint attention is the initiation of a gaze shift or gesture on the part of the child to share an experience or object with an adult (Mundy, Sigman, & Kasari, 1994). Joint attention can also refer to the responding of a child to a bid (either a gaze shift or a gesture) for joint attention by the adult. Behavioral interventions have been effective in establishing joint attention (Klein et al. 2009; MacDonald 2011; Taylor & Hoch, 2008; Whalen & Schreibman, 2003); however, the curriculum sequence for teaching this skill has not been widely published. In the MacDonald et al. (2014) study, joint attention was taught using a curriculum sequence developed by the first author, described in two published sources. The first is a book chapter chronicling a child's progression from eye contact to social referencing during conversations with others (MacDonald, 2011), and the second is a brief report outlining the specific skills within the curriculum sequence (MacDonald, 2013a, b). The curriculum is an integral part of the New England Center for Children's online curriculum called the Autism Curriculum Encyclopedia (ACE©).

Appropriate play is another important variable in the social development of CWA (Wolery & Garfinkle, 2002). CWA often do not develop play skills beyond the repetitive manipulation of objects. This deficit in functional toy manipulation also prohibits them from engaging in more complex pretend play, alone or with other children (Lifter, 2000; Rutherford, Young, Hepburn, & Rogers, 2007). The curriculum sequence used by MacDonald et al. (2014) involves four levels of play, beginning with toy construction and progressing to reciprocal pretend play with a peer (MacDonald, 2013a, b). Toy construction includes simple structured play activities, such as completing a puzzle or assembling a toy like Mr. Potato Head, which can be taught using physical prompting in a task analysis format or discrete trial training (Leaf & McEachin, 1999). The curriculum sequence requires increasingly more complex solitary play behavior, such as pretend play, like having a tea party or making pizza, to cooperative pretend play such as cooking on a grill with a friend. As with joint attention, a variety of behavioral teaching have been effective to teach play, including modeling, both in vivo (Gena, Couloura, & Kymissis, 2005; Goldstein & Cisar, 1992) and video modeling (MacDonald, Clark, Garrigan, & Vangala, 2005), pivotal response training (Thorp, Stahmer, & Schreibman, 1995), and reciprocal imitation (Ingersoll & Schreibman, 2006). Changes in play behavior have rarely been analyzed in relation to EIBI outcome, although the social validity of increasing play behavior as a measurable outcome of treatment cannot be overstated (Wolery & Garfinkle, 2002).

Intensity and Duration

Although *intensive* is considered a critical component of EIBI, researchers have used varying definitions of intensive when implementing EIBI, both in hours of direct intervention provided per week as well as the length of the intervention over time. Only one study has replicated the Lovaas's (1987) intensity of treatment delivery, which was 40 h per week over a minimum of 2 years and up to 6 years; Sallows and Graupner (2005) provided a mean of 39 h per week of service delivery for 4 years to individuals in their study with positive results. Other EIBI interventions have provided between 25 (e.g., Green et al., 2002; Remington et al., 2007; Sheinkopf & Siegel, 1998) and 35 h (e.g., Cohen et al., 2006; Zachor et al., 2007) per week of intervention, lasting from less than 14 months (Howard et al., 2005; MacDonald et al., 2014; Zachor et al., 2007) up to 2 or more years (e.g., Cohen et al., 2006; Smith et al., 2000). Despite these differences in EIBI implementation, all studies found positive effects on multiple measures of change (including IQ, standardized measures of functioning, and observational changes in behavior) following EIBI treatment, compared to either pre-intervention measures and/or a treatment-as-usual control group (Eldevik et al., 2009). Occasional differences in intensity and duration existed even within studies; Howard et al. (2005) provided fewer hours per week to children under 3 years of age. Other researchers recommended starting at the highest intensity of intervention and tapering number of session hours per week as children became more ready for inclusion opportunities (e.g., Smith et al., 2000).

The procedural question of just how much EIBI is "enough" remains to be answered. How an individual child will respond to treatment, and whether that child may show greater improvement with a more intensive dose or duration of intervention, is a difficult prediction to make at the start of treatment. Eldevik, Eikeseth, Jahr, and Smith (2006) retroactively compared yoked pairs of children receiving low-intensity EIBI (12 h per week) or similar levels of eclectic treatment. While the EIBI group made greater gains than the eclectic treatment group, the gains were not at the same level seen in studies with a more robust behavioral intervention, a finding the authors potentially attributed to both the lower intensity of the intervention as well as the lower pre-intervention IQ scores of the participants (Eldevik et al., 2006). Howard et al. (2005) took a slightly different tack and compared high-intensity EIBI (approximately 30–35 h per week) with high-intensity eclectic treatment (approximately 20–25 h per week), with EIBI emerging as the clear winner. This indicates that it is not the intensity or merely number of hours the intervention is in place that makes EIBI effective but rather the content of the intervention. When considering the EIBI literature as a whole, hard-and-fast recommendations on intensity and duration of services remain elusive. However, by taking Eldevik et al. (2006) into account, we can safely recommend that EIBI occurs at an intensity greater than 12 h per week. Based on the existing literature, 25 h per week of EIBI is the common minimum amount prescribed. Similarly, little to no research has been done on implementation of EIBI for short duration (less than 12 months). Positive effects were seen when CWA received EIBI for a mean of 13 months (e.g., MacDonald et al., 2014), and Lovaas (1987) (among others) noted that the greatest gains are generally seen in the first 1–2 years of treatment.

Quality of Service Delivery

Proper implementation of EIBI and effective monitoring of progress and procedural integrity are critical to an EIBI program's success. Each of the EIBI studies reviewed in Table 12.1 discussed protocols in place for training and supervising staff and reviewing student's programs over time. While varying levels of detail were offered and terminology differed in the descriptions, a common structure for training and supervision of the EIBI program was this: paraprofessionals worked directly with students; those paraprofessionals were trained and supervised by masters-level behavior analysts (BCBA); and the program as a whole was overseen or consulted to by a clinical psychologist or PhD-level behavior analyst (BCBA-D).

Many paraprofessionals were in school to be special educators and had bachelor's degrees (e.g., MacDonald et al., 2014), although some had high school diplomas and worked in public schools (e.g., Smith et al., 1997), and others were college students working toward a bachelor's degree (Lovaas, 1987). All had additional training specific to EIBI and had been trained by masters-level therapists (e.g., Remington et al., 2007; Smith et al., 2000). Some were trained using Lovaas's (1981) manual (Sheinkopf & Siegel, 1998), and some were trained by visiting the UCLA program site and completing an internship there (Smith et al., 1997). Generally, training specific to the job at hand seemed to be top priority over previous experience or prior level of education. Supervisors were generally masters-level behavior analysts with experience in EIBI. Many methods of quality control by the supervisors were listed, including working with students themselves, observing paraprofessionals working with students and providing feedback, meeting with the paraprofessionals as a group weekly, and meeting with paraprofessionals individually weekly to discuss student progress. Large-scale clinical oversight was generally provided by a clinical psychologist or PhD-level behavior analyst and often consisted of monthly consultation to individual cases and group meetings. Although correct implementation of EIBI and careful oversight of student progress by qualified professionals are of utmost importance to the researchers, as evinced by the attention they give to describing these details, additional information regarding how paraprofessionals were trained and caseload size for supervisors is warranted to paint a complete picture of how quality assurance was managed in these EIBI programs.

Conclusion

These critical components of EIBI outline the parameters under which positive, significant, and enduring change have been produced for young children with autism. Behavioral research has pointed to tried-and-true techniques including prompting, reinforcement, errorless learning, systematic breakdown of skills, repeated practice, moving through an established developmental sequence across domains, and programming for generalization in establishing fundamental communication, discrimination, and social skills for children with ASD. Much has been learned over the past three decades about how best to teach CWA. Future areas of research do, however, remain.

Measures of Change While positive outcome following EIBI has been demonstrated across numerous studies, the method of measuring change has, at times, differed. Much of the literature on EIBI outcome has used standardized testing to determine if significant changes have occurred during treatment, including IQ and measures of overall functioning (e.g., the Vineland Adaptive Behavior Scale). Eldevik et al. (2009) used effect size to equalize changes across tests when analyzing EIBI comparison outcome data, generally finding effect sizes between 0.5 and 1 in favor of EIBI treatment for varying testing types (i.e., IQ and adaptive behavior scores). Although global scores of functioning have a clear-cut place in assessing change for CWA, additional measures may be helpful creating a richer picture of the type of change experienced by CWA receiving EIBI and whether those changes improve their social functioning. Because CWA often continue to function behind their typically developing peers even when improvements are seen, these tests may not capture smaller-scale changes in behavior or changes in behavior that are specific to an autism profile (such as social impairment) over a more general developmentally delayed profile (such as cognitive impairment). Drawing from the findings of the Baby Sibling Research Consortium, measures of those early markers might be more sensitive assessment of treatment effects (Ozonoff et al., 2015). Additional types of behavioral change, such as changes in interpersonal social skills, play behavior, or a reduction in socially stigmatizing behavior, may be harder to categorize with a test predominantly measuring changes in IQ. For this, pairing a repeated measures analysis of operationally defined and observationally measured autism-specific deficits, such as eye contact, joint attention, imitation, and play, may be a welcome component in determining what type of behavior corresponds to a change in IQ or adaptive functioning. Additional research in these areas is needed.

Ideal Parameters of Treatment Regarding EIBI intensity, duration, and ideal starting age for treatment, the literature supports a "more is better" approach, converging on recommendations for more EIBI (greater than 25 h per week), for a year or more, and starting at as young an age as possible (ideally, before 2 years of age) (MacDonald et al., 2014). However, questions continue to be raised regarding precisely what the ideal parameters of EIBI implementation should be: Is 25 h per week enough? If we can do 40 h per week, should we? For the very young, what should be the balance between EIBI, gross motor exploration, and receiving the recommended sleep allowances, including naps? Will implementing EIBI for only a few months reap the same rewards, or produce as lasting a change, as EIBI implemented for 1–2 years? Research into these questions could enrich our understanding of how EIBI can be implemented most effectively and efficiently.

Training Proper implementation of EIBI requires nuance and skill. Therapists working with young children are often simultaneously working to shape session behavior and attending, identify and continually reassess reinforcers, shape compliance to manual guidance and prompting, establish eye contact and social interaction as reinforcing, and modify teaching to an appropriate developmental level. Providing incidental teaching opportunities and setting up the environment for naturalistic teaching are additional necessary skills. While the EIBI manuals used in the field address these topics, additional information on how therapists were trained, as well as more information on how the supervisory systems operate to provide observation, feedback, and consult, would be a welcome addition to the literature in order to better standardize these practices. Additionally, parent training and involvement varied across studies. Examining the effectiveness of parent training in EIBI and the social validity of this training would be an excellent area of continued research.

In EIBI, we have an effective tool in mitigating some of the detrimental effects of an ASD diagnosis for very young children. The techniques used in EIBI and the effects produced are well documented through comprehensive training manuals (e.g., Maurice et al., 1996) and seminal work (e.g., Lovaas, 1987), respectively. Two variables may impede implementation: funding and staffing. Increased use of distance technology and training of Registered Behavior Technicians (RBT) by the Behavior Analysis Certification Board (BACB) are two strategies that are having a positive impact on service availability. The task is now to diagnose early and place children into EIBI treatment programs that can make a lifelong difference in their developmental trajectory.

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13

Additional Treatment Parameters and Issues Requiring Study: Early Intensive Behavioral Intervention (EIBI)

Svein Eikeseth

Introduction

Research has shown that early and intensive behavioral intervention (EIBI) may produce clinically meaningful gains in language, social, and cognitive functioning and reduce aberrant behaviors associated with ASD (Eldevik et al., 2009; Reichow, Barton, Assouline, & Hume, 2012). Yet, there is a considerable variation in outcome made by individual children (Dawson, Bernier, & Ring, 2012; Eldevik et al., 2010; Howlin, Magiati, & Charman, 2009; Warren et al., 2011). This has prompted an interest in examining additional parameters that may define and improve the treatment.

The purpose of this chapter is to identify and discuss such variables. More specifically, variables addressed are predictors of individual differences in EIBI outcome, ways to optimize the delivery of the intervention, ways to improving effectiveness of the treatment, whether improvements are durable over time, how EIBI compares with alternative behavioral approaches, whether the model has been successfully adapted to different settings and populations, whether autism can be understood based on reinforcement principles, and finally, the relationship between behavioral changes and collateral changes in neurobiological functioning.

A comprehensive and complete review of these topics, however, is beyond the scope of this chapter. Instead, the review is somewhat selective, and parameters not mentioned here may also be of importance (c.f., Matson & Smith, 2008). Nevertheless, I hope that this chapter will give some ideas for further research on topics related to EIBI. The first part of this chapter will address research on predictors of individual differences in EIBI outcome, starting with pretreatment variables.

Predictors of Individual Differences in EIBI Outcome

The variation in outcome made by individual children has prompted an interest in discovering predictors of treatment outcome, to help identifying which children will benefit most from the intervention. Knowledge of such variables may also be used to select the most effective treatment for individual children and to direct research on targeted interventions for subgroups of children who benefit less from existing treatments. I will start by examining the extent to which certain child characteristics that can be assessed before treatment starts may be useful in predicting outcome.

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Pretreatment Variables

Intellectual Functioning Parents and professionals often ask whether individual characteristics of a particular child can predict how well the child may benefit from EIBI. For example, do children with more advanced cognitive skills show more progress in treatment as compared to those who start treatment with lower cognitive scores? Indeed, intellectual functioning at intake is the variable that has been most investigated as a potential predictor for outcome, and several studies have shown that high IQ at intake is associated with high IQ at the end of the treatment (Eikeseth, Smith, Jahr & Eldevik, 2002; Harris & Handleman, 2000; Hayward, Eikeseth, Gale, & Morgan, 2009). That is, children who start with a higher IQ tend to end with a higher IQ after the intervention is finished. Progress, however, can also be measured as change in scores between intake and follow-up. For example, a child may obtain an IQ score of 100 at follow-up, that is, a score within the normal range. However, this particular child may have had a score of 90 at intake and hence has made an IQ gain of 10 points. Another child may have a follow-up score of 70 and an intake score of 40. Even though this child does not score within the normal range, the child has had an improvement of 30 IQ points, that is, three times as much as how the child scored within the normal range.

When change in IQ has been used as an outcome variable, intake IQ is no longer a clear predictor of outcome: Some studies have found that intake IQ predicts IQ change between intake and follow-up (Ben-Itzchak, Watson, & Zachor, 2014; Ben-Itzchak & Zachor, 2007; Smith, Klorman, & Mruzek, 2015), but other studies have failed to find a relation between intake IQ and IQ change (Cohen, Amerine-Dickens, & Smith 2006; Eikeseth et al., 2002; Eldevik, Hastings, Jahr, & Hughes, 2012; Eldevik et al., 2009; Hayward et al., 2009; Sallows & Graupner, 2005; Smith, Groen, & Wynn, 2000).

Clearly, more research is needed to settle this issue. Perhaps a full-scale IQ, which has been used as putative predictor in the studies reviewed, is too gross of a measure and, hence, not optimal as a predictor of outcome. If so, using certain test items, index scores or cognitive domains as putative predictors may prove to be a better and more reliable predictor. This could be examined in the future research.

Chronological Age at Intake In EIBI, a goal is to start treatment as early as possible in the child's life. Optimally, intervention should start in infancy and ideally before the full-blown ASD symptoms have emerged. This is because the potential for neural plasticity such as neural regeneration, repair, and/or reorganization is presumed to be greater than the younger the children are. Also, younger children have had less time to acquire behavioral delays and hence may have not fallen so far behind typical development as compared to children that are older. Also, younger children may have had less time to develop and sustain behavioral excesses such as aggressive, stereotyped, and ritualistic behaviors. For these and other reasons, children's chronological age at the start of treatment has been investigated as a potential predictor of treatment outcome. Harris and Handleman (2000) found that young age at the start of treatment predicted better outcome, when outcome was measured by school placement. Using a number of mastered behavioral objectives as an outcome measure, Granpeesheh, Dixon, Tarbox, Kaplan, and Wilke (2009) found that children between 2 and 5 years of age had better skill acquisition as compared to older children. Also, age at intake has been found to be associated with better cognitive outcomes of a community-based intensive behavioral intervention for kindergarten- and preschool-aged children, but less so in older (school aged) children (Blacklock, Perry, & Geier, 2014; Perry et al., 2011). Recently, Smith, Klorman, and Mruzek (2015) found that age at intake predicted outcome on several measures including cognitive functioning, adaptive behavior, and autism severity.

As with IQ, however, the predictive value of age at intake is lower when outcome is measured as changes in scores between intake and follow-up. Indeed, when outcome is measured as change in cognitive or adaptive functioning, several studies have failed to find a relation between intake age and outcome (Eikeseth, Klintwall, Jahr, & Karlsson, 2012; Eikeseth, Smith, Jahr, & Eldevik, 2002; Hayward et al., 2009; Magiati, Charman, & Howlin, 2007). This includes data from three meta-studies (Eldevik et al., 2010; Makrygianni & Reed, 2010; Reichow, 2012).

Hence, age at intake is an uncertain predictor of outcome, and more research is needed to determine the extent to which age at intake is an important factor associated with improved outcome. Perhaps age of intake plays a greater role for interventions for infants and younger children, as compared to children approaching school age. This could be a topic for future research.

Social Engagement, Toy Interest, Preference Assessment, and Stereotyped Behavior

Since abnormalities in social interest and/or social skills are a core indicator of ASD, researchers have examined whether level of social engagement at intake may predict outcome. In a recent study, social approach, joint attention, and imitation were assessed through parent reports and behavioral observations. Results showed that social engagement at intake predicted higher cognitive scores and higher scores in adaptive functioning at outcome. Social engagement did not predict a reduction in autism symptoms at follow-up (Smith et al., 2015).

Children's interest in toys and routines before treatment starts has been assessed in a couple of studies. Klintwall, Macari, Eikeseth, and Chawarska (2015) assessed children's interest in toys, activities, and social routines during the administration of the Autism Diagnostic Observation Schedule (ADOS; Lord et al., 2000) and found that this was a strong predictor of change in cognitive skills and adaptive behaviors. In that study, social interest as measured by the ADOS did not predict outcome, in contrast to what was found in the Smith et al. (2015) study. In a similar study, Klintwall and Eikeseth (2012) assessed children's preferences for edible and tangible items, as well as their preference for engaging in stereotyped behavior. Results showed that children who preferred a higher number of different edible and tangible items had better treatment outcome as compared to the children who showed a preference for fewer items and that children who showed a higher number stereotyped behaviors had poorer treatment outcome as compared to those who showed fewer stereotyped behaviors.

Several other studies have shown that object interest and width of interest are important predictors of response to another type of behavioral treatment called Pivotal Response Treatment (Schreibman, Stahmer, Barlett, & Dufek, 2009; Sherer & Schreibman, 2005; Vivanti, Dissanayake, Zierhut, & Rogers, 2012; Yoder & Stone, 2006).

Hence, although several pretreatment variables have been found to predict outcome, the strongest and most reliable pretreatment predictor to date seems to be children's level of interest in objects and activities. Interestingly, there is less evidence for the predictive value of social interest and social skills.

Variables During Treatment: Early Response to Treatment

Another angle in the search for reliable predictors is to examine the extent to which factors identified early in treatment can be associated with outcome. Indeed, research suggest that initial response to treatment is such a factor (Lovaas & Smith, 1988). Weiss (1999) found that children who had the quickest acquisition of vocal imitation skills and the quickest acquisition of language comprehension skills early in treatment showed the best outcome after 2 years. Similar results were reported by Sallows and Graupner (2005) who used an "early learning measure" to predict which children would achieve test scores in the normal range by the end of treatment. Children who acquired verbal imitation within the first 16 months of treatment, or before the age of 42 months, all ended treatment with test scores in the normal range.

Recommendation for Future Research

Some general recommendations for future research may be considered. Firstly, whenever possible, the selection of putative predictors should be theory driven. For example, the study of social engagement as a putative predictor (e.g., Smith et al., 2015) is clearly theory driven, as it is consistent with, for example, the social motivation hypothesis of ASD (Dawson 2008). Secondly, predictors should be narrow and specific rather than broad. For example, since full-scale IQ has been associated with outcome, future research should aim to identify which items, index scores, or cognitive domains are responsible and which are not. Finally, putative predictors should be based on how the treatment works. For example, the edible and tangible items assessed in the Klintwall and Eikeseth (2012) study were stimuli that could be used as contrived reinforcers during treatment. That is, the higher the number of items that the children showed interest in, the larger the repertoire of putative reinforcers available for the therapists. Also, the stereotyped behaviors assessed in that study were repetitive behaviors that could interfere with intervention and hence hamper progress.

Optimal Delivery of the Intervention

Although EIBI is an evidence-based intervention (Eikeseth, 2009; Reicow & Wolery, 2009; Rogers & Vismara, 2008; Smith & Iadarola, 2015), there are still a number of issues that merit further research. For example, it is not yet clear what constitutes the optimal treatment intensity and intervention length. Also, since there is a great variability in individual children's response to the treatment, we need to learn more about how to individualize the treatment, as well as how to make the treatment more effective for those who respond less favorable to existing intervention. This is the topic of the following section.

Intensity of Treatment

Since EIBI is designed to address all of the individual child's deficit and excess behaviors rather than correcting the underlying cause(s) of the condition (which if corrected could result in a subsequent normalization of the children's behavior), it is reasonable to assume that the treatment must be intensive and long term to have optimal effects.

Lovaas (1987) provided 40 h of one-to-one intervention per week and reported that 47% of the preschool-aged children achieved normal cognitive and educational functioning at the time when they finished first grade in regular schools. Sallows and Graupner (2005) provided the same number of treatment hours, assessing children after 4 years of treatment. They found that children made a gain of 25 IQ points, 7 points in adaptive functioning, and that 48% achieved normal cognitive functioning and succeeded in regular classrooms at the chronological age of 7 years. Other studies have typically provided less intensive treatment, and results have also been somewhat mixed. Unfortunately, in these studies, treatment hours are typically confounded by other variables that can affect outcome such as treatment fidelity, intervention setting, parental involvement, and length of treatment.

Some studies have explored whether intensity of treatment may predict outcome. For example, Granpeesheh et al. (2009) found a correlation between number of intervention hours and mastered behavioral objectives during the first 4 months of EIBI. Reed, Osborne, and Corness (2007) compared high-intensity (30 h per week) with low-intensity (12 h per week) EIBI and found that the high-intensity group made significantly larger gains. In another meta-study by Eldevik et al. (2010), intensity of treatment was found to be the only consistent predictor of treatment outcome, as measured by improvement in both IQ and adaptive functioning, a finding replicated in a another meta-analysis by Makrygianni and Reed (2010).

Although there is some evidence for the notion that treatment intensity is an important treatment variable, existing research has a number of limitations, and to date, there are no experimental studies published, which have been designed explicitly to study low- versus high-intensive treatment. Hence, more research is needed to address the effects of treatment intensity on outcome. This is important because the intervention is labor intensive, long lasting, and costly, and hence, children may receive low-intensive treatment due to cost issues and staff availability. If such low-intensive treatment is ineffective, the savings obtained from reducing the number of one-to-one intervention may indeed prove to be more costly for the society because the lifetime cost of caring for individuals with ASD is high. An improvement in adaptive and independent skills may reduce these costs significantly. Moreover, the economical savings of having an individual move from being a receiver of social benefits to become a taxpayer (which may happen for some of the children receiving EIBI) are enormous. Another possibility is that the intervention in some cases may be too intensive and hence produce client "burnout" (Matson & Smith, 2008).

Length of Intervention

The length at which the intervention is provided is another variable that may affect outcome and hence be related to the question of optimal delivery of the intervention. Logically, the longer the time the child is exposed to a good learning environment, the more skills should the child learn.

Several studies have assessed children's cognitive skills at intake and then again every year for several years of intervention. Interestingly, these studies suggest that most treatment gains are made during the first year of treatment (Cohen et al., 2006; Eikeseth, Smith, Jahr, & Eldevik, 2007; Howard, Stanislaw, Green, Sparkman, & Cohen, 2014; Kovshoff, Hastings, & Remington, 2012; Sallows & Graupner, 2005). However, these studies also show that children continue to make gains after the first year of intervention albeit not as much as during the first year. For example, Howard et al. (2014) found that the children made a gain of 27 IQ points during the first year of intervention, then lost 2 IQ points during the second year of intervention, and gained 3 IQ points during the third year of intervention. Eikeseth et al. (2002, 2007) found that children increased their IQ score with 17 points during the first year of treatment and then made an additional gain of 8 points during the subsequent 2 years of intervention. Although the development was somewhat different across these two studies, the total IQ gain between intake and follow-up after approximately 3 year of intervention was almost identical, 28 points in the Howard et al. study and 25 IQ points in the Eikeseth et al. study. This is similar to other studies reporting outcome after 3 or more years (Sallows and Graupner (2005) and Cohen et al. both reported an IQ gain of 25). This data clearly shows that although children make most progress during the first year of treatment, they continue to excel in deployment as long as treatment is carried out, but it is not yet known what will happen if treatment is continued for more than 3–4 years. Hence, researchers should follow children for longer period and examine the extent to which children continue to improve with treatment and the extent to which improvement is sustained after treatment has ended.

Assessing adaptive skills, the data is similar to that of IQ, but gains in adaptive skills have been more modest as compared to IQ (Cohen et al., 2006; Eikeseth et al., 2007; Howard et al., 2014). Howard et al. (2014) found that the children made a gain of 9 points during the first year of intervention, then lost 1 point during the second year of intervention, and lost another 4 points during the third year of intervention. Eikeseth et al. (2002, 2007) found that children increased their adaptive score with 11 points during the first year of treatment and then made an additional gain of 1 point during the subsequent 2 years of intervention. The total gain adaptive behavior between intake and follow-up after approximately 3 years of intervention was 4 points in the Howard et al. study, 12 points in the Eikeseth et al. study, and 9 points in the Cohen et al. study.

It is unclear why children make lager gains in IQ and adaptive behavior during the first year of treatment, but several factors may be relevant.

Firstly, perhaps children are learning some test-taking skills early in treatment, such as sitting quietly during the assessment, attending to the test materials, listening and responding to the assessor, etc., and that this increase in compliance behavior improves overall performance. Secondly, perhaps improvement in test scores is made because the children have acquired some key skills other than compliance early in treatment and that these key skills have stronger effects on test scores as compared to the subsequent skills they acquired. Such skills may be improved language pre-academic skills such as completing puzzles, matching, and other problem-solving behaviors. One way of addressing this issue is to assess children's cognitive and adaptive skills several times (e.g., every 3 months) during the first say 18 months of intervention. It is also unclear why children are making more progress in IQ as compared to adaptive behavior, and this question could also be addressed in future studies. One possibility is that the curriculum has a stronger focus on skills assessed by cognitive test as compared to the skills involved in the instrument assessing adaptive behaviors.

Treatment Quality

Research has indicated that not all EIBI programs are equally effective (Bibby Eikeseth, Martin, Mudford, & Reeves, 2001; Eldevik, Eikeseth, Jahr, & Smith, 2006; Magiati et al., 2007). One reason for this may be that less effective programs do not meet the standards in terms of intervention quality. Intervention quality involves the extent to which the behavioral principles and methods are applied appropriately. Moreover, intervention quality involves the appropriateness of the child's curriculum, such as the extent to which the targets are appropriate to the child's skill level and learning style. Assessment of intervention quality may be conducted qualitatively, for example, by being site visited by experts in the field that are independent of the specific service provider. Such assessment can also be done quantitatively. However, additional research is needed on how to best assess the appropriateness of the child's curriculum and which skills to be assessed (Gould, Dixon, Najdowski, Smith, & Tarbox, 2011).

Supervision: Intensity and Quality

The extent to which programs are supervised by a competent clinician is another important variable that may be related to treatment quality and optimal outcome. A competent supervisor is required to have knowledge of advanced learning principles, which may be assessed through the Behavior Analyst Certification Board Examination. In addition, extensive clinical experience is required including experience of beginning, intermediate, and advanced programs designed to increase language, play, and social, emotional, academic, and daily living skills. Moreover, experience with different types of learners (e.g., auditory and visual learners, children exhibiting over-selective responding or extreme problem behaviors) is fundamental, so is supervised experience in designing and implementing individualized programs and knowledge of functional assessment and reinforcement procedures to reduce inappropriate behavior. A procedure for assessing supervisors' competency was validated by Davis, Smith, and Donahoe (2002; see also Eikeseth, 2010).

In addition to quality of supervision is the intensity in which qualified supervision is provided. Intensity of supervision may depend on circumstances such as costs, availability of specialists in early and intensive behavioral intervention, or other logistical issues. Two studies have reported supervision, on average, every 3 months (Bibby, Eikeseth, Martin Mudford, & Reeves, 2002; Magiati et al., 2007). Other studies have reported more frequent supervision such as up to 10 h per week (Eikeseth et al., 2002).

To date, only two studies have addressed associations between supervision intensity and outcome. Recently, Dixon et al. (2016) found an association between supervision hours and acquisition of learning objectives. However, the participants who received greater supervision hours typically also received a higher number of treatment hours, and when treatment hours and supervision hours were analyzed together, the number of treatment hours contributed more strongly to the acquisition of learning objectives as compared to the number of supervision hours. The study also identified a strong relation between supervisor competency and acquisition of targets and a relation between the supervisors' experience and acquisition of targets. A stronger association between intensity of supervision and outcome was reported by Eikeseth, Hayward, Gale, Gitlesen, and Eldevik (2009). In that study, intensity of supervision ranged from 3 to 8 h per month per child, and significant correlation was found between supervision intensity and improvement in IQ.

It is possible that the effect of supervision may not be linear. That is, a relative low intensity in supervision may produce little or no benefit; a certain level of intensity may yield optimal effect, while increasing supervision beyond this point may add little benefit above the optimal level. Also, what constitutes the optimal level of supervision may vary from child to child and depend on child characteristics, parental involvement, and the competency of the therapists.

Parental Involvement and Parental Stress

In EIBI programs, parents are trained on intervention methods to become co-teachers for their child. They also learn how to manage the child's challenging behaviors and how to help the child use the skills he or she has learned in everyday life. Parents are also taught how they can maintain a good family environment and how to care for siblings. If parents are able to become skilled "therapists," they may extend the intervention into the child's everyday life, and this may increase the intensity of the intervention and provide numerous opportunities for working on generalization and maintenance of newly acquired adaptive skills.

One meta-analysis has found an association between parent training and outcome (Makrygianni & Reed, 2010), but to date, no studies have examined experimentally the role of parental involvement in EIBI. Hence, further research is needed to assess the effects of parental involvement on child outcome and to develop effective parent training strategies (Strauss et al., 2012).

Several studies have shown that parents of children with ASD report higher levels of stress as compared to parents of typically developing children or parents of children with other disabilities (Bouma & Schweitzer, 1990; Hastings & Johnson, 2001; Silva & Schalock, 2011; Zablotsky, Bradshaw, & Stuart, 2013). In addition to increased levels of stress, mothers of children with ASD are at greater risk for persistent mental health problems, including depression (Glidden & Schoolcraft, 2003; Montes & Halterman, 2007). Higher levels of stress in parents of children with ASD may be due to the prevalence of problem behaviors associated with the disorder (Hastings & Beck, 2004; Hastings & Johnson; McStay, Dissanayake, Scheeren, Koot, & Begeer, 2013) or to children's lower intellectual and adaptive functioning (Rivard, Terroux, Parent-Boursier, & Mercier, 2014). A recent study assessed changes in stress levels in parents after receiving EIBI (Eikeseth, Klintwall, Hayward & Gale, 2015). Results showed that both mothers and fathers reported elevated parental stress before the EIBI program started, which is consistent with previous investigations (e.g., Bouma & Schweitzer; Lecavalier, Leone, & Wiltz, 2006; McStay et al., 2013; Silva & Schalock, 2012; Zablotsky et al., 2013). Results also showed that levels of stress for mothers decreased significantly after 1 year of EIBI, but decreases in fathers' scores were not significant. Intake parental stress was neither associated with intake scores (IQ or intake adaptive functioning) nor was it associated with outcome. This finding is consistent with that reported by Shine and Perry (2010). With only a couple of studies published so far, research on changes in parenteral stress as a function of EIBI and research on the importance of parental involvement in EIBI outcome are still in its infancy.

Improving Effectiveness of Treatment Procedures

Another important line of research is to increase effectiveness of the treatment procedures currently used in EIBI. What follows is a review of some topics that are central for improving the effectiveness of EIBI, starting with discrimination training.

Improving Effectiveness of Discrimination Training

Discrimination training concerns how teaching trials are structured to optimize learning. Some of the seminal work on discrimination training with individuals with ASD in applied settings was conducted in the 1960s and 1970s by Lovaas, Schreibman, and colleagues, when they developed and evaluated procedures to teach communication and imitation to individuals with ASD (Lovaas, 1977; Lovaas, Berberich, Perloff, & Schaeffer, 1966; Lovaas & Newsom, 1976; Lovaas, Schreibman Koegel, & Rehm, 1971; Schreibman, 1975). Today, procedures to establish discrimination and stimulus control are central to EIBI, and analysis shows that relatively simple skills (e.g., receptive identification of objects) may involve complex discriminations (Eikeseth, Smith, Klintwall, 2014). Even so, after these studies were published in the 1960s and 1970s, not much applied research has been conducted to evaluate and develop more effective discrimination training procedures, for example, to teach language comprehension. Likely, the most common discrimination training procedure used today is identical or similar to the one developed in the 1970s (Lovaas) and outlined more recently by Lovaas (2003). This procedure is designed to break down the discriminations into multiple, less complex steps and to introduce steps to gradually increase the complexity of the task as the simpler discriminations are acquired. When teaching receptive labeling of objects, for example, training consists of teaching the child to respond correctly when a particular object is requested (i.e., object one). Next, the child is taught to respond correctly when another object is requested (object two). After mastery of these two first steps, the teacher starts to request object one and object two in a semi-random and, finally, in a random order. The structure of those trials is typically based on an error analysis of the child's performance.

Some investigators have suggested that all of the steps before presenting the stimuli in a random order should be omitted. This is because the initial steps may likely establish error patterns that hamper subsequent learning of the discrimination (Green 2001). This hypothesis was supported by Grow, Carr, Kodak, Jostad, and Kisamore (2011) and Holmes, Eikeseth, and Schultze (2015). Both studies showed more rapid acquisition of receptive labeling skills when stimuli were presented randomly from the beginning of the training. In these studies, however, all participants had already acquired a number of receptive labels before entering the study. Future research could use participants who have not yet learned any receptive labels and examine whether these children also respond best to the random rotation procedure.

Which type of discrimination training procedure that is more effective may also depend on the complexity of the skill taught. For example, it is possible that one procedure is more effective in teaching a "simple skill" to a particular participant, whereas the other procedure is more effective in teaching a more complex discrimination in the same participant. Future research could explore these possibilities.

Other procedures to facilitate discrimination have been evaluated such as revised blocked-trial procedure (Smeets & Striefel, 1994), combined blocking procedure (e.g., Perez-Gonzalez & Williams, 2002; Williams, Perez-Gonzalez, & Queiroz, 2005), and sound discrimination (Eikesth & Hayward, 2009). Clearly, discrimination and stimulus control are essential in EIBI, and more research is needed in this area.

Discrete Trial Teaching Versus Naturalistic Teaching

Another important topic for research is whether teaching skills in child-led naturalistic settings is more effective than teaching the same skills during discrete trial teaching. Potential advantages of discrete trial teaching are that stimulus programming can be planned and structured, specific prompt-fading procedures can be used, and potent reinforcer can be programmed. The potential advantage of naturalistic child-led teaching is that the child's attention and motivation may be stronger as compared to discrete trial teaching because the child is initiating the interaction with the teacher and not the other way around. Also, in naturalistic child-led teaching, the reinforcer is the natural consequence that the behavior produces, such as getting to play with the horse after requesting it. This type of teaching may also more likely be followed by generalization.

In one study, Delprato (2001) reported larger gains for children who received naturalistic teaching as compared to discrete trial teaching. However, perhaps discrete trial teaching is more effective for teaching basic skills such as motor and vocal imitation, and naturalistic child-led interventions are more efficient for teaching generalized language use and to expand a basic behavioral repertoire (Schreibman, Dufek, & Cunningham, 2011; Smith, 2001). In any case, when conducting such studies, it is pertinent that the interventions compared are at a gold standard, and it is unclear whether this was the case in the Delprato (2001) study. Clearly, additional research to study child-led naturalistic teaching and discrete trial teaching is necessary.

Establishing Social Stimuli as Reinforcers

Because social stimuli typically do not function as a reinforcer for the behavior of children with ASD (Ferster, 1961), it is important to develop effective interventions to increase the children's preference for social stimuli. Classical and operant conditioning may be used to give social stimuli properties as preferred stimuli, by establishing the social stimuli as conditioned reinforces. This can be done by paring the social stimuli with other stimuli that already function as strong reinforcers, with the result that the previously neutral social stimulus becomes reinforcing. Research suggest that an effective procedure to do so is to present the neutral social stimulus to the child, require the child to make a specific response in the presence of the neutral social stimulus, and finally reinforce that response with potent reinforcer (Dozier, Iwata, Thomason-Sassi, Worsdell, & Wilson, 2012; Holth, Vandbakk, Finstad, Grønnerud, & Akselsen Sørensen, 2009; Isaksen & Holth, 2009; Lauten & Birnbrauer,1974; Lovaas et al., 1966; Taylor-Santa, Sidener, Carr, & Reeve, 2014). In this way, a number of social stimuli such as verbal statements and facial expressions (e.g., smile and nodding) may be conditioned to become reinforcers and preferred stimuli (c.f., Isaksen & Holth). Indeed, Maffei, Singer-Dudek, and Keohane (2014) showed that after establishing the behavior of observing faces and listening to voices as conditioned reinforcers, the participants with ASD demonstrated increased attention to the presence of a person, listened and responded to instructions more readily, and showed increased learning. Greer, Pistoljevic, Cahill, and Du (2011) found that after adult voices had been established as conditioned as reinforcers, orientation toward adult voices and listening to adult voices increased in free-choice settings. Also, after establishing the adult voices as conditioned reinforcers, the participants required fewer teaching trials to master tasks involving verbal instructions.

In contrast to social stimuli, certain nonsocial (sensory) stimuli may function as potent reinforcers for the behaviors of children with ASD. Possibly, these reinforcers may compete with social reinforcers in such a way that a child engages in stereotyped behaviors (such as hand flapping to produce sensory reinforcers) rather than in social behaviors (such as joint attention behavior to produce social reinforcement).

The research on social reinforcement is important and promising, but more research is needed to refine procedures to establish social stimuli as reinforcers, as well as to investigate ways to maintain the reinforcing properties of the social stimuli over time once they are established. Also, research could focus on discovering procedures for reducing the reinforcing effects of nonsocial (sensory) stimuli.

Language Interventions

Language interventions are a central part of EIBI. Children with ASD often require explicit teaching to learn language and communication. One type of language intervention which recently has received attention from researchers is teaching *intraverbal behaviors*, such as answering question "how are you?" with "fine" and saying "car" in response to hearing "you drive a…?" Together with other verbal operants (echoic, mand, tact), intraverbal behavior forms an important part of a person's ability to engage in appropriate social interaction, enabling them to answer questions and have conversations. While typical children acquire intraverbal behavior without explicit training, children with ASD may learn intraverbal behavior only after specific programming (Sundberg & Sundberg, 2011).

To examine ways in which children with ASD can be more successfully taught intraverbal behavior, one line of research has focused on procedures that enable transfer of stimulus control from a stimulus that is already known to exert control over the verbal response (the prompt) to the target antecedent stimulus for the intraverbal response. The intervention involves fading the prompt so that the target intraverbal response comes under the control of the target verbal antecedent stimulus complex. Prompts involve vocal (echoic) prompts (Ingvarsson & Hollobaugh, 2010; Ingvarsson, Tiger, Hanley, & Stephenson, 2007; Pérez-González, García-Asenjo, Williams, & Carnerero, 2007; Petursdottir, Carr, Lechago, & Almason, 2008; Secan, Egel, & Tilley, 1989; Watkins, Pack-Teixeira, & Howard, 1989), picture prompts (Braam & Poling, 1983; Goldsmith, LeBlanc, & Sautter, 2007; Luciano, 1986; Miguel, Petursdottir, & Carr, 2005), or textual prompts (Krantz & McClannahan, 1993, 1998; Sarokoff, Taylor, & Poulson, 2001; Thiemann & Goldstein, 2001).

Only a few studies, however, have directly compared the efficacy of different prompting tactics (Finkel & Williams, 2001; Ingvarsson & Hollobaugh, 2011; Vedora, Meunier, & Mackay, 2009). Ingvarsson and Hollobaugh (2010) compared the efficacy of echoic prompts and picture prompts and found that although both types of prompts were effective in teaching intraverbal responses to children with ASD, picture prompts resulted in fewer trials to mastery. Similar results have been reported in two studies comparing the efficacy of textual prompts and echoic prompts (Finkel & Williams, 2001; Vedora et al., 2009).

Interestingly, the participants' idiosyncratic learning history may affect which type of prompt is more effective. Ingvarsson and Le (2011) showed that echoic prompts were more efficient at teaching intraverbals to children with ASD than picture prompts and suggested that this may have been because the participants in their study had a history of receiving echoic prompts in their daily teaching programs. This hypothesis was supported in a study by Coon and Miguel (2012) who showed that the prompt procedure most recently used to teach intraverbal behavior was more effective in teaching new intraverbal behavior, when compared to prompt procedures not used recently.

Another recent line of research has shown that children with ASD may "work out" the answer for new, untaught questions after learning to answer some other questions (Pérez-González et al., 2007; Grannan & Rehfeldt, 2012; May, Hawkins & Dymond, 2013). For example, May et al. (2013) found that adolescents with ASD were able to answer untaught question such as "what food does Simon eat?" and "which monster eats chips?" after learning to answer other related questions such as to say "Simon" when asked "what is the name of this monster?" (while shown a picture of the monster Simon) and to learn to say "chips" when asked "what food does this monster eat?" (also while shown a picture of the monster Simon).

Another possibility is that teaching certain receptive language skills may facilitate the acquisition of intraverbal behavior. Recently, Smith et al. (2016) showed that emergent intraverbal forms occurred for children with ASD after they had learned certain receptive skills. For example, the children were able to say “tomato” when asked, “what do you eat that is red?” after learning to point to the object tomato when hearing, “what do you eat that is red?” Other studies, however, have failed to show acquisition of intraverbal behavior as a result of receptive training (Miguel et al., 2005; Petursdottir et al., 2008; Petursdottir, Olafsdottir, & Aradottir, 2008; Petursdottir & Haflidadottir, 2009). Hence, more research of this type is warranted (c.f., Eikeseth & Smith, 2013).

Durability of Improvements Over Time

Typically, EIBI programs begin in preschool years; are initially home based or kindergarten based, with one-to-one teaching; and later include a gradual integration into preschool and school settings. As the children grow older, provision is adapted based on age and ability. Adaptations may include greater emphasis on different parts of the curriculum, such as academic and social skills for those children progressing in school and functional independence skills in the home and the community for those children who learn at a slower rate. This treatment can continue as the child becomes older, to teach further age-appropriate skills, and many EIBI programs continue in this way. This is because the principles and techniques used in EIBI are effective for learners of different ages (Heinicke & Carr, 2014; LeBlanc, 2010) and are not diagnosis specific (Eldevik, Jahr, Eikeseth, Hastings & Hughes, 2010; Smith, Eikeseth, Klevstrand & Lovaas, 1997). EIBI programs can continue at the same intensity or may be reduced or phased out if the child is able to learn in a typical environment. Full-time behavioral intervention can be the main educational provision through school-age years and continue as a lifelong provision.

Most outcome studies conducted to date have measured progress in children with ASD following a period of EIBI treatment of 1–4 years (c.f., Smith et al., 2000; Eikeseth et al., 2007; Howard, Sparkman, Cohen, Green & Stanislaw, 2005; Cohen et al., 2006; Remington et al., 2007). Only a couple of studies have assessed children sometime after an EIBI program has been terminated. In one such study, Kovshoff, Hastings, and Remington (2011) found that although a EIBI group scored significantly higher on IQ, language, and daily living skills compared to a comparison group after 2 years of EIBI, these differences were no longer present 2 years after the program had ended, suggesting that gains may not be sustained over time when services are terminated. Some of the participants in the EIBI group had received a university-managed EIBI program, whereas the other participants in the EIBI group had received a parent-managed EIBI provision. A post hoc analysis showed that the children who had received the university-managed provision typically lost their gains after the treatment had ended, while the gains were maintained for the children who had received the parent-managed provision. Perhaps the parental involvement was greater in the parent-managed EIBI group as compared to the university-commissioned group, and children in the former group maintained their gains because the behavioral intervention continued for those programs that were parent managed (Kovshoff et al., 2011). This could be a topic for further research.

McEachin, Smith, and Lovaas (1993) reported follow-up results on a group of 19 children with a mean age of 11.5 years who were originally the experimental group in a study conducted by Lovaas (1987). Lovaas reported that the children who received EIBI made more gains than children in the control group, and McEachin, Smith, and Lovaas reported that these children had maintained their gains. This is the oldest group of children studied to date, and results suggest, in contrast to the Kovshoff et al. (2011) study, that gains made during EIBI can be maintained. Hence, there is an urgent need for additional follow-up research in adolescence and adulthood to examine the extent to which treatment gains are maintained over a long period of time, whether certain types of maintenance treatment are required, and which children will succeed without such maintenance treatment and who will not.

EIBI's Effects on Behaviors Other Than Cognitive and Adaptive Skills

Although outcome measures typically have involved IQ and adaptive functioning, other outcome measures have also been employed when evaluating EIBI, such as a measure of autism symptoms, behavioral problems, and social skills.

A few studies have shown that EIBI may result in the reduction of autism symptoms, as assessed by the Autism Diagnostic Instrument-Revised (ADI-R; Lord et al., 1994; Sallows & Graupner, 2005), the Childhood Autism Rating Scale (CARS, Schopler, Reichler, & Renner, 1986; Eikeseth et al., 2012), and the Autism Diagnostic Observation Schedule (ADOS, Lord, Rutter, DiLavore, & Risi, 1999; Ben-Itzchak et al., 2007). One study found no significant difference in the reduction in autism symptoms as result of EIBI (Remington et al., 2007), as measured by the Autism Screening Questionnaire (Berument, Rutter, Lord, Pickles, & Bailey, 1999).

Also, improvement in social behavior, joint attention, play, and imitation, as well as a reduction in maladaptive behaviors, aggressive behaviors, and stereotyped behaviors, as a result of EIBI has been reported (Ben-Itzchak & Zachor, 2007; Cohen et al., 2006; Eikeseth et al., 2007; Remington et al., 2007), but most studies to date have not included such measures. Hence, future outcome research should be designed to include such measures.

Comparing EIBI with Alternative Behavioral and Reinforcement-Based Approaches

A number of other comprehensive behavioral programs exist (Smith & Iadarola, (2016), most notably is the Early Start Denver Model (ESDM), which integrate behavioral strategies with developmental social-pragmatic models. The ESDM has been evaluated in a well-designed randomized controlled trial (RCT, Dawson et al., 2010). Results showed that ESDM resulted in significant improvement in cognitive and adaptive behavior, but only small, nonsignificant effects on ASD symptoms. Increases in cognitive and adaptive function for the ESDM children after 2 years of intervention were 17.6 and –0.85, respectively.

LEAP is a behavioral program that integrates children with ASD with typically developing peers in early typical education settings. LEAP has been evaluated in a well-designed RCT. Results showed that after 2 years of intervention, LEAP had moderate, beneficial effects on ASD symptoms and large, positive effects on cognitive, language, and social interaction as compared to the comparison group (Strain & Bovey, 2011).

The Pivotal Response Training (PRT; Koegel et al., 1989) is a naturalistic intervention that aims to establish key or "pivotal" responses that, when acquired, have the potential to improve performance across many other skill areas. PRT has been successful for teaching a variety of skills and particularly for reducing social deficits (Koegel, Koegel, Shoshan, & McNerney, 1999; Kuhn, Bodkin, Devlin, & Doggett, 2008), but controlled group studies and systematic reviews are available only for spoken communication.

The Princeton Child Development Institute model (Fenske, Zalenski, Kranz, & McClannahan, 1985) is another behavioral approach with documented support from numerous single-subject studies of children with ASD, but controlled group studies are not yet available.

Hence, EIBI is one of the several comprehensive behavioral interventions that can benefit children with ASD. Clearly, however, EIBI is the service model that is best researched and best documented (Smith & Iadarola, 2016). Because EIBI has already been established as effective, EIBI may be used as a benchmark or as a comparison condition when evaluating other treatment models.

Adapting the Model to Different Settings and Populations

Treatment Settings

Originally, EIBI was designed as a home-based program, where children received intensive one-to-one treatment at home before they entered school. An important reason for starting the intervention at home was to establish certain prerequisite skills that the children needed to know in order to succeed in school. The school then became the arena for mainstreaming the child with regular peers by gradually fading the treatment step by step to determine the minimal level of support needed to function in and learn from the school environment. For some children, the behavioral intervention gradually faded out because the child was able to learn from regular education.

In Scandinavia as well as in other countries, children enter kindergarten at an earlier age as compared to children in the USA. This is also the case for children with special needs such as ASD. Hence, typically, when children with ASD are referred for treatment, they already have a place in a kindergarten or preschool for typically developing children, and in addition, a special education resource has been allocated specifically for the child. For those and perhaps other reasons, the arena for EIBI has in some countries become the kindergarten or preschool rather than the home setting. EIBI has been evaluated in these settings, and outcome from school-based programs seems comparable to effects obtained from home programs in the USA (c.f., the comparison above between the Howard et al. (2014) and the Cohen et al. (2006) studies which were home-based to the school-based study by Eikeseth et al. (2002, 2007)). However, there has been no studies designed to compare differences between home-based programs and school-based programs, and until this research has been done, no firm conclusions can be drawn regarding whether they are equally effective or not. There might be other differences between school-based programs and home-based programs, which also merit further research. For example, it is unclear whether treatment goals may differ across the different treatment settings and cultures.

A potential advantage with school-based interventions is that a large number of typically developing peers and a large number of teachers are available for practicing generalization and maintenance. Moreover, school-based programs may provide more training on how to function in social settings and provide a larger focus on eating and mealtime behaviors, as well as focusing on certain daily living skills such as dressing and following routines. A potential disadvantage with the school-based intervention may be that it reduces parental involvement (see below), which is considered a key factor in EIBI. Again, these speculations need to be validated empirically and hence could be topics for future research.

EIBI for Other Populations

EIBI is designed specifically to target the behavioral excesses and deficits exhibited by individual children, and the intervention is tailored to replace such deficit and excess behaviors with functional and adaptive skills. Hence, EIBI is not designed to address “autism” per se or the “cause of autism” (Lovaas, 2003). For those and other reasons, it can be hypothesized that EIBI may be effective for other types of neurodevelopmental conditions as well.

To date, only two outcome studies have examined the effects of EIBI for non-autistic populations, both addressing intellectual disabilities. Smith, Eikeseth, Klevstrand, and Lovaas (1997) evaluated the effects of EIBI provided to 11 children with severe intellectual disabilities. A comparison group of ten children received minimal treatment. Groups were similar on all measures at intake, with a mean age at intake of 3.08 years and mean intake IQ of 28. The mean IQ gain for the EIBI group after a minimum of 24 months of intervention was 8 points, while the comparison group, on average, lost 3 IQ points over the same period. Moreover, children in the EIBI group acquired more expressive language than children in the comparison group. Hence, EIBI may result in meaningful gains for preschool-aged children with severe intellectual disabilities, although the children in the study remained significantly developmentally delayed.

Eldevik et al. (2010) evaluated the effects of EIBI for children with mild to moderate intellectual disabilities. Eleven children received 10 h per week of one-to-one EIBI. The mean intake age for this group was 54 months, and the mean intake IQ was 56. Fourteen children with a mean intake age of 46 months and a mean intake IQ of 50 received treatment as usual and constituted the comparison group. After 1 year of intervention, changes in intelligence and adaptive behavior scores were statistically significant in favor of the EIBI group (effect sizes of 1.13 for IQ change and 0.95 for change in adaptive behavior composite). Children in the EIBI group gained an average of 16 IQ points and 3 points in adaptive behavior. Sixty-four percent of the children in the EIBI group met the criteria for reliable change in IQ, as compared to 14% of the comparison group.

The results from these two studies give some support for the notion that EIBI may be effective for populations other than children with ASD. However, additional research is needed to further examine this possibility, preferably using a RCT design.

Mediators of EIBI

Can Reinforcement Be Used to Understand and Treat ASD

Since reinforcement is central to EIBI, the question arises as to whether reinforcement may not only be a key to treating ASD but also could be a key to the understanding of ASD. Over the past decade, there has been a great deal of research on infants at risk of developing ASD. The aim of this research has been to identify biological and/or behavioral markers that reliably predict later onset of ASD. Using eye-tracking technology, Jones and Klin (2013) assessed eye fixation in infants later diagnosed with ASD and compared the results to that of typically developing infants. Between 2 and 6 months of age, infants who later received a diagnosis of ASD begun fixating less on the eye regions of the adult and more on other regions such as the mouth, body, and objects in the environment, when compared to the typically developing infants. In another landmark, eye-tracking study by Pierce, Conant, Hazin, Stoner, and Desmond (2011) found that 40% of the participants with ASD preferred looking at geometric patterns rather than the social stimuli, compared to only 2% of typically developing peers. If a toddler spent more than 69% of his or her time fixating on geometric patterns, then the positive predictive value for accurately classifying that toddler as having an ASD was 100%.

These studies do not only show that participants with ASD show less preference for social stimuli, as previously suggested by Ferster (1961) and others; they also demonstrate that participants with ASD show an increased preference for nonsocial stimuli. This occurs most likely because the different types of stimuli have different reinforcement valence for the behavior of infants with a subsequent ASD diagnosis, as compared to typically developing infants and infants with developmental delays. Note that others (most notably Lovaas, Newson, & Hickman, 1987) have used the term *sensory* reinforcers to denote the type of stimuli here referred to as nonsocial reinforcers.

These findings have occasioned a nonsocial reinforcement hypothesis of ASD (Eikeseth, 2016), which asserts that infants develop ASD largely because they – for some yet unknown biological reasons – have an affinity for nonsocial (sensory) reinforcers, in contrast to typically developing children who have an affinity for social reinforcers. Nonsocial (sensory) reinforcers may select autistic behavior by reinforcing looking at geometrical patterns in the environment, moving objects, and listening to nonverbal sounds and sounds that are synchronized with movements, rather than attending to the eyes and voice of caregivers, as seen in typical development. As the infants acquire more advanced motor skills, nonsocial (sensory) reinforcers will not only select looking; they will also select a more advanced repertoire of repetitive and stereotyped behaviors such as hand flapping, object twirling, lining of objects, ear cupping, rocking, spinning of body, pacing, toe walking, repeatedly switching lights on and off, etc., all of which are defining characteristics of ASD. Hence, the increased operant control of fingers, hands, arms, and feet makes additional contingencies possible, and these contingencies may lead to stereotyped and repetitive behaviors (e.g., toe walking and spinning of body are possible after learning to walk).

Hence, if nonsocial (sensory) stimuli are more reinforcing than social stimuli, the environment will select stereotyped and repetitive behaviors over social behavior. Verbal operants such as tacts and intraverbals are shaped and maintained by social reinforcement and are often missing or delayed in children with ASD. Echoic behavior, which is more often seen in children with ASD, does not require the same type of social reinforcement since copying a stimulus may be reinforcing in itself. In children with a slightly different nervous system (such as children with ASD), the affinity for nonsocial stimuli at the expense of the affinity for social stimuli may result in a subsequent negative spiral in acquiring social interests, language skills, and social behaviors. Slight differences early in life in affinity for nonsocial stimuli can also have negative effects on the establishment of previously neutral stimuli as conditioned reinforcers, which in turn will hamper the development of language, social skills, and social interests.

For typically developing infants, in contrast, the highly potent social reinforcers will select fixation to the eye regions of adults and attentive listening to human voices. The social reinforcers will subsequently shape additional social skills such as social smiling, imitation, and babbling, which in turn are behavioral cusps that bring the infant into additional social contingencies that increase the complexity of the social interaction between the infant and the caregivers. This in turn provides the infant with additional social consequences. This type of early social dyad between the parent and the infant is highly reinforcing also for the caregivers. These social contingencies will select increasingly advanced types of social skills, such as joint attention, and more advanced social communication behaviors that in turn produce a wider range of social reinforcers. The change in child behavior leading to a change in parent behavior in turn leading to change in child behavior and so on is often referred to as transactional model of development (Novak & Pelaez, 2004). The behavior of the infant changes, and so does the behavior of the parent, and this transaction conditions previously neutral social stimuli such as body language and various facial expressions as reinforcers (Eikeseth, 2016).

According to the nonsocial reinforcement hypothesis of ASD, the key to treat or even prevent ASD is to decrease the infants' affinity for nonsocial (sensory) reinforcers and to increase their affinity for social stimuli. Logically, both biological and behavioral interventions could achieve this. Behaviorally, intervention should not only focus on establishing social stimuli as reinforcers but also aim to reducing the reinforcing valence of nonsocial stimuli.

To support the nonsocial reinforcement hypothesis of ASD, it needs to be demonstrated that children with ASD (or better yet infants who later develop ASD) not only prefer looking at nonsocial stimuli but that they also are willing to work harder to obtain nonsocial (sensory) reinforcers as compared to social reinforcers.

EIBI, Behavior Change, and Collateral Changes in Neurobiology

This vast improvement in functioning shown by some children with ASD as a result of EIBI creates a valuable opportunity to study behavior-brain interactions. Corresponding changes in brain activation or brain functioning with the achievement of improved or normal behavioral functioning as a result of EIBI, however, have not yet been demonstrated. A chief reason for this is that current scanning technologies such as functional magnetic resonance imaging (fMRI) cannot be applied to most children with ASD as the children move their heads excessively confounding the results and/or are afraid to go into the MRI scanner.

EEG is another type of technology that can be used to study changes of brain activity, and this procedure is more available and less invasive, as compared to fMRI. Yet, there has been no studies examining the extent to which changes in cognitive and adaptive functioning after EIBI are associated with changed patterns of brain activity. However, Dawson et al. (2012) examined changes in EEG activity for children with ASD who participated in an outcome study evaluating the effects of the ESDM. Event-related potentials were measured during the presentation of two conditions: faces and objects. Results showed that the ESDM group and typical children showed a shorter latency and increased cortical activation when viewing faces, whereas the community intervention group showed the opposite pattern. Greater cortical activation while viewing faces was associated with improved social behavior, suggesting that behavioral intervention may affect brain activation.

Recently, an alternate imaging tool has been available, and this scanning technology provides much of the same information as fMRI but without the constraints of head motion and fear. This scanning technology is called functional near-infrared spectroscopy (NIRS), it is relatively inexpensive, and it has been extensively used in infants to examine brain activation.

NIRS includes wearing a net or a headband of optical sensors on the head. The equipment is portable and does not have any safety risks. To assess blood flow in the brain, NIRS uses a low-power light source with detectors that see how the light changes as it passes through the brain tissue. Brain blood flow can indicate which parts of the brain are active during different tasks.

So far, there has been only a few studies published using NIRS in children with ASD (c.f., Mori et al., 2015; Keehn, Wagner, Tager-Flusberg & Nelson, 2013; Kita et al., 2011). Research using NIRS technology could examine the extent to which children receiving normal functioning as a result of EIBI show corresponding normalized patterns of brain activity. More fine-grained analysis could examine the extent to which acquisition of specific receptive, expressive, and social skills may result in corresponding normalized patterns of brain activity. Another line of research using NIRS technology can be to examine brain activation when exposing children with ASD and typically developing children to social and non-social stimuli. As of now, this is a vide open field of research, and almost any form of data integrating EIBI and changes or normalization in brain activation is of great importance and of vast interest.

Concluding Remarks

Although EIBI is widely used and well documented, there are still a well of questions to be asked. Also, much of the research discussed in the current paper is data in need of replication. This is because much of the research is based on noncontrolled studies, quasi-random studies, and/or ad hoc analysis of data obtained from studies designed to assess something else, such as when searching for predictors ad hoc in a study designed to evaluate outcome. This may be an important reason for why many conflicting results are reported. Thus, future research should not only attempt to answer questions such as the ones outlined in this chapter but also strive to use a more stringent experimental methodology than generally has been the case until today.

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Social Skills Training for Children and Adolescents with Autism Spectrum Disorder

14

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Introduction

Social skills may be defined as a set of verbal and nonverbal behaviors that allow an interaction between two or more people to be mutually beneficial and reinforcing (Morgan & Jenson, 1988). Indeed, social skills may best be conceptualized functionally as behaviors that maximize the potential for reinforcement during social interactions while simultaneously minimizing the possibility of unfavorable responses (e.g., Elliott, Racine, & Busse, 1995). Effective use of social skills not only allows an individual to contact favorable consequences but also allows an individual to be perceived as similar to their peer group—more so than simply possessing appropriately developed academic skills (Greenspan, 1980).

Much like academic skills, social skills represent learned behaviors (Elliott et al., 1995). For most individuals, acquisition of social skills does not require explicit instruction. Instead, social skills are naturally acquired and shaped through observation and interaction with others (e.g., Whalon, Conroy, Martinez, & Werch, 2015). Children with autism spectrum disorder (ASD), however, do not naturally acquire these skills. Although the underlying cause of social deficits in ASD is not yet well understood (Weiss, LaRue, & Newcomer, 2009), researchers have identified common features of social deficits in individuals with ASD.

Social Deficits in Autism Spectrum Disorder

Social skills deficits represent a defining characteristic of individuals with ASD, regardless of language or cognitive abilities (Carter, Davis, Klin, & Volkmar, 2005). The social impairments of individuals with ASD are diverse but can be placed within two broad social skills deficit categories, which include verbal and nonverbal deficits. Verbal social skills deficits include, for example, difficulty sharing conversations (Elder, Caterino, Chao, Shacknai, & DeSimone, 2006), maintaining conversations (Gutstein & Whitney, 2002), and poorly regulated speech prosody (Starr, Szatmari, Bryson, & Zwaigenbaum, 2003). Among nonverbal social skills deficits, individuals with ASD have difficulty recognizing facial expressions (Celani, Battacchi, & Arcidiacono, 1999), use poorly regulated eye contact (Pelios & Lund, 2001; Senju & Johnson, 2009), and have difficulty establishing joint attention (Willemsen-Swinkles, Buitelaar, Weijen, & van Engeland, 1998).

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Deficits of discrete verbal and/or nonverbal communicative behaviors make it difficult for individuals with ASD to engage in fluid reciprocal social interactions with others. Individuals with ASD are less likely to initiate interactions, typically respond to fewer interactions from others, and typically interact with others for less time than their counterpart typically developing peers (McConnell, 2002). As a result, individuals with ASD are at increased risk for social isolation, peer rejection (Chamberlain, 2001), and comorbid diagnoses of depression and anxiety (Bellini, Peters, Benner, & Hopf, 2007; Tantam, 2003). The development of comorbid disorders may be represented by coexisting disruptive behaviors such as aggression toward others, tantrums, or self-injurious behavior, each of which interfere with the natural development or strategic teaching of competent social skills. In addition, it is unlikely that these deficits will remit naturally. If left untreated, social skills deficits are likely to persist into adolescence and may become more obvious as the individual is required to enter increasingly complex social settings (Tantam, 2003).

Categories of Social Skills Deficits

There are several reasons for which an individual may not exhibit a particular social skill in a specific social setting. Gresham and Elliott (1987) outlined four categories of social skills deficits that impact an individual's ability to learn and demonstrate specific skills in generalized contexts. *Skills deficits* represent the absence of a particular skill within the individual's behavioral repertoire. *Performance deficits* are evident when the individual does have the target skill within their repertoire but does not reliably demonstrate the skill when expected to in a social setting. Insufficient motivation to demonstrate a target skill is a common contributor to performance deficits. However, deficiencies in social skills development or demonstration may not always be a result of insufficient motivation or lack of social interest. Even when individuals have the ability to use specific social skills, they may simply have an inability to recognize environmental cues that typically "trigger" when a particular social skill should be used (Bauminger, 2003; Mesibov, 1984).

Self-control skills deficits occur when the individual has difficulty learning a target skill due to emotional arousal that blocks the acquisition of the target skill. Emotional arousal may be demonstrated by engagement of disruptive behaviors that are often incompatible with the target skill. Finally, *self-control performance deficits* are demonstrated when the individual has learned the target skill but is unable to reliably demonstrate the skill because of emotional arousal and the individual's inability to mitigate or override this arousal. Gresham (1981) contributed an additional deficit category when he described fluency deficits. *Fluency deficits* are demonstrated when an individual has the ability to demonstrate the target skill and is motivated to do so but does so in an awkward fashion. In many cases, it may be left to the practitioner to determine and define what constitutes fluent use of a social skill.

With the pervasiveness, persistence, and specific types of deficits in mind, researchers have evaluated many approaches rooted in applied behavior analysis for promoting social skills development. The mechanisms of action facilitating the effects of social skill interventions typically include a combination of observation, modeling, and repeated trials for skill rehearsal, accompanied with positive and/or corrective feedback (Elliott, Roach, & Beddow, 2008), but the extent to which each one of these intervention components are emphasized during treatment is based on the type of social skills deficit the individual presents with. There are many different available social skill interventions, which is the most frequently utilized intervention approach for addressing verbal and nonverbal social deficits associated with ASD (Goin-Kochel, Myers, & Mackintosh, 2007). Given the variety of social skill interventions available for implementation, it is imperative that specific intervention approaches are linked with accurate and reliable assessment data.

Assessment of Social Skills

A number of assessment procedures may be used during the assessment of social skills deficits and any interfering behaviors. As with the assessment of any behavioral deficit or excess, assessment methods range along a continuum of indirect to direct processes that may be used conjointly or in isolation. Incorporating multiple assessment approaches may increase the likelihood of obtaining data that is comprehensive, accurate, and representative of the social skill problem and any interfering behaviors. The utility of the assessment process is demonstrated to the extent that the selected assessment tools assist in measuring important behavioral parameters that are subsequently linked to a corresponding evidence-based treatment. In addition, these measures may also be useful as baseline data and methods for progress monitoring throughout treatment. Each of these approaches has advantages and disadvantages inherent to their methodology and with respect to their appropriateness and feasibility for a particular setting. Practitioners are encouraged to consider and become familiar with multiple assessment techniques, their validity and reliability, as well as the available empirical support.

Indirect Assessment Assessment of social skills and interfering behaviors may begin with indirect assessment. Indirect measures are indicated by the degree of behavioral inferences that are made with the data collected. The specific behaviors of interest are not directly observed; rather, data regarding the behaviors of interest are collected via parent, teacher, or self-report behavioral interviews and behavior rating scales.

Behavioral Interviews Conducting behavioral interviews is often an important initial step during the assessment of social skills. Gresham (1998) outlined four primary goals of the interview process: (a) identify and define social skills deficits, (b) identify and define any interfering behaviors, (c) identify and define environmental conditions in which interfering behaviors may occur, and (d) determine whether the individual is exhibiting a skill, performance, or fluency deficit. One additional goal suggested is to (e) identify environmental conditions caregivers would like for specific social skills to occur. It is useful to consider these goals throughout the assessment process.

It is not uncommon for interviewees to describe social skills deficits and interfering behaviors in vague constructs. Interviewees may state, for instance, that "Tom does not have many friends and he is disruptive." Follow-up questions should yield precise information regarding the dimensions of target behaviors, including their frequency, duration, and/or intensity. Example questions include: "What do conversations with Tom and his peers look like; what specific behaviors is Tom demonstrating that makes you call him 'disruptive;' how often do these behaviors occur; how long do these behaviors last; does Tom have few friends because he can't (skill deficit) have positive peer interactions or because he won't (performance deficit) have positive peer interactions?"

Once specific behavioral parameters are defined, questions are designed to evoke answers related to relevant antecedent and consequent variables associated with the social skills deficit and any interfering behaviors. In general, questions should be asked that will evoke answers related to when and where specific behaviors occur, rather than why the interviewee thinks a behavior does or does not occur. Asking "why" implies that the interviewee knows why the behavior does or does not occur and provides a mentalistic explanation for the behavior, which may offer little value when developing a treatment protocol and is inconsistent with dimensions of applied behavior analysis (Baer, Wolf, & Risley, 1968). Collecting contextual information is useful for determining whether salient cues or consistent reinforcement for appropriate social behavior exists within the individual's environment. It is also useful for identifying stimuli in the environment that are possibly evoking and maintaining competing behaviors. Again, specific questions are asked to solicit this information, which can later be corroborated with data collected from subsequent assessment procedures.

Questions regarding specific behavioral parameters and where and when these behaviors occur may be asked of the target individual. Even if the individual does not have good insight regarding environmental variables associated with their specific social skills deficits, a direct interview may provide useful information if the behavior of interest is the individual's conversational abilities. Interviewing the target individual may also help determine whether they are capable to later complete pertinent rating scales or whether they are able to later collect self-monitoring behavioral data regarding specific behaviors of interest.

Regardless of whether the target individual can be interviewed, there is typically a need to collect information from the individual's caregivers. Caregivers may include teachers and parents or any individual with close familiarity with the individual and their environment. In addition to collecting contextual information, interviewing significant others has the benefit of assisting the practitioner determine whether caregivers have some control over the individual's environment to help facilitate the emergence of target skills in their natural setting. In addition, the practitioner may begin to gauge the caregiver's motivation for improving the behavior of interest and begin to hypothesize the degree to which caregivers may be willing to implement any and all behavioral recommendations as an extension of social skills training. Determining who has relative control over the individual's environment and determining to what extent they are willing to implement suggested interventions is useful information when programming for skill generalization.

Rating Scales Rating scales can be used in combination with behavioral interviews. Behavioral rating scales represent an efficient way for measuring parameters of social skills deficits, their relative importance, and the existence of any competing behaviors. Rating scales may be administered and scored prior to conducting behavioral interviews to help guide the types of questions asked during interview. A number of rating scales have been used to link with social skills training, but additional research is needed to determine whether these rating scales are sensitive enough to detect improvement of social skills following treatment.

The Social Skills Rating System (SSRS; Gresham & Elliott, 1990) was initially developed to measure the presence of social behavior difficulties within typically developing individuals with disruptive behavior problems and has been the most commonly cited measure for assessing social skills and evaluating treatment outcomes for individuals with ASD (White, Keonig, & Scahill, 2007). Unfortunately, many studies that included the SSRS failed to document improvement of social skills with intervention, either as a result of ineffective treatment or because the SSRS could not detect small changes as a result of intervention (White et al., 2007). The revised version of the SSRS, the Social Skills Improvement System (SSIS, Gresham & Elliott, 2008), now includes a 15-item Autism Spectrum Scale used to assess for behavior problems and social skills associated with ASD, but further evidence examining the predictive and discriminant validity of the Autism Scale is needed (Gresham, Elliott, Vance, & Cook, 2011). Still, the broader benefit of the SSIS is that teacher, parental, and self-report versions of the SSIS are available for dissemination to provide an initial estimate of the frequency and importance of social skills across a variety of situations and across informants.

Two additional rating scales that may be used to identify specific social skills deficits include the Autism Social Skills Profile (ASSP; Bellini & Hopf, 2007) and the Emotion Regulation and Social Skills Questionnaire (ERSSQ; Beaumont & Sofronoff, 2008). Both the ASSP and the ERSSQ were designed to measure the presence of unique social skills deficits by developing norm-referenced scores from a population of individuals with ASD, specifically. Most other behavioral rating scales, including the SSIS, were designed and norm-referenced for use with a broader population of individuals, perhaps limiting their ability to detect small changes during and after treatment. That norms were created for the ASSP and ERSSQ with individuals with ASD limits their use for diagnostic classification, but the specificity in which questions are asked makes them particularly useful for linking assessment with intervention. Few studies have captured positive treatment outcomes in response to social skills training using the ASSP (e.g., O'Handley, Ford, Radley, Hilbig, & Wimberly, 2016) and the ERSSQ, indicating a need for further research in this regard.

Direct Assessment Assessment of social skills and interfering behaviors should include direct assessment. Direct assessment includes a number of naturalistic observation procedures that arguably provide the most valid assessment of the behaviors of interest because relatively little inference is made regarding their occurrence or absence, especially in comparison to indirect methods of assessment. Goals during direct assessment are similar to those during behavioral interview: (a) and (b) confirm and define social skills and interfering behaviors, (c) and (d) identify contextual variables associated with social skills and interfering behaviors, and (e) differentiate between the type of deficit exhibited. One additional goal is to (f) determine which dimension of behavior represents the most socially valid dimension of behavior to measure.

Rating scale data provide a general description of the behaviors of concern, and information from the behavioral interview help to formulate sound operational definitions of specific social skills deficits and interfering behaviors. Collecting valid naturalistic observation data begins with the development of accurate operational definitions. Sound operational definitions are objective, inclusive, exclusive, and clearly describe the dimension of behavior being measured. Social skills and competing behaviors can each be measured along dimensions of *frequency*, *temporal extent*, or *temporal locus* (Cooper, Heron, & Heward, 2007). Which dimension of behavior is measured will be based on the type of social skills deficit and interfering behavior of interest.

Frequency refers to the number of times a behavior may occur across time. Frequency counts may be used to monitor behaviors that have easily defined beginnings and endings. Social skills that can be measured using a simple frequency count include the number of times an individual initiates social interactions with peers or the number of times an individual says "thank you" or "good morning." Frequency counts can also be combined with temporal parameters to derive a rate of behavior, such as the number of times an individual engages in aggressive behavior (e.g., hits/kicks other) during predetermined sets of time. Other social skills may be measured based on their *temporal extent*, or the duration in which the behavior occurs. It may be that the frequency of social initiations is less relevant than the amount of time an individual engages during social interaction. It is possible to measure the total duration of all social interactions or, incorporating the dimension of frequency, measure the duration of interactions per occurrence.

Finally, *temporal locus* refers to measurement of when a particular behavior occurs with regard to other relevant events in the environment. Measurement of response latency and interresponse time are two ways to measure temporal locus. Response latency describes the time between the presentation of a stimulus and the beginning of a subsequent response. One example is measuring how long it takes an individual to respond after being asked a question. Interresponse time is the moment in time a behavior occurs with regard to the occurrence of the previous same response. This may include measurement of the time in between instances of aggressive behaviors.

A number of direct observational procedures are available for providing quantitative data regarding each dimension of behavior and associated contextual variables. Readers are referred to Cooper et al. (2007) for a thorough description of each of these observation methods.

Direct Observational Recording Procedures Two methods of direct observation that include systematic approaches for the collection of quantitative behavioral data include event recording and time sampling. Event recording is used when observers are able to record the occurrence of a specific behavior. Event recordings are useful when behaviors occur at relatively low rates and when measuring the frequency dimension of behavior. These data can be converted into rates or percentages. Calculating frequency- or duration-based percentages or rates of behavior has the benefit of transforming direct observation data into easily understood proportional parameters that can be used to compare data across sessions even if the amount of time differs across observation sessions.

Although continuous recording methods can be used to record any dimension of target behaviors, their use in research and applied settings is associated with logistical and measurement challenges such as observer drift or observer fatigue (Gardenier, MacDonald, & Green, 2004). Time-sampling observation procedures may be used when it is difficult to collect continuous observation data. Disparate time-sampling procedures include whole interval, partial interval, and momentary time sampling. Each procedure requires that observations are divided into intervals, with intervals marked to note the occurrence or absence of target behaviors. Intervals are marked using whole interval time sampling when a specific behavior is demonstrated or absent for the duration of the interval. Intervals are marked using partial interval time sampling when a target behavior occurs at any point during an interval. Finally, intervals are marked using momentary time sampling when a target behavior occurs only during the moment in which an interval begins.

Time-sampling data are presented as the percentage of interval occurrence, dividing the number of times an interval was marked by the total number of intervals. Importantly, the accuracy of the behavior sample yielded will vary as a function of the time-sampling method used (Powell, Martindale, Kulp, Martindale, & Bauman, 1977; Radley, O'Handley, & Labrot, 2015). Whole interval time sampling typically underestimates the presence of a behavior, partial interval time sampling tends to overestimate the presence of a behavior, and momentary time sampling typically overestimates and underestimates the presence of a behavior, though to a much lesser degree. For instance, Radley et al. (2015) recorded the duration of social engagement of children with ASD, comparing partial and momentary time samples of increasing intervals to total duration of social engagement. Momentary time sampling yielded data that most closely approximated total duration of social engagement, whereas partial interval time sampling consistently overestimated duration of social engagement. Treatment interpretations from an expert panel were significantly impacted by the manner in which data were collected. Current research suggests that practitioners use momentary time sampling when measuring social engagement or duration-based behaviors.

Selecting Ecologically Valid Social Behaviors It is common for caregivers to report multiple social skills deficits and/or multiple competing behaviors. In order to determine which of these is the most ecologically valid behavior to measure, it is useful to consider whether they each belong to similar response classes and are either similar in form (topographical response class) or are governed by the same environmental variables (functional response class). Rather than intervening with multiple social skills deficits, deficits similar in form (e.g., avoiding peers, poor eye contact) may be combined when developing the operational definition of a broader skills deficit (e.g., social engagement).

Selecting a *pivotal behavior*, or a behavior that once learned, yields concurrent improvements in other previously unlearned or untrained behaviors that may represent behaviors warranting priority during intervention. Poor eye contact, for instance, represents a foundational behavior of individuals with ASD, which may inhibit other social skills from developing (Donnelly, Luyben, & Zan, 2009). Finally, in addition to consideration of response classes and pivotal behaviors, which social skill to first intervene will also depend on the extent to which caregivers report it as being problematic. Given the nature of social skills deficits, that being that they occur infrequently, it is not unusual for caregivers to first report interfering behaviors.

The occurrence of these behaviors may prevent the development of social skills (self-control skills deficit) or the ability to demonstrate the social skill even when learned (self-control performance deficit). For these reasons, it is sometimes warranted to first intervene with interfering behaviors. Doing so may require sound functional behavioral assessment, which is done to a degree using the behavioral interview and employment of rating scales and direct observation. To assist with assessing contextual variables, conditional probability analysis may be used in conjunction with any of the aforementioned time-sampling procedures. Conditional probability analysis allows observers to gauge the likelihood that a behavior will occur in close temporal proximity to an environmental variable or to other behaviors of interest. A proportion of a behavior that were preceded by a particular antecedent and followed by a particular consequence is calculated. One limitation worth noting, however, is that behaviors maintained on thin intermittent schedules of reinforcement may not be captured.

When the collective assessment data do not clearly identify a functional response class, a functional analysis may be needed. Functional analysis is an assessment procedure in which antecedent and consequent variables in the individual's natural environment are arranged so that their relative effects on the interfering behavior can be measured systematically (Cooper et al., 2007). Functional analyses are used to test whether the individual is engaging in the behavior to obtain a stimulus (e.g., attention and/or tangibles) and/or to avoid a stimulus (e.g., avoid interactions, avoid task demands). The results of the functional analysis can be used to create an intervention designed to weaken the relationship between the behavior and the identified function, while simultaneously strengthening the relationship between the identified function and a more adaptive behavior (i.e., social skills).

Once behaviors have been operationalized, contextual variables have been identified, types of skills deficits have been differentiated, and behaviors of interest are determined to be ecologically valid; assessment data may be linked with intervention.

Interventions

As deficits in social skills represent a core deficit of ASD, substantial research has been devoted to improving social functioning of individuals with ASD. Despite this, research has often found social skills training to produce mixed intervention effects. For example, Bellini, Peters, Benner, and Hopf (2007) found school-based intervention to result in only minimal improvements in social skills—particularly in non-training settings. Bellini and colleagues noted that social skills training efficacy is further reduced when training is completed in pullout groups, a frequent training setting (e.g., Gresham, Sugai, & Horner, 2001). Despite the mixed state of much of the social skills training literature, several intervention strategies have emerged as empirically supported strategies for promoting the acquisition, generalization, and maintenance of social skills.

Behavioral Skills Training Behavioral skills training (BST) is a multicomponent, active learning approach to teaching new skills. It is different from passive information-giving approaches in that the training requires the learner to emit the behaviors required to perform the new skill rather than just listening to or reading about the behaviors required to perform the new skill (Himle, Miltenberger, Gatheridge, & Flessner, 2004). Behavioral skills training includes four core components: instructions, modeling, rehearsal, and feedback (Miltenberger, 2015). Although these components have been used in skills training interventions dating back to the 1970s, Breidenbach (1984) first described the combination of the four primary components as *behavioral skills training*.

The instructions component consists of describing the discrete behaviors that are required to perform the skill and the conditions under which the behavior is meant to occur. The instructions need to be age and ability appropriate as well as appropriate for the culture and context of the learner. For example, when teaching a preschool child to introduce himself to other children, teaching the child to shake hands with his peers may be inappropriate in that preschool students don't shake hands when they introduce themselves. The instructions may be presented vocally or in writing. It may be helpful to have the learner repeat the instructions to ensure that she heard them correctly (Miltenberger, 2015).

Modeling consists of demonstrating the behaviors described in the instructions for the learner. Miltenberger (2015) described some recommendations for maximizing the effects of the model including (a) selecting models that are similar to the learner or otherwise credible based on status, (b) modeling the skill in the context(s) where the behavior will be required, (c) modeling how the behavior results in access to a reinforcer, and (d) modeling the skill as many times as required for the learner to acquire the new skill. The model can take a variety of forms including live in-person modeling (Miles & Wilder, 2009), video modeling (Poche, Yoder, & Miltenberger, 1988), story format (Wurtele, 1990), or computerized models (Vanselow & Hanley, 2014). Whatever form the modeling takes, the learner needs to have the skill demonstrated for her as a second level of exposure to the skill.

The rehearsal portion of BST consists of having the learner produce the skill either vocally (i.e., vocally recounting the steps) or physically acting out the behaviors that constitute the skill. Rehearsal serves at least two important functions. First, it gives the interventionist an opportunity to assess the learner's knowledge and understanding of the skill. Second, it gives the learner opportunities to practice the skill in a low-risk situation. There are a few factors that may increase the effectiveness of the rehearsal process including (a) rehearsing the skill in the context where the skill will be needed, (b) ensuring that the rehearsals are successful, (c) reinforcing successful rehearsals, and (d) rehearsing the behavior until the learner demonstrates fluency with the skill (Miltenberger, 2015).

The final component in BST is feedback, which consists of informing the learner of what he did correctly and what he did incorrectly. As Miltenberger (2015) indicates, feedback serves as a reinforcing consequence for appropriate demonstrations of the skill and an antecedent prompt for future attempts at the skill. As with all feedback, it should be immediate, focused on the behavior, and address one aspect needing correction at a time. In some cases researchers have added in situ training, which consists of exposing the leaner to a realistic situation that requires the newly trained skill and providing feedback based on their performance in that situation (Miltenberger et al., 2004).

Researchers have demonstrated the effectiveness of BST with developing children and adults for training a wide variety of skills. For example, Miltenberger et al. (2004) used BST to train children to safely respond to finding a gun, and Johnson et al. (2005) used BST to train children in abduction-prevention skills. Additionally, researchers have used BST to train staff to implement effective instructional techniques (e.g., discrete-trail teaching and Picture Exchange System) for individuals with disabilities (Rosales, Stone, & Rehfeldt, 2009; Sarokoff & Sturmey, 2004, 2008). Although BST has been demonstrated to be an effective instructional approach for teaching new skills to typically developing individuals, the research on its effectiveness when applied to individuals with ASD has been slower to develop.

In a recent review of BST and the teaching interaction procedure, Leaf et al. (2015) identified six studies in which researchers used BST to teach new skills to individuals with ASD. The studies ranged from 1988 to 2013 with the majority of studies occurring after 2010. In three of the six studies, researchers taught social skills to individuals with ASD (Kornacki, Ringdahl, Sjostrom, & Nuernberger, 2013; Nuernberger, Ringdahl, Vargo, Crumpecker, & Gunnarsson, 2013; Taras, Matson, & Leary, 1988), and in all three studies, BST was identified as *effective* or *somewhat effective*. An additional search revealed that there were three other studies not included in Leaf's review in which researchers used BST to teach social skills to individuals with ASD (McFee, 2010; Peters & Thompson, 2015; Stewart, Carr, & LeBlanc, 2007). Although one study was a dissertation (McFee, 2010) and one was a data-based case study (Stewart et al., 2007), in all three studies, BST produced improved social skills among participants with ASD. Some of the specific skill that were taught in these studies include responding to listener signals, changing topics, initiating a social interaction, responding to social interaction, and responding to body language.

The existing research supporting the use of BST to teach new skills to a broad range of individuals, including those with disabilities, is strong. However, the research supporting the use of BST to teach individuals with ASD new social skills is emerging but very promising. This is an area of social skills training that is ripe for further exploration both in terms of the various contexts in which BST may be used to teach new social skills to individuals with ASD (e.g., home, school, residential treatment, etc.) and also in terms of the types of individuals with ASD that may respond well to BST as a social skills training procedure (e.g., high-functioning autism, Asperger's syndrome). Additional research will be very helpful in terms of establishing the effectiveness of BST as a social skills training intervention for individuals with ASD.

Video Modeling Video modeling describes an intervention procedure in which an individual views a video depicting successful demonstration of a target behavior. The video modeling literature often describes social learning theory, in which an individual learns through observation instead of direct contact with contingencies, as the theoretical basis for the intervention (Bandura, 1969). Video modeling has been utilized to address a wide range of behaviors in individuals with ASD, from academic skills (e.g., Morlock, Reynolds, Fisher, & Comer, 2015) to vocational skills (e.g., Alexander, Ayres, Smith, Shepley, & Mataras, 2013). For individuals with ASD, video modeling may be a particularly appropriate intervention modality, as visually based intervention strategies counteract stimulus overselectivity by directing attention to the most relevant stimuli within an environment (Shipley-Benamou, Lutzker, & Taubman, 2002).

Video modeling interventions may be divided into three primary subtypes: video modeling of others, point-of-view video modeling, and video self-modeling. Video modeling of others describes the process of allowing an individual to watch known or unknown peers, or adults demonstrate the target behavior without error (e.g., McCoy & Hermansen, 2007). Videos are filmed from a third-person point of view. Although social learning theory describes models as more effective when they are similar to an observer (e.g., Bandura, 1977), researchers have often used individuals of different ages and genders with positive results (e.g., Mason et al., 2013). Video models of others are typically easier to create than other forms of video models as they require less editing and less prompting (Ganz, Earles-Vollrath, & Cook, 2011). An example of video modeling of others is found in O'Handley, Radley, and Whipple (2015), who utilized a video model of two adults engaged in conversation to promote eye contact of high school-age individuals with ASD. Following implementation of the video modeling of other interventions, rapid improvements in the duration of eye contact during conversations in both training and generalization settings were observed.

Point-of-view video modeling differs from video modeling of adults or peers in that the videos are filmed from a first-person perspective. As such, the individual demonstrating the target skill is not directly observed. Instead, the video depicts performance of the target social skill as if the individual were engaged in the skill (McCoy & Hermansen, 2007). Some have suggested that point-of-view modeling may be more effective than other types of video modeling as videos from a first-person perspective may be better able to highlight relevant stimuli (Tetreault & Lerman, 2010). Despite the potential benefits of point-of-view video modeling, the modality is less relatively less researched than other forms of video modeling (Lee, 2015). In the few examples of point-of-view modeling to teach social skills, results have demonstrated improvements in skills such as functional play (Scheflen, Freeman, & Paparella, 2012) and eye contact (Tetreault & Lerman, 2010).

The final subtype of video modeling, video self-modeling, describes the process of watching oneself engaging in the target social skill.

Video self-modeling may further be divided into two subtypes: positive self-review and feedforward (Hitchcock, Dowrick, & Prater, 2003). Positive self-review describes video recording intact, uncoached examples of target behaviors. In order to utilize positive self-review, an individual must have the target skill in their repertoire. Feedforward is a type of video modeling in which video segments of coached behaviors are edited together to produce an example of the desired social skill. The final video appears to show the individual performing the target skill flawlessly. For example, Bellini, Akullian, and Hopf (2007) utilized a feedforward procedure to increase social engagement of young children with ASD by prompting participants to interact and then editing recordings to remove facilitator-delivered prompts. Although not exclusive to research in social skills training for individuals with ASD, meta-analyses have found both subtypes of video self-modeling to be similarly effective (Mason et al., 2013).

Although several types of video modeling may be implemented, video modeling interventions generally have several features in common. Edited videos should be approximately 3–5 min long (Buggey, 2005), and several videos should be created to depict skill use in a variety of contexts—contexts that are similar to the actual setting in which the individual will be expected to use the skill. Although the literature differs on the frequency with which video models should be shown, it has been recommended that the video should be viewed in a consistent setting at a time immediately before the skill is expected to be utilized (Sigafoos, O'Reilly, & de la Cruz, 2007). Additionally, providing opportunities to practice the skill following viewing may be beneficial (Ganz et al., 2011).

In general, video modeling has been found to be effective in addressing social deficits of individuals with ASD. For example, a review of 22 studies found video modeling to be effective for teaching a variety of play-related behaviors (Fragale, 2014). In a meta-analysis of 23 video modeling interventions, Bellini and Akullian (2007) found video modeling to be an effective intervention strategy for addressing social skills, communication skills, and self-help skills. Additionally, the meta-analysis found video modeling of others and video self-modeling to be similarly effective. The positive effects of video modeling have also been documented in additional meta-analyses and reviews, with authors concluding that video modeling meets criteria for an evidence-based practice (Reichow & Volkmar, 2010; Wang, Cui, & Parrila, 2011; Wang & Spillane, 2009).

Despite the fact that substantial research supports the use of video modeling, it should be noted that researchers have frequently evaluated video modeling as part of intervention packages including other behavior modification strategies (e.g., reinforcement, self-monitoring; Reichow & Volkmar, 2010). Although not limited to interventions addressing social skills in individuals with ASD, Mason and colleagues (2013) found video modeling with reinforcement to be more effective than video modeling alone. The addition of other supplemental intervention strategies, however, was not found to be beneficial. Although these findings indicate that practitioners should implement video modeling in conjunction with reinforcement, the literature is still lacking regarding the necessity of other elements that may be included in video models—such as instruction (Kroeger, Schultz, & Newsom, 2007) and voice-overs (O'Handley et al., 2015).

In addition to considering elements that should be included in video modeling interventions, practitioners must also consider participant variables that may impact the success of the intervention. The ability to attend to a video has been suggested as a necessary but insufficient skill (Macdonald, Dickson, Martineau, & Ahearn, 2016; McCoy & Hermansen, 2007), with shorter videos potentially resulting in positive effects on attending (Tereshko, MacDonald, & Ahearn, 2010). Other skills that may be necessary include delayed matching and imitation skills (Macdonald et al., 2016).

Social Narratives Although known by various terms within the literature, such as Social Stories (e.g., Pane, Sidener, Vladescu, & Nirgudkar, 2015) or social scripts (e.g., Boutot, 2009), the terms describe an intervention procedure in which use of a target behavior is explained within the context of a story. Social narratives are typically written from the perspective of the individual and take place within a setting that the individual is likely to encounter and describe antecedents, the target behavior, and consequences of the performance of the behavior. Power Cards are a related intervention strategy that differs in that stories are written to describe a special interest character in a situation that requires use of the target skill (e.g., Daubert, Hornstein, & Tincani, 2015). As individuals with ASD may benefit from visual supports, social narratives are often supplemented with pictures and may be followed by comprehension questions (e.g., Scattone, Tingstrom, & Wilczynski, 2006).

Construction of social narratives typically involves several steps. Following identification and operationalization of the target behavior, a functional analysis of the behavior may be conducted to better allow the interventionist to individualize the social story based on the function of the target behavior (Pane et al., 2015). Next, the social narrative is constructed using descriptive, directive, perspective, and affirmative sentences (Gray, 2000). Descriptive sentences are used to define the context of and discriminative stimuli for skill use. Directive sentences direct the individual to perform the target social skill. Perspective sentences describe the thoughts and feelings of other individuals in the environment. Lastly, affirmative sentences are used to strengthen the meaning of the story; refer to commonly held beliefs, rules, or norms; or reassure the individual. Gray recommends approximately two to five descriptive, perspective, or affirmative sentences for each directive sentence.

Several benefits are associated with the implementation of a social narrative intervention. First, construction and facilitation of social narratives do not require substantial training—allowing the procedure to be implemented by a variety of personnel (Crozier & Siieo, 2005). Social narratives are also extremely flexible, capable of being written to address a range of behaviors in diverse settings. Like video modeling, the development of a social narrative intervention results in a permanent product that may be utilized repeatedly and, once developed, may be implemented with minimal adult supervision—with both factors functioning to increase the social validity of the procedure. Taken together, these elements have resulted in social narratives being implemented with frequency in applied settings (Weiss et al., 2009).

Despite the popularity of social narrative interventions, research is somewhat mixed regarding the efficacy of the intervention. Several studies have found social narratives to be beneficial in promoting acquisition of discrete social skills in children with ASD (e.g., Scattone, 2008) and decreasing disruptive social behaviors (e.g., Ozdemir, 2008). However, other research has found social narratives to be ineffective or less effective than other intervention strategies (e.g., O'Handley et al., 2015; Reichow & Sabornie, 2009). Meta-analyses have also produced mixed results regarding the utility of social narratives. For example, Wang and Spillane's (2009) meta-analysis of 36 studies found social narratives to meet criteria for an evidence-based practice. A follow-up meta-analysis indicated questionable effects on the acquisition of social skills but greater efficacy for decreasing disruptive social behaviors (Kokina & Kern, 2010). Findings of Kokina and Kern suggesting the ineffectiveness of social narratives in promoting acquisition of skills and the relative efficacy in decreasing inappropriate behaviors were further replicated (Qi, Barton, Collier, Lin, & Montoya, 2015). Interestingly, Qi and colleagues found social stories to meet What Works Clearinghouse criteria for an evidence-based practice when evaluating nonoverlap of data, despite the fact that visual analysis indicated that the procedure should not be considered evidence-based.

Although the literature is mixed regarding the utility of social narratives in addressing social skills in individuals with ASD, several findings are relatively clear. In general, social narratives are best used to decrease inappropriate behaviors (Qi et al., 2015). The addition of comprehension checks and visual supports (e.g., illustrations) appears to increase the efficacy of social narrative interventions (Kokina & Kern, 2010). Social narratives also appear to be better suited for addressing discrete behaviors rather than complex and abstract behavioral sequences. Lastly, social narratives may be ineffective when implemented in isolation and should therefore be utilized in the context of comprehensive social skills intervention (Clark, Radley, & Phosaly, 2014).

Self-Management Self-management interventions increase independence of an individual due to the fact that the individual serves as his or her own intervention agent. These interventions often involve combination of one or more of the following five components: self-observation, self-recording, self-evaluation, self-instruction, and self-reinforcement (Lee, Simpson, & Shogren, 2007). Self-observation involves training the individual to discriminate between the occurrence and nonoccurrence of a target behavior. This often includes teaching the individual to self-question (e.g., “Am I making eye contact?”). Self-observation is often preceded by a temporal (e.g., after lunch), tactile (e.g., vibration from MotivAider), or auditory cue (e.g., teacher instruction; Clark et al., 2014) to signal that the individual should determine whether they are engaged in the target behavior. The individual then may self-record the occurrence or nonoccurrence of the target behavior using a data collection form or some other data collection device (Lee et al., 2007). Self-evaluation refers to the process of determining progress toward a goal. For example, an individual may have a goal of providing ten compliments to peers while at work or initiating three social interactions during a recess period. Self-instruction involves the use of self-statements utilized to guide a target behavior. Lastly, self-reinforcement is the contingent delivery of a reward. This component is intended to increase the future frequency with which an individual will engage in a target behavior.

Utilization of self-management interventions has several advantages over interventions mediated by another individual (e.g., teacher, parent). As intervention implementation is primarily mediated by the individual with ASD, little oversight from another individual is required—allowing for greater time to engage in tasks other than behavior management (Cooper et al., 2007). This also serves to increase the independence of the individual with ASD, increasing overall quality of life. Self-management interventions also benefit from portability across settings. Social skills training decreases when intervention is implemented in pullout settings (Bellini, Peters, Benner, & Hopf, 2007). As self-monitoring is self-mediated, the individual with ASD can easily implement the intervention in a variety of settings without modification (e.g., recess, classroom, vocational setting), resulting in greater generalizability of effects (Cooper et al., 2007). For school-age individuals with ASD, the portability of self-management interventions also serves to promote inclusion in less restrictive settings.

When applied to address social skills in individuals with ASD, self-management procedures have been found to result in increasing target behaviors while decreasing inappropriate behaviors. For example, a meta-analysis of self-management research with individuals with ASD found the procedure to be effective in increasing the frequency of behaviors such as eye contact, social initiations, appropriate play, and reciprocal communication (Lee et al., 2007). Stereotypy, which negatively affects an individual’s ability to interact with others, has been found to decrease following introduction of self-management (Koegel & Koegel, 1990). Additionally, self-management interventions have been found to be effective in children as young as preschool (Lee et al., 2007) to adulthood (Southall & Gast, 2011).

In general, the literature suggests that self-management is an effective procedure for promoting social skills in individuals with ASD. In utilizing self-management interventions in applied settings, practitioners should be aware that self-management procedures are best applied to behaviors that are already in an individual’s repertoire (Southall & Gast, 2011). In the case that an individual does not already possess some form of the terminal behavior, explicit training in the behavior should be provided prior to use of self-management. Practitioners should also consider the level of functioning of individuals with whom they are considering implementing self-monitoring. If the self-management procedure to be implement involves accurate calculation or monitoring of the passage of time, it may not be suitable for all individuals, and adaptations to the procedure should be considered (e.g., Hume, Loftin, & Lantz, 2009). Lastly, although the literature varies regarding the exact self-management components that should be included in an intervention, reviews have identified components that seem integral. Self-observation, self-recording, and self-reinforcement were included in all studies evaluated by Southall and Gast (2011) and as such should be considered as core components when utilized by practitioners.

Peer-Mediated Intervention Humans have relied on social communities for survival and success dating back to before recorded history. Given the lengthy common learning history that humans share as social beings, it is clear that human behavior often comes under the control of the social behavior of peers. In modern history researchers have discovered that peer behavior can be systematically leveraged to influence the behavior of individuals who demonstrate social deficits (Odom & Strain, 1984). For individuals with ASD, social deficits make up one of the defining characteristics of their disability (American Psychiatric Association, 2013). Consequently, peer-mediated interventions are a natural fit for improving the social skills of individuals with ASD. In recent years there has been a flurry of interest in peer-mediated interventions for individuals with ASD. In 2015 alone at least five reviews or meta-analyses have been published addressing the use of peer-mediated interventions to support children and adolescents with ASD (Boudreau, Corkum, Meko, & Smith, 2015; Cole, 2015; Watkins, Kuhn, Ledbetter-Cho, Gevarter, & O'Reilly, 2015; Watkins et al., 2014; Whalon et al., 2015). This level of interest suggests that researchers see peer-mediated interventions as a promising approach for improving the social outcomes of individuals with ASD.

Peer-mediated social skills intervention has become an important behavioral technology that leverages the influence and ability of socially capable peers to improve the social behavior of individuals with ASD. Peer-mediated interventions have several advantages to adult-mediated interventions. First, if peers can serve as interventionists, then the number of available interventionists is greatly multiplied. In a context such as a school, where adult time is often stretched thin, peer-mediated interventions may offer an efficient approach to providing intervention in a way that does not strain already thin resources (Chan et al., 2009). Second, socially competent peers may function as better models of appropriate social behavior than adults because the behavior of the peer is not contrived or mechanical, as that of an adult trying to model the behavior of a child would be. Third, a peer can model the behavior in the context where the behavior needs to happen and elicit natural responses from other children, where an adult model may elicit unnatural response from peers. In other word, the accuracy of the model is improved when a peer does the modeling. Fourth, Strain, Odom, and McConnell (1984) point out that in order to have adequate social development, individuals, particularly those with certain types of disabilities, require exposure to socially capable peers who serve as models. Although exposure to socially capable peers may be a necessary component of adequate social development, for many individuals with ASD, exposure alone is not sufficient to produce age- or grade-appropriate social behavior (Laushey & Heflin, 2000). Consequently, something more systematic than just full inclusion needs to occur, and peer-mediated interventions are one effective way to do something systematic. Finally, peer-mediated interventions address the reality that social interactions are reciprocal. As such, it makes sense to intervene on both the socially delayed child as well as the socially competent child. Teaching socially competent peers to interact with children with ASD, even as part of in intervention, may break down barriers that would otherwise inhibit social interactions. Given these advantages, it makes sense that peer-mediated intervention has received so much attention among researchers and interventionists.

Peer-mediated interventions can take a variety of forms. Odom and Strain (1984) reviewed the literature on peer-mediated approaches for promoting social interaction and identified three broad classes of peer-mediated intervention. The first they call *proximity*, defined as having socially delayed children play with socially competent peers who have had no special training. Interventionists may encourage the target child to play with their typically developing peers and even teach the target child how to play with the peers, but the peers receive no instruction on facilitating social interactions with the target child. The second class of intervention that Odom and Strain identify is *prompt and reinforce*. In this type of intervention, socially competent children are trained to prompt the target children to engage in a social interaction and then to reinforce the target children by engaging in a preferred activity and providing praise or other affirming statements. The third type of intervention that they identified was *peer initiation* in which peers are trained to initiate social interactions with target children. When the socially competent peer initiates the social interactions, the target child has opportunities to respond appropriately and engage more socially appropriate behavior. In their review, Odom and Strain concluded that prompt and reinforce and peer initiation were more effective approaches to peer-mediated intervention than proximity. More recent reviews have addressed these types of interventions as they apply specifically to children with ASD.

Whalon et al. (2015) conducted a review of single-case studies addressing school-based social skills interventions for students with ASD. They identified 37 studies including 105 children that met criteria for inclusion. Of these studies, six addressed peer-mediated interventions, all of which produced improved social skills among participants. In three of the studies the peers were trained to socially engage with the participants, while in the remaining three the participants and socially competent peers were trained together. The average effect size for these interventions was NAP of .95 and Tau-U of .87, both indicating large effects on improving the social behavior of participants. Watkins et al. (2014) conducted a similar review, but they reviewed only studies including students with ASD in inclusive school settings. Their review indicated 12 of the 14 studies identified had either adequate or strong evidence supporting the use of peer-mediated interventions. Additionally, they found that the most commonly used class of peer-mediated intervention (Odom & Strain, 1984) was peer initiation with more than 70% of studies using this strategy. In a review of evidence-based interventions for improving the social communication of children with ASD, Watkins et al. (2015) indicated that peer-mediated intervention meets criteria to be considered an evidence-based practice. Their review indicated that there are 15 single-case studies of sufficient quality to support the use of peer-mediated strategies for improving the social behavior of students from preschool through high school. Camargo et al. (2014) corroborated this finding in a review of behaviorally based interventions for social skills instruction. In their review, Camargo and colleagues found that among the 30 studies identified for inclusion, the most common approach to treatment was some form of peer-mediated intervention. They also found that behaviorally based interventions, including peer-mediated interventions, meet criteria to be considered an evidence-based practice. The wealth of evidence supporting the use of peer-mediated interventions across settings, ages, researchers, and time makes it a clear case for such interventions as a strong choice for improving the social outcomes of children and adolescents with ASD.

BLISS For many children with ASD, the school is a natural place to receive treatment for a social deficit. It is an obvious fit for social skills training because so much of the time at school is spent in social interactions with peers and adults. Socially competent peers are present bidding for interaction during class, recess, lunch, and even on the way to and from school. All of this exposure to peers requires frequent social interactions and provides several naturally occurring opportunities to practice social behaviors. However, it is the necessity of these very interactions that often makes school such a challenge for students with ASD. Additionally, adults are present in most of these same contexts providing supervision, instruction, and correction. The adults too can present social challenges for students with ASD when the adults request and expect appropriate social behavior in the form of good manners, academic responses, and following directions. Although it may seem that schools are set up to magnify social deficits, they also provide the very useful combination of socially competent peers and adults trained to teach new skills. This combination makes the school an ideal place to teach new social skills. Yet, in spite of this ideal combination, some students with ASD do not receive the social support that they need in order to fully benefit from their schooling in the same manner as their typically developing peers (Gutierrez, Hale, Gossens-Archuleta, & Sobrino-Sanchez, 2007; Hunt & Goetz, 1997; Kohler, Strain, & Shearer, 1996).

The reasons that student with ASD do not receive adequate social skills support are varied and context specific, but some common reasons include the fact that many students with ASD are served in the general education setting (Chakrabarti & Fombonne, 2001), and many teachers and staff may feel unprepared to deliver effective social skills instruction. Additionally, providing social skills instruction to a small number of students can take time away from the larger group of students who require instruction. Finally, taking time for social skills instruction can take time away from the academic instruction of the student with ASD making academic success even more challenging.

To address these challenges, Ross and Sabey (2015) have developed a flexible framework to facilitate the delivery of effective social skills instruction within the school setting in a way that does not detract from the learning of the student with ASD or other students and that does not require an inordinate amount of staff time. The framework is called BLISS (brief, localized, intensive, social skills). This framework is flexible in that it can be implemented with a wide variety of curricula, in a variety of contexts, by a variety of staff, to address a variety of social skills. The framework consists of four steps, (a) assessment, (b) lesson development, (c) lesson delivery, and (d) reinforcement and progress monitoring (Sabey, 2015). Before beginning the assessment, a teacher or principal needs to identify an interventionist. The only requirements for the interventionist are that the individual has the flexibility to be available during the time the skill needs to be taught and can follow a simple lesson plan. In one study, Ross and Sabey (2015) used student teachers as interventionists. In another study Sabey (2015) used a computer specialist, a librarian, a speech pathologist, and a special education teacher as interventionists. In each case the interventionist had time available (5–15 min) when the skill would be expected to happen. Once an interventionist is identified, then the assessment process follows.

The assessment can be conducted using established rating scales such as the Social Skills Improvement System checklist (Gresham & Elliott, 2008) and the School Social Behavior Scales (Merrell, 1993) or by conducting direct observations of the target student's behavior in comparison to same-grade, same-sex peers. In either case, it is important to identify the specific deficits that the target student has in order to ensure that all social skills instruction is tightly focused on the needs of the student. Focusing only on those needs identified by the assessment can improve the efficiency of the social skills training by ensuring that staff does not waste time teaching skills that the student does not need.

Once the specific deficits have been identified, the interventionist can begin to develop lesson plans. The lesson plans can be taken from an existing curriculum or developed from scratch. Wherever the lesson plans come from, it is important that they follow an effective teaching cycle such as that used in behavioral skills training (Miltenberger, 2015). The lessons ought to be designed to offer the student several opportunities to practice the skill in the context where the skill will be needed. Within the BLISS framework, lessons are designed to last for between 5 and 15 min and to be taught in the setting where the skill is needed (e.g., playground, classroom, hallway, or cafeteria). Once the lesson plans are developed, then the interventionist can begin to deliver the instruction.

It is in the lesson delivery phase that the BLISS framework addresses many of the existing challenges with delivering social skills instruction in schools. The lessons are scheduled to begin when the student in transitioning into the context where the skill will be required. For example, if the social skill will be needed during lunch recess (e.g., joining a game), then the interventionist meets the student on the way out to recess either in a hall or office where there are limited distractions. In this setting the interventionist provides instruction by describing the skill and modeling what the skill looks like. The interventionist then has the student demonstrate the skill and provides feedback until the student is proficient. Then the student and interventionist transition to the area where the skill will be used (e.g., playground), and the student practices the skill again in increasingly natural scenarios (e.g., with socially competent student playing a game). Once the student demonstrates proficiency with the skill in the target context, the interventionist gives the student an opportunity for independent practice by giving the student an assignment to practice the newly acquired skill (e.g., join three different games today at recess). Because the lessons are short, they can be delivered daily or at least several times a week, which may improve the impact of the intervention (Gresham et al., 2001). In the case where a student does not reach proficiency within the 5–15-min lesson, the interventionist gives the student an assignment and then picks up the lesson the next day where they left off the day before. It is important that lessons not take more than 15 min so that interventionists can deliver the lesson and be back to their other duties without serious disruption.

After the lesson is delivered the interventionist can monitor progress by using either self-monitoring or some type of observation. To monitor progress, the student may be required to check off each time she successfully completes the skill, or a playground supervisor may conduct brief observations to ensure that the student is meeting the goal. When students meet their goals, the interventionist gives them and a socially competent peer of their choosing access to preferred reinforcers. Pairing success with reinforcement and socially competent peers increases the likelihood that the student will engage in the skill in the future and that the socially competent peer will be involved.

In two studies, researchers used the BLISS framework to improve the social skills of students with ASD and typically developing student at risk of engaging in serious problem behavior (Ross & Sabey, 2015; Sabey, 2015). In both studies participants made meaningful improvements in their social skills and interventionists endorsed the social validity of the intervention. Although more research is needed to further establish the effectiveness of the BLISS framework, it is a promising approach for integrating effective social skills instruction in the school setting where students with ASD need the additional support.

Manualized Interventions Although the procedures previously discussed have received support as strategies for addressing social skills in individuals with ASD, these procedures are often not implemented with frequency by practitioners (e.g., Hess, Morrier, Heflin, & Ivey, 2008; Morrier, Hess, & Heflin, 2011). Factors such as limited resources and training in evidence-based practices likely contribute to the underuse of these procedures (Bellini & McConnell, 2010). Dingfelder and Mandell (2011) suggest that many evidence-based practices have not been incorporated into training curricula or manuals that are easily utilized by practitioners, impeding the transition of research to practice. To overcome this limitation, several intervention manuals have been developed that incorporate empirically validated social skills training strategies for individuals with ASD.

Program for the Education and Enrichment of Relational Skills (PEERS) The PEERS program (Laugeson & Frankel, 2010) is a 16-lesson curriculum designed to address social skills of adolescents and young adults with ASD. Skills within the program build upon each other and are intended to be delivered in a set order. Lessons from the PEERS program are intended to be delivered daily, with each lesson being approximately 30–60 min in duration. Behavioral skills training makes up a core training strategy within PEERS.

Each skill taught within the PEERS curriculum is presented across five lessons. During the first lesson, skills from the previous unit are reviewed. Day 2 is comprised of didactic instruction in the target skill and modeling by group facilitators. Next, participants engage in behavioral rehearsal and receive feedback on target skill usage. Days 4 and 5 consist of activities that are designed to be enjoyable to the participants while requiring demonstration of the recently taught skill.

The PEERS curriculum has been evaluated in multiple studies, with results indicating beneficial effects of the program on participants. In one of the earliest evaluations of the program, researchers found participation in the program to result in improvements in parent rating of social skills (Laugeson, Frankel, Mogil, & Dillon, 2009). Concurrent increases in the frequency with which participants hosted get-togethers was also observed. Participation in the program has also been found to result in improvements in areas related to social skills, such as mannerisms, cooperation, social awareness, and social motivation (Laugeson, Frankel, Gantman, Dillon, & Mogil, 2012). Moreover, improvements in social behaviors due to participation in the PEERS program have been found to be maintained following termination of the intervention (e.g., Laugeson, Gantman, Kapp, Orenski, & Ellingsen, 2015; Laugeson et al., 2012).

Superheroes Social Skills Superheroes Social Skills (Jenson et al., 2011) is an 18-lesson social skills curriculum intended for elementary-age individuals with ASD. The program utilizes animated superhero characters to present instruction in target skills. Additionally, the program incorporates behavioral skills training, video modeling, social narratives, inclusion of typically developing peers, and self-management strategies in order to promote acquisition and generalization of target skills.

Skills taught within the Superheroes Social Skills program all follow a similar format. First, the target skill is introduced by the animated superheroes. The animated characters provide viewers with three to five discrete steps for demonstration of the target social skill. Individuals then view several video models of unknown, similarly aged peers engaging in the target skill. The group facilitator then provides an in vivo example and non-example of the skill and engages the group members in behavioral skills training. During behavioral skills training, participants are provided with self-monitoring cards for recording the frequency of accurate skills demonstration. Participants then view an animated social narrative which describes use of the target skill and play a game that requires the participants to utilize the skill. Finally, the group facilitator instructs participants to continue utilizing self-monitoring cards in generalized settings and provides a reward for participating in the group.

Several studies have investigated the effect of the curriculum on social skills of children in school settings. For example Block, Radley, Jenson, Clark, and O'Neill (2015) utilized lessons from the program to address social skills in four elementary-age children with ASD. Implementation of the program resulted substantial increases in the number of social responses of participants during unstructured recess periods, and both parents and teachers reported improved social functioning following termination of the intervention. School-based implementation with elementary-age children with ASD has also been found to result in improvements in parent report of social functioning and sociometric ratings completed by peers, further suggesting generalized effects of the intervention (Radley, Ford, Battaglia, & McHugh, 2014; Radley, McHugh, Taber, Battaglia, & Ford, 2015). Improved accuracy in target social skills was also found following intervention with preschool-age children with ASD (Radley, Hanglein, & Arak, 2016). Similarly, several studies facilitated in clinic settings have found intervention to result in improved skill accuracy in training and generalization settings (Radley et al., 2014, 2015).

Secret Agent Society Previously known as the Junior Detective Training Program, the Secret

Agent Society program (Beaumont & Sofronoff, 2008) is a multimedia social skills training program for high-functioning children with ASD. The program incorporates both group and computer-based instruction and activities to promote acquisition of target social skills. Similar to the previously described manualized programs, the Secret Agent Society program incorporates modeling and role-play. Additionally, the program also places emphasis on mindfulness-based strategies and relaxation training.

Although fewer studies have evaluated the Secret Agent Society program, extant research indicates positive effects of participation in the program. In an initial randomized trial of the intervention, significant improvements in both parent and teacher ratings of social skills were noted (Beaumont & Sofronoff, 2008). In addition, intervention effects were maintained at a 5-month follow-up. Further research has found intervention to result in improved adaptive functioning and decreases in internalizing symptoms (Thomson, Burnham Riosa, & Weiss, 2015). The Secret Agent Society has also been evaluated as a parent-delivered social skills program (Sofronoff, Silva, & Beaumont, 2015). Similar to clinician-facilitated intervention, the parent-delivered intervention resulted in improvements in social behavior and child anxiety as reported by parents. Results were also maintained over time. School-based implementation of the curriculum has been found to result in improved social functioning, with generalized improvements observed in home settings (Beaumont, Rotolone, & Sofronoff, 2015).

Limitations and Future Directions

Programming and Assessing for Generalization The ultimate goal of social skills training is generalization or the ability to teach a skill in one setting and have it occur in other appropriate settings in which the skill has not been explicitly trained. The need to explicitly teach a social skill in every possible situation where the skill would be needed is far too cumbersome a task to be a viable approach to social skills training. Moreover, in two separate reviews, Gresham et al. (2001) and Bellini, Peters, Benner, and Hopf (2007) indicated that social skills training often does not produce the generalization effects that would be so beneficial. These findings make it clear that current practice in social skills training has not yet found a replicable way to help children with ASD generalize newly trained skills to appropriate novel situations.

In response to this dilemma, McIntosh and MacKay (2008) provide a series of recommendations for increasing the likelihood that newly trained skills will generalize. These recommendations are organized into steps to take prior to intervention, during intervention, and after intervention. Prior to intervention, it is important to identify all the target settings, instructors, and people that are related to the new skill. Identifying all of these aspects of the target settings will inform where, when, and with whom the instruction takes place in order to maximize the number of relevant contextual stimuli that are present during training. This assessment also helps to plan for the numbers of different exemplar settings that will need to be trained. During intervention, it is important to provide explicit instruction, teach across a variety of relevant settings (e.g., locations, people, situations, etc.), and practice the skill enough for the child to develop fluency. After intervention, the authors recommend providing ongoing coaching, incentivizing successful demonstrations of the skill, and reducing the effectiveness of competing behaviors.

Finally, as with all good intervention efforts, McIntosh and MacKay recommend measuring the impact of social skills instruction, specifically in terms of generalization. To monitor progress, they recommend four strategies: (a) directly observing the student in novel contexts, (b) using rating scales to get reports from a variety of responders, (c) having the student self-monitor his progress, and (d) asking peers to report on the occurrence of the behavior in novel settings. If social skills interventions to ultimately be worthwhile, interventionists must deliberately and carefully plan for generalization and then assess the extent of their success. Additionally, researchers need to spend more time and attention on promoting, measuring, and reporting the generalization of intervention effects across settings.

Pullout Training An issue that is related to generalization is the use of a pullout social skills lessons in which the target child is removed from the typical instructional setting to receive social skills training. Gresham et al. (2001) point out that this is a common practice when delivering social skills training. It is often the school psychologist, social worker, or speech pathologist that pulls students out of class or some other inclusive setting in order to meet with other students with social deficits to participate in small group social skills instruction. This approach compromises the effectiveness of the instruction because it removes all of the relevant contextual stimuli that may cue the student as to when to engage in the target behavior. It is most often the case that the child with ASD does not need to work on social skills with the related service staff or with other students with ASD. It is with typically developing peers and general education staff that children with ASD need to learn to interact with, and yet none of these people are present during training. Effective social skills interventions must occur in the context where the skill needs to happen. To that end, researchers and publishers of social skills training programs need to find ways to embed training into the naturally occurring context. Additionally, it will be important to consider how typically available individuals (e.g., parents, general education teachers, peers) can be recruited to deliver effective social skills training in an inclusive way.

Variability of Behaviors Restricted and repetitive behaviors represent a core feature of ASD (American Psychiatric Association, 2013). This contributes to social behaviors that are often restricted in range (e.g., Leekam, Prior, & Uljarevic, 2011; Wolfe, Slocum, & Kunnavatana, 2014), which in turn results in difficulty adapting and generalizing social skills. Despite the fact that the restricted range of social behaviors demonstrated by individuals with ASD directly limits access to contingencies that maintain behavior in generalized settings, many programs have focused on accuracy in skills demonstration without explicitly focusing on *accurate variability* (e.g., Barry et al., 2003; Plavnick, Kaid, & MacFarland, 2015). A focus on promotion of both variability and accuracy in skills demonstration is a relatively recent phenomenon, with a literature review identifying only 14 studies targeting behavioral variability in individuals with ASD (Wolfe et al., 2014). In general, methods found to be effective for promoting social skill variability include explicit instruction in target behavior topographies, introduction of contingencies that support varied responding, and prompting variation in social skills demonstration. As social skills programming will only be judged to be effective when contrived contingencies within the context of social skills training are faded out and target social skills are maintained by naturally occurring contingencies, it is essential that both researchers and practitioners consider training for accurate variability as a component of social skills interventions.

Summary

Social skills deficits represent a core feature of ASD, which, if left untreated, result in negative outcomes throughout the lifespan. Although social skills interventions are frequently implemented, results of social skills training have often been found to be limited. Because of this, thorough assessment, utilization of empirically supported interventions, and ongoing progress monitoring represent necessary components of social skills training. Despite the fact that several interventions have been found to be effective, future research is needed to identify essential components of interventions, strategies capable of being implemented with ease in generalized settings, interventions that produce generalized behavior change, and techniques for enhancing accurate variability of social behaviors.

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Curriculums

15

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Introduction

Individuals with autism spectrum disorder (ASD) are characterized by deficits in social communication and interaction as well as displaying restricted and repetitive patterns of behaviors and interests (American Psychiatric Association [APA], 2013). The Individuals with Disabilities Education Act (IDEA) mandates that early interventions be provided to infants and toddlers with ASD and special education and related services be provided to students with ASD aged 3–21 years (Public Law 108–446, 2004). Various interventions for individuals with ASD are available to address their needs; however, most modern ASD interventions are educational in nature (Mesibov & Shea, 2011).

Each interveniton has its own curriculum and curriculum can be defined as "a plan for achieving goals" (Ornstein & Hinkins, 2013, p. 8). Planned activities directed by the interventionists to their clients are the central pieces of an intervention. An intervention curriculum guides interventionists what to teach, how to teach, and when to move on to a new target behavior or the next level of instruction. A wide variety of curriculum materials are now available for use with individual with ASD. However, it is often not easy to find the curriculum that is ideally suited to a particular intervention purpose or participants (Hickson, Blackman, & Reis, 1995).

A single curriculum may only address a set of skills in a particular area for a particular group of students. Given that each intervention program may target different skills of individuals with ASD and have clients with different abilities, it is necessary to combine or adapt materials from different sources or to design the curriculum that best meets the intervention goals and the needs of the clients. This chapter represents an effort to present the information regarding how to design a curriculum for teaching individuals with ASD. There are five steps that may be used as general guidelines for developing a curriculum. In the next part of this chapter, detailed information regarding each step and examples are presented. An example of a curriculum targeting multiple intervention goals is presented in the last part of this chapter.

How to Design a Curriculum

There are five steps that may be used for designing a curriculum. The first step is to understand the needs of individuals with ASD. The second step is to set up intervention goals based on clients' needs. The third step is to select the assess-

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ments that will be used to determine if the intervention has met its goals. The fourth step is to design lesson/instructional plans for each intervention session. The last step is to select instructional strategies that will be used during intervention.

Step 1. Understand Clients' Needs

Individuals with different autism diagnoses may demonstrate different social interaction and communication abilities, and severity levels may vary across individuals. A wide range of language abilities can be found in individuals with ASD (Kjelgaard & Tager-Flusberg, 2001; Lindgren, Folstein, Tomblin, & Tager-Flusberg, 2009; Maljaars, Noens, Scholte, & van Berckelaer-Onnes, 2012). Some individuals with ASD develop verbal skills but others do not. For the people with ASD who have acquired verbal skills, their expressive skills may not be sufficient to deal with different social demands. For the people with ASD who do not develop verbal skills or have limited verbal skills, they may rely on using gestures to communicate with other people (Chiang & Lin, 2008) and, thus, need to be taught of using symbolic communication methods. Many children with ASD have greater impairment in language comprehension than language expression (Lloyd, Paintin, & Botting, 2006; Luyster, Kadlec, Carter, & Tager-Flusberg, 2008; Weismer, Lord, & Esler, 2010). Language comprehension seems to be delayed in most individuals with ASD (Kjellmer et al., 2012; Manolitsi & Botting, 2011; Thurm, Lord, Lee, & Newschaffer, 2007). Thus, it is important to have the interventions aiming to improve language and social communication skills of individuals with ASD.

Some individuals with ASD also have intellectual disability (ID) (APA, 2013). About 64% of children with ASD have comorbid ID or borderline intellectual functioning (Wingate et al., 2014). Cognitive functioning has been found to be associated with adult outcomes in individuals with ASD (Eaves & Ho, 2008; Farley et al., 2009; Howlin, Goode, Hutton, & Rutter, 2004). Individuals with ASD who have ID are less likely to participate in postsecondary education and employment than those who do not have ID (Chiang, Cheung, Hickson, Xiang, & Tsai, 2012; Chiang, Cheung, Li, & Tsai, 2013). However, having a higher IQ does not ensure a better adult outcome; the majority of individuals with high functioning ASD or Asperger's disorder do not have a competitive job or live independently (Engstrom, Ekstrom, & Emilsson, 2003). In order to have an independent adult life, one must be able to transfer cognitive functioning into the performance of daily life activities (Sparrow, Cicchetti, & Balla, 2005). However, individuals with ASD tend to have poorer adaptive behavior than would be expected by their cognitive abilities (Bolte & Poustka, 2002; Duncan & Bishop, 2015; Freeman et al., 1991; Klin et al., 2007; Liss et al., 2001; Saulnier & Klin, 2007; Tomanik, Pearson, Loveland, Lane, & Shaw, 2007). Thus, having the interventions targeting daily living skills is also important for individuals with ASD.

Given the needs of individuals with ASD may vary across individuals and functional areas, it is important to understand individual client's needs before starting an intervention. Observing clients' behaviors, conducing necessary assessments, and/or interviewing parents and clients can reveal the baseline level of their abilities and needs.

Step 2. Set Up Goals

After knowing clients' needs, the next step is to determine the desired outcomes that an intervention aims to achieve. An intervention can aim to address a single goal or multiple goals depending on the length of the intervention and available resources. An intervention goal can be conceptualized as a specific skill or cluster of skills that a learner will acquire during intervention (Sailor & Guess, 1983). For each intervention goal, there should be short-term objectives that are measurable intermedia steps between a client's current level of performance and an intervention goal (Fiscus & Mandell, 1983). Both goals and objectives should be stated in a clear, precise, and measurable way. The *Case Study of Mark* illustrates intervention goals and objectives.

Case Study: Martin

Martin is a 10-year-old boy with ASD who also has moderate ID. He loves drawing and is very good at drawing. He can follow directions and complete assigned tasks with minimal prompting. However, he has significant delays in language skills, social interaction skills, academic skills, and independent living skills

	Intervention goals	**Short-term objectives**
Language	Martin will answer *Wh* questions	When presenting with *Who* questions, Martin will verbally answer the questions correctly 4 out of 5 trials without prompts
	Martin will request desired items verbally	When presenting with a desired item, Marin will say, *Can I have xx (the name of the item)?* 4 out of 5 trials without prompts
Social interaction	Martin will initiate social interactions with peers	When seeing peers are playing toy cars, Martin will say, *Can I play with you?* 4 out of 5 trials without prompts
	Martin will respond to social interactions initiated by peers	When peers ask him to play with them, Martin will join them 4 out of 5 trials without prompts
Academics	Martin will solve addition problems with sums up to 50	When presenting with addition problems with sums up to 2050, Martin will solve the questions correctly 4 out of 5 trials without prompts
	Martin will write a paragraph including at least three sentences about an interested topic	When presenting with pictures, Martin will write three sentences without errors on 4 out of 5 trials without prompts
Independent living	Martin will place cell phone calls	Given his mom's cell phone number, Martin will successfully place the phone call on 4 out of 5 trials without prompts
	Martin will wear a coat when it is cold outside	When presenting with weather information, Martin will wear a coat when going outside on 4 out of 5 trials without prompts

Depending on the nature of the intervention, various types of goals may be addressed through an intervention. The intervention goals can be generally grouped into two basic categories. They are remedy weakness and cultivate strength.

Remedy Weakness The majority of the intervention programs for individuals with ASD are designed to address their deficits. The main focus of this remedy weakness concept is that the deficits of students with ASD will be decreased after interventions. An example of this concept is the Individualized Education Program (IEP) for students with disabilities. The IDEA mandates that each student with a disability should have a written statement (i.e., IEP) including his/her present levels of academic achievement and functional performance (Public Law 108–446, 2004). Goals in relation to academic and functional skills should be written in the education plan as well as how the student's progress toward meeting the goals will be measured (Public Law 108–446, 2004). Although this model can show how effectively an intervention helps individuals with ASD decrease their deficits, due to the constant focus on deficits, it may potentially harm their self-esteem and bring other negative implications to them and their families.

Cultivate Strength Individuals with ASD are like people without ASD which have their own strengths. However, their strengths are often not discussed in literature or addressed in interventions. There has been a movement for service providers to conduct strength-based assessment on people with ASD to identify their personal, familial, and broader contextual strengths (Cosden, Koegel, Koegel, Greenwell, & Klein, 2006). In contrast to the deficits-focused model, this approach emphasizes the positive aspects of an individual. It encourages interventionists to establish goals that go beyond repairing someone's deficits to those of cultivating the individual's strengths and promote a better quality of life in the family (Huebner & Gilman, 2004). Some individuals with ASD show strengths and talents in drawing, playing music instruments, solving math problems, and writing computer code. However, limited interventions have been designed to cultivate their interests and strengths. Thus, more strength-based interventions should be encouraged.

Step 3. Determine Assessments

In order to determine whether the intervention has achieved its goals, ways of assessment and assessment criteria should be specified. A comprehensive evaluation plan should be determined before starting an intervention. Various evaluation tools can be used, and they can be grouped into two categories: formal standardized tests and informal procedures.

Formal Standardized Tests These tests can be either norm referenced or criterion referenced (Hickson et al., 1995). Norm-referenced tests allow interventionists to compare a learner's performance to that of same-aged peers. Criterion-referenced tests allow interventionists to measure a learner's performance against predetermined criteria. These tests often are the commercially published tests (e.g. intelligence tests, academic achievement tests, language tests, adaptive behavior tests) which can be purchased through publishers.

Informal Procedures These assessment procedures include observation, work sample analysis, criterion-referenced tests, task analysis, checklists, rating scales, interviews, and questionnaires (Hickson et al., 1995). These assessments are often made by interventionists to determine if learners have acquired target skills that they have been specifically taught.

The effectiveness of an intervention can be determined through carefully following its evaluation plan. The evaluation plan should consist of assessment material(s) and an evaluation design. Depending on the number of participants in an intervention, the evaluation design can be a single-subject design or a pretest-posttest group experimental design.

Single-Subject Design This design allows determining the intervention effects on a single participant or a small group of participants. There are three commonly used single-subject designs including the reversal or withdraw design (ABA) design, multiple baseline design, and changing criterion design (Rusch, Rose, & Greenwood, 1988).

The Reversal or Withdraw Design (ABA) Design This design consists of three phases: baseline 1 (A), intervention condition (B), and baseline 2 (A). During baseline 1, the target behavior(s) is/are observed without any presentation of intervention. During intervention, the participant(s)' target behavior(s) is/are observed while receiving intervention. After some stable and substantial changes of the target behavior(s) are observed, the treatment condition will be withdrawn. The baseline condition will then be reintroduced. For example, if one wishes to determine whether using participants' interested items would increase their attending behaviors, he/she can use an ABA design. If the numbers of participants' attending behaviors during the intervention condition are higher than those during the baseline 1 and baseline 2 conditions, it can be concluded that the intervention was effective.

The Multiple Baseline Design This design can be used across subjects, behaviors, or settings (Hickson et al., 1995). Baseline data are collected on the same behavior across two or more participants, two or more behaviors on the same participant, or on the same behavior across two or more settings for the same participant (Christensen, Burke Johnson, & Turner, 2011). After baseline data are collected, the intervention will be introduced. If the number of target behavior(s) recorded during the intervention condition is noticeably higher than that during each baseline condition, it can be concluded that the intervention was effective.

The Changing Criterion Design This design begins on collecting baseline data. During the first intervention phase, a criterion level is determined. If a participant has successfully reached the criterion level across several trials, a higher criterion level will be introduced during the next intervention phase. If a participant's target behavior improved as the criterion level was increased, this overall pattern of results is the evidence of the positive results of the intervention on the participant (Christensen et al., 2011).

Pretest-Posttest Group Experimental Design There are two types of this design. One allows a comparison of the mean performance of the same participants before the intervention and after the intervention (i.e., one-group pretest-posttest design). Another one allows the comparison of two groups (intervention vs. non-intervention) before and after the intervention (i.e., pretest-posttest control-group design).

One-Group Pretest-Posttest Design Before starting an intervention, all participants receive pretests. After pretests, all participants begin to receive the intervention. Upon completion of the intervention, all participants receive posttests which are the same as the pretests. The differences between the pretest and posttest performances of the participants can be determined by using statistical analyses. If participants' posttest scores are significantly higher than their pretest scores, it may be concluded that the intervention has positive influences on the participants.

Pretest-Posttest Control-Group Design Participants are randomly assigned to either of the intervention group or the non-intervention (control) group. Both groups will then receive pretests. After pretests, only the intervention group will receive the intervention. After the intervention has completed, both groups will then receive posttests. Statistical analyses are used to determine if the intervention effects exceed what would be expected by chance (Hickson et al., 1995).

Step 4. Design Lesson/Instructional Plans

Each intervention session should have its lesson/instructional plan to address its goals and objectives. Lesson/instructional plans guide interventionists what to teach and what materials to use during each intervention session. They also help interventionists stay organized and ensure intervention time is used appropriately and appropriate instruction is delivered to help learners develop target skills (Selmi, Gallagher, & Mora-Flores, 2015). They do not always need to be written in great details, but they need to be completed before a planned intervention session. A lesson/instructional plan should at least include

Table 15.1 Sample lesson plan

Session # Topic:		
Activity 1:	Time:	Materials:
Teaching procedures:		
(a)		
(b)		
(c)		
Activity 2:	Time:	Materials:
Teaching procedures:		
(a)		
(b)		
(c)		

the sequence of learning activities, instructional time for each learning activity, and the materials to be used during a lesson. A sample lesson plan format can be found in Table 15.1.

Step 5. Select Instructional Strategies

After goals are determined, the teaching strategies that will be used during intervention should then be decided. Teaching strategies are the instructional tools that interventionists will use to assist learners to acquire target behaviors. They include instructional methods, behavior management techniques, and arrangements of the classroom (Hickson et al., 1995). Guided by the philosophical orientations of the intervention program, clients' characteristics, and parents' expectations, appropriate teaching strategies should be selected.

Instructional Methods There are various evidence-based instructional methods for teaching individuals with ASD, and they can be grouped into four categories, including skill acquisition, motivation improvement, skill maintenance, and skill generalization.

Skill Acquisition There are several approaches typically used to assist individuals with ASD to acquire new skills, including modeling, prompts, and reinforcement.

Modeling This is a teaching strategy that an adult or a peer demonstrates a target behavior to a learner (Wong et al., 2013). For example, the target behavior is saying *water*. An adult demonstrates saying *water* to a learner. Another form of modeling is *video modeling* which offers a visual model of the target behavior via videos (Wong et al., 2013).

Prompts Prompts, such as visual, verbal, gestural, or physical assistance, are given to a learner to assist him/her to learn a target skill (Wong et al., 2013). For example, a learner is learning to say *car*. An adult presents a toy car and provides a verbal instruction (say car) to verbally prompt the learner to acquire the skill of saying car.

Reinforcement A learner's desired item or activity is given to him/her once he/she has produced the target behavior. For example, a learner says *water* to request drinking water. An adult heard the learner saying water. He/she then allows the learner to drink water.

Motivation Improvement Motivation is one of the pivotal areas that can have positive influence on the learning of children with ASD (Koegel, Koegel, Harrower, & Carter, 1999). It can be defined as "observable characteristics of a child's responding" (Koegel et al., 1999, p. 178). Improvement in motivation can be described as responsiveness to social and environmental stimuli is increased (Koegel, Carter, & Koegel, 1998). If a learner has high level of motivation in learning, it will be easier for interventionists to provide instruction, and it will also be easier for the learner to learn new skills. Thus, it is important to apply strategies to improve learners' learning motivation. Several strategies can be used to improve learner's learning motivation. They include child choice, interspersal of acquisition and maintenance tasks, natural reinforcement, and reinforcing attempts.

Child Choice Allow learners to choose preferred items or activities and the items or activities chosen by them are then used in or as the learning activities (Koegel et al., 1999). This simple strategy can effectively improve learners' learning motivation. For example, an adult asks a child if he/she would like to use a pen or marker to do writing. If the child wants to use a marker, he/she is allowed to use it for writing (Koegel, Singh, & Koegel, 2010).

Interspersal of Acquisition and Maintenance Tasks Students often are not interested in completing the tasks that they feel challenging or difficult. Learning new tasks often make students feel challenging and want to escape. However, in order to achieve intervention goals, students are required to complete challenging tasks. Blending difficult tasks with easy tasks can increase students' learning motivation. Numerous previously learned tasks are interspersed with the target skill that the learner has not already learned (Koegel & Koegel, 2012). For example, a learner can add two numbers less than 10 to yield a sum smaller than 10 but is learning the tasks adding two numbers less than 10 to yield a sum greater than 10. The easy questions can be interspersed with the difficult ones to increase students' learning motivation.

Natural Reinforcement Another strategy to improve motivation is to use natural reinforcers. A natural reinforcer is the item/activity that is directly and functionally related to the target task (Koegel & Koegel, 2012). Once a learner displays a target behavior, he/she should receive the item or activity that is directly related to the target behavior. For example, a cup of water is given to a learner once he/she said *water*.

Reinforcing Attempts Before a learner can successfully display a target behavior, he/she may need to practice the behavior many times. Depending on the learner's learning speed, his/her learning process may be long. If interventionists only provide reinforcement to learners when they successfully produce target behaviors, they may lose motivation to learn new skills. Thus, reinforcing learning attempts while a learner is trying to acquire a new skill is important. Reinforcing attempts means that a learner's goal-oriented attempts are reinforced (Koegel & Koegel, 2012). For example, a learner is learning to name balloon and want to play with a balloon, but he/she has difficulty sounding the whole word. He/she looked at the adult and said *ba*. The adult reinforced his/her attempt by giving him/her a balloon.

Skill Maintenance Maintenance refers to learners who continue to display learned behaviors after an intervention has completed. Several strategies may be used to improve skill maintenance (Westling & Fox, 2009). (A) *Continue practice.* After learners have acquired a target skill, he/she should be taught to continue to practice the skill. (B) *Multiple opportunities to practice.* Learners should be given opportunities to practice one skill at different times, instead of all at once. (C) *Intermittent reinforcement*. Once a learner has learned a target skill, reinforcement should not be given to the learner immediately but every couple trials or minutes.

Skill Generalization Given the restricted and repetitive patterns of behaviors and interests in individuals with ASD, skill generalization is often found to be difficult for this population. They may not apply the learn skills to non-training setting or non-training interaction partners. Several strategies could be used to improve skill generalization (Stokes & Osnes, 1986).

1. The target skills should be useful to the learner's daily life.
2. The target skills should result in receiving natural reinforcers.
3. Use a wide variety of stimulus exemplars.
4. Use a wide variety of response exemplars.
5. Provide training in various training conditions and settings.

Behavior Management Techniques A high proportion of children with ASD who are nonverbal or have limited spoken language use challenging behaviors (e.g., tantrum, aggression) as a form of expressive communication (Chiang, 2008). Children's problem behaviors may bring challenges for interventionists to deliver interventions to them and decrease children's learning time. Thus, it is critical to apply appropriate strategies to manage learners' behaviors.

Functional Analysis of Problem Behaviors The first step to design a program to manage learners' problem behaviors is to conduct a thorough functional analysis of the problem behaviors (Hickson et al., 1995). This analysis is to identify the antecedent conditions that trigger the problem behavior, define the challenge (i.e., a description of the problem behavior), and identify the consequent conditions that maintain the problem behavior (Horner, Albin, Todd, Newton, & Sprague, 2011). Once this information is obtained, intervention alternatives may be introduced to learners. For example, if a learner is likely to bite his teacher to escape from the task demands. Changing the nature of the task demands to be more interesting to the learners may decrease his biting behavior. Also, teaching the learner to say *No* or point to a picture with *No* sign when he wants to reject an uninterested task may replace the biting behavior.

Extinction with Positive Reinforcement of Other Behaviors Extinction means that interventionists intentionally withhold reinforcement following a learner's behavior or ignore a learner's behavior (Snell & Brown, 2011). Extinction is most effective when positive reinforcing other behaviors is also used (Kerr & Nelson, 1989). For example, if a learner uses screaming to get adults' attention, in order to decrease the challenging behavior, adults will not look at the learner when he screams but will look at him to praise him when he does something good.

Arrangements of the Classroom Learners with ASD have the tendency to become attached to routines and settings (Mesibov, Shea, & Schopler, 2004). Thus, structured physical environment and clear sequence of learning events are important to assist them in learning (Mesibov et al., 2004). The learning environment can be structured by using visual cues or furniture arrangement to let learners know which activities occur in specific areas (Mesibov & Shea, 2010). Visual cues (e.g., pictures, written words) can be used to make schedules meaningful and understandable to learners (Mesibov & Shea, 2010).

An Example of a Curriculum Targeting Multiple Skills

A large proportion of children with typical development (TD) participate in organized activities (Hjorthol & Fyhri, 2009). Organized activities (e.g., extracurricular activities, after-school programs, community programs) refer to adult-sponsored activities that have regularly scheduled meetings (Bohnert, Fredricks, & Randall, 2010). Participating in organized activities have been suggested to be positively related to physical, psychosocial, cognitive, and educational functioning development (Bohnert & Garber, 2007; Gardner, Roth, & Brooks-Gunn, 2008; Guevre-mont, Findlay, & Kohen, 2014; Mahoney & Vest, 2012; Randall & Bohnert, 2009). However, compared to students with learning disability and students with speech/language impairment, students with ASD are less likely to be actively involved with friends and participate in organized activities (Wagner, Cadwallader, Garza, & Cameto, 2004). Thus, a thematically structured teaching Saturday enrichment program is developed for children with ASD. This program aims to improve their communication, social interaction, and academic skills. It uses strategies from Applied Behavior Analysis (ABA), the Pivotal Response Treatment (PRT) (Koegel et al., 1999), and the Treatment and Education of Autistic and Related Communication Handicapped Children (TEACCH) program (Mesibov & Shea, 2010).

The curriculum used in this program is the thematically structured teaching (TST) curriculum. The TST curriculum has two main components: (a) thematic learning content and (b) structured teaching schedule. The *thematic learning content* means all the learning content is associated with the learning theme. For example, if the theme of a session is transportation, all learning content for the intervention session will be associated with transportation (e.g., car, train, airplane, bus ticket, gas price, etc.). The *structured teaching schedule* means that the schedule of teaching activities is consistent throughout the intervention. For example, the intervention session one teaching schedule is identical to that of session two and the rest of the intervention sessions.

This curriculum covers ten intervention sessions. In each session, there is a theme. The themes in this curriculum are not overlapped; thus, there are a total of ten themes. Each session is composed of four 30-mins structured sequential teaching segments: (a) dance party and greeting; (b) an interactive story and story stations; (c) language, mathematics, and science; and (d) arts projects and goodbye.

During the first segment, the theme of the week is introduced to children, and children danced to theme-related music. Each song has its choreography which is developed based on its lyric. For example, for the transportation theme, songs related to cars, airplanes, trains, and boats are selected, and dance moves resembling these vehicles are developed. Interventionists show dance moves to children and prompt them to dance to the music and interact with their peers. After dance time is finished, interventionists lead children to sing a hello song to each child and teacher present.

During the second segment, one interventionist interactively reads a story to the group; he/she has interaction with children, while he/she is reading the story. Child engagement is encouraged by acting out the story and answering the questions related to the story. The weekly story is specially chosen to match the theme of the week and appropriate to the reading level of the children in the program. For example, for the transportation theme, a story book talking about different trains and helping others is chosen. One-on-one instruction is provided to the children who need more support to learn the story. After the story is finished, children participate in station activities (e.g., playing games, watching videos, doing role-play, reading books, playing play-doh, playing LEGO) related to the story and the theme of the week. For example, for the transportation week, children are instructed to use play-doh and LEGO to create vehicles, make paper airplanes, read books about vehicles, and watch videos about vehicles.

During the third segment, the first 10 min is language instruction. Words related to the weekly story and theme are chosen. For example, for the transportation theme, the words boat, car, train, airplane, ticket, etc. are included. Each child is taught to learn vocabulary words for the week by his/her assigned interventionist using both picture and letter flash cards. Interventionists follow a specific sequence to teach vocabulary: (a) show the child the picture or word; (b) named the vocabulary word; (c) said, “This is (vocabulary word)”; and (d) ask “What is this?”. At that point, the child is expected to say the vocabulary word. If the child does not, the word will be repeated and the child will be prompted to say it. For the children who complete the weekly vocabulary words within 10 min, they are also instructed to answer reading comprehension questions and write short essays related to the weekly story. During the second 10 min, children are instructed to learn mathematics by his/her assigned teacher. Mathematics concepts (e.g., numeracy, calculation, measurement, distance, etc.) related to the weekly story and theme are chosen. For example, for the transportation theme, children work on calculation questions and word problem-solving questions related to trains. Instruction and learning materials are designed based on each child’s level. During the last 10 min, an adult leads science projects demonstration. The science projects are chosen to be associated with the weekly theme. For example, for the transportation theme, children are instructed to use liquid detergent to power a boat. Children are encouraged to have social interaction with other children while performing the science project.

During the fourth segment, an interventionist demonstrates the arts projects related to the weekly theme. For example, for the transportation theme, the arts projects include using cereal boxes to make trains, using cardboards to make cars, and using water bottles to make boats. Children are encouraged to complete at least one art project. The last 10 min of this segment is used to say goodbye. The activities of the day are reviewed. Children are encouraged to show each other their art project(s) and are asked if they have made any new friends that day. A best helper for the day is identified during this time. A sample lesson plan of the TST curriculum can be found below (Table 15.2).

Conclusion

The guidelines for developing a curriculum mentioned above can be used for the practitioners who work with individuals with ASD and the parents who are interested in teaching their children at home. A common expression used by the professionals who work with individuals with ASD is “If you see a person with ASD, you see a

Table 15.2 Sample TST lesson plan

Theme: Transportation
Section (A): Dance party/greeting
Time: 10:30–11:00
Detailed procedures
1. Tell children today's theme
2. Play dance songs. Show children the designed dance moves. Have children join teachers to do the dance moves. Prompt children to have social interactions with other children Sample songs:
(a) We go traveling by http://www.youtube.com/watch?v=cSw50Jw0H34
(b) Over the mountains http://www.youtube.com/watch?v=U8v16WEVszM
(c) Transport http://www.youtube.com/watch?v=HJ1mO0MbqCg
(d) Wheels on the bus http://www.youtube.com/watch?v=ppmwWwcaO8U, http://www.youtube.com/watch?v=Fh_aD5EswXk&list=UU4Hdb26_xnPQsntwLazMqYw
(e) Red light green light http://www.youtube.com/watch?v=KbRW73P24V8
(f) The airplane song http://www.youtube.com/watch?v=7Jim4SR3Nfg
(g) (I'd take a) car, train, airplane http://www.youtube.com/watch?v=VwQIN7QWyHM
3. After dance is completed (10 min before moving to next teaching segment), have children sit in a circle. Sing a hello song and greet with each other
Section (B): Interactive story and story stations
Time: 11:00–11:30
Detailed procedures
1. Read a transportation story (e.g., *The Little Engine That Could* by Watty Piper)
2. Act out the story while reading the text. Introduce target words and mathematics concepts. Ask children questions related to the story. Have children demonstrate the emotions described in the story
3. After reading the story, have children participate in the story stations. Prompt children to have social interactions with others
(a) Station 1: children in the station one will use Legos to build trains and cars
(b) Station 2: children in the station two will make paper plans (e.g., http://www.youtube.com/watch?v=I0a0p8ygfQM)
(c) Station 3: children in the station three will play subway map jigsaw puzzles
(d) Station 4: children in the station four will play transportation games (sample games: http://www.primarygames.com/socstudies/transportation/games.htm; http://www.coolgames.com/air-transport.html; http://pbskids.org/barney/children/games/transportation_game.html)
Section (C): Language, mathematics, and science
Time: 11:30–12:00
Detailed procedures
1. Provide children one-on-one instruction
2. Teach children the target words of the week. Have children complete the language worksheets specially designed for them

3. Teach children the target mathematics concepts of the week. Have children complete the mathematics worksheets specifically designed for them
4. Have children sit together to learn science projects
5. Demonstrate science projects to children and have children participate in at least one science project
Sample science projects
(a) Paper towel bridge http://www.youtube.com/watch?v=FAdmTzD46Kg
(b) Pepper and water http://www.youtube.com/watch?v=eR-ZV-_fQok
(c) Magnetic motor https://www.youtube.com/watch?v=hYOuWYMPj-s
(d) Air powered balloon car https://www.youtube.com/watch?v=QzY9RH_JnL0
Section (D): Arts project and goodbye
Time: 12:00–12:30
1. Show children all the arts projects. Demonstrate how to complete each one
2. Have children choose the project that he/she wants to begin to work
Sample arts projects
(a) Cereal box rubber powered car http://www.youtube.com/watch?v=ZfiV1oTF-ks
(b) Jet toy car http://www.youtube.com/watch?v=8NT0rIv7sIU
(c) Fast-food chain components rubber band-powered car http://www.youtube.com/watch?v=jmvqN3M1OoI
(d) Rubber band-powered helicopter http://www.youtube.com/watch?v=cIbGWDM3F6o
(e) Cup helicopter http://www.youtube.com/watch?v=mzUkzGy5P7c
(f) A simple rubber band-powered car http://www.youtube.com/watch?v=v3pbVAYkGf0
(g) Origami sailboat http://www.youtube.com/watch?v=ld_k-mVwHW0
(h) Water bottle boat http://www.youtube.com/watch?v=_g48fJg_rCI;)
3. Have children use the arts projects that they just made as toys to invite others to play together
4. If there are some children who also want to do coloring, provide them with vehicle coloring sheets
5. Ask children to sit in a closing circle
6. Encourage them to show the group the arts projects they made and ask them what they have learned today
7. Announce the best helper of the week and have children say goodbye to each other and teachers

person with ASD." This expression indicates that the abilities of an individual with ASD may be different from another person with ASD. Thus, being able to create the curriculum that best suits the needs of the intervention clients is important. This chapter describes the steps to develop a curriculum and the strategies commonly used in interventions for individuals with ASD. An example of a curriculum targeting multiple skills is presented. Practitioners may find the information in this chapter is useful for teaching individuals with ASD.

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Augmentative and Alternative Communication and Autism

16

Daphne Hartzheim

Introduction

This chapter provides an overview of alternative methods of communication that can guide clinicians in their work with individuals with an autism spectrum disorder (ASD). The information included in this chapter is meant to stimulate and encourage the reader to consider communication from a broad perspective outside of conventional verbal speech. Effective communication occurs in a variety of ways. This chapter introduces the reader into a unique and alternative way of communication and explains what AAC is. Different types of AAC systems will be defined and explained. Further, the chapter will guide a clinician in their decision-making process concerning which AAC system to choose and how to functionally implement the system into the natural environment. While this chapter familiarizes the reader with introductory knowledge, AAC encompasses a wide range of technologies and is appropriate for many different populations with diverse disorders (e.g., amyotrophic lateral sclerosis, dysarthria, Parkinson's disease, cerebral palsy, Down syndrome). However, this chapter does not cover all possible AAC options. The focus of this chapter is on individuals with ASD, whose motoric abilities are typically sufficient to directly operate different types of devices but whose verbal abilities are insufficient for conventional communication.

While the emphasis in characterizing individuals with autism spectrum disorders (ASD) no longer lies in a language disorder but focused on the social communication and reciprocity, it is estimated that 30% of all individuals with ASD are either preverbal, remain nonverbal or minimally verbal, or need augmented input to enhance comprehension of language (Wodka, Mathy & Kalb, 2013). Augmentative and alternative communication (AAC) aims to give these individuals a voice and enhance their language comprehension. This chapter provides an overview of the most frequently used AAC devices, systems, and evidence-based interventions for those diagnosed with an ASD.

What Is AAC?

According to the International Society of Augmentative and Alternative Communication (ISAAC), AAC is defined as a set of tools and strategies that an individual uses to solve everyday communicative challenges. The mode in which communication occurs is secondary, as long as the intent and meaning are understood by the communication partners. The mode of

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communication can be speech, text, gestures, body language, touch, sign language, symbols, pictures, speech-generating devices, etc. Everyone uses multiple forms of communication, depending on the context and our communication partner (What is AAC? 2016).

While the definition of ISAAC focuses primarily on the different modes of communication, the American Speech-Language-Hearing Association (ASHA) released a position statement on AAC including the "why" of choosing an alternative way to communicate. They state that AAC is an area of research, clinical, and educational practice. It involves attempts to study and when necessary compensate for temporary or permanent impairments, activity limitations, and participation restrictions of individuals with severe disorders of speech-language production and/or comprehension, including spoken and written modes of communication.

> "It is the position of the American Speech-Language-Hearing Association that communication is the essence of human life and that all people have the right to communicate to the fullest extent possible. No individuals should be denied this right, irrespective of the type and/or severity of communication, linguistic, social, cognitive, motor, sensory, perceptual, and/or other disabilities they may present." (Augmentative and Alternative Communication, 2016)

Based on these two definitions, AAC is not only a research, clinical, and educational practice but a means to provide an individual with the basic human need for communication and connection, regardless of the mode. With the continuation of this chapter, it is important to keep this basic human need in mind, regardless of AAC being a temporary or a permanent solution.

When speaking about AAC, we differentiate between unaided and aided AAC. Unaided AAC encompasses those modes that do not require the use of external materials, such as sign language, touch, body language, facial expressions, gestures, etc. Aided AAC systems on the other hand utilize external materials ranging from low-tech systems to mid-tech systems to high-tech devices. In this chapter the focus will be on aided AAC systems. While manual signs have shown some success with children with ASD, their preference appears to lie with aided AAC systems (van der Meer, Sigafoos, O'Reilly & Lancioni, 2011).

Low-technology (low-tech) AAC systems include anything that does not require battery operation, as simple as paper and pencil and alphabet boards. Sophisticated and well-manualized systems such as the Picture Exchange Communication System® (PECS®) and visual schedules are considered low-tech AAC.

AAC systems with *medium technology* (mid-tech) are those static devices which have the ability to store prerecorded messages, ranging from a single message to multiple levels of messages to multiple messages on multiple levels. A caregiver, therapist, or anyone else interacting with the individual can record those messages. Examples of mid-tech AAC systems are single-button devices such as a BIGmack™, LITTLE Step-by-Step™, and GoTalk™.

Incredible advances have been made with *high-technology* (high-tech) AAC systems, which are dynamic display speech-generating devices (SGD). Upon direct selection or switch activation of a cell or button, the device either speaks the word or navigates to another level for more vocabulary words. Each device is programmed with a certain number of cells on each page. Depending on the user, this can range from a grid of 2 × 2, totaling four cells or buttons on one page but can extend to a 12 × 12 grid, totaling 144 cells. Usually, the SGDs come preprogrammed with a language system for beginner, intermediate, or advanced vocabulary options. With developing language skills, the SGD can be adapted to the individual's language needs. The user selects either one symbol or a combination of multiple symbols from the possible cells and a digitized voice outputs the message. SGDs can be designated communication devices that have primarily been developed for communication purposes. They usually allow for a number of different access methods, such as activating a button with a switch or with eye gaze rather than a finger. Tablets and iPads® with designated communication applications are now frequently used by individuals with ASD, if motoric abilities are sufficient that no alternative access method is necessary. Tablets and iPads® are making SGDs more commonplace, and social acceptance for alternative communication methods is increasing. These technologies should be a serious consideration when working with nonverbal individuals with ASD. Additionally, such devices have the potential of greatly enhancing comprehension for verbal and nonverbal people with ASD. The remainder of the chapter is used to discuss ASD-specific AAC considerations. Keep in mind however that this is a rapidly changing area and therefore new technology is always being developed.

AAC and Autism Spectrum Disorders

Given the core deficit of communication and the high percentage of individuals with ASD remaining nonverbal or minimally verbal throughout their life, use of AAC is inevitable with this population. Despite the use of AAC with individuals with expressive communication deficits, children who are considered verbal or vocal can benefit from AAC as well. The predominantly visual systems are useful to enhance comprehension and to also support expression when necessary. Communicating basic wants and needs can aid in decreasing challenging behavior of people with ASD. Further, being able to communicate has the potential to increase quality of life for the individual using the AAC system. Moreover, people in the AAC user's environment can benefit from successful communication. They may no longer have to guess about the wants and needs of the person using the device. The use of AAC for language facilitation and communication is an accepted practice for individuals with ASD.

However, the individual need must be determined. The design and implementation of AAC systems must support functional independent communication (Porter & Cafiero, 2009). Such independent functional communication should occur in a variety of settings (e.g., school, home, grocery store, restaurant, etc.) with a number of different people (e.g., caregivers, siblings, family members, teachers, peers, etc.). Long-term functional outcomes should focus on:

(a) Communication autonomy: individuals should be able to express themselves in regard to their own intentions (Von Tetzchner & Grove, 2003).
(b) Communication accessibility: familiar and unfamiliar people in the environment understand and support the use of AAC form (Von Tetzchner & Grove, 2003).
(c) Communication competence: the individual is able to demonstrate sufficient linguistic, operational, social, and strategic knowledge, judgment, and skill (Light, Beukelman & Reichle, 2003).

Using AAC with the ASD population is a well-established possibility, but the options are wide-ranging to achieve the functional communication goals. First, an AAC assessment has to be conducted to determine the most appropriate, individualized system for the user. Second, the system is implemented to achieve functional outcomes. A discussion of the assessment process and different types of interventions follow to accomplish the three long-term goals.

AAC Assessment

Up to date, no autism-specific AAC assessment has been developed. An AAC assessment is different from other types of standardized assessments. AAC assessments are focused on behavioral observations without standardization. During the assessment, the clinician trials a variety of AAC systems, ranging from low to high tech, and records successful communication trials. Complexity is increased with the completion of a successful communication trial. For a high-tech AAC system, different communication systems and applications are trialed including designated AAC systems (Tobii/Dynavox®, PRC®, iPad® and tablet applications, and others).

A team comprised of those interacting and working with the individual is involved in the assessment process. The team can be made up of the client and their family, therapists (speech-language pathologist, occupational therapist,

Table 16.1 Roles of assessment team members

Team member	Potential roles during assessment
Client	Determines preference of AAC system
	Programs the device if possible
	Determines preferences of activities
Family	Chooses appropriate device
	Advocates for the client
	Involves in activities of daily living
	Develops vocabulary
Speech-language pathologist	Assesses linguistic abilities (receptive and expressive language)
	Assesses communicative functions
	Assesses ideal symbol representation
	Assesses communicative opportunities
	Assesses communicative barriers
	Determines future direction of communication needs
Occupational therapist	Determines sensory needs
	Assesses fine motor skills for accessibility of AAC system
	Assesses ideal positioning
	Determines future direction of motor skills
Physical therapist	Assesses motor skills for accessibility of AAC system
	Assesses ideal positioning
	Determines future direction of motor skills
Behavior therapist	Assesses function of challenging behavior
	Determines prompting hierarchies
	Determines preference of items with reinforcing properties
	Develops generalization strategies
Psychologist	Determines impact of AAC system on daily living of client and family
	Assesses comorbidities
	Assesses cognitive skills
Physician	Assesses and prognoses of disorders
	Diagnoses motor and sensory skills
	Prescribes AAC system
Social worker	Coordinates services
	Counsels with client and family
Teacher	Determines vocabulary needs
	Establishes interaction profiles
	Determines academic barriers
	Determines future direction of needs

physical therapist, and behavioral therapist), psychologist, physician, social worker, teacher, etc. The team approach is crucial to ensure success in the use of the AAC system across all environments and to generalize and maintain skills acquired during interventions. Potential roles of each team member are displayed in Table 16.1.

Together, they are involved in the process of gathering information and analyzing all relevant knowledge to be able to make informed decisions about the adequacy of current communication, communication needs, AAC equipment, instructions, and outcomes (Mirenda, 2001). According to Light, Roberts, DiMarco, and Greiner (1998), five primary components are included in an AAC assessment:

1. *Identification of communication needs*:

   This portion of the assessment refers to detecting all situations in which communication could occur, but where it does not due to a number of reasons, such as lack of motivation, lack of communication skills, or lack of opportunity. These needs can be all encompassing for every situation and every potential communication partner, or they can be limited to certain conditions (e.g., school, recess, home, work).
2. *Assessment of skills* (i.e., receptive language, expressive communication, natural speech, symbol representation skills, literacy skills, cognitive organization, positioning and access skills, sensory perceptual skills as they relate to AAC):

   During the skill assessment, standardized procedures can be employed such as a language assessment. Often, observational measures and caregiver reports are useful to determine the current level of functioning. It is during this ongoing skill assessment that different types of AAC systems can be trialed. The team is consulted for different skills.
3. *Identification of partner interaction strategies that facilitate communication and of environmental barriers that impede communication*:

   Each individual has a unique interaction style. Some foster communication more than others and some limit communication. Observation of current interactions with different communication partners can provide valuable insight into how AAC can be implemented. It is even possible that due to a history of unsuccessful communication attempts, an individual may no longer have an opportunity to interact with peers because he or she is no longer around peers.
4. *Intervention planning*, including the development of appropriate AAC systems and instruction in skills to enhance communicative competence:

   During this portion the assessor, together with the team, establishes goals for the AAC user to independently operate the system, to learn functional communication strategies, and to enhance their linguistic abilities. The focus is on functionality and independence.
5. *Intervention planning for the facilitators*, including instruction in interaction strategies to facilitate communication and instruction in the operation and ongoing development of the AAC system:

   This refers to teaching communication partners how to generalize communication to ALL situations of daily living. If the family or caregiver of the AAC user is involved in the implementation of the system, he or she will show more success across different situations.

Ultimately, these five components function as guiding principles for the overall AAC assessment. Overall, an AAC assessment should center around an individual's ability to participate in age-appropriate, everyday life activities. This type of assessment and intervention model is based on the *Participation Model* described by Mirenda (2001). The Participation Model provides a systematic way to conduct an AAC assessment. It takes into consideration aspects of age-appropriate participation of the individual as well as skills and knowledge of support personnel such as family, teachers, and therapist. Assessment based on the Participation Model occurs in four phases (referral, initial assessment and intervention planning, assessment for tomorrow, and follow-up assessment) (Beukelman & Mirenda, 2013).

Phase I: Referral for Augmentative and Alternative Communication Assessment

Depending on the availability of qualified AAC specialists, this phase can be brief or lengthy. Typically, therapists or teachers initiate the referral. Lack of effective communication resulting in social isolation, potential challenging behavior, and stagnation of academic progress can trigger referral to an AAC specialist. Usually, if the teacher or therapist themselves are not proficient in providing an AAC assessment, they will assist the family in finding appropriate resources. They may provide valuable information to the AAC specialist regarding application for funding of an AAC system (Beukelman & Mirenda, 2013).

Phase II: Initial Assessment

This phase is designed to gather information on current skill levels and to develop interventions based on the present level of functioning. In a team effort the child with ASD receives a holistic assessment. Cognitive, linguistic, physical, language, and sensory capabilities are evaluated by qualified members of the AAC team. Additionally, the AAC specialist assesses current communication and interaction patterns of the potential user and barriers that interfere with age-appropriate interactions. Creating a participation profile can assist in analyzing interaction patterns and compare them to their peers.

Creating a participation profile begins with identifying all possible situations and people that the individual regularly encounters, which can be at home, school, and any other setting, with parents, caregivers, siblings, extended family, friends, therapists, unfamiliar people, etc. It also includes what types of activities the individual would most likely be involved in. When analyzing the interactions of the potential AAC user, it is crucial to also observe typically developing peers. It gives insight into what their peers are interested in, how they interact with each other, and what might be inappropriate behavior. Such observations should be with a representative peer example (i.e., same age, gender, social environment) for accurate interaction characteristics. Following the peer analysis of interaction and communication patterns, the individual with ASD should be observed to identify whether he or she is participating spontaneously and without assistance, with assistance from others, or not at all. For example, a 5-year-old girl with ASD might be in the same room as her peers when playing with a pretend kitchen set. She may be seated at the table while her two friends are preparing the meal. She, however, plays no active part in the interaction with the two friends unless verbally prompted by an adult. She is participating with verbal assistance in this particular interaction. While this girl needs support to interact with her peers, she at least has the opportunity to do so. At times a number of barriers to communication can hinder successful participation in the environment. The Participation Model differentiates between opportunity barriers and access barriers (Beukelman & Mirenda, 2013).

Opportunity barriers are those barriers that hinder the AAC user from typical interactions with peers and others. Those can be due to certain policies, lack of practice, knowledge, skill, or negative attitude toward alternative means of communication.

A *policy barrier* can be a formal legislative regulation that, for example, separates a student with disabilities from their peers by placing them in isolated classrooms. Lack of resources for student support may cause a school district to create policies causing a student to be bused to a school outside their typical boundaries, therefore isolating the student from children in their own neighborhood. These policies lead to social isolation of the student and therefore to a lack of opportunity to interact with peers.

A *practice barrier* refers to such barriers that occur if we "get stuck in old ways." At times, it may occur that long-standing habits on how things have been done in the past are difficult to disrupt, regardless of family, school, or workplace. Practice barriers can certainly be a result of knowledge barriers, which are a lack of information on the side of the clinician about the different types of systems that are available and how each system works. It is not possible to teach something without first mastering at least the basics.

Knowledge barriers, including AAC intervention options, technologies, and intervention strategies, may be the most challenging barrier to overcome. Contrarily, it may become less challenging with AAC technology moving into more mainstream technology (e.g., tablets, laptops). The designated communication applications may still leave therapists intimidated and unsure of how to apply them in interventions. Such barriers would be considered *skill barriers*, in which a therapist may have learned about different types of systems and have learned appropriate software navigation but still lacks the skill and practice to implement these systems functionally.

Another opportunity barrier is the *attitude and beliefs* held by not only the potential AAC user but also family members, therapists, and teachers. Subtle beliefs that an AAC system is inappropriate need to be addressed with high sensitivity to overcome such barriers. They can, however, be extremely disruptive to the successful implementation of an AAC system. It is therefore important to consult with all members of the assessment and intervention team in the decision-making process about which AAC system to choose. It can foster conversations about attitudes and may provide a forum to prevent future conflict and frustration in regard to the implementation of the AAC system (Beukelman & Mirenda, 2013).

Different from opportunity barriers, *access barriers* pertain to the individual's capacity, attitude, and resources to contact an AAC system and communicate with such a system (Beukelman & Mirenda, 2013). While mobility can be a challenge for an individual with ASD, it is not typically a main concern for AAC selection, since most display abilities of navigating a tablet or grabbing objects independently. A discussion on AAC system preference later in this chapter provides insight to different reasons for considering multiple AAC options in the assessment phase.

During this second phase of the assessment and in accordance with the Participation Model, individuals with ASD should be evaluated in regard to their current level of communication and their potential for verbal speech. A trained speech-language pathologist should perform this portion of the assessment. They can choose from a variety of different direct and indirect speech and language assessment tools, ranging from observation, norm-referenced, criterion-referenced, and standardized assessments. Besides tests used for evaluating ASD itself, typical language assessments for a child that does not have verbal language are the *Communication and Symbolic Behavior Scale* (CSBS, Wetherby & Prizant, 2003), *Rossetti Infant-Toddler Language Scale* (Rossetti, 1990), and the *Communication Matrix* (Rowland, 1996). These tools not only determine expressive and receptive language skills but also explore precursor skills to language development, such as use of gestures, facial expression and body language, joint attention, imitation skills, initiation of communicative acts, and different communicative intents.

Additionally, the *Verbal Behavior Milestones Assessment and Placement Program* (VB-MAPP, Sundberg, 2008) can add valuable information regarding barriers to communication based on its barrier assessment. Compared to traditional language assessments, this tool was developed from a theoretical background of applied behavior analysis (ABA) and verbal behavior. In this regard, it looks at communication patterns but from a behavioral viewpoint as opposed to a developmental stand. Language and communication from the perspective of a behavior analyst are no different than any other behavior and are shaped through antecedent conditions and consequences. No evaluation should rely on results of a single assessment tool but look at skills holistically. It should also be noted that while children with verbal communication may not require an entire AAC system, they may have difficulty comprehending acoustic-only signals and therefore benefit from some of the visual enhancement strategies discussed later in this chapter.

Phase III: Assessment for Tomorrow

This portion of the assessment is dedicated to establish a robust AAC system that can grow with the individual and their skill level, as well as be appropriate for ALL environments and interactions (Beukelman & Mirenda, 2013). For example, if a preschool child with ASD is using a SGD, it should be programmed with a software system that can increase in vocabulary size and be used in an academic setting, home, and social setting. When choosing such a system, it should be noted that with changes in the vocabulary size, sometimes the page overlay changes with different cell sizes and grid setups. While this may not cause any difficulty for some children, such changes can be problematic if the child struggles with changes in routines and has been proficient with the system prior to the overlay change. It could cause a regression of previously mastered communication. Therefore, choosing a system that accounts for growth from the outset is important.

Phase IV: Follow-Up Assessment

During a follow-up assessment of the AAC system that was chosen during phase II, the AAC specialist now evaluates if changes need to be made due to changes in communication and interaction patterns (Beukelman & Mirenda, 2013). If a child with ASD has become independent in using their system in one subject at school, it is time to generalize to all school subjects. The AAC system however may need to be modified for those different classes. In another situation, the child may use their system in one social situation at home with siblings but not with children at school. This could be because the child has not acquired this skill to interact with peers at school yet, but it could also be due to lack of access to appropriate vocabulary on the AAC device. Follow-up is dependent on the growth curve of the AAC user, as well as others interacting with the child. If the caregivers are proficient in adapting AAC systems, follow-up appointments may need to be less frequent. However, caregivers cannot replace professional clinical decision-making and appropriate developmental judgment.

AAC Intervention

After the thorough AAC assessment has been completed, goals need to be formulated for operational abilities of the AAC system, for an increase in linguistic skills, to enhance social engagement and to learn strategies to repair communication breakdowns (Light et al., 1998). After developing goals in cooperation with the family and the individual, different intervention approaches have been shown to be effective for different types of AAC systems. Since we differentiate between aided and unaided AAC, we will discuss intervention based on those two systems. An emphasis is placed on aided AAC for individuals with ASD.

As a general rule, intervention should be driven by an individual's daily communication needs at home, school, and the social community. First, the type of input the individual requires for enhanced linguistic comprehension needs to be determined. Then, establishing with whom, where, when, why, about what, and how the individual needs to communicate follows. It is important to build the intervention based on the answers to these questions (Light et al., 1998).

Individual intervention planning has to be based on finding a successful way to provide every individual with ASD with a viable, robust, flexible, and generative communication system. The system should support language in the long-term if necessary. The focus needs to be on presuming competence and paying little attention to past failures to communicate. We capitalize on specific strengths (e.g., visual memory and visual processing), and we should focus on compensatory supports to address specific limitations (e.g., difficulties with comprehension of social markers and linguistic information). Establishing a successful AAC option for someone with ASD is a continued innovative process, in which we never stop to search for the solution to barriers. This requires the continued team approach throughout intervention and beyond. Our overall goal is to facilitate an individual's ability either to communicate more effectively with others or understand communication from others (Mirenda, 2001, 2008).

Aided AAC Systems

Aided AAC systems for individuals with autism range from low-tech to high-tech techniques; the most common low tech being PECS® or other picture-based interventions. SGDs are also used frequently with individuals with autism. Interventions have been shown to have a moderate to high treatment effect on participants across all ages, diagnostic criteria, and intervention settings. It is worthwhile to implement AAC across the lifespan. The most common and most research-supported interventions are PECS® and treatments with SGDs (Ganz et al., 2012). Besides those most researched approaches, visual schedules (i.e., daily schedules, activity schedules), and modeling interventions will also be discussed.

Visual and Picture-Based Interventions

Picture symbols can be used for a variety of intervention techniques, such as functional communication training (FCT), visual schedules, and choice-making. FCT refers to a set of procedures designed to specifically reduce challenging behavior by establishing the function of such behavior followed by teaching functionally equivalent communication skills (Peterson, Bondy, Vincent & Finnegan, 1995; Vaughan & Horner, 1995). FCT requires a thorough assessment to identify the function of the behavior of concern, referred to as functional behavior assessment (FBA). Usually, such a FBA is conducted by a trained Board Certified Behavior Analyst (BCBA). At the conclusion of the FBA and identification of the function of challenging behavior, systematic instruction related to teaching functionally related alternative communicative behaviors commences. FCT interventions have the clear advantage in that they teach individuals to communicate one or more functional messages while at the same time providing positive alternatives to their problem behavior (Peterson, et al., 1995). A full discussion of FCT does not fall within the scope of this chapter. For further reading on FCT, refer to Carr and Durand (1985), Fisher et al. (1993), Durand and Carr (1991), Durand (1999), and Durand (1990).

Visual schedules come in many different styles and formats and can be used in a wide variety of daily activities. The schedule displays a sequence of activities either through pictures or written words. Schedules can promote independent on-task behavior and assist individuals in understanding, following direction, and transitioning predictable activity sequences in school and home settings (Peterson et al., 1995). Positive results have been reported with getting dressed (Pierce & Schreibman, 1994), independent writing tasks (Hall, McClannahan, & Krantz, 1995), transitioning between two activities (Flannery & Horner, 1994; Krantz, MacDuff & McClannahan, 1993; MacDuff, Krantz & McClannahan, 1993), and independent play and joint play (Brodhead, Higbee, Pollard, Akers, & Gerencser, 2014). Visual-graphic daily schedules, using pictures with text, text alone, or pictures alone, have effected positive behaviors and self-management in Treatment and Education of Autistic and Related Communication in Handicapped Children (TEACCH) (Watson, Lord, Schaffer, & Schopler, 1989). Schedules have decreased problem behaviors and increased independent self-management (MacDuff et al., 1993).

A daily schedule in a classroom should be placed in a designated area that is easily seen and reached by the individual and the teacher. The schedule can be an overview of the daily classroom routines or the progression of a single activity. To ensure flexibility with different daily routines, the pictures are commonly attached to the schedule with Velcro. At the beginning of the day, the teacher explains the routine of the day. He or she points to each picture on the schedule and explains in simple terms what each picture represents. At the beginning of the activity or lesson, the teacher again points to the icon representing the activity. Once an activity is complete, the teacher or the student takes the picture of the schedule and places it in a designated "finished" spot. This can be a "finished" column to the right of the activity, or it can be a "finished" envelope at the bottom of the schedule. This procedure is followed for each activity of the day. It is important to be consistent in accompanying verbal output with the visual stimuli to ensure comprehension and increase the student's ability to transition. The schedules can be individualized to the specific classroom situation in placement, size, and visual enhancements. However, caution needs to be taken not to make the schedules too elaborate and complicated and unintentionally distracting from the actual purpose of the schedule. Pictures should be clearly visible

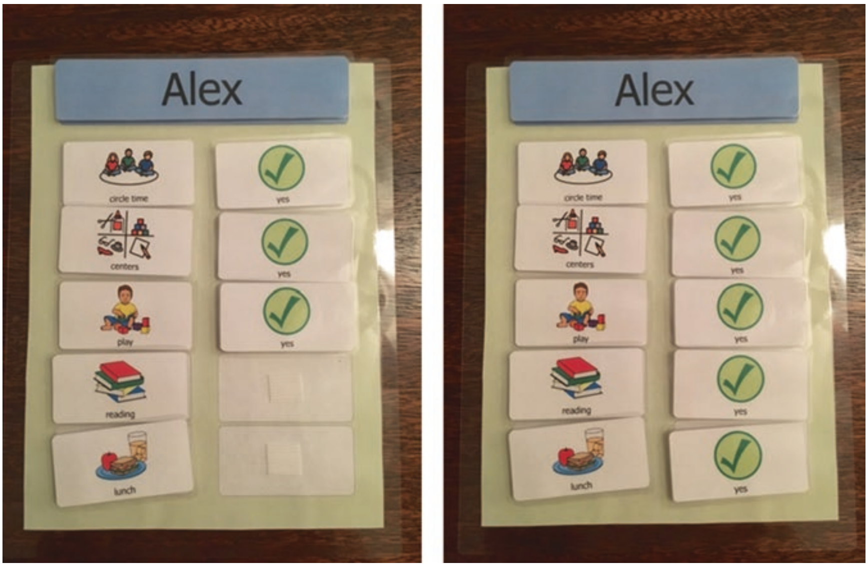

Fig. 16.1 Visual schedule in the classroom

from the background and have simple photo line drawings or easily readable words. Schedules can be used for classroom routines as well as specific activities, such as baking cookies. A baking activity may be done in a group or individually. The teacher again has a schedule prepared for each step of the baking process (i.e., getting the ingredients, getting the tools, adding of the ingredients step-by-step, preheating the oven, mixing everything together, placing the cookies on the cooking sheet and in the oven, and cooling down). At the beginning of the activity, the teacher goes through the entire schedule by pointing to each symbol and explaining each step. At each level of the schedule, the teacher points to the appropriate picture. An example of a classroom visual schedule is displayed in Fig. 16.1. Figure 16.2 shows an activity-specific visual schedule of making chocolate chip cookies. Schedules can be used for any routine-based activity or in any environment. Figure 16.3 displays examples of visual schedules at home. They support children with ASD transitioning between different activities and a variety of environments. Enhancing receptive language with visuals further aids language development.

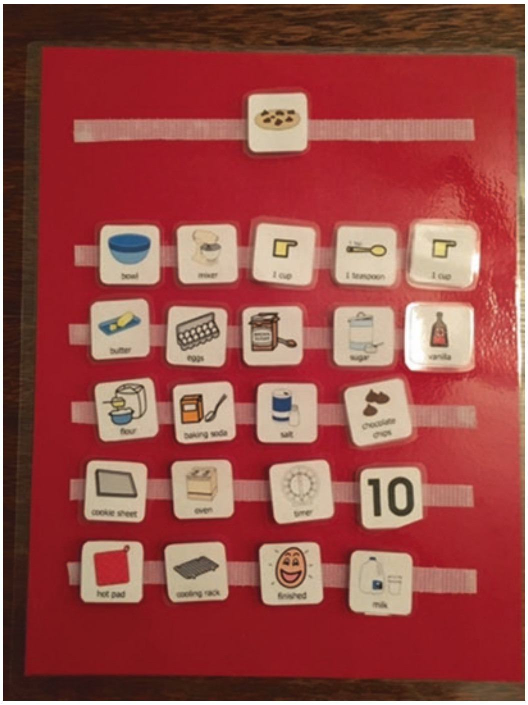

Fig. 16.2 Visual schedule making cookies

Portable visual activity schedules are implemented to support independent play or other daily routines. An activity schedule is a 5 × 8.5 in. binder with different pages in sheet protectors. Each page has one or multiple activities on it. For example, to promote independent play,

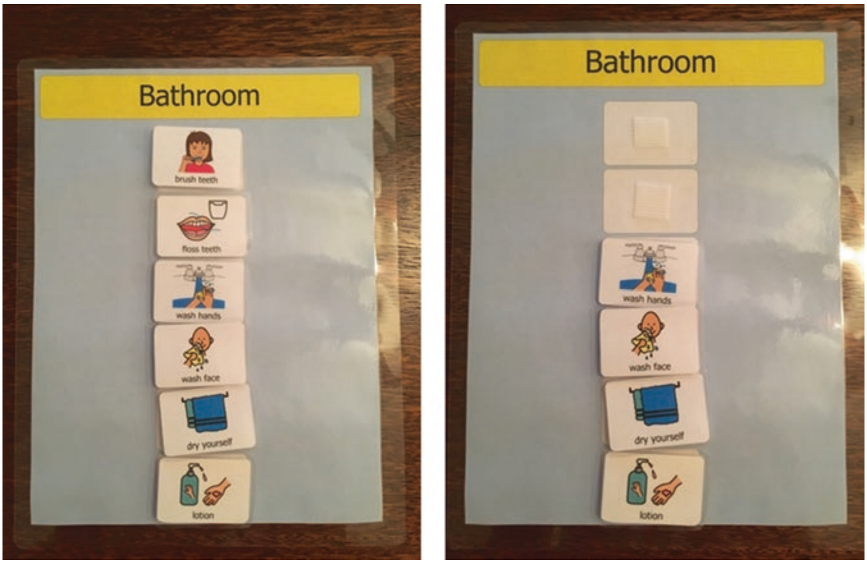

Fig. 16.3 Visual schedule at home

each page has one symbol displaying either a closed or open-ended activity. The child is taught through physical guidance to get the book, open it, and point to the symbol on the first page. He or she then gets the toy and plays with it. If the symbol displays a close-ended activity (e.g., stacking toys or puzzle), the child returns the toy to its original location. If the symbol depicts an open-ended activity, a time frame has to be indicated with the symbol. This can be done in the form of numbers or colored dots. Again, the child is taught to activate a timer with the appropriate time frame through physical guidance. After setting the time, the child plays with the toy until the timer goes off, at which point the child returns the toy to its original location and returns to the activity schedule book. This is repeated for a number of toys until the last page. Here, a reinforcer is depicted and the child receives the reinforcement with completion of the entire schedule.

Initially, during training, the child can be physically guided through each activity, but prompting should be faded as quickly as possible. Depending on the child, it may be necessary to start with one closed-ended activity. Later on the activity schedule can also support peer interaction. One page can be dedicated to choosing a peer to play. Sophisticated joint activity schedules have even been used to teach children to play hide-and-seek (Brodhead, Higbee, Pollard, Akers, and Gerencser 2014). Portable activity schedules promote independence and can be used for play as well as daily routines (e.g., bedtime, getting ready for school). See Fig. 16.4 for an example of a portable visual activity schedule for independent play and bedtime routine.

Transitioning between activities or locations can be especially difficult for some individuals with autism. A simple visual as displayed in Fig. 16.5 can aid transitioning between two different activities. The teacher or therapist first points to what is required at this point and then a reinforcer after successful transitioning. With all of the visual enhancement strategies, simple language is used to accompany the visual stimuli.

Visual symbols can further augment input related to choice-making by individuals with ASD. For this purpose, pictures of different choices are displayed. The child is asked to choose one of the items. The visual support assists language comprehension and helps the individual to successfully communicate preferences. Opportunities for choice appear to be effective in decreasing problem behavior (Frea, Arnold, & Vittimberga, 2001).

Fig. 16.4 Activity schedule

Fig. 16.5 Now-then visual transitioning

Picture Exchange Communication System® (PECS)®

PECS is a low-tech AAC system that relies on laminated picture symbols and a sturdy binder containing pictures that are attached with hook and loop fastener such as Velcro®. It is based on principles of verbal behavior from applied behavior analytic (ABA) principles. The philosophy behind PECS lies in the Pyramid Approach to Education®. At the base of teaching lie functional activities, powerful reinforcers, functional communication, and contextually inappropriate behaviors. In essence it comprises the science of learning and why learning occurs (Frost & Bondy, 2002). Given this basis, PECS should ultimately lead to communication in daily life. The learning activities should be incorporated into daily functional activities of the individual. Further, teaching should incorporate powerful reinforcers, such as highly preferred snacks, toys, and activities. Building upon this base, PECS includes the "how" of teaching communication. Error correction, a variety of evidence-based teaching strategies, effective lesson plans, and generalization methods are systematically integrated into the six-phase manualized AAC system (Frost et al., 2002). While traditional verbal imitation approaches often result in prompt-dependent and non-spontaneous speech (Schreibman, 2006), PECS relies on child-initiated communication and systematic fading of physical prompts to minimize prompt dependence (Ganz, Simpson, & Corbin-Newsome, 2008). Moreover, traditional language instruction wherein students are taught to label or comment on objects and to describe communicative functions often holds limited motivation for children with ASD (Charlop-Christy & LeBlanc, 2001). PECS provides concrete visual reminders of concrete objects available for requesting. Also, learners need to use only a small number of simple motor movements to request a variety of items. Finally, the only prerequisite for PECS is to have a reinforcer, such as a favorite toy, activity, or food. PECS is certainly suited for individuals with ASD (Ganz et al., 2008).

Picture symbols for the PECS system can be photographs of items with a solid background or they can be colored line drawings from a picture communication system (PCS) database. The sizes of the pictures can vary depending on perceptual and motor abilities of the user. PECS is taught over six main phases. The phases and a short description of each phase is described in Table 16.2 (Frost et al., 2002) with pictures of PECS books in Fig. 16.6.

PECS has shown to be effective across a variety of ages (i.e., preschool age, elementary school age, and adults). PECS training has resulted in decreased tantrums and other problem behaviors (Charlop-Christy et al., 2002; Frea, Arnold, Vittimberga, & Koegel, 2001); increased use of requests incorporating function, color, and shape (Marckel, Neef, & Ferreri, 2006); improved social interactions; and improved skill generalization (Ganz, Sigafoos, Simpson, & Cook, 2008).

Pragmatic Organization Dynamic Display

The *Pragmatic Organization Dynamic Display (PODD)* emerged in a clinical setting. It was designed to solve problems that frequently occurred during intervention. Such problems include vocabulary only being available during certain activities and activity-specific vocabulary without the option of communicating other things. If multiple displays were available to ensure access to more vocabulary, it required a high degree of cognitive and working memory to scan each display and discriminate between all symbols. Moving between different pages and inefficient vocabulary organization can be a challenge (Porter & Cafiero, 2009).

PODD is designed to support spontaneous and functional communication in all daily environments. Depending on the current level of communication and language abilities, pages have to be designed accordingly in regard to number of symbols per page. PODD features some unique strategies to enhance social communication. One such feature is the navigation between different pages with “Go to page (number)” symbols that lead to color-coded matching pages. It further provides operational commands such as “Turn the page” or “Go to (category)” symbols to facilitate movement between different pages. Similar to other systems, vocabulary is organized in association with the main content of an activity and can appear multiple times on multiple pages. For individuals it may be helpful to include words and phrases that support behavioral and environmental regulation early on in the communication book. Another unique feature of the PODD system is pragmatic starters. These are symbols that provide predictive links to pages that are commonly used for certain communicative intents (e.g., I want something, I’m asking

Table 16.2 Picture exchange communication system phases

Phases	Description
Phase I (how to communicate)	Students learn to exchange single pictures for items or activities they highly prefer
Phase II (distance and persistence)	Still using single pictures, students learn to generalize new skill by using it with different places, with different people, and across distances. They are also taught to be more persistent communicators
Phase III (picture discrimination)	Students learn to discriminate between two or more pictures by selecting their favorite item. The pictures are placed in a communication binder
Phase IV (sentence structure)	Students learn to construct simple sentences on a Sentence Strip™ by combining an “I want” symbol with a preferred item that is being requested
Attributes and language expansion	Students increase the length of their sentence by adding attributes, such as adjectives, verbs, and prepositions
Phase V (answering questions)	Students learn to use PECS to answer the questions such as, “What do you want?”
Phase VI (commenting)	Now students are taught to answer questions such as “What do you see?” “What do you hear?” and “What is it?” For this purpose, they learn to construct sentences starting with “I see,” “I hear,” “I feel,” “It is a,” etc.

Fig. 16.6 PECS® books examples *PECS® Pictures used with permission from Pyramid Educational Consultants Inc*

a question, I want to go somewhere). Predictive links can also be symbols depicting messages like I like this or something's wrong. Depending on the selection, the AAC user makes the partner and then navigates to the page corresponding with the predictive link. The page includes various things that he or she might want or need. When a conversational breakdown occurs, PODD communication books include symbols that aid in clarifying or repairing the breakdown (e.g., I don't know, I don't understand, please explain this to me) (Porter & Cafiero, 2009).

When considering AAC options for an individual with communication difficulties, it is often because there is a lack in receptive language skills. There is a differentiation between expressive communication and receptive language. Expressive language refers to the ability to make one's own wants and needs known to others through a variety of different modes (i.e., verbal output including words and sounds, written words, gestures, sign, body language, etc.). Sometimes challenging behavior can be the result of an individual's lack to communicate their wants and needs clearly to their conversational partner due to a lack of expressive communication skills. On the other hand, receptive language refers to the ability to understand verbal (i.e., spoken words) and nonverbal (i.e., facial expression, gestures, body language) communication. Prerequisite skills to receptive language are attention, perception, and memory, which includes skills such as joint attention and engagement and object permanence.

While AAC has been shown to be effective in enhancing expressive communication, it also supports receptive language through a variety of input strategies, such as aided modeling and aided language stimulation. These techniques evolved from the theoretical basis of typical language development. By the time a typical child starts using verbal language, it has had a vast amount of language modeling from people in his/her environment. Modeling language is crucial for language development. Aided modeling provides the individual with language input in the mode that he/she would use for expression, in this case an AAC system.

Augmented Communication Input

"A simple way to conceptualize the logic and theory supporting the practice of AAC modeling is to think of the analogy of a child learning a spoken or signed language. If you expected a child to learn to speak Spanish, the child should be immersed in environments that use the Spanish language. The same logic is used for a child expected to learn sign language, in that he or she should be immersed in environments where people are using sign. For children who are expected to communicate using AAC, the logic continues that the child would be immersed in and environment 'speaking AAC'. Language input is important to language acquisition." (Sennott, Light, & McNaughton, 2016)

AAC modeling-based interventions for children consistently produce large and clinically relevant effects on beginning language skills of individuals with complex communication needs using AAC across four primary domains (i.e., pragmatic, semantic, syntactic, and morphologic). Children increase communication turns, gain vocabulary knowledge, communicate multi-symbol utterances, and demonstrate knowledge of early morphological forms. These positive results are seen across a range of communication partners and contexts such as play, shared reading, art activities, and mealtimes (Sennot et al., 2016).

Augmented language input uses visual-graphic symbols that can be pictorial, text-based, or a combination of pictures and text (Cafiero, 2001). Augmented input strategies require the communication partner to use speech as well as AAC. The partner is signaling to the AAC user the mode that he or she is expected to use. It provides a model that is consistent with the output. It further signals acceptability of the AAC system as a mode for communication and that it can be used to send messages. Modeling AAC use can further provide opportunities for appropriate play, for social interaction and for learning new language concepts. AAC models may aid in language comprehension for individuals who struggle with speech-only input. It provides visual enhancement of the spoken words. Visual-spatial abilities of individuals with autism may be a relative strength, therefore supporting the use of picture-based communication systems (Drager, 2009). *Aided language stimulation (ALS) and natural aided language (NAL)* are two of the most common aided modeling interventions.

Aided language stimulation (Goosens, Crain, & Elder, 1992) is an augmentative communication strategy that uses the contextually relevant, reinforcing environments and activities of the natural language paradigm (Koegel, O'Dell, & Koegel, 1987; Koegel, Dyer, & Bell, 1987). It is a receptive language training using visual symbols along with speech. ALS most commonly uses Picture Communication Symbols (PCS, Mayer-Johnson, 2004) in an interactive manner. Symbols are arranged on environmentally specific language boards. The speaking communication partner touches symbols as he/she speaks to the nonspeaking communication partner. ALS targets a variety of communication functions such as initiation, questioning, responding, and commenting between the client and the communication partner. (Goossens, Crain, & Elder, 1992).

In the *natural aided language* (NAL) intervention, ALS was merged with naturalistic learning. The visual systems are implemented in natural, real, and reinforcing environments. It is comparable with incorporating a second (but visual) language into the everyday routines. This hybrid strategy incorporates the interactive, generative language basis of aided language stimulation with the naturalistic strategies of the natural language paradigm (Koegel, et al., 1987) and incidental teaching (Hart & Risley, 1995). NAL has been shown to increase the use of picture symbols for communication. With the use of NAL, individuals have been able to learn a variety of communicative intents. Simple requesting expanded to initiation, responding, commenting, and questioning within teacher-directed activities (Cafiero, 2001). While enhanced communication is the primary goal, NAL has the potential to positively affect academics and challenging behavior (Cafiero, 2001).

Speech-Generating Devices

With advances in technology, voice output communication aids (VOCAs) become more accessible. VOCAs or SGD are high-tech AAC systems with dynamic displays. SGDs are portable, computerized devices that produce synthetic or digitized speech output when activated. A variety of visual-graphic symbols are used to represent messages, which are activated when an individual uses a finger, hand optical pointer, headstick, switch, eye gaze, or some other means to select a symbol from the SGD's display. Which access method is employed depends on the individual's motor abilities. Most individuals with autism have motor abilities sufficient for direct selection of symbols on a SGD using their fingers.

A high-tech AAC system can be a designated communication device (e.g., Tobii Dynavox®, PRC® devices) or a tablet with a communication application (e.g., Android or iPad®). While the tablet option is less costly than a designated device, there are some downfalls. Speakers are often not sufficient for noisy environments, tablets are usually not as shock resistant to falling, and the customer service, especially for programming support, is often not included in the apps for tablets and iPad®. Designated devices on the other hand provide support, troubleshooting help, and implementation guidance from a trained representative. They are durable and usually have better voice and speaker qualities.

Individuals with autism have a relative strength regarding visual stimuli. In comparison to picture-based low-tech AAC systems, high-tech AAC systems have a large database of pictures and words already preprogrammed on the device. The potential for vocabulary growth, variability of output, and increase in communicative intents is provided. Depending on the system, the displays are designed based on different theoretical bases of language learning. For example, *Language Acquisition through Motor Planning* (LAMP®) Words for Life (PRC system) is based on motor learning of language. It combines principles related to teaching language such as readiness to learn, joint engagement, consistent and unique motor patterns, single words, auditory signals, and natural consequences. Readiness to learn assures that the AAC user is alert and attending to relevant learning stimuli. Activities need to be designed around the individual's skill level. Joint engagement refers to the moment in which both communicators are participating in the same activity or with the same object. The vocabulary on the device is organized and programmed in a manner to allow fluent communication upon mastery. The symbols are arranged in a manner with a consistent motor pattern. With increase in vocabulary, each symbol remains in the same spot. Each cell communicates single words so that novel sentences can be created independently by the user. Core vocabulary (i.e., those words that are most commonly used in a language) is taught first (e.g., "want," "go," "you"). Fringe vocabulary (i.e., content words with less frequent occurrence in language) is taught later (e.g., "piano," "cotton," "stapler"). Auditory signals occur with the activation of a button or a cell on the device, which is typical for all SGDs. Natural consequences are provided by the communication partner when he or she reacts appropriately to the auditory signal ("What is LAMP," 2016). While this type of system is available on a designated device, the software can also be loaded onto a tablet or iPad. The application "Speak for Yourself" (Speak for Yourself AAC, 2016) is also based on activating cells with a consistent motor pattern.

Compass® (Tobii Dynavox) is based on learning language in categories and situationally. This system comes pre-stored with a full-breadth of symbols, pictures, and phrases to support everyday interactions. Built-in behavioral supports and scripts assist in conversations. The Compass pagesets are designed to increase efficiency and speed of access for increased conversational fluidity (Communication without Compromise, 2016). This software is loaded on designated communication devices as well as available for download on tablets and iPads®. Additional software with categorical vocabulary pagesets for tablets include *Proloquo2Go*® and *TouchChat*®. Choosing which type of system to use depends on the individual with autism as well as the abilities and knowledge of the interventionist. Preference of the AAC user is an important component when choosing a system.

From research in the area of eye gaze, we can learn a number of suggestions when designing AAC devices for individuals with autism. Social visual information does not attract the attention of those with autism or attract attention atypically. Important social information relayed by a person or face may be lost (Gillespie-Smith & Fletcher-Watson, 2014). The manner in which an AAC system is designed can enhance social comprehension. First, in regard to delayed fixation on social content, AAC displays should remain available long enough to process the relevant information for comprehension. Symbols depicting emotional expressions could be designed with particular clarity enhancing focus on social information (such as pointing arrows or distinctive colors). Further, if possible, it may be useful to reduce social complexity in AAC displays by depicting fewer people per symbol. More social complexity leads to less focus on that area in individuals with autism (Gillespie-Smith et al., 2014).

Eye tracking studies showed that children with autism fixate on a target more quickly in a visual search and use fewer eye movements (Kemner, van Ewijk, van Engeland, & Hooge, 2008). This suggests that individuals with autism might be particularly efficient at working with AAC symbols in a traditional grid array (Gillespie-Smith et al., 2014).

Choosing an AAC System

Many factors play a role when choosing an AAC system for an individual with limited or no verbal communication skills. Some of those factors are social acceptability of the system, therapist's skill level, financial considerations, universality of the system, portability, and response effort. While all of these elements influence the decision-making process, maybe the most important aspect for consideration should be the preference of the user. More positive effects are recorded when a child has the ability to choose which AAC system he or she wants. When given the opportunity, each child demonstrated a clear preference for one AAC system. Children demonstrated greater proficiency and enhanced maintenance with the preferred AAC system. Assessing children's preferences might be important with respect to the issue of inappropriate AAC abandonment, which appears to be common. Logically, one might expect that preferred AAC options would be less likely to be abandoned (Van der Meer, et al., 2013).

Future Direction of AAC in Autism

Recently, dedicated hardware and software are starting to compete with less expensive, readily available hardware (e.g., tablets and laptops) with specialized applications to support communication. Availability of more affordable consumer-level hardware and applications gives the consumer more flexibility when selecting an AAC system. Such commonplace devices may result in a significant paradigm shift in AAC, making it more socially acceptable, affordable, portable, and readily available. Designated communication apps for consumer devices (e.g., Proloquo2go®, GoTalk®, Speak for Yourself®) may serve as full system, comparable to dedicated SGDs. Other apps however (e.g., Steps®, My Choice Board®, PicCalendar®) provide visual support for daily sequences and activities. Caution needs to be taken with technological advances. They do not replace the clinical decision-making process. Clinicians and families need to be aware that with the introduction of any technology, a substantial amount of training is required for mastery and for lasting positive results (Shane et al., 2012).

Visual modeling has already been established to be a crucial portion of AAC interventions. A new modeling program, the Visual Immersion Program (VIP), is under development enhancing visual modeling. It supports the theory that AAC learners should be immersed in visually symbol-rich environments across home, school, and community. Visuals should not only support expression but also comprehension. Further, communication with symbols should support a variety of communicative intents beyond protesting and requesting (e.g., questioning, commenting, directing). VIP is based on visual scenes to represent complex ideas by not solely relying on auditory stimuli for language comprehension. Visual scenes hold great potential when used consistently and frequently (Light & Drager, 2007). In VIP dynamic scenes are full-motion video clips that depict entire scenes, events, or concepts that unfold over time. VIP incorporates animated symbols for over 110 verbs and prepositions (ALP Animated Graphics) that were developed by the Center for Communication Enhancement of Children's Hospital Boston. Individuals with ASD sometimes benefit from animated representations of concepts (Shane, et al., 2012). Introducing animated symbols into interventions to enhance comprehension of difficult, non-concrete concepts may hold potential for future AAC systems for those with ASD.

In conclusion, this chapter on AAC in the ASD population aimed to give an introduction into what AAC is, how to best assess AAC needs, and evidence-based treatment approaches. From experience, AAC can be an intimidating treatment approach to explore for a number of different reasons. Some of those reasons may be the overwhelming amount of AAC options that can be found on the market. I urge you to try one system at a time. Hopefully, this chapter provided the reader with encouragement and direction on where to start and how to functionally incorporate AAC with individuals with ASD. AAC offers optimistic ideas for solving some of the most challenging communication breakdowns. Those ideas can be simple low-tech solutions, but they can also be high-tech devices. A teacher or clinician needs to creatively think "outside the box" and approach communication from many different angles. While there are some well-researched AAC interventions available, technology is continuously advancing, making it more accessible for a greater number of individuals. Research needs to continuously be conducted to support effectiveness and efficacy of AAC interventions. AAC may be a viable temporary or permanent communication option for some of the 30% of individuals with ASD who remain nonverbal throughout their life.

Helpful Resources

- Autism speaks list of apps for iPads and tablets with supporting research https://www.autismspeaks.org/autism-apps?page=8&tid_1=39881&tid=All&tid_2=All&keys=
- University of Nebraska Augmentative and Alternative Communication website http://cehs.unl.edu/aac/
- International Society for Augmentative and Alternative Communication (ISAAC) https://www.isaac-online.org/english/home/
- Communication Matrix https://www.communicationmatrix.org/
- Examples of different visual schedules http://do2learn.com/picturecards/VisualSchedules/index.htm

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Vocational Training for Persons with Autism Spectrum Disorder

17

Matthew J. Konst

Vocational Training for Persons with ASD

For individuals and their families, a diagnosis of autism spectrum disorder (ASD) is a major stressor. This is especially salient when children are diagnosed as infants. Uncertainty surrounding symptom manifestation and outcome leads parents to express concern about their child's future (Howlin, Goode, Hutton, & Rutter, 2004). As the diagnostic nomenclature suggests, the spectrum of symptoms observed in people with ASD complicates the provision of definitive prognostic information. Limited information about prognosis for persons with ASD is available. This is especially true once persons cross the threshold into adulthood. Factors contributing to this dearth of information include the limited research available, heterogeneity of symptoms, continuous changes in diagnostic criteria, difference in outcome measures, and presence of comorbid conditions (Howlin & Goode, 1998).

A multitude of factors confront each person as they transition into adulthood. On a broad level, factors include integration into a larger community, independent living, employment, and education (Hendricks & Wehman, 2009). These factors are especially salient for persons with developmental disabilities (Defur & Patton, 1999; Schall & Wehman, 2008). As with typically developing peers, the structure and supports in place throughout this transition vary from person to person. Unlike typically developing peers, however, this transition is further complicated by the influence of their primary disability, the presence of comorbid conditions, and the overall degree of impairment.

Reports from early analyses of adult outcome for individuals with ASD have historically been gray. Following his initial description of ASD, Kanner (1973) indicated that a bulk of participants he followed across time were living at home, in institutions, in psychiatric hospitals, or in sheltered living spaces. A recent survey of high school graduates with ASD suggested that only 4% of respondents lived independently; over 75% indicated that they continue to reside with their parents (Wagner, Newman, Cameto, Garza, & Levine, 2005). Elevated rates of unemployment preclude independent living and continue to be a pervasive issue for persons with ASD around the world. Research investigating employment for individuals with ASD has been conducted in countries around the world. Based upon a survey of adults with ASD in Canada, Eaves and Ho (2008) reported that only 4% of respondents were competitively employed. Roughly 45% of respondents indicated that they

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had never held a job. In the United Kingdom, 18% of respondents endorsed participation in supported or sheltered work environments (Howlin et al., 2004). An additional 13% of respondents indicated that they were competitively employed. In the United States, a survey of young adults with ASD revealed an employment rate of 18% (Taylor & Seltzer, 2011). A total of 6% of individuals indicated that they were competitively employed, and 12% reported participation in a supported work environment.

Barriers to Employment

Core Symptoms

In line with symptoms associated with ASD, workplace interactions are a well-documented hindrance to employment (Hagner & Cooney, 2005; Hillier et al., 2007; Patterson & Rafferty, 2001). This theme has been consistent across multiple studies focused on self-reported vocational problems (see Camarena & Sarigiani, 2009; Müller, Schuler, Burton, & Yates, 2003; Sperry & Mesibov, 2005). The degree of severity and type of social impairment are variable across persons with ASD. Social impairments related to difficulty interpreting affect, interpreting facial expressions, modulating tone of voice, and following social rules are common (Bolman, 2008; Hurlbutt & Chalmers, 2002; Hurlbutt & Chalmers, 2004; Van Bourgondien, Reichle, & Palmer, 1997). Other impairments pertaining to social interactions may also be present (e.g., poor hygiene, grooming, inappropriate sexual behaviors; Koning & Magill-Evans, 2001; Van Bourgondien et al., 1997). Additional impairments associated with core ASD symptoms include adjustments related to changes in personal and work-related routines and environments (Keel, Mesibov, & Woods, 1997). Vocational difficulties may also include limited ability to work independently and resistance to change.

Müller et al. (2003) evaluated the vocational experiences of persons with ASD via semi-structured interviews. This research also reflects the influence of core ASD symptomology and identified common challenges encountered across vocational experiences. Respondents identified factors such as interacting with peers and supervisors, learning new tasks, intolerance, and job task satisfaction as factors contributing to negative work experiences. Positive work experiences were associated with job assignments that were complimentary to interests or skills and supervisors and coworkers who were tolerant and flexible. Barriers to employment included difficulty explaining termination from previous jobs or periods of unemployment. Respondents also expressed frustration with settling for jobs for which they were overqualified. The survey by Mueller and colleagues (Müller et al., 2003) identified four overarching barriers to employment. These were the (A) application process, (B) social interactions, (C) communication with coworkers and supervisors, (D) and adjusting to vocational demands.

Insufficient knowledge about the manifestation of symptoms related to ASD may also be a barrier to employment (Bolman, 2008; Müller et al., 2003). Other researchers have reported that employers are less likely to hire persons with ASD due to fears of maladaptive behaviors (Nesbitt, 2000). The heterogeneity of symptoms and the emphasis on individualization of supports place a unique demand on would-be employers. Aside from supports on the job, researchers also suggest that general psychoeducation may be beneficial for employers. Aside from task-specific training, additional interventions may be required to decrease stereotypic behaviors or other maladaptive behaviors. Supports may also work to increase appropriate social and communication skills (Burt, Fuller, & Lewis, 1991).

Core symptoms of ASD may also serve as relative strengths for specific jobs or tasks. Smith (1995) suggested that attributes commonly observed in ASD populations may be beneficial and can be used to inform placements for employment such as preference for socially isolating or repetitive work. Persons with ASD may also excel at work requiring substantive focus and attention to detail.

Comorbid Conditions

Additional barriers to employment include the presence of comorbid conditions and maladaptive behaviors. Following a review of the existent literature, Howlin (2000) reported that the estimated prevalence of comorbid conditions in ASD populations has ranged from 9% to 89% of adults with ASD. Multiple factors such as changes in diagnostic criteria and participant selection likely contribute to the significant variance in estimates. Matson and Shoemaker (2009) outlined multiple factors that impact estimates of co-occurring ID in individuals with ASD. In general, researchers have reported rates of ID in ASD populations between 70% (La Malfa, Lassi, Bertelli, Salvini, & Placidi, 2004) and 80% (Wing, 1996; Rutter, 1983). Regardless of prevalence, researchers agree that the presence of comorbid ID within ASD populations is often associated with decreased independence and functioning in areas relevant to employment (Eaves & Ho, 2008; Farley et al., 2009; Howlin et al., 2004). These key areas of impairment include increased need for supports at home, in their social interactions, and at work. General cognitive functioning profiles for people with ASD exemplify further barriers to employment. Multiple researchers have documented deficits in executive functioning (Landa & Goldberg, 2005; Lopez, Lincoln, Ozonoff, & Lai, 2005). These impairments include impairments in working memory, attention, and motor planning (Hume & Odom, 2007; Müller et al., 2003; Patterson & Rafferty, 2001).

Taylor and Seltzer (2010) noted that ASD participants without comorbid ID were more likely to exhibit internalizing and externalizing maladaptive behaviors (e.g., SIB, property destruction, aggression) than peers with either condition alone. This association is likely due to decreased external supports. This factor may be especially salient for those in lower SES classes that may experience additional barriers to service access (Liptak et al., 2008). The presence of comorbid conditions such as SIB, property destruction, stereotypic/ritualistic behaviors, aggression, tantrums, and pica also serves as barriers to employment (Kobayashi & Murata, 1998; Smith, 1985; Smith & Coleman, 1986; Taylor & Seltzer, 2011). The presence of one or more of these conditions necessitates the need for further structure and supports to identify and manipulate behavioral functions on the job (Kemp & Carr, 1995). These behaviors are also viewed negatively and stigmatized which may deter employment or encourage isolation.

Esbensen and colleagues (2010) noted that the presence of comorbid psychiatric conditions is often a predictor of decreased independence and social functioning. Hofvander and colleagues (2000) reported that 50% of participants with ASD met criteria for an anxiety disorder. Not surprisingly, the impact of symptoms associated with comorbid conditions is not on a single plane. Adults with ASD have previously reported elevated anxiety levels associated with the increased social demands at work (Hurlbutt & Chalmers, 2004). Additional researchers have demonstrated similar states of heightened anxiety surrounding the initial pursuit of jobs and the ensuing application and hiring process (Camarena & Sarigiani, 2009).

Aside from anxiety, persons with ASD also experience elevated rates of ADHD, depression, and bipolar disorder (Hofvander et al., 2009; Kim, Szatmari, Bryson, Streiner, & Wilson, 2000). Comorbid conditions also include the presence of medical conditions such as CP, visual impairments, or epilepsy (Bellstedt, Gillberg, & Gillberg, 2005; Billstedt, 2000; Fombonne, 2003). An analysis of 815 persons with ASD identified the absence of a comorbid condition as a significant predictor of participation in competitive or supported employment (Schaller & Yang, 2005). Adults with ASD are denied vocational training services twice as often as peers with other developmental disabilities due to symptom severity (Lawer, Brusilovskiy, Salzer, & Mandell, 2009).

Rate of Employment

Despite intervention efforts, the core symptoms of ASD are pervasive across the lifespan (Gilchrist et al., 2001; Volkmar, Stier, & Cohen, 1985). Fombonne (2003) estimated that there were between 55,602 and 121,324 adolescents (15–19 years of age) with ASD. Multiple researchers have suggested that over 90% of adults with ASD are unemployed (Bellstedt et al., 2005; Engstrom, Ekstrom, & Emilsson, 2003). Other researchers estimate the rate of unemployment within the ASD population ranges from 50% to 75% (Howlin et al., 2004; Hurlbutt & Chalmers, 2002; Mawhood, Howlin, & Rutter, 2000). Although these ranges are discrepant, elevated rates of unemployment are consistent. Employment rates may be further stratified by work environments. This discernment may partially explain some of the observed variance in estimates of employment rate. An analysis of the National Rehabilitation Services Administration 911 database of job placement for 815 individuals with ASD following participation in vocational training services indicated that persons with ASD were equally likely to be placed in supported (44.8%) or competitive work environments (55.2%; Schaller & Yang, 2005). When compared to peers with other developmental disabilities, adults with ASD exhibit some of the highest rates of unemployment (Burke et al., 2010). This is likely due in large part to the unique vocational needs of persons with ASD (Bellstedt et al., 2005; Müller et al., 2003).

Although vocational training may appear like a relatively simple solution to the depressed rates of employment at face value, it is an inherently difficult and complex system (Tuma, 1983). In a competitive job market, job opportunities are variable, and the duration of job availability is often uncertain. Further, those jobs requiring more initial training delay entrance into the job market and create further disconnect between the accumulation of job skills and the ability to use them (Witte & Kalleberg, 1995). Factors such as "fit" or the ability of an individual to perform a job-specific task or series of tasks and participate meaningfully in a work environment must also be considered. Job fit becomes inherently difficult due to changes in economic demand and training requirements. Even if an individual is able to complete the necessary training and find a job that utilizes their specific skills set, jobs may become obsolete due to decreased demand, technological advances, or market shifts.

Despite all of the identified barriers and concerns, multiple researchers have documented that individuals with ASD can flourish in supported and competitive employment settings (Gerhardt & Holmes, 2005; Hurlbutt & Chalmers, 2002, 2004; Smith, Belcher, & Juhrs, 1995). Adults with ASD have been observed to flourish in a variety of industries (O'Brien & Daggett, 2006); however, the importance of individualized supports and services cannot be overlooked (Hendricks & Wehman, 2009).

Transitioning from Primary Education to Vocational Training

The Role of Primary Education

Historically the options for postsecondary education and employment have been limited for persons with ASD (O'brien & Daggett, 2006; Schall, Cortijo-Doval, Targett, & Wehman, 2006). Despite a growing emphasis on postsecondary education for persons with ASD, there is limited research of this factor demonstrating a positive impact on employment. Relative to people with SLD, LD, and ID, people with ASD have poor employment and postsecondary education outcomes (Shattuck et al., 2012). A literature review of participation in postsecondary education programs suggested that participation – even among persons with "high-functioning ASD" – is variable with estimates ranging from 7% to 50% (Howlin, 2000). Following a recent survey, Cedurland, Hagberg, Billstedt, Gillberg, and Gillberg (2008) indicated that only 2% of respondents reported having a college degree and only 11% of persons reported having attended any college. Postsecondary education attainment does not absolve persons with ASD from employment difficulties (Howlin, 2000). Contrary to intuition, IQ levels have been observed to have only a small impact on employment. Howlin et al. (2004) reported that persons with an IQ less than 70 were only slightly less likely to be employed than persons with an IQ score greater than 70.

On a broad scale, legislative efforts have brought about an increased focused on transition planning for adolescents with 504 accommodations. The identification of functional goals and the specific skills sets necessary to achieve them are important aspects of transition planning (Iovannone, Dunlap, Huber, & Kincaid, 2003). Cameto and colleagues (2004) reported that employment goals were included in most transition plans they reviewed as part of a national database. The level of employment was typically broken down into three groups: competitive, supported, and sheltered employment. Goals oriented toward competitive employment were identified for nearly a quarter of participants. Remaining recommendations for employment setting were evenly distributed between supported and sheltered work environments.

A recent investigation funded by the Office of Special Education Programs of the USDOE revealed that 85% of adolescents with ASD had a transition plan prior to exiting the primary education system (Cameto, Levine, & Wagner, 2004). However, less than 75% of persons within this group received direct instruction regarding their transition plans. Less than 33% of students with ASD were active participants in transition meetings. Although parental participation during transition planning was high, researchers reported that adult support agencies participated in less than one third of transition meetings (Cameto et al., 2004).

The transition period between primary education and the work environment is in need of further research and development (Certo et al., 2008). Although these plans are identified in the primary education setting, there is currently little follow-through once the individual graduates. A landmark study by Cameto and colleagues (2004) indicated that nearly 90% of individuals with ASD had transition plans that identified the need for post-school services. Over half of participants with ASD were identified as needing vocational training supports and services. One quarter of participants were connected with a job staffing agency as part of their transition plan. Sheltered employment and supported employment agencies were contacted for another 66% of participants (Cameto et al., 2004). Shattuck, Wagner, Narendorf, Sterzing, and Hensley (2011) captured a glaring discrepancy in service provision based upon survey results from recent high school graduates with ASD. Results suggested a significant decrease in the services received (i.e., speech therapy, case management, mental health, and medical) following high school completion. Nearly 40% of respondents indicated that they were not receiving any services. Rate of service provision was markedly decreased relative to rates observed during a previous screening with the same participants (see Shattuck et al., 2011 for a full review).

Given that the transition into adulthood involves a discontinuation of the supports received in primary education, this lack of individual preparedness and inclusion of external support services is surprising. Optimal transition planning should include active participation of the individual person to the maximum extent possible (Wehman, 2006). When level of functioning is identified as a barrier, increased efforts should be made to identify and incorporate the necessary supports that will be present to assist individuals when primary education supports are discontinued. This may include the identification and inclusion of adult support service agencies and increased emphasis on the role of education for primary caregivers.

Despite the increased focus on preparation for transitioning and employment, the current employment estimates are consistently low for individuals with ASD. Even when employed, adults with ASD typically earn less and work fewer hours than peers (Cimera & Cowan, 2009). Researchers suggest that adults with ASD are more likely to experience difficulties adjusting to new jobs, earn less than peers, and switch jobs more frequently (Howlin, 2000; Hurlbutt & Chalmers, 2004; Jennes-Coussens, Magill-Evans, & Koning, 2006; Müller et al., 2003). These complications are more pervasive for persons with ASD when directly compared to peers with other developmental disabilities (Cameto et al., 2004).

The Role of Vocational Training

Tsang (1997) describe vocational training as a program that places an emphasis on the provision of job-oriented education with the express purpose of increasing job-related skills and participation at work. This type of training typically includes job training on- or off-site or a combination of the two. Historical goals associated with vocational training were variable and included development of specific occupational skills, enhancing perceived self-worth, vocational skills enhancement, and exploring potential areas of employment (Witte & Kalleberg, 1995). Benefits associated with participation in vocational training include increased job opportunities, earnings, satisfaction, and job retention (Tsang, 1997). Economic benefits have also been associated with vocational training for persons with developmental disabilities. Mawhood and Howlin (1999) suggested that participation in vocational training programs may begin to repay (in the form of taxes) monetary investments associated with the provision of such services within 2–4 years of employment. Subsequent research has associated long-term employment with increased earnings, contributions to tax systems, and decreased reliance on federal benefits (Howlin, Alcock, & Burkin, 2005).

Vocational training services are designed to assist people with disabilities in gaining and/or retaining employment (Hendricks, 2010). A number of factors make research surrounding vocational training for individuals with ASD essential. First, minimal research has focused on this topic, despite a relatively continuous increase in prevalence of ASD. Second, the symptomology and increased prevalence of comorbid conditions necessitate vocational training supports that differ from provisions made for other persons with disabilities. Symptom manifestation is heterogeneous and leads to increasingly individualized support needs. Evaluations of preexisting vocational training programs have indicated that programs are not always beneficial for individuals with ASD (Lawer et al., 2009; Müller et al., 2003). There are presently only a limited amount of vocational programs designed specifically for serving people with ASD.

Despite the observed overlap of ASD and ID, the absence of the latter can exclude persons with ASD from participation in state or federally funded vocational training programs (Müller et al., 2003; Taylor & Seltzer, 2011). People with ASD are also excluded from vocational training programs due to the severity of comorbid conditions and problem behaviors (Lawer et al., 2009). The limited availability of vocational training programs for adults with ASD negatively impacts vocational outcome (Schaller & Yang, 2005). Fast (2004) highlighted that a majority of persons with Asperger's syndrome experience significant difficulty obtaining and retaining employment in the absence of supports. Analyses of the cost associated with service provision suggest that the provision of vocational training services to persons with ASD is more expensive than similar programs for other disability groups (Cimera & Cowan, 2009; Lawer et al., 2009).

Early work in vocational training focused on the management of stereotypic behaviors and increasing social and communication skills (Burt et al., 1991). Additional researchers focused on decreasing challenging behaviors such as aggression, SIB, and property destruction in addition to comorbid conditions such as pica to increase vocational success among individuals with ASD (Berkman & Meyer, 1988; Kemp & Carr, 1995; Smith, 1986, 1987). This research has been followed by an increased emphasis on identifying appropriate and complimentary work environments. Additional researchers have recommended that job placement should include consideration of restricted interests and knowledge of strengths and weaknesses (Hendricks, 2010). Researchers have used assessment information to identify task preferences in an effort to match these with vocational placements (Lattimore, Parsons, & Reid, 2006; Nuehring & Sitlington, 2003). Assessments have also been used to identify supports and modifications that may be necessary based upon factors such as communication and social skills (Hagner & Cooney, 2005; Müller et al., 2003).

As the interest surrounding vocational training has increased, so have attempts to identify key components in an effort to create a more structured or programmatic system. Hendricks (2010) identified five key areas for consideration with regard to vocational supports. The authors suggested that in addition to (A) job placement, consideration should also be given to (B) on-the-job provisions, (C) supervisor and peer interactions, (D) work environment, and (E) anticipated future supports. Descriptions of programs such as the Treatment and Education of Autistic and related Communication-handicapped CHildren (TEACCH; Keel et al., 1997) and Project SEARCH plus ASD Supports (Wehman et al., 2012) suggest that these are common factors in current supported employment programs.

Vocational Training

Training Methodology

The preparation of individuals for employment is the expressed goal of public education as stipulated by the Individuals with Disabilities Education Act (IDEA; 2004). The estimated unemployment rates for adults with ASD, however, indicate that our work is not complete. This difference may be due in part to the ambiguity regarding service provision for adults. Moxon and Gates (2001) drew attention to the stark contrast between the services and supports available for school-aged individuals with ASD and adults with ASD. Prior to leaving public education, there are federal guidelines in place that provide directives, including systemic evaluation, for service provision in academic settings. The same funding and centralized system is not readily accessible and available for adults.

Despite these ongoing efforts, at present, there is limited research investigating guidelines for providing vocational instruction to adults with ASD. This is especially true with regard to research surrounding instruction of job tasks. The bulk of available research within this domain is based upon the principles of applied behavior analysis and adapted from programs used to instruct other persons with disabilities. Common training components include modeling (live and video), errorless learning, graduated guidance, prompting systems, behavior chains, and the use of structured rewards (Burt et al., 1991). Behavior analytic strategies have also been adapted to decrease maladaptive behaviors in the work environment (Burt et al., 1991; Foley & Staples, 2003). The use of strategies such as picture schedules, coping strategies, functional analyses, reinforcement fading, and functional communication has been previously used to decrease aggression, SIB, property destruction, and other inappropriate behaviors (Berkman & Meyer, 1988; Kemp & Carr, 1995).

A driving influence over the need for the development of specially designed vocational training programs has been the unique need of this population. Factors that are not common components in vocational services for persons without ASD have been identified as necessary components when working with persons with ASD. One critical component of vocational training for persons with ASD is an emphasis on increasing communication and social skills (Morgan, 1996; Wehman et al., 2012). The need for more intensive intervention translates to a larger support staff. When training persons without ASD, a 1:3 staff to intern ratio is commonly reported. A 1:2 ratio is typically observed when providing the same benefits and instruction to individuals with ASD. Wehman et al. (2012) noted that they were able to fade to roughly a 2.5:1 ratio by the end of vocational training in most cases. A combined service approach has been demonstrated as beneficial for supporting adults with ASD. Points of emphasis include assistive technology, counseling, job identification assistance, on-the-job training, and assessment and diagnosis (Lawer et al., 2009). The intensity and breadth of such supports also equate to resource investment. Adults with ASD are noted to require the most expensive vocational training services, but they benefit from services as much as other atypically developing groups (Lawer et al., 2009).

Job-Based Supports

On-the-job training has been emphasized as a key component of successful employment for people with ASD (Certo et al., 2003; Lawer et al., 2009). Persons with ASD are three times more likely to be identified as requiring on-the-job supports than peers with any other developmental disability (Lawer et al., 2009). The benefits of this approach are likely associated with multiple factors. From a generalization standpoint, on-the-job training allows the individual to learn a skills set in the environment where they will be expected to perform newly acquired skills (Certo et al., 2003; Wehman, 2001). This direct experience may help to reduce the effort of vocational training services that would otherwise be forced to recreate a work environment and job demands. Early exposure to a new environment with structured supports may also help an individual with ASD acclimate to the environment and demands. On-the-job training may also help establish a routine and increase the individual's comfort level before they are expected to perform tasks with decreased levels of support.

A job coach is often present during job training and serves as a form of direct support. The supports provided by the job coach are ideally intensive at first and gradually faded (Hillier et al., 2007). Although job training is often individualized, Hillier et al. (2007) proposed a series of training goals to serve as a guide at the outset of employment. Employment goals identified included ability to identify and complete job tasks satisfactorily, knowledge of workday scheduling (i.e., start time, break time, and end time), awareness of emergency procedures, and ability to navigate the work environment. These are often components of supportive employment programs that promote job and social integration at work (Hillier et al., 2007; Howlin et al., 2005; Keel et al., 1997).

Despite the inherit benefits of on-the-job training, these services are not always available. An individual may not have a job offer in place; the task demands associated with the job may not be immediately identified, or tasks may be variable and dependent on need. Previous researchers have attempted to circumvent these issues and further increase job assimilation by offering a combination of simulated work tasks and on-the-job training (Lawer et al., 2009). Behavioral skills training has been used to teach pre- and post-placement vocational skills to persons with ASD (Hillier et al., 2007). This training strategy emphasizes instruction, modeling, rehearsal, and immediate feedback (Gunby, Carr, & LeBlanc, 2010; Miltenberger, 2008). These services are intensive and typically focus on individualized instruction and service provision. Despite the use of this procedure to train persons with ASD in various skills, limited research on the use of behavioral skills training for vocation has been carried out.

Technology Use in Vocational Training

As technology has increased, so has its integration into vocational training approaches. Seeking to reduce the demand associated with behavior skills training and expedite training, one group has experimented with a combination of treatment approaches. Burke and colleagues (2010) use a combination of behavioral skills training and PDA-based cueing to train persons with ASD to complete a complex skills sequence to criterion levels. Through the use of a multiple baseline design, the authors demonstrated faster rates of job training using a combination of these two methods. The combination of both approaches resulted in faster rates of skills acquisition relative to either approach alone.

Building on earlier prompting systems that used PDAs, more recent research has begun to integrate the use of computer systems. Augmentative communication devices have also been used to increase appropriate communication and interactions at work (Gray, 1998). Researchers have previously used a computer program to display pictures and provide sequential verbal instructions to increase task completion (Riffel, Wehmeyer, Turnbull, & Lattimore, 2005). More recently, researchers have begun to explore the integration of video modeling and virtual reality into vocational training. Smith et al. (2014) used a virtual reality platform (virtual reality job interview training) in a randomized controlled trial to examine the efficacy of such technology. Participants demonstrated significant improvements in job interview skills and reported significant increases in confidence surrounding interviews (Smith et al., 2014). The use of interactive technology such as the Apple iPod devices has been demonstrated to increase performance and task completion (Cihak, Kessler, & Alberto, 2008; Gentry, Lau, Molinelli, Fallen, & Kriner, 2012; Kellems & Morningstar, 2012; Van Laarhoven, Johnson, Van Laarhoven-Myers, Grider, & Grider, 2009). Despite these initial positive results, to date, there have been limited systematic evaluations of the use of technology for vocational training in ASD populations.

Work Environment

Individuals with ASD have previously been successfully employed in multiple settings (Hillier et al., 2007; Lawer et al., 2009). Placement is often dependent upon individual needs and the availability of specialized instruction focused on specific work-related requirements (Hagner & Cooney, 2005; Nuehring & Sitlington, 2003). A recent shift has included an increased emphasis on identifying appropriate and complimentary work environments based upon multiple factors (e.g., skills level, work history, interest, support needs).

Employment is most often broken down into three categories: competitive employment, supported employment, and structured work environment. Placement into one of these categories is not static, and in fact individuals may move across groups throughout their career. Most often the goal is for a person to ultimately be competitively employed without the use of supports. They may not start out in such an environment and factors such as changes in work environment, or task demand may necessitate the reintroduction of temporary or long-term work-based supports.

Sheltered Work Environments

Whitehead (1979) described sheltered workshops as a facility with (A) a controlled environment that (B) provides structured employment experience and (C) focuses on rehabilitation and vocational training. Additional researchers stipulated that such a program is licensed by the Department of Labor and provides wages based upon a piece-rate system (Bond et al., 2001). An estimate by Braddock, Hemp, and Rizzolo (2008) indicated that there were approximately 542,127 adults with disabilities (i.e., mental, physical, and emotional) participating in sheltered workshops. These programs are meant to train persons with disabilities, providing them with perquisite skills meant to increase the likelihood of vocational success (Howlin et al., 2004). These programs also often include leisure and recreation activities, group work placements, and special certifications for participants.

Sheltered workshops have traditionally served as a gateway to integration into supported or competitive employment (Inge et al., 2009). This role is reflected in the transition planning stage. Cameto, Marder, Wagner, and Cardoso (2003) reported that people with ASD are more likely than peers to have sheltered workshops identified in their transition plans when exiting the primary education system. People with ASD have higher rates of employment in sheltered work environments relative to supported or competitive employment placements. In one survey, over half of 66 individuals with ASD indicated that they participate in a sheltered work environment (Taylor & Seltzer, 2011). However, participation was strongly skewed based upon diagnosis as the researchers noted a significant discrepancy across participants. Specifically, an overwhelming majority (i.e., 97%) of participants had a comorbid diagnosis of ID. Participation in sheltered employment was less common for persons with ASD without comorbid ID. The implications of these results could be quite drastic given that participation in such services is a common goal identified in transition plans.

Early research surrounding sheltered workshops focused on underlying philosophies and general models. More recently, Cimera (2011) investigated the utility of such programs from an economical standpoint. Specifically, they sought to determine if participation significantly altered employment outcomes. To evaluate this idea, the authors analyzed 9,808 participants that were separated into two groups matched by gender, primary disability, and secondary disability. Participants in the first group were enrolled in a sheltered workshop prior to transitioning to supported employment. The second group did not participate in a sheltered workshop program prior to supported employment. Minimal differences were observed in employment rates; however, participants in the sheltered workshop worked significantly less and subsequently earned significantly less. Cimera (2011) also reported that the expenses associated with participation in the sheltered workshop were approximately 75% higher than those associated with supported employment. The implications of these results are immense given that it is estimated that as much as 90% of persons with ASD and comorbid ID participate in segregated service programs such as sheltered workshops (Butterworth et al., 2009).

Supported Work Environments

Drake and Becker (1996) defined supported employment as a job placement in the community with ongoing supports and coordination between worksite staff and vocational support staff. The components constituting a supported employment environment are variable and dependent on need. A supported work environment should include specific provisions and individualized supports designed to enhance a person's ability to perform in the workplace (Smith & Philippen, 1999). Garcia-Villamisar and Hughes (2007) further identified that supported employment should be designed to enable participants to make meaningful contributions. A number of positive factors have been associated with inclusion in a supported work environment, including increases in positive social interactions, quality of life, salary, and rate of employment (Chadsey & Beyer, 2001; Garcia-Villamisar, Wehman, & Navarro, 2002; Hill, Wehman, Kregel, Banks, & Metzler, 1987; Howlin et al., 2005). Additional researchers have also reported improved performance on measures of cognitive abilities following employment (Garcia-Villamisar & Hughes, 2007).

Regardless of skills set and level of functioning, researchers assert that some degree of supported employment is necessary – at least initially – for people with ASD (Nuehring & Sitlington, 2003). Hendricks (2010) recommended that direct work supports be faded gradually across time. Additional researchers have proposed that supports should not be completely withdrawn, but monitored across time (Keel et al., 1997). This monitoring may lead to a decrease in external supports and may be achieved by transitioning to internal supports (Hagner & Cooney, 2005). Internal or natural supports often incorporate an identified support system within the company such as supervisors or coworkers (Smith & Coleman, 1986). Internal supports provide more naturalistic and immediate feedback as changes occur in the work environment (Wehman, Inge, Revell, & Brooke, 2007). Although fading to naturalistic supports may be a goal, it is not always tenable and/or advantageous for the company or person with ASD.

The provision of ongoing external supports may also provide additional supports and services that extend beyond the workplace. External support staff may advocate for the individual if factors related to the primary or a secondary diagnosis begin to interfere with work performance (e.g., surgery or hospitalization related to a secondary medical condition). External supports may also provide ongoing services such as counseling, coping mechanisms, and social skills groups (Hillier et al., 2007; Howlin et al., 2005; Keel et al., 1997).

Although supported employment programs are increasingly more common, they are not always available (Wehman, West, & Kregel, 1999). Further, the provision of supported employment services is associated with a significantly greater cost relative to services associated with competitive employment (Schaller & Yang, 2005).

Competitive Work Environments

The two-part definition of competitive employment proposed by Bond et al. (2001) included an emphasis on (A) placement in an integrated community-based location and (B) earnings at or exceeding minimum wage. Taylor and Seltzer (2011) defined competitive employment, as community-based employment without supports. Both descriptions emphasize community placement as a key component. The latter definition, however, makes the distinction that no supports or day services are present. Increased age, education, and the absence of secondary conditions have been identified as predictors of successful placement in competitive employment (Schaller & Yang, 2005). Ozonoff, Rogers, and Hendron (2003) suggested that increased age is likely associated with increases in education as well as life and work experience. Previously, placement into competitive, community-based jobs was viewed as unlikely for people with ASD (Mawhood & Howlin, 1999; Nesbitt, 2000; Smith, 1995). Subsequent research has dispelled this notion. The rate of competitive employment is low relative to previously discussed vocational placements. Estimated rates have been as low as 6% (Taylor & Seltzer, 2011).

The benefits associated with competitive employment are distinct. Competitive employment placement has been associated with higher earnings and hours worked (Gilmore, Schuster, Timmons, & Butterworth, 2000; Schaller & Yang, 2005). But placement directly into a competitive employment position can be difficult. The person may be qualified for a minimum wage position in a community-based environment. But they may not be able to work in this environment without some initial supports. The social demands of the job, transportation needs, and organizational skills may all be barriers to direct placement. Oftentimes, maladaptive behaviors are severe enough to warrant behavior support plans and specific interventions before gainful employment is achieved. With appropriate supports, individuals may be able to work toward competitive employment (Burt et al., 1991). Schaller and Yang (2005) suggested that supported employment may initially be necessary as information regarding the individual will need to be gathered continuously, across multiple sources (e.g., parents, supervisors, and teachers) and environments (e.g., community, school, home, and work). The information gathered may then be used to identify individual strengths and weaknesses and aid in the development of individualized supports.

Vocational Training Programs and Associated Outcomes

Vocational Training Programs

Vocational programs such as TEACCH use a variety of methods to provide and maintain long-term supports. Of note, a supported employment program is embedded within the broader TEACCH program. The TEACCH employment program is a global approach emphasizing the importance of collaboration between professionals and caregivers of adolescents with ASD (Schopler, 1994). These methods include interacting with caregivers and coworkers, site visits, and seeking updates from employers (Keel et al., 1997). Concerns identified in this manner may lead to the identification of additional supports or additional training needs necessary to ameliorate employment difficulties before they become problematic. Persons participating in the TEACCH program are placed into one of three tiers based upon the level of services required for successful placement: mobile crew, dispersed enclave, and individual placement (Keel et al., 1997).

The individual placement tier places the most emphasis on independence in the work environment (Keel et al., 1997). The person is initially paired with a job coach that provides supports during job identification and intensive on-the-job training. Within this tier, the intensity of supports is gradually faded, but individuals typically receive ongoing supports. The dispersed enclave tier includes a single job coach that provides supports to multiple persons independently employed by the same employer (Keel et al., 1997). Persons within this tier require daily supports, supervision, and training to maintain employment. The mobile crew track includes the most intensive supports. Persons requiring this degree of support typically exhibit behaviors (e.g., aggression) that necessitate direct supports and operate in a 2:1 or 3:1 client to staff ratio (Keel et al., 1997). This tier focuses on the provision of community-based services (e.g., housecleaning) under direct supervision of a job coach. Though persons may initially participate in the mobile crew track, placement is not permanent. Keel et al. (1997) indicated that people may move to other tracks as their ability to operate independently increases.

The level of supports provided by the TEACCH-supported employment program extended beyond the site of employment. Keel et al. (1997) emphasized that service provision must be proactive and account for factors outside of work that may impact job performance. This is not a characteristic unique to persons with ASD; instead, most persons' work performance may be negatively affected by extraneous variables (e.g., sleep disruption, transportation issues, and illness). A major difference is an individual's ability to cope with these factors. In recognition of these factors, the supported employment program associated with TEACCH provided counseling and community skills training to better prepare individuals to cope (Keel et al., 1997). Initial research surrounding the TEACCH-supported employment program demonstrated a

96% placement rate for community employment and an 89% retention rate (Keel et al., 1997). No control group was included in their analysis; however, there has been limited follow-up research on the program.

Keel et al. (1997) discussed three factors that anecdotally influenced job retention. The authors noted that predictability – not repetition – was a contributing factor to job retention. They emphasized that the number of required job tasks was not a significant factor as long as they were scheduled or predictable. The focus on predictability is not limited to job tasks, but should also include the work environment. Factors such as noise or lighting in a work area should be assessed prior to placement. The influence and impact of environmental factors is variable across persons (Keel et al., 1997). Job retention was also notably influenced by the perceptions of coworkers and employers. The authors reported that the provision of psychoeducation and the dissemination of information related to ASD at job sites helped foster a better work environment.

Project SEARCH is a community-based program that emphasizes a close relationship with a large business (e.g., hospital, bank, or government office) that provides continuous job training and supports to persons with severe disabilities (Rutkowski, Daston, Van Kuiken, & Riehle, 2006). Although initially developed for persons with significant physical or cognitive disabilities (e.g., cerebral palsy, visual impairments), the program has been adapted to serve persons with ASD (i.e., Project SEARCH plus ASD supports; Wehman et al., 2012). The program requires collaboration across schools, employers, and members of the vocational training system. Participation occurs during the final years of high school and provides real-life work experience, placement assistance, and training for employment and independent living skills. Participants spend their entire school day at a specific job site and complete an average of three, 10–12-week internships across the school year.

Project SEARCH has an overarching focus on preparing the individual for competitive employment. The program initially focuses on identifying and evaluating appropriate internships by attempting to match an individual's interests with the positions available. Internships are only selected when they provide experience relevant to an individual's career goals or provide the opportunity to obtain marketable skills that will lead to employment. The program also focuses on collaboration, across providers, employers, the education system, and parents/caregivers (Wehman et al., 2012). Primary case management responsibilities are shared between the school and adult service agency. The inclusion of both parties as equal partners encourages communication and aids in continuity of care as the persons with ASD reach adulthood.

Results from an initial pilot study indicated that 78% of participants with severe disabilities were placed in competitive employment (Rutkowski et al., 2006). Recently a randomized clinical trial analyzing the extension of Project SEARCH for persons with ASD was carried out. Relative to 6% of the control group, 87.5% of persons in the treatment group were employed following program participation (Wehman et al., 2014). Wehman et al. (2012) provided a review of the steps and supports necessary to extend the program to serving to adults with ASD. Given the unique needs of persons with ASD, adaptations and additional supports were identified as necessary components for extending principles of the recent program. These included the addition of a behavior analyst to target challenging behaviors. Behavior support plans were introduced and included antecedent manipulation and differential reinforcement strategies. The introduction of self-monitoring checklists was also introduced to target challenging behaviors and increase appropriate behaviors. A daily schedule was created and reviewed with each student to promote structure and to serve as a reference. Included in this schedule were time devoted to the instruction and generalization of social skills in the work environment. Instruction included daily role-playing and practice to promote skills acquisition and generalization.

Despite the separation of more than a decade, both of these programs employed similar approaches and made some of the same conclusions. Similar to the conclusions of Keel et al. (1997), Wehman et al. (2012) noted that the provision of supports must extend beyond the work environment to include social and communication skills training. Both groups also noted the importance of visual supports and structure/routines at the site of employment. At a foundational level, each program also demonstrated the positive effects of providing a continuum of care. Each program intervened while persons were still completing their primary education. This factor differs from other researchers who may otherwise identify adults with ASD in various stages of adulthood who are unemployed. The effects of this approach are unknown at this time. But several factors of interest may be at play. The approach taken by both programs decreases the likelihood of a person with ASD to "fall through the cracks." The establishment of a working relationship between school personnel, parents, and adult service staff that is centered on gainful employment may have immense effects. In a similar manner, intervening with an emerging adult and providing them with structured support and positive employment experiences may foster different attitudes toward employment while also influencing employment outcomes. Although each program targeted a different work environment, they both further demonstrate the positive effects that systematic vocational services can have on a person with ASD.

Vocational Training Outcomes

Indirect Outcomes

Previous research has examined the cognitive benefits associated with participation in supported employment relative to participation in sheltered work activities across a 3-year period (Garcia-Villamisar & Hughes, 2007). Persons in the sheltered workshop were included as a wait list control group that did not receive any additional supports during the study. Participants in supported employment were paired with a job coach and worked an average of 20 h per week with the average length of employment being 30 months. Job placements were primarily service-based jobs in the community (e.g., retail). Persons were administered a battery of tests examining multiple factors of executive functioning before and after participation. Relative to peers in the sheltered workshop, people in the supported work group demonstrated significant improvements on 66% of the executive functioning tasks (Garcia-Villamisar & Hughes, 2007).

The generalization of these findings is limited by the criteria used for participant selection and randomization. In lieu of random assignment, participants were placed in the supported work environments if they exhibited "acceptable" vocational skills and had not previously worked in a supported work environment. Participants were excluded from the supported employment program if they had a history of psychiatric disorders, exhibited severe problem behaviors, or did not have at least 2 years of supported employment experience. The observed effects of participation in supported work environments still provide support for the inclusion of persons with ASD in supported work programs.

A series of studies carried out by Garcia-Villamisar, Ross, and Wehman (2000) and García-Villamisar, Wehman, and Navarro (Garcia-Villamisar et al., 2002) examined the immediate and longitudinal impact of participation in supported and sheltered employment for 52 persons with ASD. Variables of interest included overall quality of life and the manifestation of core ASD symptomology. At a 30-month follow-up, participants in the supported work environment evidenced improved quality of life scores. These results were maintained at a 5-year follow-up (Garcia-Villamisar et al., 2002). No change was observed for participants in the sheltered workshop. No change in ASD symptom manifestation was observed for persons in the supported work environment, but persons in the sheltered work environment evidenced an increase in ASD symptoms (Garcia-Villamisar et al., 2000).

Direct Outcomes

Mawhood and Howlin (1999) examined the effects of participation in a supported employment program across a 2-year period. Analyses focused on the impact participation had upon job placement, duration of employment, and earnings. The study included a wait list control group for comparison. Vocational supports included aid in identifying jobs, job training, psychoeducational trainings for employers and peers, and ongoing on-the-job training and support.

Mawhood and Howlin (1999) reported that 62% of persons in the supported employment program acquired employment relative to 25% of the control group. Persons in the supported work environment had higher rates of job retention and earned higher wages. No difference in hours worked was observed across groups. The authors noted that job placement was the most intensive component, requiring extensive networking, negotiation, and psychoeducation to identify appropriate employment. Mawhood and Howlin (1999) included a broad discussion concerning the traditional lack of funding for job placement and suggested that the high initial cost and demand associated with such programs may decrease as networks are established. The project included a thorough outline of project conception and development lending to replication. Generalization of these findings is possible, but participants were excluded if they had an IQ below 70, had comorbid conditions, or had any condition that would "adversely affect" employment.

Howlin et al. (2005) followed up and extended the earlier work by Mawhood and Howlin (1999) utilizing a longitudinal analysis of 147 participants. Participants were followed for up to 8 years to examine the longitudinal effects of vocational training on employment. Howlin et al. (2005) replicated original findings, demonstrating that participants in supported work settings evidenced elevated rates of employment. Observed employment rates ranged from 54% to 70% dependent on the regions of employment analyzed (Howlin et al., 2005). Primary employment industries were administrative, computing, or technical work. Job placement spanned a wide array of placements including large private companies, government organizations, charitable organizations, and small private companies (Howlin et al., 2005). At follow-up, 68% of participants in the supported work group continued to be employed 7 and 8 years later. Howlin et al. (2005) also collected anecdotal information about job satisfaction and impression of the overall process from participants and employers. Approximately 85% of participants indicated that they were satisfied with their job placement.

As part of their analyses, the authors also provided estimates of overall cost of implementation including adjustments across time. The research by Howlin et al. (2005) included some limitations in relation to generalization. Similar to the initial research, 92% of participants had an IQ greater than 80. The authors also failed to include any form of a control group for direct comparison.

Discussion

Luecking and Gramlich (2003) made the assertion that individuals with ASD should have the opportunity to participate in integrated employment. In addition to increased self-sufficiency and improvements related to quality of life, employment for persons with ASD also provides economic advantages. The addition of persons with ASD to the workforce increases their participation in the economy and may help to decrease their reliance on government funding (Järbrink, McCrone, Fombonne, Zandén, & Knapp, 2007).

The research outlined above provides a demonstration of the indirect and direct effects associated with employment across multiple domains. The research reviewed also provides the basis for the development of vocational training programs designed specifically to assist people with ASD. The broad picture suggests that such programs require a high initial investment coupled with the provision of ongoing supports. At this point, the evidence gathered suggests that participation in supported employment is less expensive and more advantageous than sheltered workshops. It is important to note that this may not be true for all individuals with ASD. A majority of the research reviewed above included persons without ID. Future researchers will need to investigate the same analyses in groups with comorbid ASD and ID, especially given the elevated rates of comorbidity observed. Future researchers will also be charged with continuing to develop and adapt these programs to fluctuations in the labor force and changes in job availability. Although each study has notable limitations, they each have their merits and include ample information lending to replication. The importance of further advancements is underscored by the increasing prevalence of ASD diagnosis and the need to find stable employment in adulthood.

General Discussion

Parents naturally have ideals and goals for their children and their futures. These ambitions do not simply disappear when their child is diagnosed with ASD. Exemplifying this idea are the questions parents commonly ask upon receiving a diagnosis (e.g., “Will they be able to have a job?”; “Will they be able to attend school?”). As scientists and practitioners, we are often averse to providing definitive answers to such questions. It is not unwise to display caution and provide broader responses to these questions given the heterogeneity of ASD and the relative dearth of outcome information that would begin to inform such questions. The topics of employment and independence are often difficult to separate and provide concrete answers.

Research investigating the positive benefits of employment is clear. Employment has been demonstrated to have both direct and indirect benefits across multiple domains (Garcia-Villamisar et al., 2002; Garcia-Villamisar & Hughes, 2007). The employment of persons with ASD is also beneficial to society (Howlin et al., 2005). Yet unemployment rates for persons with ASD are high – and stable – regardless of the country analyzed (Eaves & Ho, 2008; Howlin, Goode, Hutton, and Rutter, (2004); Taylor & Seltzer, 2011).

A number of barriers to participation in vocational training exist for adults with ASD. The absence of a comorbid ID diagnosis has been noted to prohibit participation in state of federally funded programs (Müller et al., 2003). Persons with ASD may also be excluded due to the severity of problem behaviors (Lawer et al., 2009). Additional barriers include the previously limited research demonstrating the efficacy of individual vocational training programs and the intensive services typically required (Müller et al., 2003; Lawer et al., 2009; Cimera & Cowan, 2009). Not surprisingly, persons with ASD are consistently observed to work less, earn less, and be unemployed more often than atypically developing peers (Roux et al., 2013). This also means that persons with ASD are more likely to remain financially dependent on caregivers, even when competitively employed.

A cross-sectional study identified two significant trends for vocational training for adults with ASD. First, adults with ASD are denied access to such services twice as often when compared to disabled peers (Lawer et al., 2009). Second, on-the-job supports are beneficial for job acquisition and retention (Lawer et al., 2009). This trend is probably influenced by the structure of current vocational programs. Initially, the adaptation of vocational services from other populations simply meant targeting the same concerns in a new population (e.g., stereotypical behaviors). Much of the early available research surrounding vocational training for adults with ASD was adapted from use with ID populations. These strategies were largely behavioral in nature and based upon the principles of applied behavior analysis. These techniques were used to not only increase job performance and independence but also decrease maladaptive behaviors. In addition to behavioral strategies, the provision of on-the-job support emerged as a fundamental feature – at least initially – in most vocational training research. Subsequent research has become increasingly broad in scope with an emerging emphasis on the development of global programs. In addition to preexisting components of vocational training programs, adults with ASD have been shown to benefit from increased staff to employee ratios and the inclusion of training emphasizing social communication (Morgan, 1996; Wehman et al., 2012). Functional skills set, median household income, and communication ability have each been identified as predictors of positive employment outcomes (Cimera & Cowan, 2009; Roux et al., 2013).

Researchers have continued to identify key components to guide program development. These components most often include an emphasis on supports for initial placement, on-the-job training, psychoeducation, and the provision of ongoing support (Hendricks, 2010). Oftentimes, a job coach or similar position is created to facilitate the delivery of comprehensive services. The role of a job coach is multifaceted and dependent on the needs of the individual. Common tasks include on-the-job training, social integration, provision of psychoeducation, and navigation of the job site. An emerging component of vocational training worthy of further investigation has been the use of technology. Early research focused on the use of PDAs to function as prompting systems designed to increase task performance. The combination of PDA use and behavioral skills training was shown to increase training efficiency. Researchers have also moved to increasing the use of technology in vocational training. Initial researchers have reported positive effects when using technology to prepare individuals for interviews and general social interactions in the workplace. Technology has also been used as external prompting and to augment communication.

The development and expansion of programs such as TEACCH and Project SEARCH plus ASD Supports has been driven by the unique vocational needs of adults with ASD (Keel et al., 1997; Rutkowski et al., 2006; Wehman et al., 2012). Both programs emphasize a continuum of care that begins in late adolescence and continues through adulthood – specifically through the key period when individuals age out of primary education services. Supports include an emphasis on a close and collaborative working relationship with employers and coworkers and focus on the provision of on-the-job supports. Both programs also highlight the importance of supports outside of work that may directly or indirectly impact work performance (e.g., transportation or illness). The intensity of supports is based upon individual need. The TEACCH program further individualizes services by separating placement into a hierarchy based upon the anticipated support needs. One overarching commonality and point of focus for both programs is the attention given to collaboration across caregivers. These programs work to ensure that all parties necessary are present and active members. Another commonality is the antecedent-based approach to identifying and ameliorating disruptive behaviors, including the use of daily schedules to communicate with the employee. The creators of TEACCH also emphasized that predictability – not repetition – was key for positive job performance. Both programs serve as an effective and necessary bridge that spans the gap, that is, the transition from primary education into adulthood and the workforce. This approach works to initiate collaborative efforts across care providers and to facilitate transitions.

The bulk of available research on vocational training can best be separated into three work environments. These environments are differentiated on multiple levels, but the intensity of support services provided is used as a distinguishing feature. A sheltered workshop is designed to provide the most intensive degree of supports and structure. One of the primary goals of sheltered workshops is to provide vocational training and exposure to the contingencies associated with employment. A sheltered workshop placement has often been the placement recommended for emerging adults. Recently researchers have called into question the efficacy and economic impact of this practice. Persons in a sheltered workshop earn less than peers in other settings (Cimera, 2011; Howlin et al., 2004). The cost associated with managing a sheltered workshop is also greater than other employment settings.

To date, a large amount of research has focused on the provision of services and the effects associated with supported work environments. Areas that have been identified to be positively impacted by participation in supported work environments include quality of life, ASD symptom manifestation, cognition, and social skills. These benefits have been observed when persons were compared to wait list control groups and persons participating in sheltered workshops. Persons with ASD are noted to benefit from some degree of supports regardless of level of functioning (Nuehring & Sitlington, 2003). These supports may then be faded, directed at different targets, or transferred to naturally occurring supports in the work environment (Hagner & Cooney, 2005; Hendricks, 2010; Keel et al., 1997). Employment supports aside, additional supports target factors outside of the work environment that may negatively impact job performance (e.g., social skills; Hillier et al., 2007; Howlin et al., 2005; Keel et al., 1997).

Descriptions of competitive employment focus on placement within the community and payment commensurate with minimum wage (Bond et al., 2001). Other researchers have indicated that competitive employment should also be distinguished by the absence of supports (Taylor & Seltzer, 2011). The idea of individuals with ASD being completely free of supports in the work environment is uncertain. Our definition of competitive employment would become clearer after defining what "supports" do and do not consist of. Most employed persons rely on some degree of natural or contrived support structure, coworkers, supervisors, or human resource staff. Given this concession, our definition of "support" should specify what is provided by identifying them as (1) supports provided on the job by an external entity (e.g., job coach), (2) supports provided outside of the workplace by an entity focusing on improving job performance or skills development, (3) technological supports provided on the job to increase performance, or (4) supports provided on the job by an internal entity (e.g., supervisor). The presence of such supports would identify the placement as a supported work environment; the fading and removal of these supports would be considered placement in competitive employment if they were also receiving minimum wage.

An analysis of employment databases suggested that 55% of employed persons with ASD were competitively employed (Schaller & Yang, 2005). This information must be interpreted with care given the low overall rates of employment for persons with ASD. Increases in hours worked and wages earned are positive factors associated with competitive employment (Gilmore et al., 2000; Schaller & Yang, 2005). Yet researchers have demonstrated that the wages typically earned in competitive employment are still considered to be below the poverty level (Burgess & Cimera, 2014).

Future Directions

The increasing demand for vocational training is underscored by the rise in persons with ASD entering adulthood. Cimera and Cowan (2009) reported that across a 4-year span (2002–2006), enrollment by people with ASD in the vocational rehabilitation system increased by 121%. This influx is especially problematic when traditional approaches to vocational training are coupled with the increased intensity of services that have been demonstrated to be necessary for people with ASD (Hillier et al., 2007; Lawer et al., 2009; Wehman et al., 2012).

The comparative research analyzing work environment has grown as interest in vocational training has grown. At this point researchers have looked at various outcomes associated with vocational training: cognition and executive functioning, wages earned versus hours worked, length of employment, quality of life, ASD symptom severity, job placement, and job satisfaction. To date, relatively few studies have actually analyzed the same outcomes, reported the same information, used the same population, or used compatible outcome measures, even when measuring the comparable outcomes. The ramifications of these discrepancies are large. The conclusions drawn from single studies are often used to bolster a larger, overarching ideology and conceptualization. Without commonalities across multiple studies, however, the conclusions drawn are less cohesive and thus do less to advance research surrounding vocational training. Research examining the specific components contributing to the efficacy of vocational training programs is limited. Research is emerging but is criticized due to poor experimental design (Taylor et al., 2012). In their review of the existent literature base surrounding the efficacy of vocational training programs, Taylor et al. (2012) identified a total of six publications that examined vocational training and included more than 20 participants. Determination of study design quality was based upon diagnostic approaches, statistical analysis, intervention description, outcome measurement, and study design. The authors concluded that all of the reviewed articles were of "poor quality." Factors that were identified as contributing to poor study design included nonrandom group assignment, failure to describe interventions, failure to assess treatment fidelity, absence of a control group, and lack of systematic diagnostic process (Taylor et al., 2012). The results of this review indicate that an emphasis on quality research design is necessary for future research endeavors.

Future researchers should strive to adhere to the reporting of information directly relevant to vocational training as measures of outcome. A review of previously reported research outcomes would suggest that a few key factors are universal to vocational training programs and can be reliably measured. These factors include (1) duration of employment, (2) wages earned, (3) hours worked, (4) work environment, and (5) intensity of services provided. Service intensity would best be captured as a percentage of hours worked (e.g., 10% of total hours at work). Factors that warrant further analysis include the development of a systematic approach to guide the titration of on-the-job supports. A likely approach may employ the use of a flowchart or decision checklist that is used to guide the decision to decrease supports based upon the individual's capability to perform job-related tasks independently.

Additional research regarding the increased need for supports specific to social interactions is also necessary. Although multiple researchers alluded to this component as a necessary feature of vocational training, very little information about intensity, setting, and duration of services were provided. This is also associated with an absence in outcomes research demonstrating the efficacy of job-based socialization training. The necessity of such work is underscored by the investment associated with the provision of each component of vocational training services. From an investment perspective, the ability to concretely demonstrate effective training and placement is invaluable. The answer to questions such as "How much support?" and "How many hours of social skills training?" is important to employers, employees, support staff, and caregivers. Across the continuum of work environments, a growing emphasis on cost-effectiveness has emerged. Researchers have repeatedly demonstrated increased initial costs associated with the provision of more intensive services. This initial cost has also been reported to decrease longitudinally as the program operates and increases efficiency.

One clear need is a continued emphasis on the development and refinement of a core program or agency dedicated to facilitating vocational training for adults with ASD. This would likely be at a regional or state level to most effectively maximize local resources, building partnerships with local businesses, and be in a position to navigate the differences in service availability and provision. The programs reviewed above have each demonstrated one series of characteristics commonly observed in traditional business models. Most programs were initiated with a small concerted effort, providing services in a localized geographic area to a few persons. These programs were able to grow and expand to accommodate rising demands as they became more efficient in service provision. This growth was typically associated with increased cost-effectiveness. The positive benefits were not always generalized across settings, even when a program was successful in a different geographic location. Howlin et al. (2005) reported fluctuations in outcomes as they expanded to new geographic regions and encountered new challenges. This barrier is not unique to vocational training and may be managed in the same manner that we promote generalization in other treatments and capacities, through adaptation and overt steps aimed at promoting generalization. The important factor is the continuation of efforts to identify difficulties as growth occurs, document the adaptations made, and monitor their efficacy.

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Supports for Postsecondary Education

18

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Introduction

In the past decade, college-based programs and individualized supports for individuals with autism spectrum disorder (ASD) have afforded many the opportunity to successfully attend and complete studies in higher education, and individuals with autism spectrum disorder (ASD) are opting to attend postsecondary education settings in increasing numbers. Individuals with ASD who may not have been previously included in postsecondary planning are now seeking the opportunity to expand their independence and pursue a higher education (Gobbo & Shmulsky, 2014). These rising rates may be attributed to an increase in awareness of ASD, higher rates of diagnosis, and increased focus on planning for postsecondary outcomes during secondary education (Gobbo & Shmulsky, 2014).

While many individuals with a childhood ASD diagnosis continue to need supports of some type in adulthood, a need for supports does not necessarily preclude pursuing higher education. Many who wish to pursue higher education are able to do so when provided supports to fit their individual needs. Despite the plethora of research on school-aged children with ASD and integration into general education classrooms, relatively little research has focused on factors needed for a successful pursuit of higher education once these children transition into adulthood (Zager & Alpern, 2010). Fortunately, research and program development in this area seem to be gaining traction. This chapter provides background information about those with ASD entering higher education, suggests strategies to incorporate into transition planning and assessment, provides overviews of the unique impact of ASD-related characteristics in the postsecondary environment, and outlines legal concerns as well as supports to maximize social and academic success.

Background

Van Bergeijk, Klin, and Volkmar (2008) recently predicted approximately 284,000–486,000 individuals under the age of 20 with ASD were planning to begin postsecondary education in the United States. Statistics on the number of individuals with ASD who actually attend higher education are scarce, but it is known that fewer than 24% of adults with cognitive disabilities are

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employed (Butterworth, Migliore, Nord, & Gelb, 2012). Those who are employed are typically underemployed and earn lower wages than nondisabled peers (Lysaght & Cobigo, 2014; Petner-Arrey, Howell-Moneta, & Lysaght, 2016). Even among typically developing individuals, on average unemployment is higher, and overall wages are lower in those without a college degree. It is logical to assume that for individuals with ASD, just as for their typically developing peers, postsecondary education can provide greater employment opportunities depending on the individual's motivation, skills, and interests. Furthermore, pursuing postsecondary education can be an important step in fostering independence and self-determination.

As Zager and Alpern (2010) point out, many individuals with ASD have intellectual disabilities that preclude completion of college programs without substantial modifications. These individuals often end up spending their first three or so years of adulthood in the same high school setting with younger students and/or students with more severe disabilities. This is in conflict with the Individuals with Disabilities Education Improvement Act (2004), which states students with disabilities should be included in educational settings with same-aged peers. Higher education programs facilitating continuing education in this more adult setting may be a solution to this problem, and whether the education culminates in a degree or not, postsecondary education or training is a reasonable path to personal growth and potential for individuals with disabilities (Mazzotti et al., 2009). It is also important to consider that many individuals with ASD do not have intellectual disability but are unable to most effectively apply their cognitive potential in higher education settings given all of the associated social and pragmatic demands these environments often entail. With the appropriate supports, some adults with ASD can successfully pursue undergraduate and even graduate degrees (Tevrizian, 2015).

The number of high school students with ASD who plan to pursue higher education is notable. A national study of individuals receiving special education services revealed 84.4% of individuals with ASD reported they would "definitely" or "probably" get some form of postsecondary education; of these, 61.7% indicated high likelihood of earning at least a 2-year degree, and 54.2% reported they would probably or definitely obtain a 4-year degree (Wagner, Newman, Cameto, Levine, & Marder, 2007). However, a related study found only 22.9% of high school students with ASD had a goal in their transition plan directly related to postsecondary education (Cameto, Levine, & Wagner, 2004). This is a discouraging gap between the student's expectations and formal transition plans. Caregivers can help minimize this gap by encouraging students to take an active role in their formal transition planning over the years and fostering a sense of self-efficacy in preparing for the future. Additionally, this provides opportunity for the individual to develop early self-advocacy skills that will be necessary in the context of higher education.

ASD Characteristics in the Context of Higher Education

In order to best engage in transition planning and to identify supports that may be needed in the postsecondary education environment, it is important to have an understanding of how characteristics of ASD can impact functioning in such a setting.

Assets

While individuals with high-functioning ASD will likely need a variety of supports in higher education, it is important to acknowledge the strengths they bring as well. Unique experiences, interests, and perspectives can be a major asset to class discussion, and the diversity they bring to campus can be of significant benefit to their fellow students, who can learn from their unique outlooks and viewpoints. Individuals with ASD can be very persistent and, particularly when studying in their areas of interest, able to focus on one thing for lengthy periods of time. With clear expectations, routine, and social and practical support to meet their individual needs, individuals with ASD can benefit greatly from habits of persistence, focus, and attention to detail. Additionally, individuals with ASD tend to be very honest, straightforward, and loyal (Attwood, 2007). Indeed, they can greatly enrich their campus community.

Symptoms

Symptoms of ASD including impairments in social skills, restricted and repetitive behaviors and interests, and difficulty with changes to routine can understandably interfere with success in not only academic but also in nonacademic but essential areas of functioning. Even students with ASD who have adapted well to the greater independence of high school may have significant difficulties transitioning between academic work and other activities in the college environment, where day-to-day schedules are often are more variable and may be much more hectic than when they were in high school and where there may be far fewer familiar faces.

Social Communication

In the often less-structured setting of higher education, difficulties with communication pragmatics can significantly impair success in and out of the classroom, as can the need for explicit instructions over sometimes vague or implied expectations. For example, the vagueness of instruction sometimes seen in college syllabi can present difficulties. Farrell (2004) related an anecdote from a college student who stated they were at a loss as to how to proceed with completing class assignments due to the lack of deadlines on the syllabus and vague instructions; the student reportedly never considered that they could ask the professor for assistance.

Problems with social communication are a core feature of ASD, affecting abilities such as joint attention and understanding abstract symbols or language (Zager & Alpern, 2010). Some studies of adolescents with ASD indicate extreme talkativeness, sometimes with a "pedantic monologue style" (Adams, Green, Gilchrist, & Cox, 2002) over obscure topics of interest, making them stand out from peers. Difficulties with speech and prosody may include inappropriate volume and difficulty with using or understanding variations of verbal inflection. Socializing with adolescents and adults generally requires a thorough understanding of symbolic language, including sarcasm and humor. In fact, adults with ASD have reported that communication failures with coworkers often resulted from an inability to understand double meanings, common idioms, and nonverbal cues (Hurlbutt & Chalmers, 2004).

Difficulties with social understanding and problems with engaging in reciprocal conversation can further impact communication with peers and negatively affect development of friendships. Language abilities are an integral component in predicting friendship in adolescents and adults (Howlin et al., 2000). In a study of 235 adolescents and adults with ASD, Orsmond, Krauss, and Seltzer (2004) found that only a small percentage had friendships meeting the *Autism Diagnostic Interview* (Le Couteur, Lord, & Rutter, 2003) friendship criteria (same-aged peers interacting in a reciprocal manner outside of organized settings).

Theory of Mind

As some abilities improve as an individual matures and progresses through different developmental stages, the manifestation of core ASD symptoms often changes as well (Shattuck et al., 2007). Joint attention skills are necessary for conversational skills in adolescence and adulthood; furthermore, more advanced skills are required for initiating and maintaining conversation including understanding others' interests, sensitivity to social setting/context, and an understanding of others' previous knowledge (Zager & Alpern, 2010). These skills require theory of mind.

Theory of mind is the ability to recognize and understand others' thoughts, perceptions, and beliefs as different from ones' own. Individuals with ASD have impaired theory of mind, impacting the ability to glean important information from others, via their tone of voice, and nonverbal communication via posturing and facial expressions. Difficulty accurately anticipating or perceiving others' reactions can lead to blunt honesty that can be inadvertently offensive, hurtful, or embarrassing (Attwood, 2007). Problems with theory of mind can also make it more difficult to accept different perspectives; consequently, the individual may come across as belligerent when faced with different points of view (Dillon, 2007). Problems with theory of mind can also affect some academic tasks, for example, analyzing characters in literature, discussing feelings and emotions, or completing less-structured activities requiring imagination and creativity.

Adults with ASD may be unable to continuously consider the listener's point of view when engaged in conversation, leaving out important information required for the listener to fully understand the background and context of the topic at hand. Omissions can cause confusion and communication breakdown (Colle et al., 2008). When conversations become derailed, joint attention and theory of mind are necessary to recognize and address conversational breakdowns. An individual must also be able to discern when and how to contribute to a conversation based on social and cultural norms. Difficulty understanding nonverbal cues complicates such social interactions and can make it difficult to ascertain when another person is interested, bored, annoyed, or offended. Other studies show social difficulties in vocational and other adult settings related to an inability to know when to ask questions, asking too many questions, or being too blunt (Hurlbutt & Chalmers, 2004). In a study by Müller and colleagues (2003), adults with ASD were more often fired due to social and communication problems rather than poor job performance. Accordingly, social and vocational communication supports are considered critical components of postsecondary programs for individuals with ASD (Alpern & Zager, 2007).

Executive Function

Executive functioning skills are required for tasks necessitating organization and planning, managing time and prioritizing tasks, understanding abstract concepts and impulse control, and maintaining information in working memory (Attwood, 2007; Zelazo & Müller, 2010). Many individuals with ASD have difficulties with executive functioning, affecting completion of multistep projects as well as prompt return of assignments. Difficulty abstracting the "big picture" from details is another crucial component of success in most academic tasks, which can be challenging for individuals with ASD. Executive functioning problems also affect daily living skills, such as planning meals, remembering appointments, efficiently managing completion of daily tasks through to completion, and keeping up with needed items (e.g., keys). In sum, due to impairments in executive functioning skills, individuals with ASD pursuing higher education are likely to require not only academic support but social, communication, and independent living supports.

Comorbidities

According to Siminoff et al. (2008), approximately 70% of adults with ASD have a comorbid diagnosis, with the most common including social anxiety, attention deficit/hyperactivity disorder, obsessive-compulsive disorder, Tourette's, insomnia, and depression. It is critical to take any comorbid conditions into account and ensure necessary supports are in place to address potentially problematic symptoms that may arise. Additionally, it may be necessarily to assist the individual in establishing routine care as necessary upon arriving at a new environment if they will be required to transition to new care providers in a new location. Type and amount of support needed for comorbidities varies widely and is beyond the scope of this chapter, but in the past several years, a significant amount of research has been published on this topic. For an overview of a variety of comorbidities in autism, the interested reader may refer to Matson (2015) and Mazonne and Vitielo (2016).

Other Considerations

The transition to postsecondary education can be a major stressor for even the most well-adjusted individuals. For those with ASD or other conditions, the stressors of adapting to a new environment with significantly greater independence and responsibilities may exacerbate symptoms and tax their capacity to cope with daily stressors. For those with sensory sensitivities, transitioning to a completely novel environment can include unexpected challenges.

Sensory sensitivities to certain types of lighting, smells, noise, food textures, and the like can be difficult to manage in new environments where it may be impossible to anticipate where and when these stimuli may be encountered. These sensitivities can become especially problematic if the student, taken by surprise, lacks a plan to appropriately cope with or be excused from the situation when surprise encounters occur. Preemptively planning as much as possible for when such occasions arise can be particularly helpful. For example, the individual can make a habit of identifying the nearest restroom or convenient quiet, semiprivate area when engaging in a new environment. They may consider always carrying a snack in case they attend functions where none of the foods are appetizing. Caregivers familiar with the student's individual sensitivities can assist the student in planning ahead as much as possible to prepare for such eventualities.

Planning Ahead

Transition Plans

Under the Individuals with Disabilities Education Act, transition plans are required to specify the transition services necessary to help students attain their goals (IDEA Partnership, 2004). Studies of students with ASD have indicated participation in their own transition planning during the high school years is associated with greater likelihood of postsecondary education for individuals with ASD (Chiang, Cheung, Hickson, Xiang, & Tsai, 2012). Transition planning which directly includes input from the student provides an opportunity to represent their interests so that they will be reflected in transition planning, thus improving secondary education outcomes for those who express this desire. A strong sense of self-determination is also associated with greater pursuit of postsecondary education (Morningstar et al., 2010; Test, Mazzotti, Mustian, & Fowler, 2009).

The importance of a well-planned transition from high school into higher education should not be underestimated; success in postsecondary settings requires a great deal more than interest and intellect. Successful college students need to have the ability to develop and maintain social networks, attend to daily needs such as paying bills or tuition on time and attend to personal needs, structure free time, and maintain flexibility to handle changes in class schedules and deadlines. Depending on the individual's situation, they may need to be able to negotiate living with a roommate or housemates, learning new transportation routes, planning ahead to manage completion of large projects, and planning and preparing meals.

In making plans for after high school graduation, Hurlbutt and Handler (2010) outlined the need for practical experience (e.g., skills necessary for independent navigation and problem solving in daily living in the post-high school setting) throughout the education of students with Asperger's disorder. The authors suggested a carefully considered, multiyear process to assist students as they transition out of high school and into college or the workplace. The plan should be guided by the teacher, parents, and other involved caregivers, but it should also be heavily driven by the individual's goals and foster a sense of self-determination. This process will necessitate activities that promote exploration of options and preferences, information gathering, and research about the desired life beyond high school. In Hurlbutt and Handler's example, this process resulted in creation of a career path binder functioning as a portfolio to house transition plans. The transition from secondary school can be an uncertain experience for individuals with ASD, as mandated state and federal supports are no longer required upon high school graduation (Weigand, 2011), further highlighting the need for a detailed, well-formulated transition plan.

Whether and Where to Attend

In individuals who have been diagnosed with Asperger's disorder (or have the same constellation of symptoms under the DSM-5's collapsed ASD diagnosis), obsessive, intense interests in areas of academic study are common, and individuals may be especially interested in technical vocations (e.g., computer engineering, chemistry) that necessitate a degree (Baron-Cohen, Wheelwright, Burtenshaw, & Hobson, 2007). This can make higher education an attractive plan for after high school graduation (Baron-Cohen et al., 2007). However, it may also be possible to find other suitable avenues for pursuing the individual's goals. The question of whether to pursue postsecondary education is an important one; for some individuals, vocational schools, apprenticeships, volunteer opportunities, or other avenues may be sufficient alternatives for meeting the individual's career goals. For others, taking time away from academics to explore potential vocational interests or taking a slower path to higher education by taking a class or two at a local community college may be of great benefit. Careful attention should be given to identifying the student's intrinsic desire for this path independent of parental expectations, as well as overall readiness, career goals, career requirements, and appropriateness of fit of the desired career to the individual's strengths and abilities.

Many possibilities exist for higher education, including community colleges, vocational/technical schools, and traditional 4-year colleges and universities. An additional factor to consider is whether the institution offers online classes; many institutions offer courses that are partially or entirely online. Some online classes offer the option to complete the work at ones' own pace rather than within the strict timelines of one semester. Other advantages can include avoiding problems with transportation and avoiding the anxiety of participating in a large classroom setting; on the other hand, learning to navigate transportation and participate in the social setting of the classroom can be important learning opportunities and key factors in increasing independence. The individual's personal goals and readiness must be taken into consideration in making the choice whether to take any online classes and, if so, how many.

An advantage of technical or vocational programs is that they often require fewer general education requirements, offering the opportunity to concentrate on areas of interest. This may be particularly advantageous for individuals who excel in some areas but have significant difficulty in other areas. Benefits of beginning at a local community college include smaller campuses that can be easier to navigate and, for many individuals, having the option to continue living at home to ease the transition from high school. Community colleges are often able to provide more individual attention per student and often have much smaller classes (Adreon & Durocher, 2007). For individuals who ultimately wish to transfer to a 4-year institution, however, attending community college will necessitate another major transition. Larger institutions offer unique advantages as well. Larger colleges and universities generally have greater diversity in their student body, offering a greater opportunity to meet other individuals with similar interests. Larger institutions may also offer greater diversity of courses or majors as well as more well-resourced career counseling and educational support departments, although this is certainly not always the case and many excellent programs in smaller schools exist. Additionally, some schools have programs that are specifically for individuals with developmental disabilities such as ASD.

Postsecondary Programs Specifically for Students with Intellectual Disabilities and/or ASD

In 2010, the US Department of Education initiated a 5-year funding program to 27 higher education institutions in order to establish Transition Programs for Students with Intellectual Disabilities (TPSID). These federally funded programs provide not only educational opportunities for transition-age youth with cognitive and intellectual disabilities (ID) but also important opportunities to engage in the social, occupational, and independent living environments associated with traditional postsecondary education. With the establishment of TPSID programs, postsecondary options became available to many students for whom postsecondary education was not previously an option or consideration. It is important to note that TPSID programs are specifically for students with ID; however, considering that about 50% of individuals with ASD have a concurrent ID (Centers for Disease Control and Prevention, 2014), this is highly relevant for the ASD student population. In fact, about one-quarter (26%) of the 883 students enrolled in TPSID programs during the 2013–2014 academic year had ASD. While TPSID programs have a great deal of flexibility in the types of programming they offer, they generally include some or all of the following components, in addition to legally mandated academic accommodations: certificate and degree programs, "academically specialized courses" specifically for students with ID in addition to integrated college classes, peer mentors and/or educational coaches, regular check-ins regarding student progress across different domains, communication and coordination with families, employment internships, and specialized training for educators (Grigal et al., 2015). Ongoing program evaluation of TPSID programs (883 students across 50 sites, as of the 2013–2014 academic year) is being conducted by the Think College National Coordinating Center at the Institute for Community Inclusion at the University of Massachusetts Boston.

In addition to TPSID programs, there are a number of non-TPSID programs in existence specifically for students with ASD. Many of these programs are geared toward the needs of students with ASD without concurrent ID. Like TPSID programs, there is a great deal of diversity in the programming and level of support offered by programs for students with ASD. In addition to legally mandated academic supports, these programs may provide ASD support groups, specialized classes and programming to increase life skills and adaptive behaviors, on-campus and off-campus social opportunities, special housing options, group or individual supports around deficits in executive functioning and social skills, career development, peer mentorship, occupational therapy, physical therapy, and 24-h on-call support (Carlotti, 2014). While some of these programs are offered free of charge to students with ASD, others charge fees that range from a few hundred dollars to upward of $8000 per academic year. Like TPSID programs, peer-reviewed research on these ASD-specific programs is currently limited, although program evaluation is ongoing.

Ultimately, deciding which college to attend is a personal choice, and all students, regardless of disability status, often consider many factors during this process. However, students with ASD may have unique considerations, and may weigh different factors, or have different priorities, when choosing which postsecondary school to attend. While TPSID programs and ASD programs recognize the needs of a growing student population and offer innovative supports to students with ASD, with and without concurrent ID, they are not the right choice for all students with ASD. Students with ASD, like their neurotypical peers, have many options when it comes to their postsecondary education.

Skill Building

Caregivers and other support professionals can help individuals with ASD develop and hone the skills needed for transitioning to postsecondary education before the student leaves high school. Freedman (2010) identified several categories of necessary skill sets to prepare an individual with ASD for success in higher education. For example, Freedman identified many components of asking for help that caregivers should ideally foster beginning during early childhood, including understanding the role of various people in one's life, understanding and developing a sense of social reciprocity, knowing when help is needed, identifying whom to ask for help, and knowing how and when to appropriately ask for help. Adreon and Durocher (2007) also suggested a number of areas critical to preparing an individual with ASD to transition to higher education. These issues include:

- Identifying the size and type of institution to attend
- Deciding where to live
- Assessing and teaching necessary independent living skills
- Discussing when and how to disclose diagnosis
- Learning how to identify needed academic supports and accommodations
- Identifying social supports
- Identifying strategies to assist in adjusting to the college environment (Adreon & Durocher, 2007, p. 275)

Along the same lines, Autism Speaks (2016) released an employment guide for individuals with ASD that can also be utilized for those seeking postsecondary education. The guide promotes the development of "soft skills" that are critical in the postsecondary environment. For example, caregivers are encouraged to work on active listening and effective, appropriate communication. In the postsecondary environment, these skills become especially important because they often influence social outcomes, such as how a professor perceives an email or how a student with ASD needs to ask for help if they do not understand a topic in class. Suggestions for skill building include having the person with ASD participate in role-playing or modeling with the caregiver prior to encountering these situations. Learning how to work through conflict or a situation in which the person with ASD might feel peer pressure is vital. Another suggestion for working through these common situations is utilizing Davidson and Henderson's (2010) suggested worksheet. Worksheets or other visual aids can be especially helpful as many individuals with ASD are visual learners. The individual could then work through a step-by-step guideline for navigating various situations and the appropriate response with the best chance for leading to the desired outcome.

Psychoeducational and Vocational Evaluation

Many children with ASD are assessed via the public school system, which provides a school-based diagnosis of ASD to inform Individualized Educational Plan (IEP) development. Caregivers should be aware that a school diagnosis, while very helpful and necessary for public school services, is different than a formal medical diagnosis. Students who have received a diagnosis through the school but have not received a medical diagnosis of ASD should consider pursuing additional assessment and diagnosis before attending postsecondary school, as a medical diagnosis is generally needed to receive accommodation services. Because postsecondary schools are not required to screen for the presence of any disabilities or conditions that could interfere with learning, it is unlikely that students without a previously established, formal diagnosis of ASD will be diagnosed and offered supports by their postsecondary schools (Pinder-Amaker, 2014). Additionally, after high school, there are far fewer laws that protect educational rights. Accordingly, students will likely need to advocate for themselves to receive specific accommodations (Freedman, 2010). Postsecondary schools generally require documentation of a disability (e.g., neuropsychological assessment report, a letter from a licensed mental health professional) before agreeing to provide adjustments and accommodations. It is important to note that postsecondary schools vary a great deal in their policies and procedures around providing disability services. Also, it is important to keep in mind the heterogeneity and diversity among young people with ASD. A letter stating that a student has an ASD diagnosis may not lead to the provision of appropriate accommodations and supports in a postsecondary setting. Instead, a more detailed explanation of a student's strengths and weaknesses – as well as the presence of any other conditions, psychological or otherwise, which may negatively impact academic adjustment (e.g., Cai & Richdale, 2016; Gelbar, Smith, & Reichow, 2014) – may be required in order to deliver the accommodations that will best aid the student.

Psychoeducational and/or neuropsychological evaluation can also help the individual make informed decisions in planning for the postsecondary years. The type of testing would depend on the complexity of the individual's needs; psychoeducational testing tends to focus primarily on areas affecting academic performance and is not quite as comprehensive as neuropsychological evaluations, though they often do include some measures of emotional and adaptive functioning as well. A neuropsychological exam is generally more lengthy, comprehensive (including more detail about executive function and cognitive organization/learning), and expensive. As in all treatment planning, choosing which assessments to pursue is highly individualized based on the individual's needs.

The report derived from an evaluation will provide evidence of areas of weakness warranting accommodations and thus is likely to be necessary to receive formal academic accommodations. While specific accommodations are needed, another vital piece for individuals with ASD seeking a postsecondary education is understanding their strengths and weaknesses via targeted assessment. Hume, Boyd, Hamm, and Kucharcyzk (2014) reported that in one study, 96% of individuals with ASD scored more than two standard deviations below the mean on the *Scales of Independent Behavior* (Bruininks, Woodcock, Weatherman, & Hill, 1996). This scale, which can be administered via a structured interview or a checklist, aims to assess a person's adaptive and maladaptive behaviors in certain areas of functioning (Bruininks et al., 1996). Establishing a baseline level of independent functioning and assessing which key areas necessitate support during postsecondary education may be critical to success. Another assessment that may be useful in determining the appropriate level of support needed is the *Vineland Adaptive Behavior Scale* (Sparrow, Cicchetti, & Balla, 2005). This assessment is administered via a semi-structured interview with the person's caregiver or parents and measures independence in both the personal and social domains (Klin et al., 2007). The scale assesses various domains, such as daily living skills, communication, and socialization – components all critical to a person with ASD's functioning in the postsecondary environment.

Presumably, assessing a person's level of executive functioning and independence is the first step. However, for those individuals with ASD seeking a postsecondary level of education, assessing their own interests and skills may be a key in selecting the appropriate college or trade school. For example, a larger university may offer the opportunity for a person with very narrow interests to pursue a specific major or trade, once that interest has been identified (Hurewitz & Berger, 2008). Stephen Shore, an author with ASD who has written extensively about the subject, illustrated the importance of carefully selecting a major or career path for the individual with ASD during an interview with Brownell and Walther-Thomas (2001).

In the interview, Shore described enjoying participating in music and opting to major in music education during college. However, Shore began to reconsider his major after becoming aware that the job prospects for a music major were relatively slim. He therefore opted to increase his chances for success postgraduation by double majoring in accounting (Brownell & Walther-Thomas, 2001). Shore's experience illustrates the critical importance for an individual with ASD not only to seek postsecondary education in a field that is interesting but also to become knowledgeable regarding how that field can impact their prospects after graduation. A key component of developing such awareness is to utilize and promote self-advocacy within the ASD community.

The Virginia Commonwealth University's Rehabilitation Research and Training Center and Autism Speaks (2016) recently collaborated to develop a community-based skills assessment to measure a person with ASD's social and personal functioning. The assessment helps to gauge a person's level of competence in domains such as self-awareness and advocacy, as well as career path and employment. The *TEACCH Transition Assessment Profile-Second Edition* (TTAP; Mesibov, Thomas, Chapman, & Schopler, 2007) is another measure designed to support a person's educational planning by assessing functional skills areas such as vocational skills and behavior and independent functioning, among other domains. The TTAP measures these domains through direct observation as well as a home and school/work scale. Results can be used by disability services, employment counselors, and other caregivers involved in intervention planning.

Vocational evaluation can be especially helpful, particularly if the individual expresses uncertainty about what they wish to do after graduating high school. Many schools have access to such measures. Additionally, state vocational rehabilitation centers can provide such services to eligible individuals. Students with an IEP often qualify for some transitional services through the state's Department of Vocational Rehabilitation. Not only is vocational evaluation helpful for those undecided about which direction to pursue, but it can also be especially helpful when an individual's desired career is a poor match for their abilities. It is often the case that parents recognize the mismatch between the demands of a desired profession and the actual abilities of their children with ASD; the results of career testing can be an objective springboard for having this conversation with their children. Individuals with ASD often have significant difficulty identifying their own weaknesses, particularly when it comes to social communication and interpersonal skills. They may also have little insight into the actual requirements of a given vocation. Working with a counselor who is knowledgeable about ASD can be invaluable in helping an individual to process feelings of disappointment and identify more viable vocational options, whether or not that includes postsecondary education.

Individuals with ASD wishing to gauge their interest and skills before pursuing postsecondary education are not limited to formal assessments. Myriad assessments are now available online. Though these assessments have not been normed or standardized to the ASD population, they can be an efficient way of determining a person's skills, interests, and values. For example, CareerOneStop is a website supported by the US Department of Labor and offers a free online skills assessment to measure both technical (e.g., writing computer code, operating equipment) and soft skills (e.g., critical thinking, communication). Individuals can develop a skills profile and then match their skills to various career fields in O*NET, a national database. The assessment is free and easily accessible to individuals who are comfortable browsing the Internet.

Postsecondary Supports

Many institutions of higher learning are making efforts to meet the needs of individuals with ASD by providing additional support programs. In recent years, some postsecondary education programs have begun to focus on "inclusive postsecondary education" to include individuals with disabilities, particularly intellectual disabilities, in the normative postsecondary track as much as feasible (Uditsky & Hughson, 2012). Two hundred or more programs across the country currently have programs specifically to provide more proactive support to individuals with disabilities in participating in academic programs, developing a career plan, and engaging in campus life (Blalock, 2014; Grigal & Hart, 2010).

Legal Considerations

The Vocational Rehabilitation Act of 1973 and the Americans with Disabilities Act (ADA) of 1990 improved access for individuals with disabilities who wished to pursue higher education (Americans with Disabilities Act, 1990; Rehabilitation Act, 1973); however, the highly variable needs of individuals with ASD can make it difficult for faculty and staff to understand how to best meet the needs of students with ASD (Farrell, 2004). The most frequently provided academic accommodations (e.g., extra time to take exams, alternate testing locations, tutoring, and assistance from notetakers) may not meet the needs of the individual with ASD, who may need more social supports in order to succeed academically. Additionally, the legislation does not define what qualifies as "reasonable accommodations," thus leaving the degree of responsibility incumbent on institutions open to interpretation (Hughes, 2009). The types of supports identified as often required by individuals with ASD in higher education settings are not those that are typically provided: supports for living on campus or living independently, developing peer relationships, engaging in self-advocacy, and interacting effectively with instructors (Dillon, 2007; Ellison et al., 2013; Hughes, 2009; Smith, 2007).

Disclosure

While adolescence is typically a time of increasing independence, individuals with ASD may find the transition to independence difficult and may even find their independence decreasing without appropriate support (Hume et al., 2014). For example, some individuals may lack the ability to successfully problem-solve independently when bus routes change or when they need to make unexpected changes to plans. Postsecondary students with ASD face other challenges related to their disorder, including critical thinking and difficulties in long-term planning and organization. Further, group work sometimes required in these settings may present a unique challenge for a disorder characterized by social and emotional obstacles (Gabbo & Shmulsky, 2014). Yet, Gabbo and Shmulsky (2014) also state that people with ASD may have some advantages when it comes to postsecondary education, such as adherence to the rules, desire to learn and be correct, and a passion for their chosen field or trade. In order to fully take advantage of these benefits through appropriate supports, individuals will need to advocate for themselves and consider disclosing their diagnosis.

Once enrolled in a postsecondary setting, individuals with ASD should consider whether they wish to disclose their diagnosis and, if so, how and when to disclose. Students with ASD, or any other disability, are not required to disclose the nature of their disability, or that they have a disability at all, to educators or administrators at their postsecondary school. However, if they wish to receive academic adjustments and accommodations, then they must do so by providing the necessary documentation (U.S. Department of Education, 2011). Choosing to disclose to school officials can be difficult. Some students with disabilities experience stigma, embarrassment, or other negative feelings around their disability status, and this can become a significant barrier to communicating with disability services offices and successfully advocating for important supports (Barber, 2012). Further, some students who received special education through high school erroneously may doubt their need for accommodations and supports once they enter the college environment (Pinder-Amaker, 2014), thus presenting another barrier to accessing supports.

Some aspects of disclosing an “invisible” disability, like ASD, are uniquely challenging. Pinder-Amaker (2014) made important connections between the relatively well-established literature on college students with psychiatric conditions and disabilities and the lesser-established literature on college students with ASD. Particularly, students with these types of disabilities will avoid or at least not seek out resources if they believe that accommodations will not help them or if they perceive stigma, judgment, or lack of understanding from the school staff and faculty who are supposed to help them (e.g., Eisenberg, Hunt, Speer, & Zivin, 2011). Disclosure may feel especially disconcerting for some individuals who may “pass” as neurotypical to the casual observer but who may still benefit from accommodations (Davidson & Henderson, 2010). These individuals may have learned how to suppress certain behaviors typical of ASD as well as how to increasingly engage in other more neurotypical behaviors such as making appropriate eye contact and appropriately expressing emotions. Therefore, Davidson and Henderson (2010) liken the decision to disclose the ASD diagnosis to “coming out.” The lack of understanding of social cues typical to ASD can complicate the choice of how and to whom to disclose ones’ diagnosis. Learning how to judge and read these cues may make the choice to disclose somewhat easier, as the individual could feel safer disclosing to someone who they can trust (Davidson & Henderson, 2010). One suggestion for navigating this path is creating and utilizing a worksheet outlining the disclosure process. Individuals with ASD could work with their caregiver or other support professional to develop such a worksheet before they arrive at their chosen postsecondary institution. Davidson and Henderson (2010) suggest that the worksheet detail the pros and cons of disclosing to a chosen person. For example, if the individual with ASD is considering disclosing to a peer, they should consider whether the peer is trustworthy and whether the peer typically have others’ best interests at heart (Davidson & Henderson, 2010).

Disclosing to a member of the institution may be the preferred choice, at least initially, in order to access certain supports that may prove key to success in the postsecondary environment. Gelbar, Shefcyk, and Reichow (2015) conducted a comprehensive survey of current and former students with ASD to assess if and when they chose to disclose, among other postsecondary experiences. In the study, 69% of participants chose to disclose their disability, primarily to disability service coordinators and professors – fewer individuals chose to disclose to their fellow peers (Gelbar et al., 2015). The participants who disclosed to members of the institution also utilized accommodations, such as extended time for assignments and tests, modified testing environment, social skills courses, and peer mentors (Gelbar et al., 2015). These participants chose to disclose within their first semesters in order to access supports. Clearly, when appropriate support is utilized, students with ASD can address the challenges of the disorder and may have a better chance for success.

Academic Supports for Students with ASD in Postsecondary Schools

Legally Required Academic Supports

Young adults with ASD are at high risk for suboptimal educational and professional outcomes: Shattuck et al. (2012) found that more than half of young people with ASD in the United States neither attend college nor obtain competitive employment during their first 2 years following high school. Thus, it is important to understand the key pieces of legislation that affect the postsecondary education of students with ASD and how these aim to improve educational outcomes. Per the mandates of Section 504 of the Rehabilitation Act of 1973, and Titles II and III of the Americans with Disabilities Act (ADA) of 1990, students with disabilities, including ASD, are entitled to educational supports in postsecondary schools. This is true regardless of whether students attend public or private institutions: Title II applies to publically funded colleges and universities, community colleges, and vocational schools; Title III applies to privately funded schools; and Section 504 applies to any publicly or privately funded school that receives federal funding. While the Family Educational Rights and Privacy Act of 1974 does not directly provide any supports or accommodations to students with disabilities, it does grant all students the right to access and amend their educational records, as well as protection against their educational records (including information about disability status, accommodations, and communications) being released to third parties without explicit, written consent (Family Educational Rights and Privacy Act, 1974). The Individuals of Disabilities Education Act (IDEA) of 2004 applies to school districts (i.e., K-12 schools), but it does not apply to postsecondary schools (Individuals with Disabilities Education Improvement Act, 2004). Thus, postsecondary schools are not required to provide free public appropriate education (FAPE), identify students' needs through assessments, or provide an Individualized Education Plan (IEP).

Section 504 and Title II apply both to school districts and postsecondary schools but in different ways. According to the Office for Civil Rights of the US Department of Education (2011), postsecondary schools are required to provide academic adjustments and accommodations, such that students are not discriminated against due to having a disability. These adjustments and accommodations depend greatly on the nature of a student's disability but may include one or more of the following: extended time to complete tests and assignments, use of different testing locations, access to instructors' slides and outlines before class sessions, note-taking services, a reduced or alternate course load, and access to adaptive technology (Gelbar, Smith, & Reichow, 2014). Also, if a postsecondary school provides student housing, then comparable, convenient, and accessible options must be made available to students with physical disabilities. However, there are some adjustments and accommodations that postsecondary schools are not required to provide. For instance, they do not have to "lower or substantially modify essential requirements" of a given course or degree program; they also do not need to provide services that would entail "undue financial or administrative burden" (U.S. Department of Education, 2011).

Nonlegally Required Academic Supports

As previously discussed, postsecondary schools are legally required to provide academic supports and housing options (if a school offers any on-campus housing) to students with disabilities; there are also some types of accommodations that they are not legally required to provide. However, there are many postsecondary schools that pride themselves on the range of services and supports they provide to students with ASD, which go above and beyond what is legally mandated. In their systematic review of 20 studies in which college students with ASD self-reported on their educational supports and utilization of services, Gelbar and colleagues (2014) found that academic accommodations, consistent with those required by law, were discussed in the majority (60%) of the studies. However, a significant minority (45%) of the studies touched upon additional, nonlegally required services to support students with ASD. These included peer mentorship programs, in which students with ASD are paired with volunteer neurotypical students; being assigned to a counselor, aide, or liaison for advocacy supports and help navigating the postsecondary environment; parental involvement; the use of video modeling and Social Stories (therapeutic stories that can be used to help individuals with ASD navigate familiar and unfamiliar situations); the provision of disability teams; student support groups; and cognitive-behavioral interventions provided through campus counseling centers. Indeed, in a qualitative study conducted by Barber (2012) on graduates with a broad range of disabilities from five New Jersey colleges and universities, the participants identified both legally mandated and nonlegally mandated supports as being critical to their success. These included having close, supportive relationships with one or more disability services staff members, as well as with faculty members. Also, participants noted that while learning about disability services and available supports was a cumbersome process, actually accessing those services was not.

While Gelbar and colleagues (2014) discovered a range of interventions and supports for students with ASD that students themselves described as being beneficial, they carefully noted the lack of peer-reviewed experimental research and program evaluation for many of these supports. Indeed, current recommendations for supporting the needs of college students with ASD are more based on the clinical impressions and experiences of education professionals, and research on college students with disabilities other than ASD (e.g., learning disabilities), than on empirical research with college students with ASD (Pinder-Amaker, 2014). However, as more and more young people with ASD enter postsecondary education and more programs are implemented and evaluated, the research base is very likely to grow.

Self-Advocacy

The nature of the current laws surrounding disability accommodations in postsecondary settings all but require students with disabilities, including ASD, to assume a prominent self-advocacy role. This represents a significant shift from secondary school, where a great deal of responsibility falls both on parents and the school district to make sure that students with ASD are being appropriately educated and supported. Pinder-Amaker (2014) suggested that postsecondary students would benefit greatly from a theoretical “Individualized College Plan,” in which the complex interactions between the student, family, and school that currently occur in the context of an IEP could continue into the college setting. In the absence of such a service, however, Pinder-Amaker (2014) made the important point that students with ASD would benefit from gaining self-advocacy experience, while they are still in high school. Ultimately, learning how to be a strong self-advocate takes self-knowledge, time, and practice. In many cases, this includes having a strong understanding of the supports they need to be successful and communicating these to school administrators and providing any documentation requested by their postsecondary school. Also, if students find that they are not receiving the accommodations that they were promised, or if those accommodations are not having their intended impact, then they must communicate with school administrators to address the issue (U.S. Department of Education, 2011). Fortunately, in a recent qualitative study among Australian college students with ASD and their parents, the vast majority of students (90.9%) reported feeling as though they could talk to a university staff member if they believed that their needs were not being met (Cai & Richdale, 2016). Regarding the inclusion of parents, Wolf, Brown, and Bork (2009) strongly suggest that with the student's permission, parents or primary caregivers remain involved with the student's on-campus support system. They note that for individuals with other disabilities (e.g., physical, medical, sensory, learning, psychiatric disabilities), encouraging independence often means less contact with parents. However, for some individuals with ASD, some parental involvement can be essential. The authors suggest identifying a point person to communicate periodically with parents, particularly if health or safety issues arise. A contract outlining discussed and agreed-upon boundaries of contact can help establish a professional relationship, reassuring parents while also fostering emerging independence.

Social Supports for Postsecondary Students with ASD

While many of the legally mandated and nonlegally mandated supports for college students with ASD focus somewhat narrowly on achieving academic success, college is not exclusively an academic experience. Instead, postsecondary education frequently includes multiple, meaningful social relationships, including friendships, intimate relationships, and preparation for the professional world (Pinder-Amaker, 2014). However, the core features of ASD – deficits in social communication and restricted and repetitive behaviors and interests – alongside frequently co-occurring conditions, including deficits in executive functioning and attention (e.g., Rosenthal et al., 2013), and internalizing symptoms including depression, anxiety, and obsessive-compulsive disorder (e.g., Lai et al., 2011), make success in any one of these domains all the more challenging for young people with ASD. In the following section, existing supports to address the social relationships, sexuality, and professional development of college students with ASD are explored.

Supports Around Social Relationships

College students with ASD are likely to benefit from supports to increase their social communication skills and to foster relationships with other students, roommates, and faculty and staff. These may include, but are not limited to, social skills groups, support groups for students with ASD, participation in student groups not specifically related to disability (e.g., orchestra, anime club), on-campus and off-campus social outings for students with ASD, individual therapy with counseling center providers, and participation in peer mentorship programs. In their review of a Campus-Based Inclusion Model (CBIM) for high school and college students with ASD, Zager and Alpern (2010) stressed the particular importance of supporting students in the area of social communication, which has important implications for social relationships. In particular, they described students participating in weekly therapy sessions led by speech-language pathologists, using standardized measures to assess students' communication skills, naturalistic observation of students to determine their communication skill needs, and measuring students' self-perceptions of their communication skills and abilities. Overall, interventions that are focused on the domain of social communication, highly individualized to students' needs, and implemented before students attend postsecondary school full time are likely to help students with ASD have more successful social relationships during their college years.

Supports Around Romantic Relationships and Sexuality

Compared to their neurotypical peers, college-age students with ASD overall have less sexual knowledge, fewer sources of sexual education, and less sexual experience (Brown-Lavoie, Viecili, & Weiss, 2014; Mehzabin & Stokes, 2011). Individuals with ASD also have much greater difficulty interpreting the social cues of others to ascertain others' emotional reactions or intent. These disparities may have particular implications in the college setting, where many students engage in romantic and sexual relationships. Emerging research suggests that adolescents and adults with ASD are at increased risk both for showing inappropriate dating behaviors, such as stalking or being inappropriately assertive/persistent (Stokes, Newton, & Kaur, 2007), and for being victims of sexual abuse (Brown-Lavoie et al., 2014). Very little research currently exists on the implementation of sexual education programs and other interventions to support the healthy sexualities of college students with ASD, although several research-informed curricula do exist (e.g., Davies & Dubie, 2012; Henault, 2005).

Supports Around Professional Development

Professional development and career preparation are increasingly being recognized as an area where many postsecondary students with ASD need particular support. Despite increased programming for students with disabilities more broadly, college graduates with disabilities appear to be disproportionately unemployed compared to their nondisabled peers (U.S. Department of Labor, 2015), although some studies do suggest fewer disparities and more optimistic outcomes (e.g., Fichten et al., 2012). Similarly, a quarter of students who exited TPSID programs at the end of the 2013–2014 academic year did not have paid employment or participate in any other career development (Grigal et al., 2015). Recognizing the significant social skills (e.g., interacting with coworkers and supervisors, business etiquette) and executive function skills (e.g., time management, decision making) that are often needed to be successful in the professional world, Dipeolu, Storlie, and Johnson (2015) provided a series of recommendations as to how postsecondary schools can better prepare students with ASD. These included initiating professional training and development early in one's college career (e.g., internships), group counseling and social skills training, individual sessions with counseling center and/or disability services staff, peer mentorship programs, career assessment (while keeping in mind that most measures of career aptitude were not designed for use with individuals with ASD), career preparation supports (e.g., résumé and cover letter advice, mock interviews), and ultimately taking a strengths-based approach to helping students with ASD determine their career goals (Grandin & Duffy, 2008). These supports will assist students with ASD, so that they may pursue competitive and fulfilling careers after graduation.

Attitudes Toward Postsecondary Students with ASD

Many of the interventions and supports described in the current chapter target individuals with ASD and help them adapt to postsecondary environments and their expectations. However, researchers are starting to consider ways in which the responsibility could be shifted from the individual to the system in order to provide better experiences and outcomes for college students with ASD. An important first step in designing this type of intervention is to understand the attitudes of postsecondary schools and their inhabitants toward students with ASD. For example, Nevill and White (2011) found that neurotypical students who had a first-degree relative with ASD were significantly more open toward students with ASD symptomatology (presented through hypothetical vignettes), compared to neurotypical students without such a relative. Further, no differences in openness toward students with ASD were found between neurotypical male and female students or between students studying different majors (categorized as social sciences, physical sciences, engineering, and other subjects). In another recent study, neurotypical college students rated written descriptions of students with ASD symptoms and a formal ASD diagnosis more positively than written descriptions of students with ASD symptoms but without a diagnostic label (Matthews, Ly, & Goldberg, 2015). In this study, however, male students were found to express more positive attitudes, across conditions, than female students. Together, these studies show that neurotypical students have a strong capacity to understand and accept peers with ASD and that there may be malleable factors that can be targeted via intervention in order to increase this acceptance. Studies like these provide an important framework for future interventions that may change the environment, instead of the individual, to help students with ASD thrive in postsecondary settings. Indeed, the presence of diverse students, including those with ASD, increases awareness and reduces stigma, thus benefitting the entire college community (Pinder-Amaker, 2014).

Family Involvement

In a survey of studies looking at family involvement and postsecondary outcomes for students with ASD, Dallas, Ramisch, and McGowan (2015) found few studies looking at this topic. Additionally, most of the studies included a low number of participants, such that results should be taken as theoretical in nature. These studies provide a glimpse at how supports for the postsecondary education experience are viewed by those in varying roles. Findings from the studies indicated that the amount of parent involvement expected by institutions varies widely but that in general parents are viewed positively. Examples of parental involvement from the institutional standpoint included written progress reports to parents, weekly emails, and parent informational sessions about services and expectations (Barnhill, 2016). Szentmiklosi (2009) surveyed community college students and found family members managed information related to disability services, attended multiple disability service appointments, acted as class notetaker, and provided transportation. Parents identified the type of help provided as including things such as assisting with money management and paying bills, assisting with laundry, continuing to manage appointments, and identifying and helping problem-solve difficult social situations (Morrison, Sansosti, & Hadley, 2009). Feedback from the students themselves identified several themes that contribute to appreciated assistance from a caregiver: a strong sense of trust, an intimate connection, a shared vision of independence, a presumption of competence, understanding, and communication (Robledo & Donnellan, 2008). Both students and service providers identified family member involvement as appreciated in Schlabach's (2008) study, with students often relying on family for emotional support as well as practical assistance as students lived with or near their family. Family members played an integral role in assisting with choosing an institution, campus visits, time management, problematic social situations, and serving as advocates when needed (Schlabach, 2008). Of course, not every student will welcome the same degree of familial involvement, and family members should respect these differences.

Conclusion

In conclusion, increasing numbers of individuals with ASD are choosing to pursue postsecondary education. Though there is relatively little research on this topic thus far, it is gaining traction. Additionally, in recent years, a number of resources and programs have been developed to assist individuals with ASD in planning and reaching their postsecondary education goals. A variety of postsecondary paths exist including some programs developed specifically to provide supports for individuals with ASD. The decision of whether and where to pursue postsecondary education is a complex one, and planning is best begun years in advance including yearly IEP planning throughout the high school years. Students with ASD are likely to need supports beyond the traditional academic supports for learning disabilities. For example, supports to address deficits in executive function, daily living skills, and social skills may be needed. However, individuals with ASD can also be a notable asset to the campus community. Postsecondary education provides many with not only the opportunity for important educational- and employment-related attainments but also a developmentally normative environment to continue developing social skills and independence. Many individuals with ASD can successfully reach their postsecondary goals with the appropriate, well-coordinated supports as programs to provide these supports and research into best practices continue to develop.

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Sensory Integration Therapy and DIR/Floortime

19

Jasper A. Estabillo and Johnny L. Matson

Introduction

The increasing prevalence of autism spectrum disorder (ASD) has also led to an increase in treatments for the disorder. Given the lifelong impairments on an individual's functioning associated with ASD, families of those affected may seek out numerous treatments to assist with developing skills. Although applied behavior analysis (ABA)-based interventions have been shown to be effective for individuals with ASD (Dawson et al., 2012; Estes et al., 2015; Matson, Tureck, Turygin, Beighley, & Rieske, 2012; Peters-Scheffer, Didden, Korzilius, & Sturmey, 2011; Reichow, 2011), there continues to be a myriad of alternative treatments purported to aid in treating ASD symptoms and related problems. Interestingly, few other developmental and medical disorders have been subject to such a high number of controversial treatments as ASD (Metz, Mulick, & Butter, 2005). It has been suggested that ASD has been so prone to fad treatments because of the heterogeneous nature of the disorder, comorbid problems, limited access to empirically based treatments, and/or lack of knowledge of ASD and effective interventions (Metz et al., 2005). Given the differences in functioning across individuals with ASD and emphasis on individualized treatment, it may be understandable that families may seek out alternative treatments; however, it is up to clinicians and practitioners who work with families to educate them on effective interventions.

Sensory integration and DIR/Floortime are two alternative therapies that may be provided for individuals with ASD. A few research studies on both interventions indicate some support; however, wide-scale efficacy studies are lacking and long-term outcomes are currently unknown. This chapter discusses the background, applications, research, and conclusions for each therapy.

Sensory Integration

Background

Sensory behaviors have historically been associated with ASD. In his classic study, Kanner (1943) included descriptions of children with sensory fascinations with lights and spinning objects, as well as hypersensitivity to sounds and moving objects. Although not specified in previous editions of the Diagnostic and Statistical Manual for Mental Disorders (DSM) (American Psychiatric Association [APA], 1980, 1994) for ASD symptoms, sensory behaviors were typically captured within the criteria of stereotyped and repetitive motor mannerisms and persistent

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preoccupation with parts of objects. The DSM-5 (APA, 2013) includes "hyper- or hypo-reactivity to sensory input or unusual interest in sensory aspects of environment; (such as an apparent indifference to pain/heat/cold, adverse response to specific sounds or textures, excessive smelling or touching of objects, fascination with lights or spinning objects)" under criteria B4 for ASD.

Researchers have also established that individuals with ASD often seek or avoid sensory stimuli in the environment, including auditory, tactile, and vestibular input (Baranek, Boyd, Poe, David, & Watson, 2007; Ben-Sasson, Carter, & Briggs-Gowan, 2009; Ben-Sasson et al., 2008; Hazen, Stornelli, O'Rourke, Koesterer, & McDougle, 2014; Rogers & Ozonoff, 2005). It is estimated that greater than 80% of children with ASD also have problems with sensory processing (Ben-Sasson et al., 2009). Joosten and Bundy (2010) found that children with ASD and stereotypical behaviors have significantly greater sensory processing problems ($d = 2.00$) than typically developing children. In a meta-analysis of studies on sensory impairments in individuals with ASD, Ben-Sasson et al. (2009) found that the greatest difference between children with and without ASD was for hypo-reactivity ($d = 2.02$). Additionally, large effects were also found for hyper-reactivity ($d = 1.28$) and sensory-seeking behaviors ($d = 0.82$). Developmentally, sensory processing problems appear to be a greater impairment during childhood and become less significant as one ages. Between 0 and 6 years, hyper-reactivity and sensory-seeking behaviors were found to increase, then peak between 6 and 9 years, and ultimately decrease after 9 years of age.

Sensory behaviors may also be associated with other ASD-associated deficits. The most common sensory behavior in children with ASD is hypo-reactivity in social contexts (Baranek et al., 2007). This refers to deficits in response to social stimuli, which can be attributed to the social communication impairments characteristic of the disorder. The repetitive movements commonly seen in individuals with ASD may also be attributed to sensory processing problems (Rogers, Hepburn, & Wehner, 2003); sensory reactivity has been found to be associated with the restricted and repetitive patterns of behaviors and interests characteristic of ASD (Boyd et al., 2010; Boyd, McBee, Holtzclaw, Baranek, & Bodfish, 2009; Gabriels et al., 2008). Researchers have also suggested that impairments in sensory processing may result in inappropriate behavioral responses, which can affect an individual's development of communication, socialization, and adaptive behavior skills (Jasmin et al., 2009; Schaaf, Toth-Cohen, Johnson, Outten, & Benevides, 2011). Additionally, sensory selectivity may influence an individual's food aversions (Leekam, Nieto, Libby, Wing, & Gould, 2007; Paterson & Peck, 2011).

Greater than 60% of children with ASD receive sensory interventions, typically combined with other therapies including OT, and it is the most commonly requested service requested by parents of children with ASD (Green et al., 2006). Thus, the need to address treatment needs for sensory behaviors in individuals with ASD is warranted.

Definition

Sensory-based interventions are centered on the idea that sensory information may be augmented by applying various sensory sensations in order to change an individual's arousal state (Parham & Mailloux, 2010). As such, sensory processing is described as necessary for a person to receive, regulate, integrate, and organize external sensations that are received in one's central nervous system to produce correct behavioral responses (Bundy, Lane, & Murray, 2002). Therefore, the underlying assumptions of sensory integration are (1) the central nervous system is plastic, (2) the sensory integration process has a developmental progression, (3) the brain is composed of systems that are hierarchical which function together, (4) adaptive behaviors and sensory integration have a circular relationship, and (5) humans are innately driven to develop sensory integration through engaging in sensorimotor activities (Fisher & Murray, 1991; Metz et al., 2005). Sensory interventions have several components: use of a variety of modalities, various target behaviors, passive and active child participation, and applications in various contexts (Case-Smith, Weaver, & Fristad, 2014). Thus, the purpose of sensory interventions is to address underlying sensory dysfunction and improve one's ability to integrate sensory stimuli (Ayres, 1979; Dawson & Watling, 2000). Clinicians using sensory integration therapy report improvements in individuals' ability to focus attention and remain on task, reduction in maladaptive behaviors, and general improvements in additional skills such as language (Devlin, Leader, & Healy, 2009).

Ayres Sensory Integration Therapy is a clinic-based, child-centered intervention in which play-based activities are provided in order to contrive opportunities for a child to engage in adaptive responses (Case-Smith et al., 2014). According to Ayres (1979), sensory integration therapy is based on "neurological processes that organize sensation from one's own body and from the environment and makes it possible to use the body effectively within the environment." It is believed that typical sensory function is a natural result of sensorimotor development and the appropriate integration of sensory behaviors allows the individual to engage and participate in a variety of meaningful and purposeful activities.

In contrast, sensory-based interventions are structured, adult-directed sensory strategies that are incorporated into other routines and therapies in attempt to improve behavioral regulation (American Academy of Pediatrics, 2012; Case-Smith et al., 2014). These interventions are based on the theory that certain types of sensory input (e.g., pressure, rocking) may be calming to individuals and promote self-regulation. Examples of sensory-based interventions include dry brushing, wearing a weighted vest, and incorporation of various gross motor activities. Dry brushing and compression involve providing the individual with deep pressure to the skin and joints (Wilbarger & Wilbarger, 1991). Similarly, a weighted vest may be worn in order to provide pressure to the individual's body. Multiple sensory-based interventions may be incorporated into an individual's treatment plan, and a "sensory diet" may be implemented in which different types of sensory stimulation are given to the individual on a specified schedule in order to treat "sensory defensiveness" (Wilbarger & Wilbarger, 2002). Sensory defensiveness is defined as the "overreaction and avoidance of a sensation from any sensory modality" (Wilbarger & Wilbarger, 1991). The sensory diet may include various activities such as gross motor actions (e.g., jumping on trampoline, swinging) in addition to dry brushing and deep pressure throughout the day.

Applications

Sensory integration therapies were developed to address sensory dysfunctions in individuals. In addition to individuals with ASD, the treatment has been used with individuals with intellectual disabilities, learning disabilities, behavioral problems, and cerebral palsy (Case-Smith & Miller, 1999; National Board for Certification in Occupational Therapy, 2004; Spitzer, Roley, Clark, & Parham, 1996; Watling, Deitz, Kanny, & McLaughlin, 1999). It is frequently implemented with individuals on the spectrum, and the high use of sensory integration in this population may be due to the overlap between sensory stereotypies and sensory stimulation (Davis, Durand, & Chan, 2011). Sensory integration therapies are typically implemented by occupational therapists; Watling et al. (1999) conducted a survey with occupational therapists and found that 82% reported always using some form of sensory integration therapy in their practice. However, some sensory integration techniques may also be used by teachers and other practitioners (Worley, Fodstad, & Neal, 2014). Additionally, sensory integration therapies are some of the most commonly recommended treatments by professionals in the school system (Miller, Schreck, Mulick, & Butter, 2012).

Effectiveness

The difficulty in assessing the effectiveness of sensory integration therapies is in the heterogeneity of interventions used, as well as the skills targeted. Researchers have studied various components of sensory integration therapy and sensory-based interventions; however, due to the differences in therapies used, methodology, outcomes, and populations studied, there is limited research on the effectiveness of sensory integration itself.

In order to assist with concerns regarding the research on sensory integration therapy, Parham and colleagues (2007, 2011) developed the Ayres Sensory Integration Fidelity measure to assess the ten essential elements of Ayres Sensory Integration Therapy. The essential components include (1) ensure the individual's physical safety, (2) present a range of opportunities for sensory stimulation, (3) use activities and arrange the environment to help the child maintain self-regulation and attention, (4) challenge the individual's motor control, (5) challenge praxis and organization of behavior, (6) collaborate with the child on choice of activities, (7) contrive activities to present the just-right challenge, (8) ensure success, (9) support the individual's motivation to play and engage in the activity, and (10) establish rapport with the individual. Regarding psychometrics, content validity, internal consistency, and inter-rater reliability on the total score were found to be high on the measure (Parham et al., 2011). Use of this measure may be helpful for future research because the operational definitions of components of sensory integration therapy will allow researchers to measure various aspects of the intervention. As outlined by the American Occupational Therapy Association (2014), research opportunities in sensory integration research include using occupational therapy with sensory integration approaches to develop individual functional goals, motor skills, sensory-perceptual skills, emotional regulation skills, communication and social skills, mental function, and pain management.

Research Supporting

Several individual research studies have been conducted to examine the effectiveness of sensory integration therapy and sensory-based interventions. The following recent reviews of sensory integration treatments are discussed to provide research on the overall effectiveness of the intervention type.

Case-Smith et al. (2014) conducted a systematic review of studies on sensory integration therapy and sensory-based interventions published between 2000 and 2014. Two randomized controlled trials of sensory integration therapy were reviewed, with positive effects for child performance found ($d = 0.72–1.62$). The additional sensory integration therapy studies reviewed also showed reduction in sensory problems. For sensory-based interventions, few positive effects were found. These included single-sensory strategies used to influence one's state of arousal (e.g., weighted vest). As stated by the authors, sensory-based interventions may not be effective due to the lack of fidelity to treatment protocols or targeting specific problems with sensory processing.

Watling and Hauer (2015) conducted a systematic review of the literature from 2006 to 2013 on the effectiveness of Ayres Sensory Integration Therapy and sensory-based interventions in occupational therapy for individuals with ASD. Moderate evidence was found for the use of Ayres Sensory Integration Therapy, and mixed results were found for sensory-based interventions. The studies included in the review met with published criteria to be classified as Ayres Sensory Integration Therapy. Three of the four Ayres Sensory Integration Therapy studies reviewed showed positive effects for reducing autism symptoms. For the sensory-based interventions, single-sensory interventions (e.g., weighted vests) had little or no effects, but vestibular input (e.g., spinning, swinging, hanging upside down) had some limited support.

Research Not Supporting

A review conducted by Lang et al. (2012) found no consistently positive effects of sensory integration therapy for children with ASD. The authors examined 25 studies and found 3 studies with positive results, 8 studies with mixed findings, and 14 studies with no benefits of sensory integration therapy. They concluded that there was insufficient evidence for sensory integration to be used for this population. Moreover, the authors stated that it may be inappropriate for agencies that are mandated to use evidence-based interventions to be using sensory integration therapy. Agencies such as public schools, which are required under the Individuals with Disabilities Education Improvement Act (2004), were cautioned against the use of this intervention due to lack of empirical evidence.

Baranek (2002) found low-level support that sensory integration practices improve social skills in children with ASD. Both research on Ayres Sensory Integration Therapy and other sensory-based interventions (e.g., sensory stimulation techniques, auditory integration and related interventions, visual therapies, physical exercise) were reviewed. Results were inconsistent across studies, and in the few controlled studies included, there was limited support.

Polatajko and Cantin (2010) called for an urgent need for well-controlled studies examining the effectiveness of interventions used in occupational therapy with well-defined, homogenous populations on outcomes that target adaptive skills. Additional rigorous randomized controlled trials using manualized protocols for sensory integration therapy and sensory-based interventions are needed to evaluate their effects. There is a need for higher-level studies with larger sample sizes and operationalized definitions with systematic methods to determine the effect of sensory interventions in individuals with ASD. Additionally, studies examining the effect of sensory-based interventions on specific behaviors are needed.

Discussion

Researchers have suggested that sensory problems can affect children's behavior but the relationship between sensory problems, stereotypic behavior, attention, activity level, and regulation is not well understood (Case-Smith et al., 2014). The underlying approach to sensory integration therapy is improving behaviors associated with sensory dysfunction; however, most studies do not use neurophysiological measures to support their assertions (Metz et al., 2005). The underlying mechanisms between nervous system impairment and functional behavior changes are not known (Iarocci & McDonald, 2006; Metz et al., 2005), and research is needed on the neurobiology of sensory symptoms and how to treat them (Hazen et al., 2014). Additionally, it is not clear whether children with sensory problems have an actual "sensory disorder" of their sensory pathways or if these impairments are due to other developmental and behavioral disorders (American Academy of Pediatrics, 2012). Because sensory difficulties are often seen in various developmental and behavioral disorders, it is recommended that an evaluation be conducted for these disorders be completed to determine where the individual's deficits lie and how to treat them.

Overall, there is a lack of solid evidence in support of sensory integration therapy for individuals with ASD (Worley et al., 2014). In addition to the inability to connect sensory integration therapy with mechanisms underlying sensory dysfunction, there is concern that sensory integration therapy may be associated with increases in challenging behaviors (Devlin et al., 2009; Devlin, Healy, Leader, & Hughes, 2010; Mason & Iwata, 1990). Without direct behavioral intervention to redirect the individual or provide them with replacement behaviors, the rate of challenging behavior may increase.

As suggested by Wong et al. (2015), researchers and clinicians should use a combination of evidence-based practices to address the unique needs and goals of the individual when planning treatment. At present, the field lacks consensus regarding sensory interventions, and there is insufficient support for this intervention (Wan Yunus, Liu, Bissett, & Penkala, 2015). Given the limited evidence for sensory integration therapy and sensory-based interventions, it is not currently considered to be evidence-based practice. However, if a family is interested in pursuing sensory therapies, the American Academy of Pediatrics also states that sensory-based interventions may be acceptable but only if used as a component to a comprehensive treatment plan (2012). As such, it is unclear what sensory interventions families should seek and what clinicians should recommend (Case-Smith et al., 2014). Because it is unknown how sensory integration therapies may be effective and what components of the interventions are effectual, families should be cautioned about sensory integration therapies. Therefore, families should be informed of the limitations of sensory integration therapies and how to evaluate their effectiveness through behavior tracking and rating scales (American Academy of Pediatrics, 2012).

DIR/Floortime

Background

DIR/Floortime is the application of the Developmental, Individual-differences, and Relationship-based (DIR) model that focuses on the child's developmental abilities in the context of his or her individual processing profile and interactions with the family (Greenspan & Wieder, 2006, 2007). The components of the DIR model are Development, which emphasizes the child's developmental level in developing a treatment plan; Individual-differences, which focuses on the child's unique needs; and Relationship-based, which described the learning relationships that the child has with their caregivers. This model focuses on the individual's social and emotional development, sensory processing, and motor planning skills by working with the individual's strengths and weaknesses at each stage of development to build healthy foundations for social, emotional, and intellectual abilities (Greenspan & Wieder, 2006; Masse, McNeil, Wagner, & Chorney, 2007). The child's functional emotional skills are assessed and used as a foundation for teaching new skills. Additionally, the child's sensory modulation abilities and motor planning skills are also taken into consideration for developing interactions (Greenspan & Wieder, 1999). Greenspan and Wieder (1999) view ASD as an "inability to relate to others affectively in a reciprocal fashion in a variety of contexts." Thus, DIR/Floortime aims to create mutually enjoyable shared experiences between the child and parent and, therefore, reduce the child's social isolation (Masse et al., 2007).

As ASD is characterized by pervasive impairments in social communication, DIR/Floortime is based on the foundation of increasing positive social interactions to develop more complex skills. In this model, there is an emphasis on creating meaningful interpersonal relationships between the adult and child (Wagner, Wallace, & Rogers, 2014). As stated by Greenspan and Wieder (1999), "the primary goal of DIR-based intervention program (sometimes referred to as Floortime) is to enable children to form a sense of themselves as intentional, interactive individuals, develop cognitive language and social capacities from this basic sense of intentionality, and progress through the six functional emotional developmental capacities." There are critical milestones that are central to the DIR/Floortime approach. They include (1) self-regulation and interest in the world, (2) developing relationships and attachment with others, (3) reciprocal communication, (4) complex communication, (5) emotional ideas (e.g., pretend play, identifying emotions, perspective taking), and (6) emotional thinking (e.g., connecting one's actions and feelings, understanding the relationship between self and others). These milestones progress sequentially and are important for individuals to develop communication, thinking, and emotional coping skills (Metz et al., 2005).

Definition

Floortime is one component of the DIR model and refers to the specific technique of getting on to the floor to work with the child and build his or her skills. The technique emphasizes a child-lead approach and joining the child in his or her world to promote their functional emotional developmental capacities. It is a child-lead intervention in which the role of the caregiver is to develop the child's skills by following the child's lead. During Floortime sessions, the adult follows the child's interests and uses their interactions to promote the child's progression through socialization skills (Wieder & Greenspan, 2003). Foundational skills such as joint attention, engagement, basic gestures, and problem solving are emphasized to promote development of more complex skills.

The primary objective of DIR/Floortime is to encourage parents to meet their child at the child's developmental level (Greenspan & Wieder, 2007). Parents direct their child to increasingly complex interactions through a process of "opening and closing circles of communication." Dedicated DIR/Floortime sessions are encouraged throughout the day. In addition to Floortime sessions, parents are also encouraged to utilize natural opportunities to implement DIR/Floortime strategies throughout the day, such as during the morning routine and meal times. DIR/Floortime therapists work with caregivers in the family's home, in clinics, or in the child's school setting in order to provide the caregivers with as much support for the child as possible (Wagner et al., 2014).

Applications

DIR/Floortime was developed for young children with ASD. It has primarily been utilized in this population. The literature on DIR/Floortime has focused on young children (i.e., infants, toddlers, and preschool-aged children), and there is no information on the use of this intervention for older individuals. Given the nature of the intervention, it may not be appropriate for individuals outside of the indicated developmental age range.

Regarding the settings that DIR/Floortime is implemented, the intervention is typically conducted in the family's home, in clinics, or in schools (Wagner et al., 2014). Floortime sessions are to take place daily in the family's home with the caregiver and child (Greenspan & Wieder, 2006, 2007). These sessions are conducted during playtime in which the parent follows the child's lead and facilitates development of various skills. Therapists may also attend Floortime sessions in order to provide feedback and assist the caregiver.

Effectiveness

There is very limited research on the effectiveness of DIR/Floortime as an intervention for individuals with ASD. Current studies are small scale, and there are a limited number of studies comparing the efficacy of DIR/Floortime to other intervention methods. Therefore, additional research on this therapy is needed.

Research Supporting

Greenspan and Wieder (1999) examined treatment outcomes for 200 children after implementing the DIR/Floortime intervention. After at least 2 years of DIR/Floortime treatment, over half of the children showed significant improvements in social, cognitive, and academic skills, as well as decreases in social isolation (Greenspan & Wieder, 2006). Clinically, those children no longer scored in the Autistic range on the Childhood Autism Rating Scale (Schopler, Reichler, & Renner, 1986). At follow-up 10–15 years later, children who had initial gains continued to show treatment gains, such that they continued to show little or no impairments in core ASD symptoms.

In a pilot study by Solomon, Necheles, Ferch, and Bruckman (2007), the DIR/Floortime approach was found to be effective at increasing social communication skills. The study participants included 68 children aged 18 months to 6 years old who completed an 8–12 month program of 15 h per week of 1:1 interaction with their parents. About 45% of children made good to very good clinically significant developmental progress. Importantly, parents were found to be effective at implementing the intervention. This study provided preliminary support for the use of DIR/Floortime as a cost-effective intervention for young children with ASD.

Another pilot study by Pajareya and Nopmaneejumruslers (2011) examined the efficacy of DIR/Floortime in preschool children in Thailand. Thirty-two children and their parents were enrolled in the study. Parents were trained by the researchers on how to implement DIR/Floortime sessions. After implementing the intervention for about 15 h each week over 3 months, the children in the DIR/Floortime group made significantly greater gains on measures of emotional development (e.g., engagement, social-emotional reciprocity, communication) and decreases in ASD symptom severity when compared to a typical treatment group.

Casenhiser, Shanker, and Stieben (2013) conducted a randomized controlled trial to evaluate the efficacy of a DIR-based intervention. The intervention group received 2 h of coaching and therapy each week, while a community therapy group received various services for around 4 h each week. The study examined the quality of social interaction (i.e., engagement in play), ability to engage in and initiate joint attention, degree of enjoyment in interaction, and language ability. Fifty-one children aged 2–4 years were given treatment over 1 year. The children in the DIR-based intervention group made significantly greater gains in social interaction skills over the community treatment group. Specifically, the DIR-based intervention group showed greater improvements in enjoyment of interactions, engagement in interactions, and initiation of joint attention.

Research Not Supporting

A study by Hilton and Seal (2007) compared ABA intervention and DIR/Floortime and found mixed results. The researchers randomly assigned 2-year-old male monozygotic twins with ASD to either DIR/Floortime or ABA intervention. Both children had severe language delays. After 9 weeks, results showed that the child who received ABA had slight gains in the Communication and Symbolic Behavior Scales (Wetherby, Watt, Morgan, & Shumway, 2007) composite score, while the DIR/Floortime child had slight losses. The ABA child showed improvements in the areas of gestures, vocal communicative means, and social-affective signaling, as well as decreases in the areas of reciprocity and symbolic behaviors. The DIR/Floortime child showed improvements in reciprocity and symbolic behaviors and had decreases in vocal communicative means and social-affective signaling. The greatest difference between the interventions was that the ABA child was found to have greater improvements in response to name and completion of one-step instructions. The DIR/Floortime child had greater improvements over the ABA child in imitation and spontaneous production of words. Data from this study indicate that DIR/Floortime may aid to in improving skills; however, given the small scale of the study (i.e., number of participants as well as timeline), it is unclear what additional factors may have played a role in the outcome and if these treatment gains are maintained over time.

Discussion

Although the few studies on DIR/Floortime indicate promising treatment gains, there is currently such limited research on the intervention that it is unclear if the intervention is effective and should be recommended for individuals with ASD. There are several limitations that should be considered when evaluating DIR/Floortime. First, because there are so few studies, the research must be replicated. In order to do so, intervention methods (e.g., treatment dosage, skills targeted) should be operationalized. Secondly, most studies have small sample sizes, which limit generalization of results. Thirdly, additional variables that may play a role in the efficacy of the therapy should also be explored.

Lastly, future research studies should compare DIR/Floortime to other methods of intervention and assess treatment gains over longer periods of time. A major limitation of DIR/Floortime is the intensive nature of the intervention. DIR/Floortime requires caregivers to spend significant time with their children conducting Floortime sessions; as such, families must be highly motivated and able to dedicate the time to implement the intervention (Masse et al., 2007).

While this intervention lacks sufficient research evidence, there are components of DIR/Floortime that are part of traditional behavioral therapy which may benefit children with ASD. The DIR/Floortime model incorporates several teaching methods including incidental teaching, optimizing interactions, and shaping and reinforcement techniques. The difference between DIR/Floortime and ABA-based interventions is that DIR/Floortime does not use discrete trials to teach skills. Although DIR/Floortime emphasizes child-lead interactions, the parent is able to incorporate several teaching methods that are used in traditionally behavioral approaches. Additionally, while the focus of DIR/Floortime is to develop social-emotional skills, there are components that may promote the development of the child's motor, cognitive, and language skills (Wagner et al., 2014).

Conclusion

The combination of professional recommendations and influence of anecdotal reports of success with various treatments may lead many caregivers to seek multiple therapies for their child (Miller et al., 2012). As a result, most children with ASD are receiving between four and six therapies (Goin-Kochel, Myers, & Mackintosh, 2007). Most parents are in the view that more therapies are better; however, parents do not typically prioritize treatments being evidence based, with about half of parents choosing research-supported treatments for their child (Miller et al., 2012). It is, therefore, the responsibility of professionals in the field to educate themselves on empirically based treatments and provide families with valid recommendations.

Regarding sensory integration therapies and DIR/Floortime, there is limited evidence for the effectiveness of these interventions for children with ASD. Although some studies show marginal improvements, the efficacy and effectiveness of these treatments are not to the same level as ABA-based treatments (Tarbox, Dixon, Sturmey, & Matson, 2014). ABA-based treatments have the most empirical support in treating ASD (Lofthouse, Hendren, Hurt, Arnold, & Butter, 2012; Matson & Smith, 2008; Tarbox et al., 2014). Given the growing number of individuals affected with ASD, it is important that funding sources provide services for empirically based interventions. Researchers state that the most effective therapies for individuals with ASD are individualized treatments that include functional communication training, social skills intervention, and behavioral supports (Lofthouse et al., 2012). Interventions for individuals with ASD should be lifelong, with multidisciplinary services that are evidence based and found to be effective, including applied behavior analysis, educational programs, speech therapy, occupational therapy, social skills training, and physical therapy.

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20

Socialization Programs for Adults with Autism Spectrum Disorder

Saray Bonete and Clara Molinero

During the last decades, there has been increasing recognition of the need to carry out studies to ascertain the effectiveness and efficiency of different types of intervention and programs aimed at training or improving pragmatics, social communication, and interpersonal skills – the main areas affected in ASD individuals. As scientific knowledge regarding the provision of intervention at first infancy has grown in quality and quantity over the last decades, the need to focus on adolescents and adults has become more urgent (Mazefsky & White, 2013). Social deficits in adults with ASD may lead to problems in important areas of quality of life such as family relations (Krasny, Williams, Provencal, & Ozonoff, 2003), friendship (Jobe & White, 2007), romantic relationships, and vocational success (García-Villamisar & Hughes, 2007). These difficulties extend over time, and significant improvements cannot be made by the mere passage of time (Howlin, 2000). When they reach adolescence, social interests usually increase, but deficiencies persist and make proper and normal relationships more difficult (White, 2012). Moreover, it is the time when adolescent consciousness develops. During this stage in life in which *fitting in* is of utmost importance, these teenagers feel alone, rejected, and even attacked by their peers. Furthermore, given their optimum cognitive ability, these youngsters suffer social difficulties and become a risk group for developing low self-esteem, anxiety disorders, and/or depression (Barnhill, 2007; Ghaziuddin, Weidmar-Mikhail, & Ghaziuddin, 1998). As they grow into adulthood, social ability deficiencies could give rise to a barrier that diminishes their job prospects (Krasny et al., 2003). Adults with ASD are likely to suffer misemployment or feelings of dissatisfaction with social relations (García-Villamisar & Hughes, 2007; Szatmari, Bartolucci, Bremmer, Bond & Rich, 1989; Venter, Lord, & Schopler, 1992). Faced with this background, it is logical that during the last decade research efforts have been made which focus on feasibility and effectiveness of social skills training programs in order to prevent or at least mitigate the negative consequences of this social dysfunction (Reichow & Volkmar, 2010).

The literature on social skills is extensive, although there are different approaches and backgrounds (psychometric perspective, clinical psychology, educational area, cognitive psychology, etc.). Gresham, Sugai, and Horner (2001) grouped the social skills interventions into deficits in acquisition, performance, and fluency of social skills. The first type of training addresses acquisition deficits, giving rise to explicit unspoken rules and meanings in social situations (e.g., through social stories). The

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second, appropriate performance training, focuses on problem-solving and positive reinforcement. Finally, training that tries to increase the fluency of appropriate social behavior uses exposure and practice tasks (e.g., repeating social scripts applicable for different interactions). White, Koenig, and Scahill (2007) differentiated between group-based social skills training and individual programs. Following the same structure, Rao, Beidel, and Murray (2008) reviewed programs classifying them according to traditional social skills training and social skills plus generalization skills training. Therefore, the emphasis is on the strategies and contexts. Other review articles (McMahon, Lerner, & Britton, 2013; Palmen, Didden, & Lang 2012; Reichow & Volkmar, 2010) examine the empirical evidence within the framework of a best evidence synthesis, sorting by the age category and the delivery agent of the intervention (technological, parental, non-parental adult delivery, peer delivery, or combined delivery). Cappadocia and Weiss (2011) meanwhile focus on the different components included in the therapeutic package of each training program, comparing results between traditional social skills training, social skills training with explicit cognitive-behavioral orientations, and social skills training groups with parent-intervention components.

As we can see, variables for classification are multiple. The lack of consensus regarding the definition of social skills limits the comparison across interventions and conclusions about measures of changes, as it depends on the assessment tools which in turn are a function of the defined constructs. This chapter is an attempt to compile the empirical evidence of social skills interventions, synthetizing the remarkable research conducted in socialization programs for adolescents and adults. We collected most of the variables that were addressed in recent reviews and meta-analysis, such as background theory and target skills, intervention delivery agent, evidence-based criteria, participants description, intervention type and density, settings, and assessment type. In this case, we first tried to differentiate according to the theoretical orientation,[1] either because it was explicitly stated by authors or extracted from the way they approached the concept of social skills and what each intervention claimed to train (Bonete, Calero, & Fernández-Parra, 2015).

The core of the chapter organization is based on our proposal of three main approaches to the construct of social/interpersonal skills according to what authors believe is the essence and nature of social skills. Thus, depending on each social skills definition, programs will have specific goals to guide the training. To this end, they will choose either a group or individual format and different psychological strategies (instructional format or didactic lessons, social performance training, ABA, naturalistic interventions, etc.) and techniques (role-playing, modeling, instruction, mediation, etc.). In fact, this chapter describes manualized socialization programs as intervention packages. We also identify the kind of concrete strategies used in each one of them (structured-learning approach, social performance training, naturalistic interventions, peer-direct training, teaching strategy based on parents or teachers) and the techniques (cartooning, power cards, role-play, visual techniques, feedback, reinforcement, etc.) which could be implemented as part of different socialization programs and independently of the theoretical backgrounds.

In this sense, for some authors, social skills are the combination of *different discrete behaviors*. Others would state that *the social cognition* approach is the key to understanding the complexity of situations and how thoughts play a fundamental role in the interpretation of reality. There is a third group of professionals that defend the *interpersonal skills* concept and focus on interpersonal problem-solving process for training (for a review, see Bonete & Molinero, 2016).

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[1] Vocational skills or leisure programs, although somehow play a role in social skills proficiency, are addressed in Chap. 17 of this manual and therefore are not the interest of this chapter.

The three approaches mentioned highlight different aspects of the nature of social competence. They reflect three levels of understanding that should at least be considered when looking for outcomes in social competence, as it is such a complex and wide construct. Moreover, the three of them could be combined in order to address different needs throughout social development according to the participants' level and age or even simultaneously when needed.

In this chapter, we review the scientific research published during the last decade according to these three identified perspectives, addressing the issue of complex socialization skills interventions for adolescents and adults with ASD that can help them lead a happy, normal life. We hope the reader might find a guideline which supports his own idea of social skill intervention. With this overview of different treatment studies, our aim is to offer a source from which one may be able to choose the best intervention for a given patient, according to their needs and the available setting.

This chapter was based on the last published studies, reviews, and meta-analysis (Cappadocia & Weiss, 2011; Hotton & Coles, 2016; Rao et al., 2008; White et al., 2007); most treatment manuals were selected for their methodological rigor, although they cover different steps of the four phases described by a NIMH working group concerning the development, testing, and dissemination of psychosocial interventions (Smith et al., 2007): (1) formulation and systematic application of a new intervention technique, (2) manualization and protocol development, (3) efficacy studies, and (4) community effectiveness studies. Some others were chosen due to their original content, despite being in an initial stage of research. The aim of including these programs' description is that new research groups may subsequently take over where these studies have left off and do so in an increasingly rigorous manner.

The programs represented in this chapter meet some of the indicators for evidence-based practice and well-established treatments in adults (Reichow & Volkmar, 2010) and were all chosen because they contained manualized programs. According to Reichow and Volkmar, the six basic criteria are (1) description of inclusion/exclusion criteria to ensure homogenous sample and adequate diagnosis; (2) intervention focus on improving one or more social skills of ASD individuals; (3) inclusion of at least one social outcome of the participants; (4) the study presents an adequate research design such as a randomized clinical trial, quasi-experimental multiple-group comparison, or single-subject experimental design; (5) published results at peer-refereed journals available in English; and (6) the study addresses important variables to be qualified as a study with strong methodological rigor ratings (proper study design, some kind of generalization or maintenance of changes assessment, and some of the defined procedural fidelity criteria). Criteria one to three and five are fulfilled in most of these training programs. The fourth and sixth criteria are not always achieved, but some studies were included when considering that subsequent studies could be developed to confirm the findings, testing efficacy and effectiveness. The full description of fundamental criteria for each program is summarized in Tables 20.1, 20.2, and 20.3.

Social Skills Training Programs

As mentioned above, the following classification is a focus on the theoretical approach to the social skills construct. At the same time, important evidence-based variables must be considered (for a complete synthesis, see Reichow & Volkmar, 2010). To clarify the exposition, each of the dimensions that guide the presentation of the different programs presented across the chapter[2] is hereby described:

- *Intervention type* (IT)*:* Concerning the techniques and methods used by the practitioner during the intervention sessions. Reichow and Volkmar define eight categories: *ABA*, *naturalistic interventions*, *parent training*, *peer training* (and mediation), *social skills groups*,

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[2] Initials and acronyms were specified to explain tables' information.

Table 20.1 Summary of social skills interventions focus on discrete behaviors training

Ref	Intervention type/ program description and delivery agent	Aim/target skills	Density and setting	Target sample n	Age, gender, and IQ	Research design G/M fidelity	Type of assessment/ outcome measures	Effects evidence	Extras
Mesibov (1984)	Individual psychotherapy plus 60-min group sessions	To achieve positive peer-related social experiences	–	Adolescents and adults with autism diagnosis	14–35 years	UT	Self-report measures (S)	Positive changes, no quantitative data available	Individual sessions before each session
	NPA		12 weeks	*n* = 15		No M/G	Videotaped role-play (O)		
			Clinical			No F			
Howlin and Yates (1999)	Non-manualized program	Understanding social difficulties and improving conversational skills based on recent personal events	150 min	ASD adults	19–44 years old	UT	Therapist appreciation	Enhancement of understanding and social skills	Role-play, group activities, and structured games were included
			1×/month	10 adults		No M/G			
			1 year			No F			
Barnhill et al. (2002)	Teaching your child language of social success (Duke et al., 1996)	Nonverbal skills in different contexts	60 min + activity within community	Learning disabilities (ASD, PDD-NOS, AHF)	12–17 years	UT	Child report	Five of the seven participants improved scores. Small changes	Activity within community (2–3 h) after each session
	NPA		(2–3 h)	*n* = 8	7M, 1F	No M/G		Good parent satisfaction	
			1×/week		IQ NR	No F			
			8 weeks						
			Clinical						
Webb Miller, Pierce, Strawser, and Jones (2004)	SCORE Skills Strategy (Vernon et al., 1996) commercialized package with guidebook and videotape. School settings or community environments	Five specific skills: share ideas, compliments, offer help, recommend changes, self-control	60 min	Children and adolescents	12–17 years	UT	Paper-pencil test for participants	Positive changes for 4 of the 5 skills	

	Role-playing and games	Systematic instructional sequences	2×/week	$N = 10$	10 M	No M/G	SSRS parent report	No improvements according to parent report	
	NPA		10 weeks		74–126 VIQ	No F			
			School settings						
Golan and Baron-Cohen (2006)	Mind Reading Program (Baron-Cohen, Golan, Wheelwright, & Hill, 2004): computer-based training program with short video clips, voice recording, and written examples	Emotions and mental states	2 h	Study 1:	All ages	Multi-group comparison	Close related measures and generalization measures	Greater improvement in intervention group in close related measures only	
	Technological delivery		1×/week	AS and HFA	Study 1:	No M		Study 2:	
			10–15 weeks	Participants	17–50 years	G in final assessment		Greater improvement than CG in close related measures only	
			Home	$n = 19$ ASD	14 M, 5F	No F			
			Study 2:	$n = 22$ ASD CG	80–138 VIQ				
			2 h software + support sessions	$n = 24$ CG	Study 2:				
			1×/week	Study 2:	17–50 years				
			10 weeks	$n = 13$ ASD used software plus	12 M, 1F				
			1×/week	Group session	76–128 VIQ				
			Home (and clinic)	$n = 13$ social skills group	10 M, 3F				
				$n = 13$ CG	10 M, 3F				

(continued)

Table 20.1 (continued)

Ref	Intervention type/ program description and delivery agent	Aim/target skills	Density and setting	Target sample n	Age, gender, and IQ	Research design G/M fidelity	Type of assessment/ outcome measures	Effects evidence	Extras
Tse, Strulovitch, Tagalakis, Meng, and Fombonne (2007)	Skillstreaming (Goldstein & McGinnis, 2000): modeling, role-play, group performance, and transference of training	Behavioral problems, not only ASD samples	1 + 1/2 h	ASD and typical children and adolescents	13–18 years	UT (quasi-experimental pre-post no CG)	Self-report and parent report measures	Significant improvement after treatment	Individualization
	NPA	Behaviors taught: eye contact, nonverbal communication, politeness, etc.	1×/week 12 weeks Clinic	*n* = 46 ASD (grouped in 7–8 participants)	28 M, 18F IQ NR	No M/G No F			
Kandalaft, Didehbani, Krawczyk, Allen, and Chapman (2013)	Virtual Reality Social Cognition Training	Enhancement of social cognition, social skills and social functioning	1 h	High-functioning autism adults	18–26 years	Quasi-experimental pre-post	S, D:	Improvement in ToM measures and emotion recognition	Virtual reality scenarios
	NPA; TD		2×/week 5 weeks	*n* = 8	6 M, 2F M age = 21.25 M IQ = 111.88	UT No M/G No F	ACS-SP, WASI, Eyes and Triangles (ToM), Ekman 60F, SSPA	Also real-life social and occupational functioning	
Laugeson, Gantman, Kapp, Orenski, and Ellingsen (2015)	UCLA PEERS adults program: Program for the Education and Enrichment of Relational Skills	Verbal and nonverbal social skills: conversation, humor, managing embarrassment, dating, dealing with rejection, etc.	1 + 1/2 h	ASD adolescents and young adults	18–24 years old and their parents	RCT	Self-report measures *TASSK* (Laugeson & Frankel, 2006)	Significant improvement in self-report and parent-report measures	???
	In community settings		1×/week	*n* = 12 ASD (divided in groups)	9 M, 3F	M at 16 week follow-up	Parent-report measure *SSRS* (Gresham & Elliot, 1990)		

			14–16 weekly	$N = 10$ (wait-list group)	IQ $M = 107{,}44$	No G	And others		
					7 M, 3F	F in every session and feedback			
					IQ $M = 102{,}13$				
Morgan, Leatzow, Clark, and Siller (2014)	Interview skills curriculum (ISC): manualized group-delivered program	Social-pragmatic skills for job interviews	1 + 1/2 h	Young adults with ASD	18–36 years old	Matched RCT	Observation in posttreatment mock job interview, VABS-II and PHQ-9	Improvement of interview skills	
	NPA		1×/week	$n = 12$ randomly assigned to treatment	27 M, 1F	M at 12 week follow-up			
			12 weeks	$n = 15$ or wait-list group	IQ $M = 103$	No G			
Vernon et al. (2016)	START Program	Discrete social skills	2 h	ASD adolescents	IQ $M = 103$	F monthly	Self-report and parent report on SSIS-RS, SRS-2, and live conversational measures	General positive outcomes (but heterogeneous results between participants)	Weekly individualized homework assigned by social facilitators
	Clinical setting		1×/week	$n = 6$	13–16 years old	UT, clinical case series and multiple baseline			
	NPA		20 weeks		3 M, 3F	No M/G			
					81–127 IQ	F in every session			

Delivery agent: *NPA* no parent assisted (research/clinician)
Social outcome measures: *P* parent report, *S* self-report questionnaire, *C* clinician rating, *T* teacher rating, *B* blinded rater, *O* behavioral or observational, *D* direct assessment
Setting: *C* clinic or university, *S* school, *O* other or unspecified
Extras: individualization (*I*), parent involvement (*PI*), homework (*H*), typical peers (*TP*)
? unspecified, *NR* not reported, *UT* uncontrolled trial

Table 20.2 Summary of social skills interventions focus on cognitive-behavioral training

Ref	Intervention type/ program description delivery agent	Aim/target skills	Density and setting	Target sample n	Age, gender, and IQ	Research design G/M fidelity	Type of assessment/ outcome measures	Effects evidence	Extras
Provencal (2003)	Two phases: first sessions with adult tutor, second sessions with peers. At the same time, parents were trained in groups	Trains specific social skills combined with CBT	75 min	ASD adolescents	12–16 years	Quasi-experimental pre-post: treatment group compared to not-treatment group	S and P	Large symptoms reduction and social skills improvement	Parents received training on parenting anxiety
			1×/week	*n* = 10 treatment group	M, F	No G/M	ADI-R	No gains in understanding friendship or emotion recognition	
			32 weeks	*n* = 10 ASD randomized non-treatment group	IQ	No F	ADOS	Effect size reported	
Lerner, Mikami, and Levine (2011)	SDARI Program (Lerner & Levine, 2007), sociodramatic affective-relational intervention. uses dramatic techniques: affectively engaging acting, interaction with children and staff, video games, and physical activities	Teaches social-pragmatic skills	5 h	ASD youth	11–17 years	Quasi-experimental pre-post: training group compared to matched non-intervention group	S and P	Social problems decreased	Motivators like video games and physical activities
	NPA		5×/week	*n* = 9 ASD intervention group	M age = 14,31	G/M: assessment periodically, every 3 weeks 5 times	EDI, CBCL, SRS, SSRS, BDI-Y, DANVA-2		In vivo practices, satisfaction survey

			6 weeks (summer program)	$n = 8$ non-intervention group (matched in age and diagnosis)	8 M, 1 F M age = 14,32 6 M, 2F Regular IQ	No F			
White et al. (2013)	MASSI program: individual's thoughts, feelings, and actions and their interactions	Social competence: management of anxiety and social skills	60–70 min	ASD adolescents with anxiety disorder	12–17 years	Experimental pre-post	S, P, C	No significant differences between groups before treatment	Weekly homework
			1×/week	$n = 15$ treatment group	M age = 14 years	No G/M	SRS,PARS,CASI-	16% improvement of social impairment	Concurrent parent training
			20 weeks	$n = 15$ randomized wait-list group	11 M, 4F M verbal IQ = 100 M age = 15 years 12 M, 3F M verbal IQ = 94	F: after each session	Anx, DDCGAS	26% anxiety symptoms decreased Effect size reported	Satisfaction and involvement assessment
Eack et al. (2013)	CET program: Enhancement Therapy with high structured sessions, cognitive exercises about specific behaviors, and rehearsed social situations	Social and nonsocial-cognitive impairment	1 h	ASD adults	18–45 years	UT: quasi-experimental pre-post	S, O, C	Enhancement of cognitive deficits and social behavior	Homework
	NPA		1×/week 80 weeks 60-h computer-based training +45 group sessions	$n = 14$ treatment group	M age = 25.29 years M IQ = 117.70	No M/G No F	CSQ-8, MATRICS, CSSCE Interview	Large effect size reported	Satisfaction and adherence assessment

(continued)

Table 20.2 (continued)

Ref	Intervention type/ program description delivery agent	Aim/target skills	Density and setting	Target sample n	Age, gender, and IQ	Research design G/M fidelity	Type of assessment/ outcome measures	Effects evidence	Extras
De Bruin et al. (2015)	MYmind: mindfulness training	Mindfulness to increase social responsiveness, communication, social cognition, and social motivation, among other skills	90 min	ASD adolescents	11–23 years old	UT pre-post	Self-report and parent-report measures	Improvement in aim variables at post-test and follow-up	Weekly homework
	Clinical setting		1×/week	*n* = 23 adolescents in training group	M age = 15,8	M: 9 weeks follow-up			Concurrent parent training group
			9 sessions		17 M, 6F	No F			
					No M IQ				
Chung, Han, Shin, and Renshaw (2016)	Online game for social cognition	Social communication, emotion recognition (words and faces)	1 h	ASD adolescents	13–18 years	Quasi -experimental pre-post	S: CARS, SCQ, fMRI	Grater improvement when CBT+ game	Homework
	TD		3×/week	*n* = 10 CBT + game group	8 M, 2F	No M/G			
			6 weeks	*n* = 10 CBT group	M age = 15.8	No F			
					M IQ = 80.0				
					9 M, 1F				
					M age = 16.3				
					M IQ = 80.4				
Olsson, Rautio, Asztalos, Stoetzer, and Bölte (2016)	KONTAKT: manualized ongoing program for social skills	CBT and social cognition to enhance social skills	Brief intervention: 1 h	ASD children and adolescents	8–17 years	UT quasi-experimental pre-post training group	S, P, C: DDCGAS, OSU-	Pre-post improvement in functional skills and less clinical symptomatology. No communicational skills improvement	Parents sessions
			1×/week	n = 22 training group	M age = 12.3	No M/G	Aut-CGIS, SRS, SSGT interview		
			12 weeks		12 M,8F	No F			
			Long intervention:		IQ >70				
			1 h						
			1×/week						
			24 weeks						

Hillier, Fish, Cloppert, and Beversdorf (2007)	The Aspirations program	Social and vocational skills	1 h	ASD adolescents and young	18–30 years	Pre-post	O and S: IPR, AQ, EQ,	Improvement in EQ and number of social interaction,	Feedback meetings with parents, participants, and staff
	NPA		1×/week	*n* = 13	M age = 19	No M/G		Self-esteem and positive attitude toward others increase; anxiety and ASD symptoms decreased	Satisfaction questionnaire
			8 weeks		M IQ = 108.08	No F			
					11 M, 2F				

Delivery agent: *NPA* no parent assisted (research/clinician), *TD* technological delivery
Social outcome measures: *P* parent report, *S* self-report questionnaire, *C* clinician rating, *T* teacher rating, *B* blinded rater, *O* behavioral or observational, *D* direct assessment
Setting: *C* clinic or university, *S* school, *O* other or unspecified
Extras: individualization (*I*), parent involvement (*PI*), homework (*H*), typical peers (*TP*)
? unspecified, *NR* not reported, *UT* uncontrolled trial

Table 20.3 Summary of social skills intervention focus on interpersonal skills and social problem-solving process

Ref	Intervention type/ program description	Aim/target skills	Density and setting	Target sample n	Age, gender, and IQ	Research design G/M fidelity	Outcome measures	Effects evidence	Extras
Bauminger (2002)	Socio-emotional intervention program	Three levels of intervention: discrete social skills, social cognition and reality interpretation, and socio-interpersonal problem-solving	60 min	Children and adolescents	8–17 years old	UT pre-post	Observational assessment of the interactions, problem-solving and emotion understanding tests, and teachers rating for social skills	Progress in the three levels of intervention with parents, teachers, and peers	Peer meeting 2×/week
	T (in class) and peers participate		3×/week	*n* = 15	11 M, 4F	No M/G			Parent involvement
			7 months		IQ M = 81,36	F 2×/month author's supervision			
Turner-Brown, Perry, Dichter, Bodfish, and Penn (2008)	SCIT-A: Cognition and Interaction Training	Emotion recognition, ToM, attribution, and social interaction skills	50 min	ASD adults	18–55 years old	Quasi-experimental design	Short questionnaire about SCI-A, FEIT for emotion recognition, hinting task for ToM skills and other measures of social functioning	SCIT: significant improvement in ToM and communication skills	
	Three phases (six sessions): social cues awareness, socially relevant facts, and integration		1×/week	*n* = 11	M age = 42,5	No M/G		TAU: no change	
	Clinical setting		18 weeks	*n* = 6 SCIT group	5 M, 1F	No F			
				n = 5 TAU (treatment as usual)	M IQ = 113,3				
					M age = 28,8				
					5 M				
					M IQ = 110,6				
Liu et al. (2013)	Workplace training program	Socialization, communication, and emotion. Psychoeducation about workplace principles	6 h ×/day	Adults with ASD and intellectual disability	18–24 years old	UT pre-post	Work Personality Profile, Scales of Independent Behavior-R, and Observational Emotional Inventory-R	Significant improvements in some workplace social behavior, social communication skills, and emotional control	

	Occupational therapist and assistants		5×/week	$n = 14$	M age = 24,60 years old	No M			
	Community settings		6 months		10 M, 4F	No F			
					NV IQ = 72,52				
Pugliese and White (2014)	Problem-solving therapy for ASD people	Promoting effective problem-solving skills	90 min	ASD college students	18–23 years old	Pre-post single-subject design	Social Problem-Solving Inventory-Revised: Long Form (SPSI-R:L), outcome questionnaire	Improvement in SPSI-R:L and OQ only in two participants	Summarizing sheets after each session
	Clinical setting		1×/week	$n = 5$	M age = 21,27	M: 8 weeks follow-up/No G			Weekly homework
			9 sessions		5 M	F after each session			
					IQ 111–136				
Bonete et al. (2015)	SCI-laboral: interpersonal problem-solving for workplace adaptation. Sequential training following ten particular problem-solving phases	Training thinking abilities to be applied in different interpersonal problem-solving processes	75 min	ASD adults	16–29 years old	Quasi-experimental design	Evaluation for the Solutions to Interpersonal Conflicts (ESCI),	Significant improvement in social problem-solving task and parent-report socialization scale and	Weekly homework task in social problem-solving process
	Community setting		1×/week	$n = 50$ SCI-labor group (ASD participants)	43 M, 7F	M: 12 weeks follow-up (general questionnaire)	Vineland Socialization Scale (VABS) and Osnabrueck Ability to Work Profile (O-AFP)		
			10 weeks	$n = 50$ Control group (NT participants without training)	M IQ = 96,26	No G			
					M NV-IQ = 47,96	No F			
					M age = 19,54				
					43 M, 7F				
					M NV-IQ = 51,62				

Delivery agent: *NPA* no parent assisted (research/clinician)
Social outcome measures: *P* parent report, *S* self-report questionnaire, *C* clinician rating, *T* teacher rating, *B* blinded rater, *O* behavioral or observational, *D* direct assessment
Setting: *C* clinic or university, *S* school, *O* other or unspecified
Extras: individualization (*I*), parent involvement (*PI*), homework (*H*), typical peers (*TP*)
? unspecified, *NR* not reported, *UT* uncontrolled trial

visual techniques (including video modeling), and *others*. It also includes distinguishing between a *structured learning approach*, *social performance training*, and *social skills support group*.

- *Evidence-based criteria* (EBC)*:*Based on the Evaluative Method for Determining Evidence-Based Practices in Autism (Reichow, Volkmar, & Cicchetti, 2008), whereby four categories are described: *overall experimental rigor rating*, *study design*, *inclusion of generalization/maintenance assessments* (G/M), and *procedural fidelity.* Procedural fidelity was described in detail as *fidelity of treatment adherence*, *treatment differentiation*, and *therapist competence.*
- *Research design* (RD): Distinguishing between a *randomized clinical trial* (RCT), *quasi-experimental multiple-group comparison* (Q-E), *or single-subject experimental designs* (SSED). In this chapter few studies with single-subject experimental designs were included (calculating Reliable Change Index with very small samples, Jacobs & Truax, 1991), but single-case interventions were not presented (for a review in this matter, Wang, Parrila, & Cui, 2013)
- *Delivery agent of intervention* (DAI)*:* Adult mediated (parent, P; no parent assisted, NPA), peer mediated, a combination of both of them, and technological delivery.
- *Description of sample* (DS): *Sample size*, *group of age*, *gender*, and *IQ*.
- *Type of assessment: Parent report*, *child report*, *clinician or staff-report questionnaire*, *social-cognitive assessment*, and *behavioral observation.*
- *Intervention density* (ID)*:* Concerning a quantification of the amount of direct services provided during the intervention. Reichow and Volkmar (2010) specified the quantification of the intervention density: (a) *session duration* (min), (b) *number of sessions per week*, and (c) *total length of the intervention* (in weeks).
- *Settings* of implementation (S): *Home*, *clinical*, *school*, or *community setting.*
- *Extras:* Following Miller, Vernon, Wu, & Russo (2014), different extra information was described, when relevant information was not collected under any other category but nevertheless enriched the intervention. An example would be *individualization*, *parent involvement*, *homework*, and *typical peers* in the group intervention.

We tried to picture a full scheme of the different kinds of programs professionals can find addressing social difficulties in adolescence and adulthood. Therefore, range of age is around 13 years old to adulthood. As an exception, we included some studies which considered earlier ages when the mean age of the sample was during the adolescence stage, and we believe that the content could be implemented for older subjects. In some cases, tables summarized information of the relevant studies that were historically important (because of their novelty, genuine contribution, etc., e.g., Mesibov, 1984; Howlin & Yates, 1999; Webb et al., 2004; Provencal, 2003; Olsson et al., 2016; Bauminger, 2002 and Liu et al., 2013) although they could not be widely described in the text as they are not the most representative of the specific category (discrete social skills, cognitive-behavioral approach, or interpersonal skills), they do not fulfill any of the current evidence-based standards, or their mean age was mainly pubescent.

Understanding Social Skills as Behaviors

A great number of authors present social skills as specific behaviors that need to be incorporated in anyone's repertoire. From this perspective, the assertive behaviors are considered the most skillful. Social skills are conceptualized as learned skills, with each specific situation determining the behaviors deemed adequate. Therefore, training is focused on increasing positive behaviors in social situations (Caballo, 1993). Multiple social responses must be practiced. Different programs choose different topics of instruction such as conversational skills, verbal and nonverbal cues, making friends, paying and receiving compliments, appropriate use of humor, handling teasing and bullying, handling rumors, practicing interviewing, asking and giving help, and apologizing. If the training of specific behaviors is understood as key, a very wide social skills curriculum will inevitably be the result.

From this approach, social competence is understood as the putting into place of the acquired skills. A successful implementation would be followed by social recognition, occupational achievements, etc. Emphasis is given to what others actually observe. Socially skilled people are the ones who maximize their profits. The skill is measured by what is observed, and, consequently, the training works on explaining the skill, practicing it, and increasing the frequency of each skill through different contexts. A selection of studies which follow this trend are summarized in Table 20.1.[3]

Historically, it is important to highlight the pioneer work in social skills intervention made by Mesibov (1984). Although most of the rigor ratings applied nowadays were not included, it was the first research reporting qualitative data of improvements in a sample of 15 adolescents and adults with ASD (14–35 years). He combined 30-min individual psychotherapy sessions followed by a 60-min group session for 12 weeks. Positive results were found through self-report measures and videotaped role-plays.

Mind Reading[4]

Baron-Cohen et al. (2004) developed this material as a systematic guide for all ages to teach emotions and mental states specifically; therefore, it could be considered a part of the discrete social skills training approach. It consists of a computer-based intervention that uses drawings or photographs for teaching emotion recognition focused on basic emotions and using only facial expressions (Golan & Baron-Cohen, 2006).

Systematically organized emotions and mental states (according to the emotions groups and developmental levels) were the content of this software. The program included short video clips, films of faces, voice recordings, and written examples of situations that evoke each emotion. To facilitate generalization, the face videos and voice recordings comprised actors of both genders, various ages, and ethnicities. It was thought that such a complete guide would be useful for exploiting the ASD good systemizing skills.

Golan and Baron-Cohen (2006) examined improvements in recognizing complex emotions in faces and voices. They compared a group of 19 ASD participants that used *Mind Reading* at home alone (intervention group) to a control group of 24 ASD matched participants that were assessed twice with no intervention in between and a unique assessment of a typical control group of 24 people with no psychiatric history. Between 10 and 15 weeks was the length of time between assessments. At the end of the program, the intervention group improved significantly more than the control groups based on the Cambridge Mindreading (CAM) Face-Voice Battery (Golan, Baron-Cohen, & Hill, 2006) and two closely related measures created by the same research group (Reading the Mind in the Eyes task and Reading the Mind in the Voice task) but did not show better performance than the ASD control group when a test for holistic distant generalization was implemented (the Reading the Mind in the Film). Therefore, improvement following the intervention was limited to close generalization tasks.

In a second experiment, a comparison was made among a group of ASD/HFA participants who used the *Mind Reading approach* alone and who were also assisted by 10 weekly sessions in small groups with a tutor ($n = 13$) and two control groups, adults with ASD attending social skills training ($n = 13$), and a typical control group of the general population. As in the first experiment, the intervention group improved significantly more than the ASD participants who were undergoing alternative social skills training, but only in

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[3] There are some additional studies which were included in the tables that are not described in the text either because they were frequently described in the past or because they mainly addressed preadolescents.

[4] http://www.jkp.com/mindreading

the close generalization face task, and moreover failed to improve on the distant generalization task. Thus, the use of systematic software training may be beneficial, although more intensive training may be needed to achieve generalization. This study has received strong methodological rigor ratings, according to evidence-based practice approach in autism (Reichow & Volkmar, 2010). Meanwhile, results should be taken with some reserve due to an important limitation – the social skills group received much fewer total training sessions, which might have accounted for some of the improvement difference.

Looking at the results and reflecting on the difficulties in generalizing holistic materials, authors recommended the use of *Mind Reading* as a first step in training trajectories; later, context and integration of different socio-emotional cues should be incorporated into the treatment in order to obtain a wider view of the social situations.

Skillstreaming[5] (Goldstein & McGinnis, 2000)

This prosocial skills training program is available for different instructional levels (early childhood, elementary school children, and adolescents). Staff training materials were also developed. In concrete, *Skillstreaming the Adolescent* was developed for use with youths with behavioral issues (aggression, immaturity, withdrawal, etc.) and not specifically for adolescents with ASD. The skills areas were presented in different levels from the *easiest skills* (asking a question, introducing yourself, etc.) to *advanced social skills* (asking for help, apologizing, convincing others, etc.), *skills for dealing with feelings* and *stress*, and *alternatives to aggression.* The last edition also included some lessons on planning skills (related to social problem-solving skills).

The work approach included teaching modeling, student role-playing, group performance, feedback, and transference of training (practicing the skills at home and in the community). It was conceived to be flexible and easy to use. Each session repeated the same sequence of activities: check-in, review of last week's skill, introduction of new skill, role-play, snack break, activity, and closing. In the manual, one can find a first part on implementation matters, and it includes forms and leader and observer checklists to ensure program integrity.

Part of this program content was tested for children in different studies (Lopata, Thomeer, Volker, Nida, & Lee, 2008; Lopata et al., 2010), but for the adolescent version, only a preliminary study was found. Tse et al. (2007) examined the improvements of a social skills training group based on the skillstreaming curriculum in a sample of 46 adolescents with ASD (13–18 ages) for 12 weeks. Each group was composed of seven to eight adolescents, one trained social worker, and one trained psychologist. They combined psychoeducational and experiential methods (especially role-play) for teaching social skills such as eye contact, introducing oneself to others, awareness and expression of feelings, nonverbal communication recognition, politeness, listening, conversational skills, negotiation, dealing with teasing and bullying, hygiene, and dining etiquette. As part of a few sessions, an outdoor activity was organized responding to the need for generalization.

Pre- and post-program measures were taken (self- and parent-report questionnaires). Data analysis revealed that significant improvements were made in social competence and problem behaviors. The strength of this study was its large sample size, although there was not a control group to contrast it with, and therefore we cannot be sure if the improvements were due to the intervention itself or other factors. Taking into account that this program obtained successful outcomes when it was applied to children with ASD under rigorous experimental conditions (Lopata et al., 2010), replication of the study under randomized controlled trials for adolescents should have promising results.

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[5] http://www.skillstreaming.com/

UCLA PEERS Program: Program for the Education and Enrichment of Relational Skills[6]

The PEERS program (Gantman, Kapp, Orenski, & Laugeson, 2012; Laugeson & Frankel, 2010; Laugeson, Frankel, Gantman, Dillon, & Mogil, 2012) aimed at teaching specific behaviors that facilitate positive social interactions and diminish socially inappropriate behaviors. In this case, the authors understand social skills as discrete specific skills (verbal and nonverbal) that are learned by instruction and rehearsal. Lessons focused on conversational skills; electronic forms of communication, developing friendship networks and finding sources of friends; appropriate use of humor, peer entry strategies, peer exit strategies, organizing get-togethers with friends, handling teasing and embarrassing feedback, dating etiquette, handling peer pressure and avoiding exploitation, and resolving arguments with friends (Gantman et al., 2012). A manual was created for adolescents and subsequently also adapted for young adults, in which some additional treatment modules were included based on developmental appropriateness. It consisted of 12–14 weekly 90 min sessions in groups of nine to ten participants. There were separate sessions for young and caregivers and were applied in community settings.

The techniques used through the whole program were didactic lessons, role-playing, behavioral rehearsal exercises, performance feedback, and weekly socialization homework assignments. The didactic lessons were based on a presentation of concrete rules and steps in order to systematize the information collected using Socratic questioning (Gantman et al., 2012). Each session began with a review of the homework assignment, followed by a didactic lesson (parents received an outline of it). In each session, group leaders modeled the specific social skill, and it was practiced through role-playing, with participants rehearsing each new skill learned, and feedback was given from tutor and peers. Homework was assigned for the next day.

This program was tested following the recommendations for evidence-based practice. It was first tested through pilot studies and properly manualized. Afterward, efficacy studies were carried out (Dolan et al., 2016), and it was also tested in community settings (Gantman et al., 2012).

Turning again to adolescence, this program was delivered to 33 adolescents between 13 and 17 years of age and their parents (Laugeson & Frankel, 2010) by comparing a treatment group with a delayed treatment group in a randomized control trial. Adolescents improved in knowledge of social skills rules for making and keeping friends, according to a test specifically developed for the program content (Test of Adolescent Social Skills Knowledge, TASSK, Laugeson & Frankel, 2006), and parents reported significant changes compared with the wait-list control group on the Social Skills Rating System (SSRS; Gresham & Elliot, 1990). Looking for efficacy, a second study was ran (Laugeson et al., 2012) with a new sample of 28 adolescents with autism from 12 to 17 years of age (treatment group vs. delayed group). Again, significant improvements were found in the SSRSS and the Social Responsiveness Scale (SRS, Constantino & Gruber, 2005) according to parents and also in knowledge of social skills (on the TASSK-R). Moreover, 16 weeks later, treatment gains were maintained for the treatment group for all outcome measures except one. However, teacher participation was limited, and this data was far less conclusive.

The PEERS adults program was also developed and tested (Gantman et al., 2012; Laugeson et al., 2015). The first randomized controlled study was made with a sample of 17 adults with ASD (18–23 years of age; Gantman et al., 2012). Using the same questionnaires, significant improvements were found in overall social skills knowledge and awareness, social responsiveness, empathy, frequency of get-together, and less self-reported loneliness. In the most recent replication (Laugeson et al., 2015), the randomized controlled study included 12 adults with ASD in a treatment group and compared the outcomes with a delayed control group ($n = 10$). Again, this was

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[6] https://www.semel.ucla.edu/peers/young-adults

based on the SSRS, SRS, the Quality of Socialization Questionnaire (QSQ, Laugeson & Frankel, 2010), and the Empathy Quotient (EQ, Baron-Cohen and Wheelwright, 2004). Results showed improvements in overall social skills, frequency of social engagement, and social skills knowledge with a significant reduction of ASD symptoms and a maintenance in most of the measures at 16-weeks follow-up with gains in decreased problem behaviors and externalizing behavior and improvements in self-control and social awareness. This is in concordance with Mandelberg et al. (2014) who found durability of treatment gains in a sample of adolescents with ASD that had participated in the PEERS program from 1 to 5 years earlier. These findings are interpreted as being modulated by the parent or caregiver involved in the program.

Schohl et al. (2014) found significant improvements in get-together, higher ratings of friendship skills, fewer reported problem behaviors, and lower social anxiety. Their results are of special value as it is the only study independent of the authors of the manual, reducing the risk of investigator bias for testing this intervention program. Yoo et al. (2014) also observed significant changes in social interaction and communication; specifically, they also examined the positive changes in maternal anxiety, which was reduced, and the depressive symptoms of participants.

What is also very important about this intervention is the fact that improvements were obtained through different outcome measures, including new observational scales such as the Contextual Assessment of Social Skills (Ratto, Turner-Brown, Rupp, Mesibov, & Penn, 2011), which enriched its veracity and relevance due to the ecological characteristics (White, Scarpa, Conners, Maddox, & Bonete, 2015; Dolan et al., 2016).

The Interview Skills Curriculum (ISC)

This manualized intervention was developed as a 3-month treatment package to work on increasing social-pragmatic skills, especially those needed for a successful job interview – something particularly relevant when reaching adulthood. The topics were selected to reflect parts of an interview process in a structured format. The curriculum was organized into three areas, with four lessons designated for each one: *character attitude and person*, *small talk*, *nonverbal communication* and *hygiene*, and, finally, *interview questions*, *closing interview*, and *follow-up*. Strategies such as discussion, role-play, video feedback, peer review, and games were implemented during the treatment.

Morgan et al. (2014) tested this manual in a pilot study with a randomized, controlled trial experimental design. Twenty-eight adults between 18 and 36 years old participated, although only 24 completed the study. Outcomes were analyzed by a proximal outcome, based on *the mock job interview*, in which sample scores improved. As distal outcomes, authors reported scores in the Vinelad Adaptive Behavior Scale (VABS) and the depression scale Patient Health Questionnaire. Although changes were not statistically significant, participants of the experimental group increased scores on the VABS and had the same depressed symptoms as the control group based on the second one with medium- and large-size effects, while the wait-list group remained stable. The small sample size limited the conclusions to be made, but the results highlight the importance of training to enhance performance.

The START Program (Vernon, Miller, Ko, & Wu, 2016)

These authors proposed teaching discrete social behaviors by changing the teaching methodology. They did not use didactic lessons but rather experiential learning as the core of the training. Their intervention addressed motivational, conceptual, and skills deficits by combining didactic methodology and an experiential treatment approach. In this way, exposition to the complex reality of social interactions is made easier with the incorporation of a trusted therapist and highly motivated peers with normal development whose aim is to “connect” with the participants.

The START Program sessions always followed the same structure: First, *check-in session* (5 min) followed by *unstructured socialization time with self-management* between the participant and an assigned social facilitator (20 min). During this time, topics were introduced by the participants without predetermined agenda, and participants tracked their use of individual target skills. A *structured social activity* followed (20 min), which varied each week and focused on team-building activities and party games. After that, an *interactive social topic discussion* (20 min), where participants shared their reflections and in which social facilitators introduced the week's social skill topic, and finally, an *individual checkout session* (5 min) in which participants rated their level of comfort, the use of their identified target skills, and interactions with others. The social facilitator also provided a homework objective each week to promote additional experiential learning opportunities in their natural settings (for a complete description see Vernon et al., 2016).

Preliminary outcomes have only recently been published, but they seem promising. We include this intervention process because of its pioneer approach, although study limitations (lack of group of comparison, small sample, etc.) should be addressed in further research.

In their research, Vernon et al. (2016) recruited a group of six adolescents (13–16 years) with individual goals which changed every 5 weeks if they showed acquisition. Prior to intervention, participants were assessed and taught to self-manage, encouraging them to self-manage their use during each START group session. Three social facilitators were trained to run the group.

Social competence improvements were obtained through self-report, parent-report measures (Social Skills Improvement System Rating Scales (SSIS-RS) and the Social Responsiveness Scale (SRS-2)), and live conversational measures for *increasing social inquiries*, *decreasing negative statements*, *increasing verbal contributions*, and *decreasing verbal contributions.* General improvements were found based on repeated measures for each individual participant. Currently, a randomized, controlled trial is underway, increasing methodological rigor and exploring long-term follow-up data.

Virtual Reality Social Cognition Training

Kandalaft et al. (2013) proposed a program that used virtual reality in ASD adults and was supported by empirical evidence of its effects. The aim of this intervention was to enhance theory of mind (ToM), emotion recognition skills, and social and occupational functioning. Eight individuals between 18 and 26 years old participated in a pilot study testing this program for 5 weeks, organized into two sessions per week.

In each session, different virtual environments were presented using Second Life software, and participants had to interact according to a learning objective for each session. The objectives of each session were discrete social skills (e.g., introduction to others, emotion recognition, conversation), and ToM skills (e.g., conveying social cues, cynicism) developed in different scenarios (e.g., interaction with a friend, job interview, blind date).

An assessment battery of social cognition, social skills, and ToM collected pre- and post-intervention improvement. Data analysis showed significant increases on the social-cognitive measures (Ekman 60 and The Reading the Mind). Some changes were observed on the conversational skills measures although not significantly. A follow-up survey was also carried out to assess the long-term impact of the program, and participants reported specific social benefits. The results suggested this virtual reality software offers promise as a platform and training intervention to improve social cognition. Further research is needed to test its efficacy and social validity.

Up to now, all studies we have looked at address training in social skills using a group intervention format. However, there are also some successfully applied single-case interventions which fulfill evidence-based standards but which are out of the scope of this chapter (Wang et al., 2013 for an extensive review).

Social Cognition Interventions to Improve Social Skills

The second approach identifies social skills with social cognition, referring to the individual's capacity to process and interpret reality adequately, avoiding negative thoughts and inadequate responses. Interpretation of reality is taken into consideration, becoming a crucial part of the training (Mavroveli, Petrides, Sangareau, & Furnham, 2009). From this point of view, cognitive-behavioral interventions are the main representative by training not only discrete skills but also the interactions among emotion, cognition, and behaviors in context as they are related to each other (Beck, 1976; Bulter, Chapman, Forman, & Beck, 2006). In this case, the target works on the obstacles which impede optimal conditions to the expression of a specific social skill (e.g., personal insecurity, fear of negative evaluations, etc.), identifying behavior patterns and uncovering thought processes (e.g., black and white thinking) (Lerner, White, & McPartland, 2012). A skilled person manages to avoid mistaken thoughts like unjustified inferences, selective abstractions, totalitarian thinking, errors of maximization and positive qualities minimization, or baseless generalization (Ballester & Gil, 2002).

Concerning the ASD population, this approach provides participants with a framework for the integration between social-cognitive processes and social behavior (Stichter et al., 2010). Although some modifications of regular CBT need to be done when used with ASD children and adolescents (Attwood & Scarpa, 2013), it has been useful to set off positive changes in social competence (White, Ollendick, Scahill, Oswald, & Albano, 2009a; Lopata et al., 2008). In fact, most of the developed interventions by this approach were primarily conceived to treat comorbid conditions such as depression and anxiety in adult Asperger participants (Gaus, 2011).

Some of these programs are described below, highlighting those that were evidence based or had a high-quality intervention design, although unfortunately, the majority of the studies lack some of these aspects (Bishop-Fitzpatrick, Minshew, & Eack, 2014).

SDARI Program, Sociodramatic Affective-Relational Intervention[7]

Based on the formerly called drama-based social pragmatic intervention (Lerner & Levine, 2007), this is an integrative approach for teaching social pragmatics using dramatic principles and techniques. It was conceived as an intervention model for small groups of teens with Asperger syndrome. This intervention meets the American Psychological Association's standard for probably efficacious treatment. This group-based manualized intervention has three core components: (1) the use of affectively engaging improvization games and dramatic training adapted for the ASD population as techniques, (2) child-child and child-staff relationship for reinforcement of social interactions, and (3) age-appropriate motivators such as video games and noncompetitive physical activity. It was specifically devised for adolescents, due to their increased social awareness and motivation that may facilitate active participation. With the increase in social-pragmatic skills, generalization may then occur more easily. Authors emphasized social engagement more than behavioral accuracy. From their point of view, emotionally engaging activities with socially simplified components increase successful social experiences, which in turn positively affect the outcomes. In fact, the authors prioritized social engagement over behavioral accuracy.

The initiative included staff training which consisted of specific intervention activities, characteristics of the clinical population and behavior management strategies. Its basis was that drama activities effectively address social-cognitive skills and strengthen relationships (Guli, Semrud-Clikeman, Lerner, & Britton, 2013). Therefore, we located it under this epigraph, as in this case social problem-solving is not training as a stepwise sequence but a skill by itself, together with others. The program was made up of ten weekly sessions during the school year and another program at a summer camp, which took place 7 days a week for 6 weeks. The manual included a daily schedule, sequence and definition of everyday

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[7] http://spotlightprogram.com/

goals, and corresponding activities (Lerner & Levine, 2007 for an extension). All activities for each session were related to the day's goal, but this was not explicitly expressed until the end of the session when adolescents were asked to review when they used the goal during the session. Among the topics, common adolescent behavioral problems were presented and intervention strategies given.

Although randomized controlled trials are the gold standard method for evaluating the efficacy of any social skills intervention, SDARI was only tested this way in children with ASD (Lerner & Mikami, 2012). In youth, the intervention was also applied (Lerner et al., 2011) comparing nine youths with ASD (11–17 years of age) with matched group who did not receive intervention. Due to its implementation in a psychotherapy setting, participants were selected through convenience sampling. However, many of the indicators of quality for group evidence-based practices research in autistic populations (Reichow et al., 2008) were present. As part of a Spotlight Summer Program, participants attended 4 h sessions every weekday for 6 weeks in the summer. Each group was made up of five youths (in which only one to three were the study participants) and three staff per group (who were unaware of who were the study participants). Treatment fidelity was controlled. Positive results were found in some subscales of the Social Skills Rating System (SRRS) related to social assertion, errors in identifying emotions decreased compared with those youths who did not participate in SDARI during the same period, and these changes were maintained 6 weeks after treatment finished. Moreover, social problems decreased at posttreatment based on the Child Behavior Checklist.

The Aspirations Programme[8] (Hillier et al., 2007)

The *Aspirations Programme* used semi-structured group conversations to improve self-esteem, reduce anxiety, and increase positive attitudes toward peers in adolescents and adults with ASD. It was designed in eight 1-h weekly sessions, including pre- and post-assessment for empirical support of the program: self-report measures and observation. On this occasion, 13 individuals between 18 and 30 years old with ASD took part in the program. Each session consisted of sharing experiences, giving advice, and creating problem-solving strategies as a group.

Initially, for each session, a facilitator suggests the topic for discussion and the areas to be covered. At the end of the session, the group reviews what has been told and what they have learned. After the program, participants held monthly meetings where they could strengthen their friendships. These meetings facilitated generalization to real-life problems in a more unstructured setting, although this effect was not assessed in the study. In addition, there was also a parent support self-directed group – weekly during the program and monthly when it ended.

Hillier et al. (2007) evaluated the effects of the intervention for each participant through self-report measures and structured observation at the beginning and end of the program. This assessment showed that some ASD-related symptoms decreased, and attitude toward peers relations and empathy improved after the program, although there was no control group.

Later, Hillier, Fish, Siegel, and Beversdorf (2011a) replicated the program, increasing the sample size and strengthening the assessment design. This time, 49 ASD participants between 18 and 28 years old and divided into nine groups were evaluated 2–3 weeks before the program and at the end of it. Moreover, assessment design added depression and anxiety measures in order to know if the program could help in these areas. As an evidence support for the effects of the program, results of this assessment showed a reduction in anxiety and depression symptoms, as well as some improvement in attitudes toward peers.

At the same time, Hillier, Greher, Poto, and Dougherty (2011b) created a variation of this program named *SoundScape*[9] that made use of

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[8] http://faculty.uml.edu/ahillier/aspirations.htm

[9] http://faculty.uml.edu/ahillier/SoundScape_Music_Program.htm

music. Again, the target was self-esteem, anxiety and depression symptoms, and attitudes toward peers in ASD adolescents and adults. This time, 22 participants between 13 and 29 years old were divided into two groups. The SoundScape program was also a program made up of eight weekly music sessions. Each session lasted 90 min, where a facilitator directed musical activities which also included technology training (e.g., various types of music listening, playing with different instruments, and composing music, multimedia production, short film creation). Finally, pre- and post-assessment measures (self- and parent-report questionnaires) showed an improvement in attitudes toward peers, self-esteem, and anxiety symptoms.

MASSI Program (White et al., 2010a)

A clear example of a behavioral cognitive program for ASD population is the Multimodal Anxiety and Social Skills Intervention (MASSI program; White et al., 2010a), simultaneously targeting anxiety management and social skills. It addressed the individual's thoughts, feelings, and actions and also the interactions among these three domains in order to change social competence. It was a short intervention (12–16 sessions) based on didactic teaching. The program included parent and family involvement, individual therapy, and group intervention; all of them proved useful working with adolescents and adults with ASD. Individual therapy allows for the individualization of the program, according to a particular need, in order to work on behavioral aspects and cognitive influences. The program included 12 individual therapy modules with 50–75-min sessions (plus an extra session if needed). The group therapy was designed as the place to provide safe opportunities to practice specific social skills and anxiety management strategies with peers. The manual recommended starting 3 weeks after the beginning of the individual therapy. The package included seven 60-min group therapy sessions. Moreover, parents were involved in the program to follow the adolescent learning, providing exposure exercise during the week and encouraging with homework tasks and activities. Parent coaching took place after each session during approximately 15 min (White et al., 2010a).

The program was manualized and structured. Each session included regular practice, immediate, direct, and specific feedback on performance, positive social learning experiences, modeling skills, and psychoeducation about ASD and anxiety.

Program feasibility was tested using its initial version, *Multi-component Integrated Treatment*, with four participants (12–14 years of age) with ASD by White et al. (2009a). In that study, therapist treatment integrity, participants' adherence to treatment, and consumer satisfaction were all acceptable. Therefore, a randomized control trial was carried out (White et al., 2013) with a sample of 30 adolescents with ASD and a diagnostic of at least one anxiety disorder. The authors compared outcomes of 15 ASD teens who participated in the MASSI program with a wait-list group of 15 adolescents. The intervention was run by five licensed clinical psychologists. Without any significant differences between groups prior to participation in the program, 9 of the 15 participants from the intervention group demonstrated individual reliable change on the SRS, and four of them also significantly changed their anxiety scores. Mean group scores were significantly lower on the SRS, but change was not statistically significant on the anxiety scores of the intervention group. As expected, the waitlist group did not improve in any aspect. Participant adherence and treatment integrity were high, and families reported acceptable satisfaction.

MYmind: Mindfulness Training for Youngsters with ASD (de Bruin, Blom, Smit, van Steensel, & Bögels, 2015)

This training is an adaptation and combination of the Mymind protocol for children with attention deficit hyperactivity disorder (ADHD)

(Van der Oord, Bögels, & Peijnenburg, 2012) and mindfulness training for reducing anxiety and depression in adults with ASD (Spek, Van Ham, & Nyklíček, 2012). Some modifications were made, such as adding a ninth session to increase repetition. We include this program among this intervention selection as it is a good example of intervention aimed at working on the interrelation of thoughts, feelings, and behaviors which results in a positive effect in social interactions even though this program does not train social skills specifically. This training focused on enhancing attention, (bodily) awareness, and self-control by doing mindfulness exercises in typical stressful situations for the ASD population such as the social interactions. Being aimed at individuals with ASD, sessions were highly structured and guided to reduce insecurity. At least one of the parents participated in concurrent mindful parenting training based on the *Mindful Parenting* book (Bögels & Restifo, 2013).

In this study pre- and post-measures were taken (De Bruin et al., 2015), and adolescents reported about their ASD core symptoms, the Mindful Attention and Awareness Scale-Adolescent version, and two self-reports about their own worries and ruminations. For their part, parents answered about mindfulness skills, and, what is more interesting, they filled the Social Responsiveness Scale about their children, which measures ASD symptoms in social contexts. Adolescents improved in social cognition and social communication, and both parents and adolescents improved their quality of life.

This study is just a first approach to this innovative way to address social difficulties. A randomized control trial or a comparative training program would be necessary to test its efficacy to address social difficulties in adolescents and adults with ASD.

Cognitive Enhancement Therapy (CET) (Eack et al., 2013)

This program targeted social and nonsocial-cognitive functioning in adults with ASD that lead to employment difficulties, limited social functioning, and poor academic achievement, for example. The targets of CET were the cognitive skills under successful interpersonal interacting and problem-solving. CET was structured in 60 h of computer-based neurocognitive training (two participants with a coach) and 45 min of group sessions training social-cognitive abilities over the course of 18 months.

Computer-based training (an hour per week) was organized into three modules: attention, memory, and problem-solving, to improve cognition, processing speed, cognitive flexibility, high-order cognitive abilities, etc. After some months, group sessions started with six to eight participants in each group (1.5 h per week). In these sessions, spontaneity, others' perspective, emotions management, etc., were trained. Each session was highly structured in stages: introduction (*welcome back*), *homework presentation*, *cognitive exercise*, *feedback*, *brief psychoeducational lecture*, and *homework assignment*. These exercises integrated several aspects of social cognition, while the group solved everyday social problems from the perspective of more than one character. They performed the message in pairs and worked on their different intentions and emotions, the message that initiates the action, and how to resolve discrepancies to get a solution. Finally, a generalization of the learning was also trained through some homework, although this effect is not assessed in the study.

Eack et al. (2013) carried out this program in a group of 11 adults with ASD for 18 months. Results of cognitive and behavioral assessment showed highly significant and large effects of treatment in neurocognition and social cognition training. Some improvements were particularly impressive: processing speed, social cognition, and social functioning. Generalization of this social cognition training was observed in vocational effectiveness, interpersonal effectiveness, and their ability to adjust to different conditions. A randomized clinical trial was presented last year including functional magnetic resonance imaging (fMRI) with positive results for change.

Similar results have been found lately in other studies that included technology in cognitive training for ASD participants, although usually for children or adolescents (for a revision, Wass & Porayska-Pomsta, 2013); one of them will be described below.

Online Game for Social Cognition (Chung et al., 2016)

Chung et al. (2016), within a CBT framework, developed an online prosocial game to improve social cognition in 15 Korean ASD adolescents with ages between 13 and 18 years old. Simultaneously, they compared them with another group of 15 ASD adolescents that used off-line CBT game. Both groups were assessed at the beginning and at the end of the program in ASD symptoms, social communication, emotion recognition of words and faces, and fMRI scanning while carrying out word and face emotion recognition exercises.

The online game program lasted 6 weeks and was organized into three 1-h sessions per week. During these sessions, they played the online game in a closed room. The game included chatting, presenting virtual gifts, and imitating other players, in order to improve their avatar and become friends with other avatars. At the same time, a trainer interacted online with the participant to introduce a CBT intervention.

The off-line program consisted of 18 CBT sessions for 6 weeks, where a psychologist trained social cognition skills (e.g., conversational attitudes, verbal skills, assertiveness, stress management, coping strategies). Again, in this case, some aspects of social problem-solving skills were presented, but the focus was not training the process which allows to understand a situation but rather the different socialization skills involved.

As the reader can appreciate, all of these programs (SDARI, Aspirations, MASSI, MYmind, CET, etc.) aim at socialization in adolescents and adults. In this case, discrete social behaviors are in the background but are not the target. All these programs share their interest in working on social cognition from a broader perspective. In each case, they focus on different aspects that affect social cognition (thoughts, behaviors, emotions), and each of them uses a different strategy to address the issue. However, none of them prioritizes on the social problem-solving process itself. This is the pattern of thinking which we encompass under the following epigraph, the approach of social problem-solving training.

Interpersonal Skills and Social Problem-Solving Programs

Although the impact of the perspective of interpersonal skills on developing intervention programs has been less than others, its reputation is actually rising as part of Gardner's multiple intelligence model and emotional intelligence scope (Goleman, 1996). This approach highlights the importance of the role that others play in an interaction where ethical issues are dealt with in context (Gardner, 1983; Pelechano, 1984). The main difference with discrete social skills is to be found in the fact that the concept of *interpersonal* skills includes continually considering the others' perspective, understanding others' thoughts and feelings, offering help, giving confidence, etc. Therefore, this competence is expressed through social problem-solving skills, which can also be trained. From this point of view, the emphasis is on perspective taking, consequence evaluation, cause attribution, and the generation of action alternatives. Each domain is a fundamental part of the social problem-solving process. All domains, different steps of a sequence that must be adequately completed to solve conflicts, may be nourished with properly implemented discrete skills to obtain a fluid interaction. Interpersonal competence is needed when clashes of interest appear. Spivack and Shure (1991) define social problem-solving competence as the ability to generate multiple alternatives when a conflict situation arises, developing a feasible plan to reach the desired outcome, anticipate consequences of a behavior, and manage consequences and causes. After reviewing the scientific literature in social problem-solving (Bonete & Molinero, 2016), we agree with D'Zurilla and Goldfried (1971) with their definition of different domains of social problem-solving process, and, like Pelechano (1984), we share the opinion that passing from a domain to another follows a sequence, going forward and back when the solutions seems to fail. Nevertheless, we also recognize the ability to solve social problems as a particular process with special connotations.

In the ASD population there is not a great deal of literature on the cognitive process of social problem-solving skills (Solomon, Goodlin-Jones, & Anders, 2004; Antshel et al., 2011) despite being highly applicable in daily life interaction. In the following paragraphs, we look at different programs that, from our personal point of view, address the issue of fluency in social interactions, focusing on the training of the social problem-solving process. It should be borne in mind that some of these interventions were defined by authors as cognitive-behavioral training. Both perspectives are not incompatible insofar as cognitive-behavioral techniques and contents may be implemented, but we propose this category as an independent one as these programs focus on the different domains needed to picture a whole social problem which needs to be resolved.

Social Cognition and Interaction Training for Autism (SCIT-A) (Turner-Brown et al., 2008)[10]

This group intervention was originally developed and validated for adults with psychotic disorders to improve social cognition, social skills, and community functioning. Successfully used with individuals with schizophrenia (Penn et al., 2005; Combs et al., 2007), this program was adapted for adults with autism (18 years old and older) based on similarities in social-cognitive functioning (Couture, Penn, & Roberts, 2006).

The program targeted emotion recognition, theory of mind, attributions, and social interaction skills, among others. The original SCIT program consisted of three phases: "emotion training," "understanding situations," and "integration." In the adaptation for people with autism, Turner-Brown and her colleagues changed these dimensions for three phases, namely, "interest/disinterest and social cues awareness," "socially relevant/irrelevant facts," and "integration." Specific videotapes were created to show social situations that were more appropriate for the social challenges of adults with autism.

Turner-Brown et al. (2008) tested the feasibility of this intervention comparing ($n = 6$ adults) a normal treatment group made up of ($n = 5$) adults with ASD. Researchers measured social cognition based on emotion recognition and ToM tasks and also social functioning by administering two self-report questionnaires on communication and social skills performance. Significant improvements were found in ToM skills and communication in the SCIT group with large effect sizes. Group attendance and satisfaction with the program were also very high.

This study is very relevant insofar as it properly addressed the range of age after 18 years old. The manual approach is also a clear example of this holistic perspective of training the social problem-solving process which needs to take place when facing social interactions. However, the authors did not provide detailed information regarding the treatment of the control group. Having access to information regarding the comparison treatment's component would have enriched the results. It should also be noted that, despite being a small sample, there was a wide range of ages, which would mean maturation differences among participants as a potential moderator variable.

Group-Based Social Competence Intervention (SCI) (Stichter et al., 2010)

This intervention was created specifically to meet the social needs and address the complex challenges of youth with ASD (Stichter et al., 2010). Based on scaffolding learning, the curriculum provided opportunities to practice abilities in the participants' natural environments in order to promote generalization of learning. This intervention

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[10] Adaptation of the Social Cognition and Interaction Training by Roberts et al. (2004).

focused on the "core deficits" of ASD such as *theory of mind*, *emotion recognition*, *and executive functioning*. Similar to what other interventions tried to target (Solomon et al., 2004; Webb et al., 2004), in this case, an effort was made to generalize learning to natural settings by the introduction of a scaffolded approach.

This program worked on thinking patterns. Strategies used were metacognitive strategies, self-monitoring and self-regulation, exposure, and response situations. This intervention consisted of 20 h of group intervention conducted twice weekly for 10 weeks with a range of four to six students per group. The curriculum provided five modules to be applied in four 1-h sessions. The modules addressed were (1) facial expression, (2) sharing ideas, (3) turn taking, (4) feelings and emotions, and (5) problem-solving. The first session insisted on the importance of applying discrete skills (such as using greetings, making appropriate eye contact, and acknowledging the presence of others) through the whole program sessions. Modules from 1 to 4 are prerequisites needed to solve social problems adequately. In fact, the authors tried to promote acquisition of necessary skill sets by giving multiple opportunities for structured and naturalistic practice with the aim to allow generalization to their natural environment.

The structure was maintained in each module: reviewing the previous skill learned and introducing the next one, skill modeling, practicing, and a closing activity or review. Each new skill was built upon previous ones, and maintenance of previous skills was reinforced throughout. The program included the teaching of specific social skills on a CBT model, working on interrelations among thoughts, emotions, behaviors (examples of intervention are given in Stichter et al., 2010), and problem-solving.

At present, there are different versions depending on age: *SCI-Elementary* (6–10 years of age), *SCI-Adolescent* (11–14 years), *SCI-High School* (teens aged 14–18), and *iSocial* (an interactive, online, three-dimensional virtual learning environment for the same program). Some of the groups where this program was applied included a concurrent parent education program. Unfortunately, we did not find published studies analyzing the efficacy and effectiveness of the SCI-High School.

Problem-Solving Therapy for Adults with ASD, PSS:101 (Pugliese & White, 2014)

Pugliese and White (2014) adapted the evidence-based problem-solving therapy of D'Zurilla and Nezu (2007) for adults with ASD methodology.[11] Although their work is only a preliminary approach to validating this therapy in ASD, we include this study as it is a valuable example of adjusting the original manual of evidence-based general therapy to an ASD population.

In order to apply it to their specific population, they provided a first psychoeducational session on ASD and problem-solving. Subsequently, three sessions were focused on positive problem orientation in relation to problem-solving, and four sessions were focused on practicing specific dimensions of the problem-solving process through different techniques. A final session was centered on evaluating attempts to implement and redefine solution plans when necessary. The content of the program was preserved while adding specific strategies from CBT and social skill interventions frequently used in ASD population. Additional examples were included, focusing on the new challenges associated with adaptation to university life.

This pilot study involved a sample of five college students. Improvements were assessed through a questionnaire measuring the cognitive process of social problem-solving, the Problem-Solving Inventory-Revised: Long Form (SPSI-R:L), and an outcome questionnaire to assess client status throughout the course of therapy. Problem feasibility was determined by analyzing treatment integrity, treatment adherence, and consumer satisfaction. The program seemed feasible with good scores in these three measures. Homework completion was not homogeneous,

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[11] Based in the original work of D'Zurilla and Nezu (2007).

but most group members highlighted the positive experience and the opportunity to meet others with ASD on campus. However, when outcome measures were examined through reliable change indices, only two of the five participants achieved significant clinical change after treatment, and the other three did not show any significant positive change in problem-solving at all. Further research is needed to explore the efficacy of this therapy, with different measures to detect changes. It is well known that only a self-report questionnaire about problem-solving skills is a poor measure of change. We encourage researchers to continue working on the validation of this program. We believe this is one of the best approaches to provide ASD adults with the necessary holistic tools. This goal probably cannot be reached by training discrete skills alone or only working on interactions between thoughts, feelings, and emotions and their consequence on social behaviors.

The Interpersonal Problem-Solving Program for Workplace Adaptation; SCI-Laboral (Bonete et al., 2015)

The intervention called "Interpersonal Problem-Solving Program for workplace adaptation" [Programa de Solución de Conflictos Interpersonales para la adaptación laboral, SCI-Laboral] is based on an approach called *social problem-solving in phases* (D'Zurilla & Goldfried, 1971; Pelechano, 1995) as the cognitive process involved is based on resolution phases such as defining problem, taking perspectives, generating solution, and considering consequences. Through sequential training, the program centered each session on one particular step of the interpersonal problem-solving process. Based on Pelechano (1995), phases were delimited as (1) introduction to interpersonal problem-solving skills and description of AS's characteristics, (2) conversational skills, (3) defining a problem, (4) different points of view, (5) thinking of causes, (6) generating solutions, (7) considering consequences and choosing the best option, (8) planning of action, (9) evaluating actions and facing failures, and (10) reviewing the process.

The program was made up of ten weekly 75-min sessions for groups of four to six adolescents and adults with ASD assisted by a therapist. Through a meditational approach and building on different examples of daily interpersonal problems, the participants worked on the different phases session by session. The aim was to train a thinking process to be applied to different contexts in a flexible way.

This meditational approach was developed with Feuerstein's work on mediated learning experience. Mediated learning has been also applied to the clinical population (Haywood, 2000; Haywood & Lidz, 2007). It consists of implicit teaching. Building on the participants' knowledge, it introduces different forms of help to facilitate participants in furthering their knowledge of the social problem resolution process. Particularly in this program, all given examples were focused on the workplace environment for solving interpersonal problems due to its importance for adaptation during this stage of life.

The program was manualized and its implementation structured (Calero, García-Martín, & Bonete, 2012). Each module followed the same outline: reviewing the previous day's learned step of social problem-solving and homework task, a representative drawing was shown at the beginning of each session from which participants may disclose the phase they were going to work on each day. Subsequently, examples of problematic situations starting from an impersonal problem, followed by a conflict of interest between two people and, finally, an interpersonal problem affecting a whole group were given. Opportunities to share personal experiences of the same or similar kind, role-playing and feedback, and, finally, a review of the principal ideas of the session were also addressed. At the end of the session a homework task was given consisting of a step-by-step resolution of two interpersonal problems (Bonete, Calero, & Fernández-Parra, 2011). When the program was finished, participants received a portfolio with their homework and templates for new situations to come.

This version for adolescents and adults was studied in a sample of 50 adolescents and adults (from 16 to 32 years of age) who were trained for 10 weeks (Bonete et al., 2015). Participants showed positive outcomes. In general terms, they improved in the social problem-solving task *Evaluation for the Solutions to Interpersonal Conflicts* (ESCI) and the Vineland Socialization Scale (VABS-S) reported by parents. Participant involvement was considered high based on attendance and homework completion, and participants and parents' satisfaction were also recorded with clear success.

Although it is a valuable study due its heterogeneous sample, results are limited because of the methodological issues. Following evidence-based criteria, a randomized control trial or treatment comparison design would be of great importance in determining efficacy.

All these studies offer a way to train the entire social and interpersonal problem-solving process. This approach in particular tries to keep a broader focus for training social competence in order to facilitate interpersonal and vocational success.

Conclusions

As can be seen, advances have been made in addressing interventions for social difficulties of adults with ASD. There are different approaches and some new and creative initiatives. Moreover, some treatments are gradually satisfying important evidence-based practice criteria.

One of the conclusions of special note is the many *methodological limits and flaws in design* usually found in intervention studies. Reichow, Steiner, and Volkmar (2012) and Reichow and Volkmar (2010) highlighted this issue. They found that most studies did not measure either generalization or maintenance criteria. In addition, many of the papers did not measure the procedural fidelity of the intervention, and only a few evaluated treatment adherence. The measurement of social validation (e.g., consumer satisfaction) has gained in importance in the last years as there is a forever increasing awareness that effectiveness is about not only empirical evidence but also social validity in order to make the use of manualized programs more widespread (Callahan et al., 2016).

Some other difficulties we found are that most of the studies included adolescents and adults with medium to high functioning. Clinical pre-intervention assessment increases costs, and therefore it is at times difficult. However, the different functioning levels of participants indiscriminately mixed together affect the validity of the results.

In addition, as one may see, *different theoretical approaches lead to different intervention designs.* In our opinion, these three approaches should neither be dismissed nor overrated. The first approach is very useful when specific behaviors need training. In particular, for ASD adults, these programs (*discrete behavior programs*) may raise the frequency of adequate social behaviors. They can be seen as easy-to-learn skills that lead to more social or job success.

When ASD adults have the capability to understand the cognitive substrate underlying social behavior, and depending on the available resources for intervention, the second group approach (*social cognition programs*) shows the cognitive components that may explain social behaviors. In addition, some of them might explain the cognitive elements not only within oneself but also in others. These kinds of programs train the cognitive-behavior dyad, facilitating the acquisition of social rules and social competence.

The third approach (*interpersonal skills programs*) aims to go a step further by teaching about the process underlying social interactions. The interpersonal problem-solving skills appear as the competence to picture the situation and understand it. In this way, even when sometimes interaction might have some costs (taking others' perspective, surrendering something, fatiguing cognitive processes or discussions, etc.), it reports many benefits (social relations, understanding others, sharing each other's experiences, caring, affection, friendship, etc.). Interpersonal understanding may lead people to a point at which they arrive to maturity in the communal living; in other words, people may work to solve interpersonal conflicts because, even if one conflict might seem unconquerable, it can produce personal growth.

Not only are there differences regarding the theoretical approach, but there are also *different methods in intervention leading to different results*. Therefore, numerous intervention techniques can be used when designing a program, either for training or for assessment. We have mentioned some of them: video modeling, in vivo techniques, technology resources (in assessments like fMRI or during intervention like virtual reality).

Finally, *different social issues* can be treated in intervention programs. We have found that most programs focused on relationships with peers, while many others centered on job or professional success. However, there are a few programs aimed at love relationships and dating. ASD adults usually have difficulty in this domain, and it could be helpful to develop programs that take this issue as a primordial aim.

In conclusion, some advances have been made in scientific evidence of social skills interventions for adults with ASD, but improvements are still needed. We trust that the reader has found this chapter adequate as a brief guide on what manualized programs are available for adolescents and adults with ASD. Our wish is also to inspire our peers to continue working on analyzing effectivity and effectiveness for these interventions.

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Treatment of Addiction in Adults with Autism Spectrum Disorder

21

Laurence Lalanne, Luisa Weiner,
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What Are Addictive Disorders?

Addictive disorders, such as substance abuse and dependencies included in the DSM-IV Codes (American Psychiatric Association [APA], 1994) and DSM-5 substance use disorders, are common disorders involving either the overuse of substances like alcohol or drugs or behavioral addictions such as gambling, internet gaming, or video gaming disorders. Addiction develops over time and is a chronic and relapsing disorder. The DSM-5 classification of substance use disorders combines the psychological, physical, and social consequences of SUD and adds craving as a new criterion absent from the DSM-IV classification. Craving is defined as an intense desire for something, i.e., a substance. Lifetime DSM-5 SUD diagnosis requires the presence of at least two psychological, physical, or social criteria during the 12 months preceding the interview, or previously, and SUD severity levels are classified as mild, moderate, or severe (2–3, 4–5, or ≥6 criteria, respectively) (American Psychiatric Association, 2013).

Many factors are involved in the development of SUD. Among them, genetic vulnerability, social and family factors, psychological traits (i.e., impulsiveness, sensation seeking), and specific psychiatric illnesses (e.g., anxiety, mood disorders, schizophrenia, autism) are the most prominent. These vulnerability traits precipitate toward addictive disorder if and when subjects come into contact with a given substance (drug availability).

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Thus, the context of the availability of a given substance will be associated with substance use. For example, if someone is used to drinking alcohol with friends in a bar, this context of the bar may reactivate the craving for drinking through associative learning. Whether substance use initially is pleasurable or provides relief from internal discomfort, it becomes a problem when it is associated with a loss of control. According to Goodmann (Goodman, 1990), "addiction is employed in a pattern characterized by 1) recurrent failure to control the behavior (powerlessness) and 2) continuation of the behavior despite negative consequences (unmanageability)." "The essential feature of this disorder is a cluster of cognitive, behavioral and physiological symptoms that indicate that the person has impaired control of psychoactive substance use and continues use despite adverse consequences." In addition, the maintenance of addiction is characterized by difficulty controlling the consumption of a given substance, which reflects the transition toward compulsive consumption (Koob & Le Moal, 2008).

Loss of control is associated with both cognitive disorders and neurobiological impairments. Main neuropsychological features associated with SUD are (i) attention and memory bias focused on the substance and the context with which it is associated and (ii) executive dysfunction that impairs both inhibition of behaviors associated with substance use and the problem-solving skills needed to avoid substance use and to take the decision to end substance use (Lalanne et al., 2015). These cognitive disorders reflect neurobiological impairments in (i) reward circuitry, i.e., the mesocorticolimbic system, involving neuroplasticity modifications in the striatum, which is responsible for motivation and pleasure related to dopamine release; (ii) the hippocampus and amygdala, which are responsible for learning new associations between drug and context; and (iii) the prefrontal cortex, which is responsible for problem-solving and cognitive control as a whole (Feltenstein & See, 2008; Koob & Volkow, 2010). These modifications keep substance users in their addictive behaviors, and treatment consists in prescribing pharmacological therapies, modifying reinforced behaviors involved in the disorder, identifying and restructuring dysfunctional cognitive bias and beliefs, and alleviating cognitive impairment. Cognitive impairment, in particular, affects an individual's overall quality of life and his/her social and functional abilities. Moreover, functional and social impairment may be increased if addiction is comorbid with other psychiatric disorders such as mood disorders, schizophrenia, or intellectual disability.

Regarding comorbidity with autism spectrum disorders (ASD), many studies have reported a reward system dysfunction in individuals with ASD, as well as hypoactivation in the mesocorticolimbic circuitry, associated with poor dopamine activity in response to social and monetary reward (Kohls et al., 2011, 2013; Scott-Van Zeeland, Dapretto, Ghahremani, Poldrack, & Bookheimer, 2010). Cerebral dopamine dysfunction has also been reported in ASD, akin to what has consistently been found in individuals with SUD (Arias-Carrión & Pŏppel, 2007). Thus, neurobiologically speaking, individuals with ASD may have a higher risk of developing addictive disorders. Furthermore, psychiatric comorbidities frequently found in individuals with ASD (i.e., ADHD, anxiety, mood disorders) are also frequently reported in addictive disorders. Lastly, psychological and neuropsychological features associated with ASD, such as impulsiveness and cognitive rigidity, may predispose these individuals to developing addictive disorders. In the present work, following inpatients with ASD, and epidemiological reminder, we examine these different aspects of addictive behaviors specific treatments that might suit this population.

Epidemiological Reminder About Addictive Disorders in Patients with ASD

Substance Use Disorder in Patients with ASD

Little is known about the comorbidity of ASD and SUD, since studies in this field are scarce. In ASD, co-occurrent SUD is thought to be rare. Impaired social skills and lower-than-average novelty-seeking behavior in patients with ASD may reduce their access to their substance-using peers and, thus, to the substances themselves (Bauminger & Kasari, 2000; Prendeville, Prelock, & Unwin, 2006; Sizoo, van den Brink, Gorissen van Eenige, & van der Gaag, 2009; Soderstrom, Rastam, & Gillberg, 2002). Moreover, Hofvander et al. (2009) reported that while psychiatric disorders (i.e., anxiety, ADHD, depression) are frequently comorbid with ASD, SUD is a comorbidity seldom found in this population, due to the fact that, psychologically speaking, individuals with ASD usually have few sensation-seeking traits and tend to be more introverted, whereas the opposite personality traits are thought to predispose individuals to developing SUD. In their paper, Sizoo et al. (2010) explored the prevalence of comorbid SUD in ADHD and ASD. Although they revealed a higher rate of comorbid SUD in patients suffering from ADHD compared to those with ASD (58% versus 30%), they showed that patients with ASD and those with ADHD share similar risk factors for SUD. Compared to a control group, both patient groups reported more adverse family events, had more parental SUD, and started smoking at a young age. In the context of their study, De Alwis et al. (2014) recruited 3,080 young adult Australian twins (mean age 31.9 years) and assessed them for ADHD symptoms, autistic traits, substance use, and substance use disorders via a cross-sectional interview and self-report questionnaires. They highlighted that ASD and ADHD traits were associated with high levels of regular smoking and cannabis use. However, ASD and ADHD traits were unrelated to alcohol use. Individuals with ASD are probably less inclined to alcohol use because of their limited social interactions usually associated with recreational drinking and alcohol intoxication (Santosh & Mijovic, 2006). It is important to note, however, that individuals with ASD have a similar risk of developing alcohol dependence as patients with anxiety or depression (De Alwis et al., 2014). In adolescence, ASD diagnosis was associated in previous studies with a relatively low risk of SUD (Ramos et al., 2013), but in a recent study Mulligan, Reiersen, and Todorov (2014) showed that adolescents with moderate to high ASD symptoms have an elevated risk of alcohol and tobacco use, especially in the case of comorbid ADHD disorder (Mulligan et al., 2014). Furthermore, adolescents with ADHD and ASD traits might be at risk of other drug abuse. Whereas few studies reported the dual diagnosis between ASD and SUD in adults and adolescents, recent data (e.g., Mulligan et al., 2014) suggest that the association between the two disorders might be underestimated. Moreover, there are no data regarding the prevalence of SUD in high-functioning autism (HFA), and it may be that patients with HFA show higher rates of comorbid SUD, because they are able to develop strategies for interacting with substance-using peers. Matthew Tinsley, an adult with HFA, reported that he used alcohol "to cope with his anxiety, to maintain his friendships, and to give access to a whole host of relationships and even to sustain careers" (Tinsley & Hendrickx, 2008). He assumed that patients with HFA have the tendency superficially to display a "normal" façade when they drink alcohol, which may explain why their alcohol dependency is not better diagnosed. Recent studies support this hypothesis. For instance, Clark, Tickle, and Gillott (2016) interviewed eight adults with Asperger syndrome about which factors they considered had led to the development and maintenance of their problematic substance use. The authors identified six main themes and explored two of them – self-medication and social facilitation – more thoroughly, since they were more often reported and seemed particularly relevant to ASD. Thus, from a psychopathological standpoint, alcohol use in this population might be related to some of the core symptoms associated with autism, namely, social anxiety and change-related anxiety. Moreover, from a neuropsychological standpoint, Lalanne et al. (2015) suggested that patients with HFA could use alcohol and psychostimulants to cope better with their social and behavioral difficulties and also to compensate for their neuropsychological impairments (i.e., social cognition impairments, executive dysfunction, and weak central coherence). Since cognitive impairment and psychiatric comorbidities are well-known vulnerability traits that may precipitate individuals into developing SUD, it seems necessary to gain a better understanding of how they are related to the development of this comorbidity in ASD in order to treat SUD in patients with ASD.

Behavioral Addictions in Patients with ASD

Boys and girls with ASD, but especially boys, spend 62% of their leisure time watching television and playing video games (Mazurek & Wenstrup, 2013). Mazureck and several authors reported behavioral addiction, especially problematic video game use in boys and adolescents with ASD (Engelhardt & Mazurek, 2014; Mazurek & Engelhardt, 2013; Mazurek & Wenstrup, 2013). In one of their studies (Mazurek & Engelhardt, 2013), they explored video game use in boys aged from 8 to 18 suffering from ADHD or ASD and compared them to a control group. Both groups (ADHD and ASD) showed a greater risk of problematic video game use than the control group. In patients with ASD as well as in those with ADHD, attentional disorders were strongly associated with problematic video game use. Moreover, the same authors described how environmental factors are largely to be blamed for the development of this behavioral addiction in ASD patients. Indeed, access to video games in the bedroom and the absence of parental rules regarding video game use are two causes of problematic video game use (Engelhardt & Mazurek, 2014), with consequences for sleep. Problematic video game players spent less time per night sleeping regardless of their diagnosis (ASD, ADHD, or typical development), and in ASD patients, there was a direct relationship between the impact on sleep and the number of hours spent playing video games (Engelhardt, Mazurek, & Sohl, 2013). One study explored the possibility that in adults with ASD, as compared to controls, exposure to violent video games increases aggressive behavior, aggressive-thought accessibility, and aggressive affect. Adults with ASD were not differentially affected by exposure to violent video games (Engelhardt, Mazurek, Hilgard, Rouder, & Bartholow, 2015). However, in adults, no study has ever explored the proportion of problematic gamers among patients with ASD. Regarding the poor social skills of adults with ASD, it is likely that many ASD patients who are problematic gamers in adolescence will continue as such in adulthood. However, exposure to video games in adults with ASD needs to be explored in future studies. Likewise, all behavioral addictions, like gambling, which is widely available via the Internet, need to be explored in further research studies. To date, no report has described such problems in adults with ASD.

Comorbid Psychiatric Disorders in Patients with ASD: Relationship with Addictive Disorders

Psychiatric comorbidities are very frequent in patients suffering from ASD. Among them, mood disorders and anxiety disorders such as phobia and ADHD, in particular, have been often reported (Ghaziuddin, Ghaziuddin, & Greden, 2002; Gillberg et al., 2016; Hofvander et al., 2009; Matson & Cervantes, 2014). This high rate of comorbidities is associated with poorer outcome. Moreover, patients with more severe ASD symptoms are more likely to experience additional comorbid symptoms (Gadke, McKinney, & Oliveros, 2015). Whether these psychiatric comorbidities affect social insertion, family relationships, and friendships, or cognitive abilities, they are also associated with a high risk of developing addictive disorders. This association, namely, dual diagnosis (here, the association between a neurodevelopmental or psychiatric disorder and SUD), was reported in data analyses with regard to the National Epidemiological Survey on Alcohol and Related Conditions (NESARC-USA), which showed there is to be a link between major depression and alcohol dependence (OR = 3.7, 95% CI = 3.1–4.4) (Grant et al., 2007) and, in women, between major depression and smoking (Husky et al., 2008). Mood disorders are often associated with alcohol use (Odds ratio = 3.5, 99% CI = 2.7–4.5) and anxiety disorders (Odds ratio = 2.7, 99% CI = 2.1–3.7) (Compton, Thomas, Stinson, & Grant, 2007; Grant et al., 2007). Moreover, according to Callaghan et al. (2013), the prevalence of smoking among individuals with psychiatric conditions is approximately two to four times higher than in the general population. Adults with ADHD use more psychostimulants, cannabis, nicotine, and alcohol than their peers (Groenman et al., 2013; Katusic et al., 2005; Levy et al., 2014; Upadhyaya et al., 2005;). Consequently, since patients with ASD are often comorbid with other psychiatric disorders frequently associated with SUD, the treatment of SUD in ASD patients should also take account of how the other psychiatric comorbidities are being treated.

Cognitive Disorders in Patients with ASD: Relationship with Addictive Disorders

Several neurocognitive particularities have been associated with ASD. Among them, social cognition impairment, executive dysfunction (i.e., in respect of planning, cognitive flexibility, working memory, attention control), and a specific and detailed information-processing style have been the most studied and constitute the main endophenotypic traits of the disorder (Hill & Frith, 2003). These neurocognitive traits have been linked with some of the behavioral disturbances found in ASD, namely, social anxiety and anxiety associated with unexpected events or transitions. Thus, as suggested by case studies (Lalanne et al., 2015), it is possible that these neurocognitive traits may be vulnerability risk factors for the onset and maintenance of addiction disorders in patients with ASD. On the one hand, anxiolytic substances (i.e., alcohol, benzodiazepines, or marijuana), in particular, may trigger social interaction and be a way of coping with their lack of social skills and reduced ability to cope with change in their environment (Kronenberg, Goossens, van Busschbach, van Achterberg, & van den Brink, 2015; Kronenberg, Slager-Visscher, Goossens, van den Brink, & van Achterberg, 2014; Sizoo et al., 2009). On the other hand, some patients with ASD report that tea, coffee, or certain drugs enhance their attentional abilities, helping them to initiate nonroutine activities, such as work-related tasks (Lalanne et al., 2015). Like patients with ADHD, SUD patients use psychostimulants that enhance their attentional and concentration abilities. It is all the more true given that patients with ASD are frequently comorbid with ADHD, which increases their attentional disabilities (Ghaziuddin et al., 2002; Gillberg et al., 2016; Hofvander et al., 2009; Matson & Cervantes, 2014). Adaptive functioning, in particular, is highly dependent on self-control, problem-solving, and the ability to initiate functional strategies and adapt to nonroutine events, e.g., executive functioning. Numerous studies suggest that these abilities are impaired in ASD (Banaschewski et al., 2011; Lalanne et al., 2015, Rommelse et al., 2015;Wallace et al., 2015; Zhang et al., 2015). Impulsiveness and cognitive rigidity, in particular, may be associated with the onset and maintenance of SUD in ASD (Koob & Le Moal, 2008). Indeed, addictive disorders are defined as the repetitive use of certain substances, usually the same substance, in a routine context. Thus, patients with ASD who present ritualized behavior patterns and, on a neuropsychological level, cognitive rigidity may be particularly prone to developing and maintaining SUD. Consequently, treatment of SUD in these patients has to take account of neurocognitive traits that might contribute to maintaining the SUD.

Interventions

Psychosocial interventions are the crux of treatment for addiction. The main criterion of effectiveness is either the reduction of consumption or abstinence, depending on the goals set by the patient. Improvements across a broad range of areas of functioning are also expected (e.g., physical and psychological well-being, HIV and hepatitis risk behaviors, interpersonal relationships, employment and criminal behavior). However, psychological, neurocognitive, and psychiatric comorbidities might be barriers to attaining the goal of the intervention. Thus, treatment of SUD requires multilevel care that includes pharmacological, psychological, and cognitive remediation therapies. Regarding cognitive impairment, in particular, it is important to note that executive or attentional dysfunction might have different and sometimes additive etiologies in the case of ASD, such as ADHD, depression, bipolar disorder, and anxiety disorders. Therefore, to treat SUD in patients with ASD, it is important to assess patients' neurocognitive profile; psychological traits involved in maintaining the SUD, such as specific beliefs associated with the SUD (i.e., I cannot cope socially without alcohol); functional abilities (i.e., social skills); social and family environment; and psychiatric comorbidities, since these factors are key to achieving permanent abstinence or controlled use of substances in this population.

Psychosocial Interventions

The most widely used and evidence-based psychosocial therapies with SUD are motivational interviewing, brief interventions, and cognitive behavioral therapy (CBT) (Jhanjee, 2014). Motivational interviewing and brief interventions are the therapies most used because they are easy to carry out in primary care settings. They were first developed for alcohol and tobacco use disorders. Brief intervention consists in brief counseling for patients with addiction disorders but who come under primary care. It might be used, for example, in the case of admission to a general hospital following a car crash or in the case of acute intoxication (Bien, Miller, & Tonigan, 1993). Motivational interviewing is a patient-centered, semi-directive method for enhancing intrinsic motivation to change by exploring and resolving ambivalence (Miller & Rollnick, 2012). The principles of motivational interviewing are to help patients come to terms with their ambivalence about their behavior and to stimulate change. Some of the techniques used to reach this goal include expressing empathy through reflective listening, developing discrepancy between patients' goals or values and their current behaviors, avoiding argument and direct confrontation, adjusting to client resistance, and supporting self-efficacy and optimism. Motivational interviewing is not a stand-alone therapy delivered with the intention of achieving behavior change. Instead, it prepares an individual for change by increasing contemplation and commitment to change (Arkowitz, Westra, Miller, & Rollnick, 2007). A Cochrane review showed that motivational interviews have an impact on the extent of substance use disorders (Smedslund et al., 2011). To the best of our knowledge, however, there have been no studies regarding the use of motivational interviewing alone in patients with ASD. Based on our clinical experience, motivational interviewing can be effective in this population, provided some of the neurocognitive and behavioral particularities found in ASD are taken into account. For instance, because of patients' concrete information-processing style, their literal understanding of communication, and cognitive rigidity, clinicians need to use explicit terms, be wary of abstract goals, help patients verbalize their ambivalence, and favor the use of visual schema and/or written aids in order to elicit the emergence of ambivalence in these patients. However, even when patients with ASD are able to realize the discrepancy between their behavior and their goals, they are often too anxious to change. This anxiety may be associated with cognitive rigidity. Thus, motivational interviewing may be a first step toward change and could be incremented by family-oriented therapies, the goal of which is to alleviate stress in the family, insofar as although addiction is an individual problem, families are deeply affected a family member's addiction. According to Copello, Velleman, and Templeton (2005), three types of family-focused interventions may be effective in alleviating stress in family. First, promoting the substance user's commitment to his care and his will to change may be important for encouraging the family to support a patient faced with his choice. Secondly, it may be important to involve family members and substance-misusing relatives in the patients' treatment so that they take on an active role. Finally, each member of the family needs to be supported in this situation with suitable follow-up. In the same way, raising a child or an adolescent with ASD is a profoundly stressful experience (Duarte, Bordin, Yazigi, & Mooney, 2005; Montes & Halterman, 2007). In particular, behavioral difficulties are a barrier for adult independence and community involvement (Smith & Philippen, 2005) which impact the whole family. For the families of adult individuals with ASD, specific therapies such as multifamily group psychoeducation (Smith, Greenberg, & Mailick, 2012) have been developed to help and support them. “Such intervention involves weekly group sessions wherein multiple family members are together provided with education on the nature, course, and management of the condition as well as training in and activities for practicing problem-solving” (Smith, Greenberg, & Mailick, 2012). The goal of the family psychoeducation model is to promote education and problem-solving strategies which impact family stress and give all family members an active role in the treatment. When SUD and ASD are combined, it amounts to a “double burden” for the family. Whereas, as far as we know, no specific family therapies have been designed to address this combination, therapists and carers must be attentive to family suffering and stress. Moreover, family interventions may increase the generalizability of newly learned functional behaviors, especially in individuals with ASD.

Although combining psychosocial and family therapies might be helpful for patients with ASD and SUD, they sometimes need a much more structured and intensive behavioral therapy for them to commit to change.

Cognitive behavioral therapy (CBT) is based on learning principles and the theory that behavior may be influenced by cognitive processes (Dobson, 2000). CBT is a structured psychological approach, derived from a cognitive model of drug misuse (Beck, Wright, Newman, & Liese, 1993; Dobson , 2000). According to this model, distorted cognitive bias and dysfunctional beliefs may play a role in the maintenance of addiction. There are also overlearned associations between specific contexts and substance use, which are associated with craving. Thus, CBT uses a cognitive and behavioral approach to addiction, relying on both strategies to promote change in the direction of the patient’s goals and to prevent relapse. Cognitive therapy relies on identifying distorted cognitive bias and restructuring dysfunctional thoughts that may be associated with seemingly irrelevant decisions that lead to a relapse. The behavioral strategies used are coping with substance cravings (through the use of distraction for instance), cue exposure, promotion of nondrug-related activities, relaxation training, and long-term prevention of relapses. Other elements of CBT include social skills training and problem-solving skills which are determinants of SUD in ASD. Moreover, the long-term maintenance of treatment goals involves making use of specific problem-solving and planning abilities. According to Jarvis, Tebbutt, and Mattick (2005), to prevent relapse patients need to identify situations and/or places (like where an alcoholic consumes alcohol with friends) or states (using alcohol to cope with a negative emotion, to make it disappear for example) that trigger a craving and make people vulnerable to drugs. Once identified, the goal is to develop new strategies to avoid high-risk situations that trigger craving and to develop skills for managing craving in the case of exposure and other painful emotions without using substances and learning to cope with lapses. CBT has been found to be effective for treating SUD as a stand-alone therapy. There is evidence, however, that abstinence rates can be improved by combining psychosocial approaches, which are delivered according to patients’ difficulties, with pharmacological treatments for alcohol abstinence, like acamprosate (Feeney, Young, Connor, Tucker, & McPherson, 2002) and naltrexone (O’Malley et al., 1992). In patients with ASD, behavioral therapies such as applied behavior analysis (ABA) and social skills training are the most widely used and evidence-based treatments available (e.g., Virués-Ortega, 2010; Otero, Schatz, Merrill, & Bellini, 2015). CBT, for its part, has been mainly used to treat comorbid mental illnesses, such as anxiety disorders (e.g., Wood et al., 2015; Ung, Selles, Small, & Storch, 2015). In such cases, CBT was adapted to suit patients with ASD-specific neurocognitive and behavioral styles. Such adaptations include greater use of visualization to assist patients with identifying their emotional states, their thoughts, and all “the invisible” aspects involved in communication (Ekman & Hiltunen, 2015). To the best of our knowledge, there are no reports regarding its effectiveness in treating SUD in patients with ASD. Based on our clinical experience, however, CBT adapted to ASD may be effective for treating SUD in this population, although executive dysfunction, mainly cognitive rigidity, may reduce its effectiveness in some patients with severe executive impairment. Indeed, patients may display greater resistance when challenged about their dysfunctional beliefs (i.e., I am unable to function socially without alcohol; I cannot deal with change-related stress without smoking) via Socratic questioning or may have difficulty generating alternative thoughts when stimulated to do so. In such cases, clinicians may prefer behavioral experiments to verbal techniques. However, change-related anxiety and cognitive rigidity may also be barriers to performing such experiments in patients with severe executive impairment. In such cases, cognitive remediation therapy, aimed at improving executive dysfunction, or behavioral therapy alone, may be proposed prior to CBT, with a reasonable chance success (Lalanne et al., 2015).

Cognitive Remediation

Cognitive remediation therapy targets cognitive dysfunction that can be associated with both SUD and ASD, through training, facilitation, and/or compensation techniques, in order to alleviate the functional burden associated with neurocognitive impairment. As mentioned above, neurocognitive impairment, such as executive dysfunction, is involved in the onset and maintenance of addiction. Moreover, it may also reduce the effectiveness of psychosocial therapies in SUD. Whereas cognitive disorders have been studied extensively in relation to alcohol dependence, there are fewer reports in relation to SUD. In alcohol-dependent subjects, executive and memory deficits impact negatively on the possibility of reducing substance use and increase the risk of relapse (Pitel et al., 2009). Segobin et al. (2014) showed the spontaneous recovery of cerebral structures (fusiform gyrus, paracingulate and anterior cingulate gyri, striatum, cerebellum) 6 months after alcohol withdrawal but only if alcohol consumption was reduced to less than about one glass per day during this period. Memory deficits recover much faster than executive deficits (Pitel et al., 2009). Thus, the development of strategies to ameliorate executive and memory processes may reduce the risk of relapse, which is especially high in the first year after withdrawal. Cognitive remediation has been poorly explored in relation to addiction to date, except for alcohol use disorder. Some studies (Houben, Nederkoon, Wiers, & Jansen, 2011; Houben, Wiers, & Jansen, 2011; Rupp, Kemmler, Kurz, Hinterhuber, & Fleischhacker, 2012; Wiers et al., 2015a, 2015b) have shown that executive deficit remediation, through techniques such as goal management training (GMT) and inhibition reinforcing, reduces alcohol consumption for a period of 1–2 months in students (Houben, Havermans, Nederkoorn, & Jansen, 2012), as well as in patients suffering from a moderate to severe alcohol use disorder (Wiers et al., 2015). Moreover, alleviation of executive impairment has been shown to be accompanied by activation changes in the medial prefrontal cortex (Wiers et al., 2015b). However, these studies suffer from a number of limitations. First, patients with SUD may present with memory impairment, especially when they have a history of alcohol, cannabis, psychostimulant, or heroin consumption (Gould, 2010), and memory processes are necessary for learning and developing strategies and new routines in a process of change. Therefore, it may be necessary to develop strategies that target both executive and memory dysfunction. Only one publication reported memory improvement in patients suffering from Korsakoff syndrome, a chronic neuropsychiatric disorder caused by alcohol abuse and thiamine deficiency (Oudman, Nijboer, Postma, Wijnia, & Van der Stigchel, 2015). It is possible to argue that programs adapted more specifically to the severity of cognitive deficits should be better able to enhance executive functions and promote functional recovery in patients, depending on the extent of their cognitive impairment. It is all the more relevant for dual diagnosis patients, i.e., patients suffering from a psychiatric or neurodevelopmental disorder combined with SUD. In ASD patients who have a SUD, cognitive impairment may be associated with both ASD and the substance use. Consequently, in the case of dual or trial diagnosis patients with ADHD, ASD, and SUD, if the patient presents with executive dysfunction that may interfere with psychosocial therapies, cognitive remediation which targets planning, problem-solving, and inhibition abilities may be particularly helpful as an adjunct therapy to pharmacotherapy and other psychosocial approaches. As far as we know, there are no reports regarding the effectiveness of cognitive remediation of executive processes in ASD with SUD. However, our own data suggest that cognitive remediation of executive processes is able to alleviate working memory, cognitive flexibility, inhibition, and planning difficulties and at the same time have a positive impact on social functioning, depressive symptoms, and self-esteem in this population (Weiner, Bruckmann, & Bizet, 2010). In this study, cognitive remediation consisted in 3 months of twice-weekly sessions that made use of our own adaptation of the flexibility module of the CRT program for schizophrenia developed by Wykes, Huddy, Cellard, McGurk, and Czobor (2011), GMT, and a working memory training program developed by Levaux et al. (2012). Similar positive results were found when this composite program was used in two patients with ASD and SUD prior to CBT (Lalanne et al., 2015).

Group Interventions

Three groups could be distinguished, one centered on a specific treatment related to a specific motivational stage (precomtemplation, contemplation, or action), one centered on the development of social skills, and a support group. Given that Alcoholics Anonymous is only for alcoholics, another group, Narcotics Anonymous, has been developed for people suffering from drug addiction. They use a traditional 12-step model which promotes, for example, admitting addiction or compulsion, learning from past mistakes and making amends for these mistakes, and, finally, developing a new code of behavior. At the end, the treatment involves helping others suffering from addictive disorders. These therapies have proved effective in patients suffering from addictive disorders (Krentzman et al., 2010), but there are no data about the efficiency of such groups for patients with ASD and SUD. For ASD patients, support groups are an opportunity for adults with ASD and their families to share their experience and their difficulties. Meetings are proposed as a way of learning about ASD and how it affects social life. The impact of such groups is connected with sound psychological and sociological theories and the helper-therapy principle, theories of experiential knowledge, and social support theories (Salzer et al., 1994). In the case of ASD and SUD, support groups may be of invaluable help for the process of behavioral change (toward abstinence, for instance) and also as social support as regards efforts to stay sober (relapse prevention). Social skills training groups that take account of the specific needs of individuals with ASD and SUD should also be designed. Such groups already exist for other diagnoses frequently found comorbid with SUD (e.g., bipolar disorder and SUD). In ASD, it is possible that substance use is at least partially sustained by the beliefs these individuals have about their inability to cope with social situations. Thus, if the aim is to prevent relapse in the long run, it is crucial to help patients improve their social skills and their feeling of self-efficacy.

Pharmacotherapy

Pharmacotherapy for Addictive Disorders

In addictive disorders, there are few certified medications available for abstinence and reduction other than for alcohol addiction. We shall describe the specificity of prescription in patients with ASD and SUD. For reduction, there are two medications, one certified nalmefene (Marazziti et al., 2015), which showed a reduction in alcohol consumption when accompanied by psychosocial follow-up, and another, baclofen (Lesouef, Bellet, Mounier, & Beyens, 2014, a meta-analysis), the effectiveness of which is mixed. There is no specificity of their prescription in ASD, except that baclofen is not recommended in France in the case of severe psychiatric disorders and a high level of precariousness. It is worth noting that some reports point to some improvements in socialization in ASD individuals with arbaclofen, one of the baclofen enantiomers (Frye, 2014). We found no case reports about the use of baclofen in alcohol-dependent ASD patients.

For the maintenance of alcohol abstinence, three medications are recommended (disulfiram, acamprosate, and naltrexone), but their efficacy is poor. Disulfiram is as effective as the other treatments but controversial because of its strong side effects, especially cardiovascular disorders (Skinner, Lahmek, Pham, & Aubin, 2014). Up to now, it is considered a treatment of second intention. In a comparison of naltrexone to acamprosate, acamprosate seems slightly more effective for maintaining abstinence and naltrexone slightly more effective for reducing heavy drinking and craving (Maisel et al., 2013). Naltrexone has been tested in patients with ASD, and it has been found that low doses of naltrexone (0.5 mg/kg) have a positive effect on hyperactivity, tantrums, social isolation, stereotypical behaviors, self-mutilation, and irritability in children and improve social and reduce aggressive behaviors in adults (Baghdadli, Gonnier, & Aussilloux, 2002; Doyle & McDougle, 2012; Rossignol, 2009; Roy et al., 2015; Roy et al., 2015b, review; Wynn & Brunetti, 2009 a review). Subsequently, following these clinical observations, naltrexone was regarded as having potential for treating ASD. Consequently, with respect to maintaining alcohol abstinence, patients with ASD might theoretically benefit from being prescribed naltrexone for both ASD and their alcohol use disorders. However, we have not found any studies or even case reports to support this view.

For tobacco addiction, same conventional prescriptions could be offered to patients with ASD and tobacco use disorder. Chewing gum or nicotine patches could be proposed first as nicotine replacement therapy and would be combined with psychosocial follow-up. Bupropion and varenicline could be proposed as a second step but would have to be carefully prescribed in patients with psychiatric disorders. Results in the literature are mixed. A meta-analysis carried out by Thomas et al. (2015) showed no increase in suicide or attempted suicide, suicidal ideation, depression, or death with varenicline (Thomas et al., 2013, 2015) and bupropion (Thomas et al., 2013). However, Molero, Lichtenstein, Zetterqvist, Gumpert, and Fazel (2015) suggested that varenicline is associated with a very slight increase in the risk of suicidality and accidents. Given that it is not clearly demonstrated by results that smoking cessation drugs do not cause psychiatric symptoms (Davies, 2013), a follow-up with a psychiatrist would be recommended in tobacco-smoking patients with mood disorders combined with ASD, in the case of varenicline and bupropion prescription. Again, we found no reports of clinical experience with these drugs in these tobacco-smoking ASD subjects.

For cocaine addiction, no treatment is currently certified (Karila et al., 2011, 2014), but based on publications, some recommendations have been given about pharmacotherapy in combination with psychosocial follow-up. To manage cocaine withdrawal N-acetylcysteine may be proposed at the dosage of 1,200 mg per day to alleviate symptoms associated with withdrawal and reduce craving. Topiramate, an antiepileptic drug whose action modulates mesocorticolimbic transmission, may be offered at the dosage of 200 mg per day to prevent relapses. Disulfiram reduces the high associated with the increased levels of dopamine in the case of cocaine intoxication. Since disulfiram has many cardiovascular effects, its prescription should be restricted to specialist centers, especially in the case of cocaine addiction combined with alcohol addiction. Once again we found no reports about the pharmacotherapy of cocaine addiction in ASD patients.

Although there is no description of opiate addiction in patients with ASD, replacement treatments, like methadone and buprenorphine/buprenorphine-naloxone, have been proposed. Follow-up must be very strict for methadone and buprenorphine initiation. Finally, for behavioral addictions, regardless of whether behavioral treatment should be encouraged first, many pharmacological treatments have been tried. The principles of these treatments are to reduce impulsiveness by prescribing antidepressant treatments such as specific serotonin reuptake inhibitors (SSRI) and tricyclic and/or to decrease craving by prescribing, for example, nalmefene, naltrexone, topiramate, NAC, and memantine. However, none of these treatments are certified (Grant & Kim, 2006). This fact also raises the question of the specific pharmacodynamic effects of such largely used psychotropic drugs in ASD patients. For instance, SSRI seem to reduce behavioral disorders such as self-injurious behavior and ADHD-like symptoms in young ASD patients when taken at a very low dose (for instance, venlafaxine 18.75 mg/day) (Carminati, Deriaz, & Bertschy, 2006; Carminati et al., 2016). Such effects in ASD patients are difficult to match with known effects in non-ASD patients.

Moreover, regarding the side effects of anti-addictive treatments, patients with ASD and SUD should be followed by a therapist skilled in both addictology and psychiatry. On the psychiatric side, a specific ASD expertise would be expected.

Some authors reported that cognitive enhancers were beneficial in patients suffering from cognitive disorders combined with addictive disorders. This is of particular interest for patients suffering from both psychiatric and addictive disorders and in whom we observe cumulative cognitive disorders.

Pharmacotherapy for Cognitive Disorders: Cognitive Enhancers

As neuropsychological and clinical observations have shown, patients suffering from SUD develop cognitive impairments, such as executive, memory, attentional, and temporal disorders (Gould, 2010), which are also found in other pathologies such as neurological, neuropsychiatric, and psychiatric disorders. Based on these observations, physicians tried to treat patients suffering from different types of addictive behavior with medication aimed at improving cognitive deficits previously prescribed in neurological and psychiatric disorders (Sofuoglu et al., 2013). In their article, Sofuoglu et al. (2013) propose testing cognition-enhancing drugs in patients suffering from addiction, particularly during protracted abstinence. According to him, such medications could help patients maintain their abstinence or cut down on their addictive behavior. Clinical trials have shown that methylphenidate, used to raise attention levels in patients suffering from ADHD, has a tendency to enhance the executive performance, and especially response inhibition (Levin, Evans, Brooks, & Garawi, 2007; Li et al., 2010), of patients addicted to psychostimulants by reducing their craving for cocaine (Levin et al., 2007). Adolescents with ASD and ADHD usually benefit from methylphenidate in that it helps curb their impulsiveness, improving their behavioral control and hyperactivity (Pearson et al., 2013; Santosh, Baird, Pityaratstian, Tavare, & Gringras, 2006). There is no description of how it affects adults. As impulsive behaviors are strongly associated with addiction onset and the persistence of addictive disorders, it could be very interesting to prescribe methylphenidate in patients with multiple comorbidities, i.e., ASD/ADHD/SUD. Although this observation has yet to be confirmed in clinical trials, other authors, like Kumar, Prakash, Sewal, Medhi, and Modi (2012), suggest that cognitive and behavioral impairments in patients with autism could be treated with psychostimulants such as methylphenidate or nicotinic agonistic agents.

Pharmacotherapy for Dual Diagnosis

As reported above, patients with ASD regularly suffer from other psychiatric disorders like depressive disorders, ADHD, anxiety disorders, and even psychosis (Ghaziuddin et al., 2002; Gillberg et al., 2016; Hofvander et al., 2009; Matson & Cervantes, 2014). All these psychiatric pathologies are associated with a heightened risk of SUD and require treatment. Recently, literature reported that some pharmacological treatments might have a positive impact on dual diagnosis, including mirtazapine, for depressive disorders comorbid with SUD (Graves, Rafeyan, Watts, & Napier, 2012; Lalanne et al., 2015). On the other hand, some antipsychotics, like risperidone and haloperidol (especially in Japan), which are frequently prescribed in autism to manage irritability, behavioral aggressiveness, and maladaptive behaviors in children, adolescents, and adults (Hsia et al., 2014; Scott & Dhillon, 2008; Sharma & Shaw, 2012), might impact SUD. For example, Dawe, Gerada, Russell, and Gray (1995) showed that a single dose of haloperidol increases nicotine intake in smokers. Moreover, nicotine dependence is greater in patients treated with haloperidol (Kim, Han, Joo, & Min, 2010), owing to pharmacological aspects of haloperidol as a dopamine receptor type 2 antagonist involved in pleasure associated with dopamine action. DR2 antagonism is also associated with increased craving, which leads patients to overconsume to compensate for the effects of antipsychotics. Consequently, prescribing atypical antipsychotics, which have less DR2 antagonism, particularly in cases of addiction to opiates (Gerra et al., 1985; Kern, Akerman, & Nordstrom, 2014), cocaine (Longo, 2002), and nicotine is generally recommended (Wijesundera, Hanwella, & de Silva, 2014; Wu, Chen, & Lee, 2013). Also, in patients with ASD comorbid SUD, haloperidol should be avoided and replaced by risperidone. Studies have moreover suggested that risperidone has some positive effect in the case of cocaine addiction (Akerele & Levin, 2007; De La Garza, Newton, & Kalechstein, 2005) and likewise aripiprazole in the case of alcohol and cocaine addictions (Anton et al., 2008; Brunetti et al., 2012; Stoops, Lile, Lofwall, & Rush, 2007). Among antipsychotics, clozapine seems to be of real value for treating addiction in patients suffering from psychiatric disorders. Clozapine shows less affinity for DR2 receptors but a greater affinity for DR3 and DR4 than other antipsychotics (McCormick, Wilson, Wilson, & Remington, 2013; Seeman, 2014), and in clinical studies these effects are associated with a reduction of addictive disorders (Keltner et al., 2000). In patients, addiction decreases significantly (by around 85%) when patients suffering from psychiatric and addictive disorders switch from classic antipsychotic drugs to clozapine (Procyshyn, Ihsan, & Thompson, 2001; San, Arranz, & Martinez-Raga, 2007). Moreover, Kumar et al. (2012) described in their paper how clozapine is effective for improving behavioral symptoms in patients with ASD. Consequently, it might be of particular interest in ASD patients who suffer from both severe behavioral symptoms and addictive disorders. As in many other parts of this chapter, we propose building a bridge hypothesis between ASD patient studies and SUD patient studies, but studies or reports about dual diagnosis patients are lacking to date.

Multidisciplinary and Holistic Cares

Like dual diagnosis patients, for example, schizophrenic patients with substance use disorders, with cannabis, alcohol, and tobacco being the main substances involved in these patients (Thoma & Daum, 2013), patients with autism comorbid SUD need an integrated approach to their health and substance abuse treatment. In SUD associated with psychiatric disorders, in particular, Torrens, Rossi, Martinez-Riera, Martinez-Sanvisens, and Bulbena (2012) showed the superiority of a multidisciplinary approach combining different therapies delivered in a coordinated fashion by different therapists: addictologist, psychiatrist, psychologist, social worker, etc. However, the fact is that a specific program has to be defined according to patients' difficulties to promote the best outcome. In patients with ASD and SUD, it might be important to treat vulnerability factors, namely, psychiatric comorbidities like ADHD, anxiety, mood disorders, and psychotic disorders, and taking into account the behavioral traits of ASD that might predispose these individuals to developing SUD (e.g., impaired social skills, change-related anxiety, lack of imagination). Moreover, cognitive impairments might be taken into account before starting CBT. Accordingly, a neuropsychological assessment might be useful to identify neurocognitive particularities that promote substance use disorders, such as executive deficits, as well as specific cognitive remediation of executive dysfunction. As a parallel approach, CBT, which is very well structured, seems to be appropriate in patients with ASD and SUD and might be combined with a family approach that promotes familial guidance. Such specific care involves many different professionals (e.g., psychiatrist, neuropsychologist, psychologist, addictologist, etc). Alongside such specific care, psychoeducation programs could be helpful to these patients in informing them about the risks associated with drugs, assisting them with setting their own objectives, adopting a different lifestyle, and restoring relationships with friends and family. Such programs support the idea of integrated care and a multidisciplinary approach involving several different types of networks (Lang, Bonnewitz, Kusterer, & Lalanne-Tongio, 2014).

Social Rehabilitation

In dual diagnosis patients, precariousness is not rare. Social rehabilitation that promotes patients' autonomy and accompanies them throughout their rehabilitation is an important part of struggles with addiction. Involving patients' families is extremely important as regards care in the case of both SUD and autism. Patients with ASD experience real difficulties finding a job, difficulties which become even more acute in the case of SUD. Consequently, social workers have to take account of difficulties pertaining to both diagnoses when steering the patient toward a suitable structure, such as a Center of Assistance by Work, where staff are trained in behavioral difficulties relating to psychiatric disorders. Until now, however, there is no specific structure that accompanies patients with dual diagnosis on their path to find employment. It could be important to run sheltered employment programs where the majority of workers are people with dual diagnosis, namely, with psychiatric disorders or neurodevelopmental disorders and SUD. These programs should be supervised by workers trained to deal with patients' specific disabilities. Moreover, in such centers, access to multidisciplinary care workers should be promoted, and direct connections could improve specific care given to these patients. All in all, social care is important for enabling a patient to regain his or her independence and a new identity outside of drug addiction. Specific structures could be developed for dual diagnosis patients.

The Concept of Personal Recovery

Personal recovery is defined by Anthony (1993) as "a deep, personal, unique process of changing one's attitude, values, feelings, goals, skills, and roles." It thus requires developing a new meaning and purpose of life, beyond the effects of the illness. Common elements of recovery as identified by Davidson (2005) include renewing hope and commitment, redefining self, incorporating illness and managing symptoms, involving in meaningful activities, overcoming stigma and assuming control, becoming empowered and exercising citizenship, and being supported by others. In individuals suffering from dual diagnosis, such as ASD and SUD, clinical recovery is particularly difficult. One study (Kronenberg et al., 2015) identified the use of personal recovery strategies in two groups of dual diagnosis patients (ADHD-SUD vs. ASD-ADHD) via semi-structured interviews. Compared to ADHD-SUD patients, patients with ASD and SUD reported more difficulty becoming active agents of change, and limited empowerment and hope, which makes their personal recovery a difficult concept and complex process. According to the authors, these results are due to the clinical characteristics associated with ASD, i.e., social and behavioral difficulties, which make these patients particularly dependent on support from others with finding activities and filling their lives. It is also possible that these difficulties are due at least in part to the neurocognitive particularities reported in ASD (cognitive flexibility, social cognition, lack of imagination), as we have already suggested before. Moreover, autobiographical memory abnormalities have been reported in ASD (Crane, Lind, & Bowler, 2013). Such abnormalities suggest that the concept of selfhood and the setting of future goals based on self-values may be impaired in these individuals. Thus, when using the concept of personal recovery in patients with ASD, it is important to take into account their neurocognitive profile and the obstacles that may be encountered in this population in relation to its implementation in clinical practice.

Training for Early Identification

In his book, Matthew Tinsley (2008) reported that for patients with ASD, drugs are a way of coping with anxiety and depression and of improving their social skills. Consequently, drugs may mask their diagnosis for a long time. Little is known in psychiatry or in addictology about the occurrence of SUD in patients with ASD. However, there are many quick clinical assessment tools available for identifying SUD (e.g., for nicotine addiction Fagerström's questionnaire, for alcohol addiction the Alcohol Use Disorder Identification or AUDIT, or for cannabis addiction the Cannabis Abuse Screening Test). In adolescents, specific tests could be useful. For example, the CRAFFT (Car, Relax, Alone, Forget, Friends, Trouble) Screening Test is a test for screening for substance-related risks and problems in adolescents. Whether or not the diagnosis of SUD in patients with ASD should be encouraged, it is likely that patients with ASD and SUD mask their autism for a long time, using their SUD to facilitate their social skills. Lalanne et al. (2015) reported the cases of two patients with comorbid ASD and SUD, who were diagnosed a long time after their first medical visit. Awareness raising and training of caregivers should improve the detection of patients with ASD. In particular, it would be very easy to raise awareness about the idea that patients with ASD may abuse drugs to enhance their social skills, fill their days, or cope with everyday stress. Such a profile of substance use disorder could guide professionals toward this diagnosis with the help of questionnaires and thorough clinical investigation.

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Diet and Supplementation Targeted for Autism Spectrum Disorder

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Diet and Supplementation Targeted for ASD

Popular culture is replete with stories of cures for autism spectrum disorder (ASD) based on food. While not a core symptom of ASD, food and feeding are prominent concerns. Kanner (1943) is among the first to note food-related challenges in his study group of children with ASD. Then, diet-based interventions became topical in 1969 when Goodwin and Goodwin reported a successful diet-based intervention for a child with both celiac disease and ASD using a gluten-free diet. Since then parents have been drawn to dietary and supplementation interventions with the hope of a cure for ASD. However, prevailing scientific evidence does not support elimination diets or supplements as cures for autism; still dietary interventions remain popular. Survey data that evidences this point is found in the parental use of elimination diets presented by the Autism Research Institute report titled *Parent Rating of Behavior Effects of Biomedical Interventions* (Edelson, 2010). This report documents survey data on parental perception of medication, supplements, and elimination diets over the last half century. Thousands of these surveys report children with ASD “got better” when parents implemented an elimination diet. Depending on the diet implemented, 45–71% of parents rated improvement versus only 2–7% rating “got worse,” which is a trend that is significantly different for pharmacological interventions. An obvious difference between diets and medication is the familiarity, availability, and ease with which an elimination diet can be implemented. This can be taken to mean that parents are willing to try what is available and do so independent of professional assistance. In addition, this survey data highlights parent’s willingness to try even hazardous interventions. For example, parents reported high use and parental satisfaction with chelation therapy, an experimental treatment for ASD that has been linked to fatalities (Baxter & Krenzelok, 2008). Overall, this survey data highlights parental dedication and commitment to making significant lifestyle changes for their loved ones with the hope of improving ASD symptoms.

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This chapter seeks to discuss diet and supplementation and ASD as it relates to nutritional health, assessment of nutritional health, empirical evidence, GI disorder impact on ASD, support for those considering these types of intervention, and the future direction of this field. Our goal is to acknowledge the following realities: (1) nutrition is important; (2) current research does not support dietary interventions as a specific cure for ASD; (3) individuals with ASD are at significant risk of food-related comorbidities; (4) overall physical, emotional, and behavioral health can be improved by addressing these food-related comorbidities; (5) families are willing to try what is available and will need guidance to match interventions and evaluate intervention efficacy; (6) well-aware clinicians can offer this guidance; and (7) research is constantly evolving our understanding of how food is related to ASD.

Nutritional Health

Food Is Medicine

The idea of food as medicine is old, dating from ancient cultures as far back as 1000 B.C. (Yao, Hao, Pan, & Wang, 2012). Since this time, families have been waiting impatiently for science to explain the brain-gut connection. While science unlocks these mysteries, families must remember that as with all medicine, food can be seen to have three effects – the benefits of nourishment, growth, and repair; side effects such as gastrointestinal upset, insomnia, or cavities; and adverse reactions such as life-threatening interaction with medications or allergies. When thinking of food side effects, consider that side effects are not bad, merely unintended effects of the food. For example, weight gain for an under-eater would be a positive outcome. Gaining weight for this person is a good thing, whereas for others it will be non-optimal. A food adverse reaction will include food allergies, metabolic disease like diabetes, and gastrointestinal disease like Crohn's or celiac disease. Here the food is not only having an unintended effect, it is causing harm.

Advances in food science have sparked popular dietary movements such as the idea of "functional foods," which has been gaining popular attention since the 1980s (Yao et al., 2012). Functional food is defined as natural or formulated nutritious foods consumed as part of a daily diet, i.e., not a capsule, tablet, or powder, that contain ingredients that may provide a health benefit beyond the traditional nutrients that it contains and thus contribute to the prevention of nutrition-related diseases, the increase in physical health, and the promotion of mental well-being (Crowe & Francis, 2013). An example would be the cardiac benefits of oatmeal. The concept of food as medicine is a mainstay of complementary, alternative, and integrative health approaches, which advocates nontraditional interventions, such as diet and supplementation, to heal and promote health (Ernst, 2012).

Scientists are beginning to identify how food and ASD are related. Still, empirical connections between food, supplements, and dietary interventions for ASD are premature (Buie et al., 2010). However, knowledge of this connection is accumulating rapidly with the work addressing medical disorders. The high incidence of food-related-ASD comorbid medical disorders and related symptoms is informing our understanding of how food may affect behavior. For example, research into gastrointestinal dysfunction has recently helped to identify the robust connection between gastrointestinal disorders and ASD. McElhanon, McCracken, Karpen, and Sharp (2014) recently presented evidence that individuals with ASD are at a higher risk of developing gastrointestinal disorders, which was previously only a hypothesis. Leading gastroenterologists, including Buie et al. (2010), agree on several points related to gastrointestinal disorders: (1) GI dysfunctions need to be addressed, (2) individuals with ASD experience the full range of GI dysfunction, (3) the remarkable prevalence rate of GI dysfunction in individuals with ASD, and (4) there is no ASD-specific GI disturbance. Additionally, there is a strong consensus that comorbid gastrointestinal disorders may be increasing challenges faced by individuals with ASD and disorders such as constipation, diarrhea, acid reflux, and food allergies should be routinely assessed.

It is likely that dietary and supplementation interventions will have its greatest benefits for individuals with ASD in the management of food-related comorbid conditions. Fortunately, there is strong empirical evidence that comorbid gastrointestinal symptoms are improved by dietary and supplementary interventions. It follows that, as the individual returns to health, improvements in behavioral challenges and return of functional skills will also be seen. Therefore, there is utility in implementing dietary and supplementation interventions and thus a need to consider what effects, side effects, and/or adverse reactions might the given individual with ASD experience when considering food as medicine. In other words, the goal is to identify what constitutes a healthy diet, or optimal nutrition, for a specific individual.

Nutrition: "The Balanced Diet"

Optimal nutrition for a specific individual begins with an understanding of basic nutritional requirements. Food is simultaneously basic and complex. At its most basic, eating is the first milestone in infancy, and food provides the nutrition for life. The last century heralded unparalleled nutritional discoveries. With these discoveries, the concept of a balanced diet has evolved. The identification of vitamins, minerals, essential amino acids, and essential fatty acids as critical dietary needs has informed the US Department of Agriculture (USDA) concept of a healthy diet. For over 120 years, the USDA has published dietary guidelines (Davis, 1999). As science has expanded our understanding of nutrition, the four food groups and food pyramid of our youth have given way to My Plate in the most recent revision of the USDA dietary guidelines (USDA, 2016). The guidelines promote an understanding of the importance of balancing the nutritional and energy needs of our body with the nutrition and energy supplied by our diet.

Dietary Considerations: Children

The balanced diet provides the necessary energy and building materials for the exceptional growth and development of childhood. Growth of the body and brain in childhood is rapid and nonlinear. Therefore, not only are sufficient proteins, carbohydrates, fats, vitamins, minerals, fiber, and water necessary, these building blocks must be available during critical growth periods. Specific to the brain, fatty acids, omega-3 and omega-6, are required during the rapid brain growth of young children, whereas for adults the demand is relatively less. Researchers have not yet discovered the complex algorithm defining these needs; therefore, a steady supply of dietary resources must be ingested daily to ensure healthy growth and development (Prado, 2014). Obtaining an adequate supply is further complicated by specific nutrient demands through the day, with it necessary to have sufficient nutritional supply available during the day to optimize learning and then the night to supply rapid growth periods (Taki, 2012). Attainment of adequate nutrition is further complicated by the core symptoms of ASD. For example, children with ASD are found more likely to have protein and calcium deficiencies because of food selectivity (Sharp et al., 2013). Obesity is also a concern that often presents as a challenge in preschool children due to core symptoms of ASD (Presmanes Hill, Zuckerman, & Fombonne, 2015). To aid in developing a balanced diet for all children and teens, with and without ASD, the American Academy of Pediatrics website healthychildren.org offers basic nutrition information (American Academy of Pediatrics, 2016).

Dietary Considerations: Adolescents/Young Adults

Dietary needs shift as brain maturation and physical development accelerate during puberty with increased nutritional demands to fuel rapid bone and muscle growth in the early teens and brain reorganization through the early twenties. While calorie demands are greater for young men, young women entering puberty have greater demands for iron and calcium. Inadequate calcium during adolescence can increase risk for osteoporosis later in life. Poor eating habits during childhood may result in the emergence of health issues during the teen years. While obesity is a growing concern for all age groups, teens with ASD are at increased risk for lifelong struggles with weight and the associated immediate and long-term health risks (Phillips et al., 2014). Obesity is not the only challenge youth with ASD may face. Adolescents with ASD are at increased risk for medical conditions including diabetes, seizures, muscular dystrophies, and schizophrenia (Kohane, 2012). Accordingly, these comorbid conditions will need special dietary considerations. As mentioned above the American Academy of Pediatrics website healthychildren.org offers basic nutrition information (American Academy of Pediatrics, 2016).

Dietary Considerations: Adults

Adults with ASD face the challenge of balancing caloric intake and activity shared by all adults but complicated by the core symptoms of ASD. By this time food selectivity and sedentary lifestyles have become resistant to change at a time when the high calorie demands of physical growth in the late teens have significantly decreased, posing an increased risk of poor overall health. As adults with ASD age, they are at an increased risk of obesity, heart disease, diabetes, immune disorders, mental illness, and even dental issues (Croen & Zerbo, 2015; Tyler et al. 2011). Dental issues are an inconspicuous concern yet relevant because adults with ASD have reported experiencing greater pain and anxiety during dental care which makes diagnosing periodontal disease more difficult (Blomqvist, Dahllöf, & Bejerot, 2014). Periodontal disease is an additional concern as it raises the risks of poor nutrition, heart disease, and diabetes (Cullinan, 2013). All the factors placing individuals with ASD at increased health risk are not well understood; however, a balanced diet may help to lower risk and manage these diseases. As adults with ASD achieve independence, guidance on diet and a healthy lifestyle is critical. Because nutritional needs vary with age, activity level, pregnancy, illness and medication, diet, and lifestyle, education is a lifelong necessity. For individuals with mental illness, years of psychotropic medication use also places them at risk. For example, antipsychotic medication use increases the risk for obesity, diabetes, and related conditions. Therefore, medication education should also include suggestions for diet to promote a healthy lifestyle. The *Academic Autistic Spectrum Partnership in Research and Education (AASPIRE) Healthcare Toolkit* is a resource designed to improve health care for adults with ASD and their health care providers (Academic Autistic Spectrum Partnership in Research and Education, 2015). More nutrition information targeting specific issues faced by adults is available at nutrition.gov (USDA, 2016).

Assessment of Nutritional Status

Our bodies and our mental processes are the result of complex biochemical interactions that depend on nutrients and adequate hydration. The morbidity associated with nutritional deficiencies highlights the importance of nutritional assessment. Nutrients such as protein, fats, carbohydrates, vitamins, and minerals provide the building blocks for cells and the energy to power the millions of chemical reactions in the human body, and nearly all these processes need water. Our body is able to synthesize some nutrients, called nonessential nutrients, while the essential nutrients must be consumed by our diet. To aid in meeting these nutritional needs, several agencies have published guidelines. The USDA publishes basic dietary guidelines. Specific guidelines for the assessment of nutritional status are published by the American Academy of Pediatrics, the American Gastroenterological Association, and many other specialty organizations (see American Academy of Pediatrics, Committee on Nutrition, 2013). Autism Speaks publishes more information such as synthesized nutritional research and guidelines, making this critical information accessible to individuals with ASD and their families.

Nutritional Assessment of Individuals with ASD

Individuals with ASD are at increased risk of nutrition-related health problems. Nutritional deficiencies contribute to impaired growth, obesity, anemia, low bone density, and many other health issues (Adams, Johansen, Powell, Quig, & Rubin, 2011; McElhanon et al., 2014; Sharp et al., 2013). The assessment of nutrition-related problems in individuals with ASD involves both nutritional and medical assessment. The nutritional assessment begins with parent education on feeding behavior of children with autism. For an example, see the publication Exploring Feeding Behavioral Autism: A Parent's Guide to Exploring Feeding Behavior in Autism presented by Autism Speaks Autism Treatment Network (2014). Parental observations are then completed to inform well-child pediatric visits that screen for nutrition-related concerns. If weight loss/gain, restrictive eating, gastrointestinal distress, or other food related concerns are identified, other medical assessment is warranted. The medical assessment includes a detailed history, completion of a growth chart, physical examination, and indicated laboratory studies. Specialized medical or behavioral assessments may be ordered to aid in diagnosis and treatment. Caregivers may assist the medical and behavioral assessments by completing a 3–5 day food/eating behavior diary and a list of gastrointestinal and behavioral concerns. Teens and adults might track diet and symptoms with apps to better inform medical decision-making. For example, the assessment and treatment of abdominal pain, constipation, diarrhea, gastroesophageal reflux, and food allergies may be referred to a gastroenterologist. After obtaining history and physical examination, the gastroenterologist might order X-rays, stool studies, and additional blood tests before considering endoscopy or colonoscopy.

Dietary Interventions for ASD

Empirical evidence is scant for many dietary interventions implemented in the hope of benefitting individuals with ASD. The gluten-free, casein-free diet and ketogenic diet are exceptions. While these diets do not cure ASD or treat core symptoms, the empirical evidence for these diets is robust.

Gluten-Free, Casein-Free Diet

The gluten-free, casein-free (GFCF) diets are now the most commonly used dietary interventions for individuals with ASD. However, the GFCF diet is an evidence-based medical intervention for the management of celiac disease (Murray, Watson, Clearman, & Mitros, 2004). In persons with celiac disease, gluten and casein found in wheat, barley, and rye cause an immune reaction in the gut that results in damage to the lining of the intestine causing GI distress (National Institute of Health, 2015; Tonutti & Bizzaro, 2014). Regrettably, the GFCF diet has not been proven to treat ASD symptoms. Researchers have suggested that the positive behavioral change experienced by individuals with ASD who used the diet is directly related to the alleviation of GI distress (Chaidez, Hansen, & Hertz-Picciotto, 2014; Elder et al., 2006; Johnson, Handen, Zimmer, Sacco, & Turner, 2010; Seung, Rogalski, Shankar, & Elder, 2007).

The use of GFCF diets for the treatment of ASD has its basis in the 1969 Goodwin and Goodwin report of a successful diet-based intervention for a child with both celiac disease and ASD using a gluten-free diet. In exploring this relationship, Panksepp (1979) suggested the symptoms of ASD might be due to excessive brain opioid activity. Panksepp hypothesized that individuals with ASD had an abnormally permeable intestinal membrane, or "leaky gut," through which peptides with opioid activity could be absorbed and enter the central nervous system (D'Eufemia et al., 1996). Once in the brain, peptides with opioid activity could then result in symptoms of ASD. Specific to the GFCF diet, this hypothesis posits that peptides found in gluten and casein are responsible for triggering the opioid reaction (Whiteley & Shattock, 2002). Thus, this hypothesis supported the use of the GFCF diet to treat autism symptomology, the idea being that excluding foods with gluten and casein would improve ASD symptoms. There is some empirical evidence that gut permeability may be compromised in some gastrointestinal disorders resulting in diarrhea, constipation, and gastroesophageal reflux, conditions common in individuals with ASD (Adams et al., 2011). However, the opioid excess hypothesis is based on limited and tenuous evidence that (1) animals given exogenous opioids were accurate models for ASD, (2) abnormalities in opioid levels in individuals with ASD could be measured, and (3) naltrexone, a drug that reverses the effects of opioids, could improve ASD symptoms (Leboyer et al., 1990). Subsequent researchers have refuted the opioid excess hypothesis by demonstrating that individuals with ASD do not have higher levels of neuropeptides (Cass et al., 2008; Dettmer, Hanna, Whetstone, Hansen, & Hammock, 2007; Hunter, O'Hare, Herron, Fisher, & Jones, 2003) and that naltrexone administration rarely improves ASD symptoms (Feldman, Kolmen, & Gonzaga, 1999).

Of the studies that have found positive effects in behavioral symptoms (Knivsberg, Reichelt, Høien, & Nødland, 2003; Pennesi & Klein, 2012), none have established benefit at a significant level. Johnson et al.'s (2010) research on developmental outcomes and problem behaviors found that individuals on the GFCF diet showed some gains in developmental outcomes and problem behaviors, but these improvements were not statistically significant, and control group also showed improvements in some areas. The lack of evidence for GFCF diets is further reported by research findings that gluten and casein supplementation, that is, an increased intake of gluten and casein, was not related to increased challenging behavior or GI symptom severity (Pusponegoro, Ismael, Firmansyah, Sastroasmoro, & Vandenplas, 2015). Overall, studies are unable to find adequate evidence for the use of this diet to treat behavioral symptoms or improve developmental functioning in individuals with ASD. Still, it has been suggested that the elimination of gluten and casein from an individual's diet may positively impact a subpopulation of individuals with ASD, but these improvements should not be generalized to the entire population (Pennesi & Klein, 2012) and may more likely be related to the symptom relief from a GI dysfunction.

The popularity of the GFCF diet may be explained by several studies that have found that parental perception of efficacy can be specious. Researchers have found that parents may report improvements despite a lack of statistically significant findings across measures (Elder et al., 2006). Harris and Card (2012) found that the behavior patterns and GI symptoms of children on a GFCF diet did not differ significantly from those not on the GFCF diet. However, when asked, 100% of parents with children on the GFCF diet reported both GI symptoms and behavior had improved on the diet. Hurwitz (2013) suggested that the discrepancy between parent report and empirical data might be due to parent's high hopes for improvement and investment in the implementation of the GFCF diet. It has also been suggested that when parents have expectations of improvement, they may misinterpret variability in their child's behavior as evidence of effectiveness (Sandler & Bodfish, 2000). Further, Green (2007) explains that for parents, more time involved and more money invested into an intervention result in a more favorable impression of intervention effectiveness. Interestingly, young age has been suggested to be a possible predictor for being a responder to GFCF diets (Pedersen, Parlar, Kvist, Whiteley, & Shattock, 2013). Perhaps this finding is also related to parental misinterpretation.

Ketogenic Diet

There is a significant body of literature on the ketogenic diet as a method to reduce seizures. Because seizures are common in individuals with

ASD, the effect of the ketogenic diet has been explored as a treatment for ASD core symptoms (Evangeliou et al., 2003; Herbert & Buckley, 2013). The ketogenic diet is a high-fat, low-protein, and low-carbohydrate diet that is designed to elicit biochemical changes that are typically associated with starvation (Freeman et al., 1998). This biochemical response results in the replacement of glucose with ketones as the primary source of fuel for the brain (Hartman, Gasior, Vining, & Rogawski, 2007). The use of the ketogenic diet to control seizures is well established and has been supported by earlier research (Groesbeck, Bluml, & Kossoff, 2006; Kinsman, Vining, Quaskey, Mellits, & Freeman, 1992; Neal et al., 2008). Related to ASD, the majority of studies that have positive effects on ASD type symptoms have focused on mouse models (Ahn, Narous, Tobias, Rho, & Mychasiuk, 2014; Ruskin et al., 2013). However, there is still inadequate evidence to support the effectiveness of this diet for humans with ASD (Castro et al., 2015). A final concern is that use of this diet is related to known health risks such as slow growth, skeletal fractures, and kidney stones (Groesbeck et al., 2006).

Commonly Used Diets in the ASD Community

Restrictive Diets

The restrictive diets, i.e., the elimination of ingredients from an individual's diet, have their place in treatment. They are routinely prescribed for physical disorders including food allergies and sensitivities, inflammatory bowel disorders, seizures, and fungal and viral infections (Srinivasan, 2009). Because individuals with ASD are more prone to these conditions, restrictive diets may be appropriate to ease the pain and suffering of these comorbid conditions, thereby improving overall quality of life. However, eliminating certain ingredients from a diet brings the risk of an imbalance in the diet. For example, removal of dairy from a diet due to casein allergy may cause calcium deficiency.

The following tables of dietary restriction and supplement interventions give a brief description of dietary interventions commonly used in the ASD community. The tables note the medical conditions, for which the dietary intervention is intended, the basis for the intervention in individuals with ASD, risks associated with the dietary restriction or supplementation, and resources to learn more about the diet.

Name of diet	Gluten-free diet
Basic description	A gluten-free diet eliminates foods containing gluten, a protein commonly found in wheat, barley, and rye
Intended use	• Celiac disease
	• Non-celiac gluten sensitivity (NCGS)
	• Wheat allergy
Description of illness	*Celiac disease*: a gluten-free diet is prescribed for individuals with celiac disease, non-celiac gluten sensitivity, and wheat allergy. According to the Celiac Disease Foundation (CDF, 2016), celiac disease is an autoimmune disorder, which occurs in about 1 in 100 people. In individuals with this genetic predisposition, gluten damages the small intestine (CDF, 2016)
	NCGS: the UCLA Divisions of Digestive Diseases reports that individuals with NCGS have some of the physical symptoms of celiac disease but a normal small intestine biopsy
	Wheat allergy: individuals with wheat allergy produce an allergic antibody to wheat (UCLA Divisions of Digestive Diseases, 2016)
Hypothesis behind use in individuals with autism	In 1979, Jaak Panksepp proposed a connection between autism and opiates, noting that injections of minute quantities of opiates in young laboratory animals induce symptoms like those observed among individuals with autism (Research Autism, 2015). Then in 1991, Kalle Reichelt suggested a relationship between autism and the consumption of gluten and casein (Smeltzer, 2011)

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Name of diet	Gluten-free diet
Evidence for use in treating autism	For individuals with ASD who have comorbid celiac disease, NCGS, or wheat allergy, the gluten-free diet may lessen pain and gastrointestinal distress leading to improved physical and behavioral health. In the absence of these disorders, there is no evidence to support the use of a gluten-free diet to treat ASD
Risks	Gluten-free diet limits protein intake. According to the National Foundation for Celiac Awareness (2012), gluten-free products may not be enriched or fortified with micronutrients such as folic acid, iron, vitamins D and K, and calcium. Additionally, the gluten-free diet may be higher in fat, sugar, salt, and calories than regular versions and more expensive (Research Autism, 2015)
Internet resources	• Celiac.org • Gastro.ucla.edu • GFCFdiet.com

Name of diet	Casein-free diet
Basic description	A casein-free diet eliminates dairy that comes from mammals
Intended use	Casein allergies
Description of illness	A casein-free diet is prescribed for individuals with casein allergy (not whey or lactose intolerant). A casein allergy occurs when the body mistakenly thinks the protein in casein is dangerous and produces allergic antibodies. National Food Service Management Institute (NFSMI, 2014) suggests 2–5% of individuals under the age of three suffer from milk allergy. Experts also suggest that majority of individuals with casein allergies will outgrow this allergy within the first few years of their life (NFSMI, 2014)

Name of diet	Casein-free diet
Hypothesis behind use in individuals with autism	Low levels of lactase (enzyme necessary to digest lactose) are found in some individuals with ASD (Adams, 2013). Some individuals with ASD may have an abnormal immune response to casein (and usually simultaneously gluten). In 1979, Jaak Panksepp proposed that the brain becomes damaged when casein in the form of harmful peptide (acting like an opioid) enters the central nervous system causing behavioral problems in animal models (Research Autism, 2015)
Evidence for use in treating autism	No studies have investigated the efficacy of a casein-free diet alone. For individuals with ASD who have comorbid casein allergies, a diet free of casein may lessen pain and gastrointestinal distress leading to improved physical and behavioral health. In the absence of this allergy, there is no evidence to support the use of a casein-free diet to treat ASD
Risks	A casein-free diet limits calcium intake, and calcium is an important mineral for musculoskeletal and bodily functions (Siri & Lyons, 2011). A person on this diet may need to take calcium supplements for a balanced diet
Internet resources	• GFCFdiet.com • Healthychildren.org

Name of diet	Ketogenic
Basic description	A diet high in fat, adequate protein, and low in carbohydrates. This combination changes the way energy is used in the body (brain uses ketones for energy instead of glucose) and results in an elevated level of ketone bodies in the blood (known as ketosis)
Intended use	Helps control seizures in some patients with refractory epilepsy

Name of diet	Ketogenic
Description of illness	Epilepsy is one of the most common neurological disorders after stroke and is diagnosed when the individual has recurrent, unprovoked seizures. Seizures occur when cortical neuron fires excessively and/or hypersynchronously and disrupts normal brain function. An estimated 1 of 3 individuals with ASD has epilepsy. In 30% of cases (Autism Speaks, 2016; Levisohn, 2007), epilepsy does not respond to pharmacological treatment
Hypothesis behind use in individuals with autism	The diet was designed in 1921 by Dr. Russell Wilder at the Mayo Clinic to treat seizures. Because the individual is consuming so few carbohydrates and so much fat, the fat is converted into ketone, and the ketone bodies replace glucose as the brain's energy source, which decreases seizures. It has been suggested that it may also improve ASD symptoms. One hypothesis for this is the ketogenic diet increases adenosine compound in the brain, therefore decreasing inflammation
Evidence for use in treating autism	There is some evidence that this diet may decrease some types of seizures. Related to ASD, the most promising studies are on mice. Masino et al. (2011) found a decrease in ASD symptoms in mice eating a ketogenic diet. Evangeliou et al. (2003) report limited beneficial use but poor tolerability for individuals with ASD. Additionally, Castro et al., 2015 suggest that there is some potential for the ketogenic diet, but there is inadequate evidence to support its effectiveness
Risks	Acidosis, high cholesterol, kidney problems, osteoporosis, GI disturbances, nutrient and calorie deficiency
Internet resources	• Charliefoundation.org • Epilepsy.com • Epilepsyfoundation.org

Name of diet	Specific carbohydrate diet (SCD)
Basic description	This diet eliminates complex carbohydrates (lactose, fructose, and starches) and is based on the idea that if diet is limited to simple carbs, it will "starve out toxins" in GI tract and restore GI and immunological functioning. The diet also uses fermented products (yogurt) to repopulate gut with healthy bacteria
Intended use	This diet was initially designed to treat Crohn's disease, ulcerative colitis, and celiac disease
Description of illness	Crohn's disease and ulcerative colitis are inflammatory bowel diseases (IBD) that affect the gastrointestinal tract (inflammation of the intestine). The Crohn's and Colitis Foundation of America (2016) reports that an estimated 1.4 million American suffer from IBD; however, it is most commonly diagnosed in adolescents and young adults. According to Doshi-Velez et al. (2015), individuals with ASD experience increased prevalence of IBD
Hypothesis behind use in individuals with autism	In 1950, Dr. Sydney Valentine Haas laid the foundations of SCD by helping a patient with ulcerative colitis maintain lasting remission through diet and fermented food. This patient was Elaine Gottschall's daughter. It was Dr. Gottschall, a biochemist, who coined the term specific carbohydrate diet and spent most of her life researching the science behind the diet; her findings were published in *Breaking the Vicious Cycle*. A recent advance in this hypothesis suggests that individuals with ASD lack enzymes necessary to break down the carbohydrates into sugars (Siri & Lyons, 2011). This can lead to abnormal gut flora. SCD restricts the type of carbohydrates intake by allowing the person to eat foods that require minimal digestion and that can be quickly absorbed. Removing hard-to-digest foods can help with GI problems and decrease discomfort. Additionally, promoting normal gut function can lead to improvements in overall health which includes behavioral, emotional, and cognitive health (Research Autism, 2015)
Evidence for use in treating autism	No studies have investigated the efficacy of the SCD for individuals with ASD. Only anecdotal accounts suggest improvements in eye contact, language, anxiety, and self-stimulatory behavior in individuals with ASD (Gottschall, 1994)
Risks	If an individual refrains from dairy products while on SCD, calcium supplements are likely necessary for a balanced diet

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Name of diet	Specific carbohydrate diet (SCD)
Internet resources	• Scdlifestyle.com • CCFA.org • Webmd.com

Name of diet	Feingold diet
Basic description	The Feingold diet eliminates foods containing salicylates, synthetic food colors, flavors, fragrances and preservatives, and artificial sweeteners
Intended use	The Feingold diet may help individuals with salicylate and food color sensitivities
Description of illness	To help them protect against diseases and insects, plants produce a chemical called salicylate. According to Auckland Allergy Clinic (2014), some adults and children have salicylate sensitivity—when the body is unable to tolerate more than a certain amount of salicylate at a time (low tolerance to salicylate). Salicylate sensitivity depends on the individual and the type of salicylate (Edelkind, 2012)
Hypothesis behind use in individuals with autism	The Feingold diet was based on an allergy diet designed by Dr. Lockey of the Mayo Clinic. In 1965, Dr. Ben E. Feingold observed a link between certain foods and synthetic additives and their effect on children with hyperactivity and learning. In 1973, Dr. Feingold tested his hypothesis—synthetic additives and certain foods containing natural salicylate can trigger hyperactivity. Related to ASD, it has been suggested that since symptoms of ADHD are common among individuals with ASD, then this diet may improve attention and hyperactivity challenges. Additionally, a deficiency of phenol sulfur transferase (PST) is noted among individuals with ASD. Salicylates are a subgroup of phenols that are occasionally difficult for individuals with ASD to break down

Name of diet	Feingold diet
Evidence for use in treating autism	No studies have investigated the efficacy of the Feingold diet to treat ASD; only improvement in ADHD-type symptoms is suggested; however, this is anecdotal data. Related to ADHD, newer research by Nigg, Lewis, Edinger, and Falk (2012) found that removing food additives and dyes reduced ADHD symptoms in 33% of children with ADHD. Conversely, the FDA's position on "food-related behavior problems," i.e., ADHD, is that these behaviors appear to be the result of person-specific food/additive intolerance and exhibited by predisposed individuals with an unclear etiology although the etiology may involve genetic, endocrine, or immunologic pathways (Aungst, 2011)
Risks	There appear to be no medical risks for this diet however; there is the concern that reliance solely on diet limits the opportunity to receive appropriate professional help to treat ADHD
Internet resources	• FDA.org • Quackwatch.com • Reserchaustim.net • Feingold.org

Name of diet	Yeast-free diet
Basic description	The yeast-free diet can help inhibit overgrowth of yeast, called *Candida albicans*. Yeast is normally found on and in the body. It is hypothesized that yeast produces harmful toxins that affect behavioral and mental functioning of an individual with ASD. Yeast levels are measured by stool test. Medication, homeopathic remedies, and dietary changes can treat yeast overgrowth
Intended use	Yeast overgrowth

Name of diet	Yeast-free diet
Description of illness	Invasive candida can cause candidemia, a bloodstream infection, which is treated with antifungal medications. This often occurs in people with weakened immune systems. Typically, these infections are treated with medication. Although candidemia does not seem to be treated with the yeast-free diet, less severe forms of yeast overgrowth such as thrush or yeast infections can respond to this diet
Hypothesis behind use in individuals with autism	Rimland claims to have been investigating the relationship between candida and autism since 1966. The "leaky gut" hypothesis implies that controlling yeast overgrowth can help GI problems. The yeasts were hypothesized to create toxic chemicals, which can affect the developing brain/mental functioning; it can also damage the intestine, which can lead to digestive problems (Srinivasan, 2009). Moreover, yeast overgrowth can result in pain and various behavioral symptoms associated with ASD such as hyperactivity, inattention, aggression, self-stimulatory behavior, food selectivity, sensory defensiveness, and high-pitched squealing
Evidence for use in treating autism	No studies have investigated the efficacy of the yeast-free diet. Only anecdotal accounts suggest that the yeast-free diet helps with concentration and obsessive behaviors
Risks	Occasional diarrhea is reported among individuals as a reaction due to elimination of yeast from the colon. However, no severe adverse reactions are noted (Levy & Hyman, 2005)
Internet resources	• Pathfindersforautism.org
	• Lancommunity.org

Supplementation Diets

The supplementation of diets is the adding of supplements to the diet to replace verified deficiencies or in an attempt to treat hypothesized metabolic abnormalities. It is important to remember that the Food and Drug Administration (FDA) does not regulate over-the-counter supplements beyond the stipulation that supplements may not make a claim of treatment efficacy unless approved by the FDA (US Food and Drug Administration, 1995). Therefore, supplements may present risk, e.g., not containing what they claim or having impurities (Adams, 2013). The United States Pharmacopeia, a nonprofit organization that sets standards for the identity, strength, quality, and purity of medicines, food ingredients, and dietary supplements (The United States Pharmacopeial Convention, 2016), can verify dietary supplements.

Name of diet	Probiotics
Basic description	Live bacteria and yeasts that are good for the digestive system are given to normalize the gut microbiome
Intended use	Irritable bowel syndrome, inflammatory bowel disease, infectious or antibiotic-related diarrhea
Description of illness	GI problems
Hypothesis behind use in individuals with autism	"Preliminary evidence" suggests that there is an imbalance of bacteria in a subgroup of individuals with ASD (see Autism Speaks)
Evidence for use in treating autism	Some research suggests that it reduces inflammation and restores normal gut microbiota, thereby helping with GI issues. There is lack of scientific evidence on the use of probiotics among individuals with ASD
Risks	Safe for most people, may have mild side effects such as upset stomach, diarrhea, bloating. Probiotics may also cause allergic reactions. Immunocompromised individuals or individuals using antibiotics should use caution while starting probiotics (Madzhidova et al., 2015)
Internet resources	• Autismspeaks.org
	• Webmd.com
	• NCCIH.nih.gov

Name of diet	General diet supplementation
Basic description	Vitamins and minerals are necessary for health. A wide range of vitamin (A, B3, B6, B12, C, D, and E) and mineral (calcium, iron, magnesium, zinc) supplements have been hypothesized to benefit individuals with ASD. Fatty acids (omega-3) are found in the cell membrane and are essential for brain function. Dimethylglycine (DMG) is necessary for cell function
Intended se	Vitamin or mineral deficiencies and fatty acids are due to deficiency diseases, poor diet, absorption problems, or other causes
Description of illness	A description of all illnesses related to vitamin and mineral deficiencies is beyond the scope of this article. Please refer to the resources below
Hypothesis behind use with individuals with ASD	Gastrointestinal issues and food selectivity may result in nutrient deficiencies. In addition, supplements may improve epigenetic vulnerabilities including inflammation, mitochondrial dysfunction, oxidative stress, and abnormal methylation. Individuals with ASD are at increased risk for calcium deficiency. Low levels of omega-3 fatty acids are found in neurodevelopmental disorders such as ADHD, dyspraxia, and dyslexia—these conditions have similar symptomatic and biological characteristics as ASD (Kidd, 2002). Individuals with autism are at risk of deficits of omega-3 fatty acids (Lofthouse, Hendren, Hurt, Arnold, & Butter, 2012; Kidd, 2002)
Evidence for use in treating ASD	The biomedical subgroup of complementary and alternative medicine treatments for ASD reviewed the evidence for multivitamin supplementation for individuals with ASD in 2013. The quality of evidence was rated as "fair" with a daily multivitamin supplementation being recommended by the committee (Hendren, 2013). Initial pilot studies suggest that omega-3 may be beneficial in controlling symptoms of ADHD (Madzhidova et al., 2015; Lofthouse et al., 2012). However, majority of the studies did not show significant benefit of omega-3 fatty acid in treating ASD
Risks	Between 2004 and 2103, over 23,000 emergency room visits each year were related to supplements (Geller et al., 2015). In some individuals, risks related to fatty acids include mild GI discomfort, including diarrhea and nausea (Madzhidova et al., 2015). Additional scientific evidence is needed
Internet resources	NIH Office of Dietary Supplements NIH National Center for Complementary and Integrative Health Webmd.com University of Maryland Medical Center, Complementary and Alternative Medicine Guide United States Pharmacopeia (USP.org)

Considerations for Diet and Supplementation Use

Since efficacy research does not yet support a clear connection between dietary interventions and/or supplementation and the core symptoms of ASD, the most relevant use of diet and supplementation is to address comorbid symptomatology. Of the well-established comorbid symptoms, those that are related to feeding and gastrointestinal concerns are the most pertinent to a discussion of diet and/or supplementation use. Specifically, feeding and gastrointestinal (GI) function are diet-related concerns that have been documented since Kanner (1943) noted food and feeding issues in the form of food intolerance in his study group of children with ASD. More recently, Ming, Brimacombe, Chaaban, Zimmerman-Bier, and Wagner's (2008) study of 160 children with ASD found half suffered long-term food intolerance, and in 25%, the onset occurred in infancy with infant formula intolerance. Below are several important considerations that need to be acknowledged by the clinician looking to start a dietary intervention and/or supplemental addition for an individual with ASD.

Feeding Challenges

While not a core symptom of ASD, feeding challenges are common in individuals with ASD (Emond, Emmet, Steer, & Golding, 2010), often beginning in infancy (Ming et al., 2008). The etiology of feeding challenges is multifactorial including behavioral, physiological, emotional, cognitive, and medical (Vissoker, Latzer, & Gal, 2015). However, clinicians hypothesize that a core symptom of ASD, excessive adherence to routines and rituals, may foster the development of feeding challenges (Matson & Fodstad, 2009).

Feeding challenges include chewing and swallowing problems, eating-/feeding-related aggression and tantrums, food refusal, food selectivity/restricted food intake, eating too quickly, idiosyncratic eating rituals, over- or under-eating, pica, poor appetite, rumination and pocketing, spitting/eating, vomiting, and gastroesophageal reflux, with food selectivity being the most common (Bandini et al., 2010; Beighley, Matson, Rieske, & Adams, 2013; Schreck, Williams, & Smith, 2004; Vissoker et al., 2015). Research evidence suggests food refusal may be associated with texture (Hubbard, Anderson, Curtin, Must, & Bandini, 2014; Johnson, Handen, Mayer-Costa, & Sacco, 2008), which may, in turn, be related to sensory sensitivity in this population (Cermak, Curtin, & Bandini, 2010, 2014). There are also reported differences in the types of food individuals with ASD consume, such as fewer vegetables (Bandini et al., 2010; Johnson et al., 2008) and less dairy (Herndon, DiGuiseppi, Johnson, Leiferman, & Reynolds, 2008). Children with ASD are often reported to prefer starches, often called a "beige diet." Gorrindo et al.'s (2012) study of the eating habits of children with ASD found that more than 25% of all calories consumed were starchy foods, followed by dairy and sweets, with nuts, eggs, and fish rarely eaten. Many individuals with ASD have difficulties with food selectivity and an insistence on sameness that often includes dietary preference. When this happens, the individual suffers from limited nutritional intake, which may lead to a lack of fiber, fluids, or other nutrients (Kuddo & Nelson, 2003). However, despite a potentially more restricted food repertoire, research has not established significant differences in nutrient intake between individuals with ASD and typically developing individuals (Herndon et al., 2008; Hyman et al., 2012; Johnson et al., 2008) with the exception of protein and calcium (Sharp et al., 2013). A debilitating cycle may ensue for some individuals with feeding challenges leading to poor nutrition, which in turn impacts GI functioning, resulting in physical discomfort exacerbating all challenging behaviors including ASD symptoms (Mannion & Leader, 2014).

The *Diagnostic and Statistical Manual of Mental Disorders* (5th ed.; *DSM-5*; American Psychiatric Association, 2013) section on eating disorders comprises feeding disorders common in ASD including pica, rumination disorder, and avoidant/restrictive food intake disorder (AFRID). Hospitalizations for pica increased 93% between 1999 and 2009, with 31% occurring in children with ASD in 2009 (Zhao & Encinosa, 2011). Rumination disorders are more common in individuals with neurodevelopmental disorders where it may be a form of self-soothing or stimulation (American Psychiatric Association, 2013). Avoidant/restrictive food intake disorder, new to DSM-5, is diagnosed when the avoidant or restrictive eating leads to malnutrition and requires intervention.

Gastrointestinal Symptomatology

Special attention should be made to identify GI symptomatology given the high prevalence of comorbid GI symptoms found in individuals with ASD (Bauman, 2010). Unfortunately, clinicians treating ASD are not typically looking for GI symptomatology, and clinical practice guidelines do not routinely consider the potential impact of GI symptomatology on the ASD presentation (Buie et al., 2010). When the clinician does begin to assess for GI symptoms, arriving at a diagnosis is complex as there are no reliable signs or symptoms that can consistently aid the clinician to distinguish between functional and structural disorders (Bauman, 2010). The important difference here is that structural disorders are seen at a cellular level and cause physical changes that more easily facilitate diagnosis, whereas the functional symptoms manifest as subjective symptoms, i.e., the more-challenging-to-identify type that relies on effective communication. Research to improve the diagnosis of GI disorders is complicated since the majority of research participants are children who generally present with functional or subjective symptoms, rather than the more-easily-identified structural symptoms (Gorrindo et al., 2012). Researchers agree that subjective symptoms are particularly susceptible to under-identification or misidentification due to the lack of effective communication (Bauman, 2010; Buie et al., 2010). Clinicians have noted that even in those who can verbally communicate, there is still the challenge of sensory processing which impairs the ability to describe the subjective experience, e.g., symptoms of pain and accurate localization of discomfort (Baron-Cohen, 1991). Thus, the clinician focusing attention on GI symptomatology will be met with systemic and diagnostic challenges.

Atypical GI presentation and diagnostic overshadowing are other considerations for the clinician. Several researchers warn that atypical behavioral manifestations of GI symptomatology are common in individuals with ASD (Buie et al., 2010; Mannion & Leader, 2014). For example, GI disorders can present as non-GI dysfunction such as sleep problems or challenging behavior (Buie et al., 2010). Further, comorbid symptoms may be overshadowed when challenging behaviors are prominent (Reiss, Levitan, & Szyszko, 1982). Buie (2005) explains how atypical GI presentation and diagnostic overshadowing might obfuscate diagnosis. The behavioral manifestations that may be ascribed to ASD may actually be an atypical behavioral manifestation of GI symptomatology. As an example, Buie describes that body movements or mannerisms, observed in ASD, which are suggestive of a seizure or stereotypy, may be due to comorbid medical conditions, such as gastroesophageal reflux disease. When behavioral manifestations such as chest tapping, facial grimacing, intermittent gulping, chewing on nonedible objects, constant eating or drinking, applying pressure to the abdomen, aggression, self-injurious behaviors, and sleep disturbances occur, the clinician may consider that the individual with ASD may be attempting to cope with physical discomfort by these behavioral manifestations (Buie et al., 2010). The risk is that these overt physical gestures such as pointing, rubbing, and/or tapping an affected area, such as the belly, may be considered part of the ASD presentation and overlooked as a possible form of communicating a specific location of pain or general discomfort. For instance, when individuals present with vocal stereotypy or repetitive behavior, this behavior could be incorrectly attributed to being a symptom of ASD and not a comorbid GI symptom (Mannion & Leader, 2014). Overall, the clinician will have to be conscious of these sources of risk for misattribution of overt behavioral manifestations.

Communicating GI Distress

Researchers, like Matson and colleagues, have shown a variety of comorbidities that exacerbate symptoms of ASD (Matson et al., 2011; Matson, Boisjoli, & Mahan, 2009; Matson & Rivet, 2008). Their work indicates a need for identifying and correctly diagnosing comorbid disorders. Identification and diagnosis are made challenging by several factors; however, communicating challenges may be the most significant as many as half of those with ASD use nonverbal methods of communication (Leyfer et al., 2006). Often pain, discomfort, and/or inconvenience persists when limited verbal and nonverbal communication impedes diagnosis. Even individuals with adequate communication are still vulnerable as some may lack a theory of mind, which may limit communication of mental states and experiences (Baron-Cohen, 1991). Here, communication deficits compound the distress of GI symptoms by limiting the ability to communicate discomfort. Bauman offers that identifying and managing comorbidities will result in an improved quality of life and sense of well-being by allowing for more effective participation in educational and therapeutic programs. Mannion and Leader (2014) suggest that identification of comorbidities sets the stage for educational and therapeutic programs by teaching functional communication such as communicating pain awareness and localization. While communication deficits have a significant impact on diagnosis and treatment of GI distress, teaching functional communication skills for distress will also have a considerable impact on the individual with ASD.

GI Symptomatology and ASD Severity

Several researchers have indicated that GI dysfunction may aggravate the presentation of ASD symptomology. Wang, Tancredi, and Thomas (2011) report a positive correlation between GI symptom severity and autism severity in their research group of North American children with ASD. Peters et al. (2014) found a specific relationship between compulsive behavior and the GI symptoms of constipation and diarrhea or soiling for children with ASD. Chaidez et al. (2014) found a specific relationship with levels of irritability, social withdrawal, stereotypy, and hyperactivity and the GI symptoms of constipation, diarrhea, abdominal pain, and gaseousness for children with ASD. Chaidez et al. also found a specific relationship with irritability, social withdrawal, and stereotypy and the GI symptoms of painful stool passing, sensitivity to food, and difficulty swallowing. Maenner et al. (2012) found a positive relationship of what might be considered associated features of ASD, e.g., argumentative, oppositional, or destructive behaviors and GI dysfunction. Mannion and Leader (2014) have noted that comorbid GI dysfunction can increase challenging behaviors. Other ASD researchers have suggested that GI pain may increase levels of escape-maintained challenging behavior, e.g., tantrum behavior (Buie et al., 2010; Mulloy et al., 2010). However, several researchers have not found the same relationship in their research populations (Chandler et al., 2013; Mazefsky, Schreiber, Olino, & Minshew, 2014; Molloy & Manning-Courtney, 2003; Nikolov et al., 2009). Wang et al. (2011)suggest several reasons for this variability, including variability in the ASD symptomatology of participants, use of control groups, differing data sources, and variability in the definitions of GI symptoms. The presence of GI symptomatology and its impact on ASD severity are not fully understood; however, the variability of reported research findings stresses the need for future research.

ASD Comorbidities Impacted by GI Dysfunction

As mentioned above, GI symptoms are relevant to ASD; these physical symptoms have the potential to exacerbate symptomology and the potential to interfere with interventions (Mannion & Leader, 2014). Significant bodies of research offer evidence that the below comorbid ASD conditions may also be related to GI dysfunction: psychopathology, sleep disturbance, constipation, and language skills.

Comorbid Psychopathology

A positive link has been made between ASD, comorbid psychopathology, and GI symptomatology by several researchers. Mazurek et al. (2013) found that children with ASD and GI symptoms had significantly higher rates of anxiety on the Child Behavior Checklist (CBCL; Achenbach & Rescorla, 2001); in addition they also had higher sensory-over-responsivity scores on the Short Sensory Profile (Dunn, 1999). Mazefsky et al. (2014) found significantly higher levels of affective problems for children with ASD and no intellectual disability who also had GI dysfunction on the CBCL. Nikolov et al. (2009) found that children with GI problems showed greater irritability and social withdrawal on the Aberrant Behavior Checklist (Aman, Singh, Stewart, & Field, 1985) and greater anxiety on a scale modified by Sukhodolsky et al. (2008). Williams, Christofi, Clemmons, Rosenberg, and Fuchs (2012) found greater anxiety in their sample of children with both chronic GI symptoms and ASD. They also suggested a positive link between ASD, comorbid psychopathology, and GI symptomatology and found that as age increases so do symptoms of psychopathology. They examined CBCLs completed by parents and found that the young children, ages 1–5, with ASD and GI symptoms had higher rates of emotional reactivity, anxious/depressed mood, somatic complaints, internalizing problems, affective problems, and anxiety problems. The older, school-aged children, ages 6–18, in this study had the highest scores on all CBCL subscales and higher total scores on the CBCL. Mannion and Leader (2013) found similar results in their study of GI symptoms in children with ASD. They report that the total number of GI symptoms also predicted total scores on the Autism Spectrum Disorder-Comorbid for Children (Matson & Gonzalez, 2007). They found three predictive associations: abdominal pain and constipation predicted conduct behavior, diarrhea predicted tantrum behavior, and nausea predicted worry/depressed behavior, avoidant behavior, and conduct behavior (Mannion & Leader, 2013).

Sleep Disorders

Sleep disorders are common among individuals with ASD. Buie et al. (2010) suggest that a possible cause of nighttime awakenings may be a gastrointestinal disorder, such as gastroesophageal reflux disease. For individuals with ASD, sleep problems are predictive of gastrointestinal symptoms (Williams, Fuchs, Furuta, Marcon, & Coury, 2010). Individuals with GI dysfunction commonly experience increased night awakening and pain (Ming et al., 2008). Mannion and Leader (2013) found that breathing-related sleep disorders and daytime sleepiness predicted both abdominal pain and bloating. In addition, under-eating, avoidant behavior, and GI symptoms predicted sleep problems, abdominal pain predicted sleep anxiety, and under-eating, avoidant behavior, constipation, diarrhea, nausea, abdominal pain, and bloating predicted parasomnias and daytime sleepiness. In Mannion and Leader's (2013) participant group, sleep problems occurred in 92.3% of those with nausea, 91.1% of those with abdominal pain, 90.9% of those with bloating, 90% of those with diarrhea, and 83.7% of those with constipation. Johnson, Giannotti, and Cortesi (2009) recommended that all children with ASD be screened for potential sleep disturbances.

Constipation

Constipation is a frequent challenge for individuals who have poor nutrition and hydration. A recent meta-analysis by McElhanon et al. (2014) found that constipation was three times more likely for individuals with ASD than their peers. Gorrindo et al. (2012) found that constipation was associated with younger age, increased social impairment, and limited expressive language. Expert consensus guidelines for individuals with ASD and GI dysfunction specify the need for medical professionals to evaluate their patients for latent constipation and to consider empiric treatment of constipation for individuals who are nonverbal (Buie et al., 2010). In a notable study comparing parental reports of GI dysfunction relative to those by pediatric gastroenterologists, constipation was the most frequently occurring GI symptom at 85% (Gorrindo et al., 2012). An added finding was that parents tend to be poor at discriminating symptom variability, which prompted these researchers to recommend the expertise of a gastroenterologist to accurately identify GI dysfunction and determine the nature of the GI disorder. Practitioners should also help to evaluate parent-child communication about toileting needs to find the extent that limited expressive language contributes to constipation by thwarting appropriate toileting skills (Gorrindo et al., 2012).

Language Skills

Several popular culture sources report that lost expressive language skills have been restored by dietary changes. However, empirical evidence has not yet made this connection clear. Early research by Valicenti-McDermott, McVicar, Cohen, Wershil, and Shinnar (2008) reported an association with language regression, a family history of autoimmune disease, and gastrointestinal symptoms. Valicenti-McDermott's team found that children with ASD who presented with abnormal stool patterns reported more frequent language regression. More recently, Gorrindo et al. (2012) reported a novel finding; they showed that a large portion of children with comorbid GI dysfunction and ASD lacked expressive language. However, several other researchers have studied this relationship and have not found evidence for a correlation with GI disorders and loss of language (Baird et al., 2008; Chandler et al., 2013; Hansen et al., 2008; Molloy & Manning-Courtney, 2003; Niehus & Lord, 2006). While these findings are mixed, there appears to be utility in considering language skill as vulnerable to GI disorders, although further research will need to clarify the relationship with language skills, ASD, and GI disorders.

Support for Those Considering Diet and Supplementation Intervention

Families' use of dietary and supplementation intervention is driving professionals to apply scientific rigor to evaluate the efficacy of these interventions for the treatment of ASD. However, an exact course is premature as current scientific evidence supports multiple pathways leading to the disorder. Given the diversity it follows that effective intervention needs to be person specific and formulated by assessment to maximize the benefit. Therefore, the clinicians will need to understand the complex behavioral and physiological issues common in individuals with ASD. Below is a discussion of factors relevant to supporting those considering a diet and/or supplement intervention; the need for assessment, the need to scrutinize therapeutic claims, and the need to appreciate that families will seek to use these types of interventions.

Gastrointestinal: Medical Assessment

Evidence does not now support elimination or supplementation diets for ASD in the absence of specific comorbid conditions; therefore, comorbid conditions need to be identified. A vast list of possible comorbid GI conditions and symptoms that have been studied includes abdominal pain, abdominal bloating, abnormal stool pattern, bloody stools, celiac disease, colitis, constipation, Crohn's disease, diarrhea, encopresis, feeding issues, frequent vomiting, food allergy, food intolerance, food regurgitation, food selectivity, foul-smelling stools, gaseousness, gastritis, GERD, esophagitis, inflammatory bowel disease, mouth ulcers, and weight loss (Buie, 2005; Chandler et al., 2013; Wang et al., 2011). Expert consensus (Buie et al., 2010) recommends the following approach to assessing GI disorders: medical history and physical examination; anal examination; assessment of the back and spine; analysis of a stool specimen including an assessment for parasites, enteric pathogens, stool guaiac, electrolytes/osmolarity, and serum electrolytes; liver function tests; assessment of nutritional status; and abdominal roentgenogram to assess bowel gas pattern and the possible retention of stool. Navigating the challenges posed by identifying these conditions may require the integration of the family. Families may help with this assessment by observing eating behavior, food intake, and physical and behavioral responses to food closely while keeping meticulous records.

Gastrointestinal: Indirect Assessment

Given the challenges of assessing subjective experience in individuals with ASD, an indirect assessment can provide reliable and valid information. Unlike direct and experimental assessment, indirect assessment uses a structured interview to gather information from parents or caregivers. Indirect assessments may be particularly helpful for diagnosing functional disorders, those without biological markers, especially where the use of other types of tests and procedures has high cost and low diagnostic yield (Dhroove, Chogle, & Saps, 2010). A commonly used indirect assessment measure used by gastroenterologists is the ROME protocol. Since 1994, the Rome Foundation has classified functional gastrointestinal disorders. The fourth generation of this classification system, the Rome IV criteria, was released in 2016. Clinicians using the Rome IV, or any other indirect assessment, should be aware that parents of children with ASD tend not to overreport GI dysfunction and in fact are at risk for underreporting symptomatology (Gorrindo et al., 2012). This caution also highlights the clinical necessity of screening for GI disorders with thorough but concrete interview questions to ensure that terminologies and concepts discussed mean the same thing to both the clinician and the informant.

Identifying/Evaluating Therapeutic Options

The sheer number of sources offering hope for symptom relief with diet and supplementation is daunting. To navigate the identification and evaluation process of these sources, families will need well-informed clinicians who apply scientific principles to the proposed dietary intervention and advise on the risk to benefit ratio. Tuzikow and Holburn (2011) offer these basic questions for considering an intervention's scientific merit: (1) Is the intervention approach based on the scientific process and with a valid analysis?, (2) Does it have replication that can be found in peer-reviewed journals?, and (3) Is it built upon other bodies of knowledge? Myers and Johnson (2007) offer that the ideal evidence for supporting or refuting an intervention should include the following: peer-reviewed research with appropriately diagnosed, well-defined homogeneous study populations; randomized, double-blind, placebo-controlled design; adequate sample size to support the statistical analysis presented; use of appropriate, validated outcome measures; and control for confounding factors, such as the placebo effect and the natural history of the disorder. Of the standards that support scientific merit, replicability is the hallmark characteristic of valid scientific effort. Poor experimental integrity, including a lack of proper control groups or procedural control, hampers replicability rendering research too vague for others to reproduce reliable findings with significance. Ethically, the scientific process must be based on sound experimental design that has withstood the scrutiny of an institutional review board. Institutional review board approval is a key ethical standard here and is always a part of sound experimental design, especially research involving vulnerable populations such as children. Given the technical sophistication of these standards, perhaps the rule of thumb for clinicians and families to rely when identifying/evaluating dietary interventions is determining if research findings to support the intervention are endorsed by a jury of peers and put forth for community review in professional journals and conferences.

Factors for a Risk/Benefit Analysis

Questions of safety and efficacy are the primary concern. Clinicians can help in analyzing the benefit to risks ratio by considering a 2 × 2 square with safety and efficacy at the top and unsafe and ineffective at the side. An intervention that is both safe and effective is ideal, and, of course, interventions that are neither safe nor effective should be discouraged. For an intervention that is considered risky but effective, it should be either discouraged or monitored closely. Monitoring the response to the intervention should be dedicated to safety concerns. In the case where the intervention is safe but ineffective and has the families' interest presents a need for its own analysis. The decision to tolerate this intervention or not is based on secondary concerns such as time, money, effort, and hope. If the cost of these secondary concerns is minimal, then Cohen (2002) recommends the practitioner to tolerate the use. For a more thorough analysis, Cohen recommends considering the severity and acuteness of illness, the likely outcome with conventional care, the degree of invasiveness, the toxicities and adverse effects of conventional treatment, the quality of evidence for efficacy and safety of the intervention, and the family's understanding of the risks and benefits of the intervention, voluntary acceptance of those risks, and the family's ability to implement the intervention with fidelity. In addition, the clinician needs to honor the basic principles of biomedical ethics: (1) respect for the individual's autonomy, (2) beneficence, (3) nonmaleficence, and (4) justice, i.e., fairness in providing access to essential care (Cohen, 2002).

Federal Resources

Several federal resources are available to help evaluate scientific merit. Of those most related to dietary and nutritional information, the Food and Drug Administration (FDA) and the National Center for Complementary and Integrative Health (NCCIH) will provide the best source of information related to dietary interventions for ASD. Where the FDA regulates and monitors foods and drugs that have a potential for harm, the NCCIH is responsible for researching and commenting on products and practices that are not generally considered part of conventional medicine, e.g., dietary interventions. Commonly the research findings of the NCCIH will prompt the FDA to take regulatory action. The NCCIH recognizes that the public has ready access to enormous amounts of complementary and integrative health information; however, most of this information is incomplete, misleading, inaccurate, or based on scientifically unproven claims (Ernst, 2012). Therefore, the NCCIH mission "is to define, through rigorous scientific investigation, the usefulness and safety of complementary and integrative health interventions and their roles in improving health and health care" (Ernst, 2012). For the clinician providing support to families, reliable dietary and nutritional information may be obtained from the FDA and the NCCIH.

Definition of Complementary and Integrative Health

The NCCIH defines complementary and integrative health approaches (CIHA) as "a group of diverse medical and health care interventions, practices, products, or disciplines that are not generally considered part of conventional medicine" (Ernst, 2012). Of note is the change in ideology away from the use of "alternative." The NCCIH (2015) differentiates complementary from alternative in these ways: "complementary" is a coordinated use of nonmainstream practice along with conventional medicine, and "alternative" is when a nonmainstream practice is used in place of conventional medicine. The NCCIH adds that true alternative medicine is uncommon, most people use nonmainstream approaches along with conventional treatments. Further, it considers "integrative" health care as the coordinated use of conventional and complementary approaches together. The use of the term "complementary health approaches" describes practices and products of nonmainstream origin, whereas the use of "integrative health" describes the incorporation of complementary and mainstream approaches. Levy and Hyman (2005) offer that complementary and integrative interventions used with ASDs can be further categorized as "biological" or "nonbiological." Nonbiological interventions include treatments such as auditory integration training, animal-assisted therapy, or music therapy. Biological interventions include diets and supplementation. The NCCIH defines biologically based practices to include the use of botanicals, animal-derived extracts, vitamins, minerals, fatty acids, amino acids, proteins, prebiotics and probiotics, diets, and functional foods (Ernst, 2012).

Talking with Families

Health care practitioners who work with families and individuals with ASD should recognize that many of their patients will use nonstandard therapies (NCCIH, 2016). Myers and Johnson (2007) point out that these families are willing to pursue any interventions believed to present some hope of helping their child, and this is especially true if the therapies are considered to be safe, e.g., touted as natural. As noted in the previous tables, natural substances are not without risk. In addition, nonstandard interventions which are often unsubstantiated and ineffective (Ernst, 2012) also compete with validated treatments and may lead to physical, emotional, or financial harm due to depleting time, effort, and financial resources (Myers & Johnson, 2007). Below is a dissection of the clinicians and families' role in the evaluation of CIHA.

Clinicians' Role

The American Academy of Pediatrics Committee on Children With Disabilities points out the responsibility of the practitioner to (1) become knowledgeable about CIHA, (2) be able to evaluate the scientific merits of interventions, (3) be able to identify risks or potential harmful effects of treatment approaches, (4) to provide balanced information and advice about treatment options, (5) to educate families on the evaluation of the scientific merit of information about treatment, (6) to avoid dismissal of CIHA in ways that convey a lack of sensitivity or concern, (7) to recognize feeling threatened and guard against becoming defensive, (8) to offer assistance in monitoring and evaluating the CIHA, and (9) to actively listen to the family and continue to work with families even if there is disagreement about treatment choices (Sandler et al., 2001). Kemper, Vohra, and Walls (2008) suggest that pediatricians ask parents about all interventions used because families often do not volunteer information about CIHA. Inquiry will help the pediatrician assist the family in correctly identifying the etiology of improvements or adverse effects that may arise. Questioning should include asking if a patient is using any vitamins, herbs, supplements, teas, home remedies, special foods, or diets. Overall, health care practitioners are in the best position to help families in distinguishing empirically validated treatment approaches from unproven treatments and to identify those that have been proven to be ineffective and potentially harmful.

Families Role

The NCCIH (2016) recognizes that despite the support of efficacy studies, special diets may help some people with ASD but follows with the caveat that nutritional well-being needs to be carefully monitored before and while on the diet. The NCCIH urges families to consult their medical practitioner before implementing interventions, as some complementary and integrative approaches have not been studied in children because children were excluded from older research studies. Exclusion was due to special protections mandated for research involving children. However, this has changed with new requirements from the NIH to include children in all studies unless scientific and ethical reasons prevent inclusion (Ernst, 2012). Additionally, the NCCIH stresses to families the importance of talking to the health care practitioner for assessing what, if any, complementary approach would help since there is very little high-quality research on CIHA for ASD (NCCIH, 2016).

Dealing with "Scientific Breakthrough"

Families are vulnerable to any number of fad intervention claims. The "scientific breakthrough" claim is especially alluring as it presents as something new and sounds like valid science promising life change with this breakthrough. However, caution is advised before implementing interventions based on "scientific evidence" that circumvents the full scientific validation process mentioned above. Stanovich (1985) responds wisely to these claims of sudden breakthroughs. He explains that science tends to move slowly and that very few times have we seen great leaps in any field of science. He posits that problems in science are not solved with a single experiment, even one that completely decides the issue and overturns all previous knowledge. Specifically, new theories must connect to previously established empirical fact, building on it with new facts while accounting for the previously held facts. As this is occurring, scientists review and replicate findings until a critical mass of support is achieved. In other words, the preponderance of the evidence supports one theory over any other theory and allows no theory to be beyond challenge.

Nickel (1996) offers several "red flags" of caution for the clinician to share with families to help guard against unfounded therapeutic claims. The practitioners can advise families to seek additional information when they encounter the following: (1) treatments that are based on overly simplified scientific theories; (2) therapies that are claimed to be effective for multiple, different, and unrelated conditions or symptoms; (3) claims that individuals will respond dramatically and some will be cured; (4) use of case reports or anecdotal data rather than carefully designed studies to support claims for treatment; (5) lack of peer-reviewed references or denial of the need for controlled studies; and (6) treatments that are said to have no potential or reported adverse effects (Nickel, 1996).

Dealing with the "Too Good To Be True"

Clinicians will likely deal with the too-good-to-be-true therapeutic claim, a claim that persists as viable despite reasonable evidence to the contrary. One reason that these claims persist is the urge to provide symptom relief. Decisions for therapeutic intervention often rest on surrogate decision-makers; mostly these people are acting on behalf of a person identified as a loved one. It may be the need to "do something" to provide symptom relief for a loved one that stimulates hope in the too-good-to-be-true therapeutic claim.

Another reason that too-good-to-be-true therapeutic claims may persist is flawed thinking. Stanovich (2009) hypothesizes a thinking flaw that may account for the tendency toward irrational thinking and action despite having adequate intelligence called "dysrationalia." This thinking flaw occurs when thinking is made vulnerable by two processes, "the cognitive miser" and "mindware problems." The cognitive miser tendency is taking the easy way out when trying to solve problems by using quick and minimal cognition and is vulnerable to overgeneralizing, under thinking, and abandoning effortful cogitation early. Our cognitive miser does not seek to identify variables that may account for a correlational relationship. Our cognitive miser may be duped by faulty "person-who-evidence" logic. This is a tendency to think "that can't [/can] be true, because I know a person who …" leading one to discount all other variables or evidence (Stanovich, 1985). Stanovich's concept of "mindware" is a term used to describe needed cognitive tools such as specific knowledge, rules, and strategies used to think rationally. "Mindware problems" arise when these tools are not available or are faulty and prevent the rational evaluation of information. Flawed thinking is present when things that are too good to be true are not dismissed or, worse, invested in heavily.

Clinicians are tasked with helping identify and dismantle vulnerabilities that prevent the dismissal of too-good-to-be-true therapeutic claims (Tuzikow & Holburn, 2011). Avoiding the cognitive miser tendency can be done by calling attention to overgeneralizing, under thinking, and tiring of effortful cognition. Overcoming the mindware problem includes addressing two areas Stanovich calls "mindware gaps" and "mindware contamination." The gaps are the absences of strategies or tools for rational decision-making. The contamination is having bad tools or information. Mindware contamination is the most relevant to too-good-to-be-true therapeutic claims. It is based on four beliefs: beliefs that are not based on evidence, beliefs that are attractive and hopeful, beliefs that are easily spread to others, and beliefs that are potentially harmful (Stanovich, 2009). Particularly relevant to evaluating too-good-to-be-true therapeutic claims is that this type of cognitive error spreads easily when it promises a benefit to the user. An additional caveat offered by Stanovich is that intelligence does not protect us from contaminated mindware and inimically greater intelligence may increase the use of rationalization to support beliefs. In general, the clinician may have the best outcome to addressing too-good-to-be-true therapeutic claims by recognizing beliefs that are not based on evidence and potentially harmful.

Sites to See: Useful Resources

In addition to the resources identified above, there are several well-established government resources with helpful information to consider when choosing an intervention. The primary resource for CIHA is the National Center for Complementary and Integrative Health, which currently has publications related to ASD treatments in addition to herbs and supplement efficacy (e.g., see publication titled *7 Things To Know About Complementary Health Approaches for ASD* or publication title *Herbs at a Glance*). The FDA provides additional information on herb and supplement safety (e.g., see publication titled *Tips for Dietary Supplement Users*). The US National Library of Medicine offers health-related information via MedlinePlus including information on herbs and supplement, food and nutrition, and health education materials. The USDA provides information that is helpful in designing a healthy diet at ChooseMyPlate.gov. Information on the current federally funded research and how to participate in ongoing studies is available at ClinicalTrials.gov. In addition to government resources, there are several examples of well-established private resources. For example, the American Academy of Pediatrics is a professional organization that offers resources for both the professionals and families. A resource for efficacy and safety is Quackwatch.com. Launched in 1996 and administrated by Stephen Barrett, MD., this website hosts an international network whose focus is on consumer protection, medical ethics, and scientific skepticism. This site offers evidence-based information to consider when evaluating interventions. An affiliate resource is the National Council Against Health Fraud, which offers weekly updates of reliable health summaries including scientific reports, legislative developments, enforcement actions, related news items, website evaluations, recommended and non-recommended books, research tips, and other information relevant to consumer protection and consumer decision-making (Barrett & London, 2016).

On the Horizon: The Microbiome-Gut Brain Axis

Definition

The complex interrelationship between the digestive and nervous systems has been the subject of scientific inquiry for centuries. In fact, Ivan Pavlov spoke of the functional interdependence of the nervous and digestive systems at his 1904 Nobel lecture:

> Precise knowledge of what happens to the food entering the organism must be the subject of ideal physiology, the physiology of the future. Present-day physiology can but engage in the continuous accumulation of material for the achievement of this distant aim. … It is clear to all that the animal organism is a highly complex system consisting of an almost infinite series of parts connected both with one another and, as a total complex, with the surrounding world, with which it is in a state of equilibrium. The equilibrium of this system, as of any other system, is a condition for its existence. (Pavlov, 1904)

Pavlov understood that technology would allow the discoveries of the future. He foreshadowed the discovery of intricate biochemical webs we now call the microbiome-gut-brain axis (Cryan, 2011).

Historically, Banks used “gut-brain axis” in 1980 to describe the relationship of the gut [duodenal] hormone, cholecystokinin, plasma, and cerebrospinal fluid (Banks, 1980). The gut-brain axis currently refers to the bidirectional signaling between the gut and brain via neural and humoral mechanisms (Bercik, Collins, & Verdu, 2012). The neural components include the vagal, spinal, and sympathetic nerves as well as the enteric nervous system (ENS). The ENS is the nervous system of the gut, responsible for intestinal motility, hormone secretion, blood flow, and mucosal fluid exchange (Sassellia, Vassilis, & Burns, 2012). The humoral components include hormones, neuropeptides, and cytokines. Humoral components are also produced by the gut microbiota (Bercik et al., 2012). The gut microbiome is the genetic encoding of the microbiota of the gut. The microbiota of the human body includes bacteria, viruses, eukaryotes, and archaea that far outnumber our own cells (Clemente, Ursell, Wegener Parfrey, & Knight, 2012).

The microbiota of the gut are critical to our health. These symbiotes promote absorption, immunological maturation and health, and even cognition in ways we are only beginning to understand (Cryan, 2011; Heijtz et al., 2011). Compounds may be activated or inactivated by the gut microbiota. Dysbiosis, an imbalance or disruption of healthy gut microbiota, has been linked to physical and mental disease states (Carding, 2015). A healthy gut may be upset by diet, infection, stress, environmental toxins, and other factors (Clemente et al., 2012).

The M-G-B Axis and ASD

The high prevalence of gastrointestinal symptoms in individuals with ASD is well documented, but the etiology of these symptoms is less clear (McElhanon et al., 2014). Early hypotheses citing issues such as a "leaky" gut, gut opioid production, and yeast overgrowth of the intestine, while possibly true in some individuals, have not withstood scientific analysis as a hallmark of ASD. New research focuses on the quadrillions of bacteria that populate the human digestive tract. New technologies have allowed the analysis of gut bacteria at a genetic level in a fraction of the time required for growing bacteria in a petri dish. Exactly what constitutes a healthy gut has not been fully defined, but common patterns are emerging. These patterns, or ratios of bacterial types, are called "enterotypes" (Arumugam et al., 2011). The study of enterotypes common in individuals with ASD has revealed bacterial ratios that do not fit common patterns (Benach, 2012; Krajmalnik-Brown, 2015). Hsiao (2014) suggests the gut-brain axis explains the contribution of such GI abnormalities to the clinical manifestations of ASD-associated symptoms as well as immune dysregulation and metabolic dysfunction. While this exciting research has renewed interest in nutrition, probiotics, fermentation, and other special diets, the current state of our knowledge does not allow interventions tailored to the needs of the individual. Promises to cure ASD by eliminating dysbiosis or normalizing the enterotype are premature.

Conclusion

It is inevitable that parents of children diagnosed with ASD will use the available treatments to help alleviate their child's suffering. Easy access to blogs, forums, medical research, and websites may seem to contain answers, but the data regarding dietary interventions is often anecdotal and insufficient to support efficacy. Our understanding of the vital impact that food has on physical and mental health is increasing at a rapid rate. Technological advances are allowing genetic and physiologic study of the effects of food, including supplementation and restriction diets, on individuals with ASD as well as almost instantaneous communication of study results. This communication often comes in sound bites promising cures, demanding that it must be approached with a critical eye. What study results mean for the individual with ASD is a complex question, but it remains clear that diet does not cure autism. Sound treatment decisions require behavioral assessment of feeding behaviors, dietary assessment, and the identification of comorbid medical conditions, especially gastrointestinal disorders, for an individualized approach. Dietary interventions should be based on peer-reviewed, replicated studies and include a careful analysis of potential risks and benefits for the individual. The expected benefits should be measureable. The response to dietary interventions should be monitored to document efficacy and prevent harm. Most important, the clinician should be well informed.

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The TEACCH Program for People with Autism: Elements, Outcomes, and Comparison with Competing Models

23

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Treatment and education of autistic-related communication-handicapped children (TEACCH) is a family-centered lifelong approach to education for people with autism spectrum disorder. The specific services provided by TEACCH practitioners depend on the needs of the family and may include assessment and diagnosis, intervention, community integration, employment, and supported living (Lord, Bristol, & Schopler, 1993). A common feature in all TEACCH services is the focus on utilizing the strengths and abilities of the client, with its proponents placing an emphasis on TEACCH's flexibility and person-centered approach (Siegel, 2008).

TEACCH has been used to support children, adolescents, and adults with autism for over 50 years, and it is widely recognized and implemented throughout the world (see, e.g., two special issues of the *International Journal of Mental Health* published in 2000 for a global overview of TEACCH services). A multinational Internet survey completed by parents of children with autism found that over 30 % of parents were currently using, or had used, a program based upon the TEACCH model (Green et al., 2006). TEACCH is also used extensively in public schools around the world (Hess, Morrier, Heflin, & Ivey, 2008) and is a funded public health program in North Carolina.

Historical Development

The development of TEACCH began in the 1960s when professionals were viewing autism as a mental disorder caused by emotionally frigid mothers and largely absent fathers. A young graduate student, Eric Schopler, came to believe that this view was misguided and detrimental to children and families (Schopler, 1971). In his doctoral work, Schopler sought to demonstrate that autism was not an emotional illness caused by parenting styles but a disorder that affected the processing of sensory information (Schopler, 1965, 1966). These studies were followed by research into the perceptual differences in children with autism (Reichler & Schopler, 1971) and their tendency to respond better when learning skills in structured rather than unstructured sessions (Schopler, Brehm, Kinsbourne, & Reichler, 1971). Schopler and colleagues concluded that people with autism were much better visual leaners than auditory learners and that they benefited from structured learning environments.

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These findings, in conjunction with a change in professionals' attitudes toward the parental influence in the etiology of autism, laid the groundwork for the development of TEACCH (Mesibov, Shea, & Schopler, 2005).

The early years, of what was to become TEACCH, were somewhat revolutionary in terms of autism treatment. Schopler and child psychiatrist Robert Reichler interacted directly with the children working with their parents as co-therapists, rather than treating the parents as the cause of the problem. Children and parents were observed interacting, and therapists were involved to support and model intervention techniques that were practical. As these early clients aged, the developers extended TEACCH to include adolescent and adult services (Mesibov et al., 2005).

Today the TEACCH model is no longer just for children and their parents; it offers programs for individuals with autism across the life span. For example, Van Bourgondien, Reichler, and Schopler (2003) investigated the use of the TEACCH program in a residential program for adults with autism; Orellana, Martinez-Sanchis, and Silvestre (2014) used a TEACCH-based approach to increase compliance among clients during a dental assessment; and Fischer-Terworth and Probst (2011) incorporated TEACCH elements into a treatment program for people with dementia, to mention a few notable examples. As TEACCH has evolved over the last half century to meet the needs of its clients, the content of TEACCH programs has also evolved. Yet, TEACCH family-centered philosophy has remained unaltered.

The TEACCH Philosophy

TEACCH developers recognized that, despite the variability among people who share the diagnostic label of autism, there were also many similarities. For them, autism involved lifelong challenges in perception, communication, and learning. Interventions should help to balance the unique characteristics of the person with autism and the social conventions of the wider community and culture. They coined the term *culture of autism* as a way of thinking about the characteristic patterns of behavior seen in individuals with autism and used this concept as the basis for interventions leading to the long-term goal of community participation (Mesibov et al., 2005).

The notion of culture of autism emphasizes the preference toward processing visual information; strong attention to detail and limited general attention; difficulty with organizing ideas, material, or activities; limited communication; attachment to routines; restricted interests; and marked sensory preferences and dislikes. The goal for the TEACCH practitioner is then to support parents, educators, and others who work with persons with autism to see the world though their eyes. Those working with the person aim to teach them to function as independently as possible while making the environment more understandable and suited to the needs of these individuals (Mesibov et al., 2005).

Structured Teaching

The structure teaching process is believed to develop independence and self-esteem (Lord et al., 1993; Mesibov & Howley, 2003; Schopler, Mesiboc, & Hearsey, 1995). Structured teaching contains strategies tailored to suit the strengths of people with autism. For example, the strong emphasis on visual strategies and predictability rests upon the assumption of a primarily visual and routine-based learning style (Schopler et al., 1995; Mesibov & Shea, 2010).

Eclecticism

TEACCH therapists often merge knowledge from a range of fields including speech language therapy, social work, early intervention, special education, and psychology (Lord et al., 1993). TEACCH's eclectic approach incorporates techniques from many perspectives to achieve the end goal of meeting the crucial needs of families: managing challenging behaviors and promoting learning. Thus, it is not unexpected that the TEACCH approach to structured teaching shares common features with other interventions including behavioral, developmental, and ecological perspectives (Lord et al., 1993). For example, in the 1970s, TEACCH borrowed elements of the behavioral approach by incorporating contingencies of reinforcement. Similarly, the behavioral approach to preference-based teaching (Reid & Green, 2005) translates into TEACCH's emphasis on preferred activities. It is expected that tasks that are more meaningful to the learner will be more easily understood, practiced, and generalized. This emphasis on meaningful behaviors was also influenced in the 1980s by the increasing presence of cognitive social learning theory, where meaningfulness was seen as crucial for generalizing behaviors from one learning environment to another (Bandura, 1986).

TEACCH owes to developmental psychology its aim to set learning goals after the developmental level of each individual. The TEACCH model has also adopted cognitive constructs to characterize the deficits of people with autism in executive functioning and attention.

Despite its eclectic nature, there are key elements that are often present in structured teaching programs. These elements comprise the cornerstone of TEACCH (Mesibov et al., 2005).

Key Elements

TEACCH proponents discourage a standardized curriculum for each individual has his or her unique learning style and skills. However, all TEACCH programs include some key elements of structured teaching: organization of the physical environment, visual information, task organization, and work systems. Individual programs are developed within the structured teaching framework and with consideration of the child's developmental level and individual needs. Goals often involve the development of communication and daily living skills that would lead to functional independence in adult life (Schopler et al., 1995, Mesibov & Howley, 2003; Mesibov et al., 2005). Although the TEACCH program has been evaluated as an omnibus approach, component analyses to weighing the individual and combined effectiveness of the various elements of structured teaching are rare.

Visual Information Visual information is intended to make tasks clear, meaningful, and understandable for the learner. Common elements include *instructions* (i.e., verbal description of what a child has to do with the material provided for a task), a particular *task organization* (i.e., the separation and distribution of tasks into meaningful groups), and strategies to increase *clarity* (i.e., cues to what is the most important aspect of the task). TEACCH practitioners use visual information in lieu of verbal instructions owing to the limited receptive language ability in this population.

Visual information may take many forms depending on the individual: from written checklists to visual schedules and actual objects. For example, visual schedules provide information about the order in which a series of tasks ought to be completed. Visual schedules help with transitions and can help the individual to become independent from the cues and prompts of others. Visual schedules, also known as activity schedules, have been studied extensively in the behavior-analytic literature. Activity schedules have been shown to increase skill acquisition and on-task behavior (e.g., MacDuff, Krantz, & McClannahan, 1993) while decreasing challenging behavior (e.g., Dooley, Wilczenski, & Torem, 2001). However, a review by Lequia, Machalicek, and Rispoli (2012) noted that setting, autism severity, and existing verbal abilities moderate the effectiveness of activity schedules.

Organization of the Physical Environment The TEACCH practitioner modifies the environment in order to clarify what is expected from the learner and facilitates independence (Mesibov et al., 2005). For example, in a classroom setting, the location of the furniture can be used to cue the upcoming activity. The discrimination can be established by performing specific activities at specific locations—boundaries should also exist at home for the learner to discriminate where to eat, sleep, dress, and so forth. Welterlin, Turner-Brown, Harris, Mesibov, and Delmolino (2012) found that children's work skills improved when parents were taught to provide physical structure by organizing furniture, creating boundaries, and arranging materials. Room arrangement can also help to decrease stimulation (e.g., less things on the wall), limit distractions (e.g., sitting in cubicles to work rather than at group tables), and promote independence (e.g., having free access to already mastered activities). In this connection, Hume and Odom (2007) reported that minimizing visual and auditory distractions facilitates learning.

Task Organization Predictability within both activities and their sequences is believed to help the person with autism understand their environment. Predictability can be achieved by a close adherence to activity schedules and routines. These may include pre-planned sequences of steps used for tasks, chores, and recreation. The schedule provides information on where, when, and what the activity will be. It is recommended this information be communicated visually. For example, Probst, Jung, Micheel, and Glen (2010) found a decrease in challenging behavior in a young girl when schedules and a choice board were provided as part of their social skills training. TEACCH proposes that when the environment does not provide routines, the individual with autism will develop his or her own, which are likely to be less adaptive and acceptable. Although TEACCH is clear about the importance of routines as a learning catalyst, it acknowledges that flexibility should be incorporated.

Work Systems While organizing the physical space and providing predictable tasks are presented as prerequisites for engaging the individual, a work system (also referred to as *structured work* or *activity systems*) would still be needed to convey the specific demands of a task. Work systems are sometimes referred to as *structured work* or *activity systems*. They tell the person what task to engage in, how much is required, how long the activity will last, how to know when the activity is finished, and what happens after it is finished. The work system may vary for new and mastered tasks. For novel tasks, the practitioner uses one-on-one instruction, hand-over-hand and visual prompts, social encouragement, and access to preferred activities at the end of the session, whereas for already mastered tasks, the child is expected to work independently in a workstation with minimal distractions (Schopler et al., 1995).

The TEACCH Program in the Outcome Literature

There have been few attempts to summarize systematically the TEACCH outcome literature. Some of the barriers to effectively pool the available evidence have to do with the notion of evidence present among TEACCH circles and with the nature of the empirical literature evaluating the TEACCH program. Prominent commentators tend to present TEACCH as a diverse, lifespan-long approach that is both a philosophy and a method informed by a *culture of autism*. These attributes have been presented as a conceptual basis that places TEACCH above standard quantitative and meta-analytical methods for weighing clinical evidence (Mesibov & Shea, 2010). These arguments, albeit informative, do not seem to justify non-evidence-based clinical practices. For example, interventions such as those based on applied behavior analysis have been independently evaluated by psychometric assessments, controlled trials, and meta-analyses, in spite of the fact that standard methods for quantifying clinical evidence differ from the single-subject experimental tradition in which most behavior-analytic research is grounded (see, e.g., Virués-Ortega, 2010).

Although the number, samples size, and design of TEACCH program evaluations remain limited, advances in meta-analytical methods have made it possible to aggregate the evidence available in a systematic and cogent manner. Virues-Ortega, Julio, and Pastor (2013) compiled the evidence from 12 TEACCH trials conducted in eight countries. Although these studies did not produce the high methodological quality scores—there were few randomized controlled trials—they did have a number of favorable attributes:

(a) well-validated standardized assessments; (b) led by multiple semi-independent international teams; (c) with few exceptions, those delivering the intervention had been trained directly by the original TEACCH center in North Carolina; and (d) methodological quality scores and study design were not associated with effect magnitude. The intervention induced very limited gains in standardized evaluations of cognitive and verbal performance and developmental status: overall effect sizes fell within the small effect size range. Similar effect magnitudes were reported for communication, motor, daily living, and social adaptive skills and also for more narrowly defined behavioral repertoires including eye-hand coordination, gross motor functioning, imitation, and perceptual discrimination. Effects within the negligible to moderate range deserve limited commentary, as they are unlikely to be compatible with clinically important gains. Figure 23.1 illustrates some of these findings.

Maladaptive behavior, as evaluated by the Vineland subscale (Sparrow, Cicchetti, & Balla, 2005), may be an exception to the somewhat disappointing findings offered by the pooled analysis. The outcome demonstrated a moderate-to-large overall effect size. However, subsequent analyses suggested that the effect may be subject to significant small-study and publication biases (Egger, Smith, Schneider, & Minder, 1997). Specifically, the amelioration of maladaptive behavior may have been the result of outlier studies within the pool included in the meta-analysis or have been a product of a systematically biased publication trend. While the effect on maladaptive behavior showed some promise, it required further replication before evidence-based recommendations could develop from these findings.

It is possible that the putative effects of the TEACCH program upon maladaptive behavior may be parsimoniously characterized as the product of noncontingent reinforcement, which is a well-documented procedure for attenuating challenging behavior in the behavior-analytic literature (see, e.g., Fischer, Iwata, & Mazaleski, 1997). Specifically, the presentation of preferred social and leisure activities in a behavior-independent fashion, consistent with the emphasis on preferred activities present in structured teaching sessions, may attenuate various forms of challenging behaviors.

According to Virues-Ortega et al. (2013), TEACCH studies tend to present greater gains in the areas of perceptual and motor, adaptive, and verbal and cognitive abilities in studies conducted with school-age participants (6–17 years of age), whereas studies targeting younger children (0–5 years of age) almost invariably produced nonsignificant effects sizes. Interestingly, important aspects of the interventions evaluated including participants developmental age during baseline, intervention intensity (hours per week),

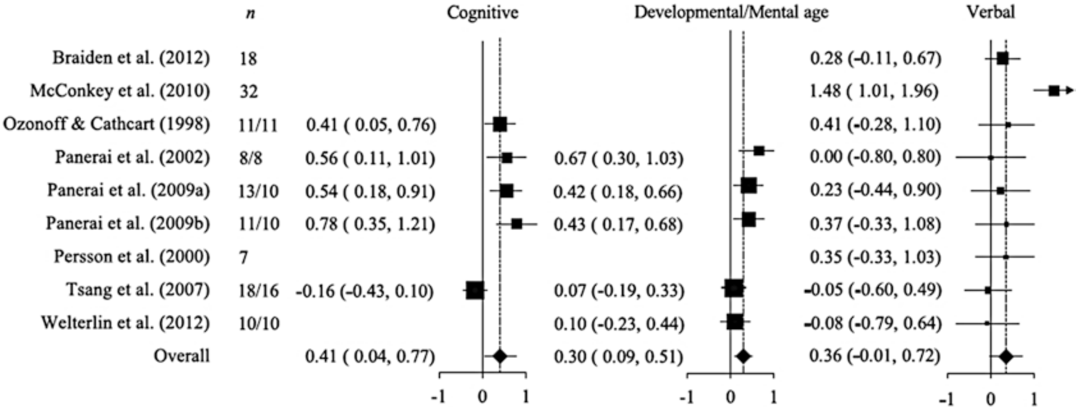

Fig. 23.1 Effect sizes and 95 % confidence intervals of selected TEACCH outcomes. Effect sizes above one suggest favorable treatment effects. Standardized outcomes from the Psychoeducational Profile and selected IQ tests (Based on Virues-Ortega et al. (2013))

intervention duration (weeks of intervention), and intervention setting (home vs. school based) were not associated with significantly larger or smaller effects in any of any of the key dependent variables, most of them derived from the Psychoeducational Profile (PEP) (Schopler, 1990).

While the literature summarized above is not conclusive, it points to the facets of the TEACCH program that might be more promising, and it helps to identify the weaknesses in the literature that require further replication. Some fundamental aspects of the intervention make it hard to assess and optimize. First, key concepts of the intervention are not operationalized, and few studies report treatment integrity. Second, the intervention model is fundamentally eclectic. The latter added to the lack of experimental research supporting the key intervention elements make it impossible to build a self-correcting body of evidence-based practices.

According to Virues-Ortega et al. (2013), TEACCH could be conceptualized as a targeted intervention with narrowly defined strengths. Namely, the quantitative evaluation of the literature does not support the adoption of TEACCH as a comprehensive approach to address the wide array of behavioral and social challenges posed by clients diagnosed with autism over their life span.

TEACCH and Alternative Intervention Models

There is a dearth of studies directly comparing the TEACCH program with other comprehensive psychosocial approaches to intervention for people with autism. A few studies provide an indirect preliminary comparison with early intensive behavioral intervention programs based on applied behavior analysis (Eikeseth, Smith, Jahr, & Eldevik, 2002; Howard, Sparkman, Cohen, Green, & Stanislaw, 2005), learning experiences and alternative program for preschoolers (LEAP) (Boyd et al., 2014), and integrated classrooms (Panerai, Ferrante, & Zingale, 2002; Panerai et al., 2009).

TEACCH and Applied Behavior Analysis-Based Interventions

Siegel (2008) discussed some procedural differences between the TEACCH model and discrete trial training (DTT), a common behavior-analytic strategy. Siegel stated that TEACCH classrooms typically utilize visual schedules for classroom routines and workstations to organize and structure individual work, whereas in a classroom using DTT, adult prompting has a more preeminent role. The TEACCH model, relative to DTT, allows for more initiation from the child and encourages the child to problem solve. In a TEACCH classroom, if a child is having difficulty with a task, the teacher will wait and allow the child to complete the task. Similarly, if a child is off-task, the teacher will allow the child to reengage before presenting any prompts. Siegel suggested that the child-directed nature of TEACCH was in contrast to DTT, where the child is prompted back to his or her task immediately. Siegel concludes that TEACCH is a more natural way of teaching along the lines of typical child development. Although Siegel does state that DTT is a method rather than a comprehensive service, the contrast is somewhat misleading in that DTT is simply one of many behavioral strategies and cannot be equated with applied behavior analysis—a similar error would involve comparing early intensive behavioral intervention with TEACCH workstations. Siegel commented only on procedural differences but provided no formal comparison of learning outcomes.

Eikeseth et al. (2002) conducted a yearlong study with 4- to 7-year-old children with autism who attended public kindergartens to assess the efficacy of early intensive behavioral intervention. They compared the outcomes of the behavioral intervention with eclectic treatment that utilized aspects of TEACCH. Both groups received treatment, from a trained therapist, for at least 20 h a week for the duration of the study. Therapists in the behavioral intervention group were trained specifically for the study and had more direct supervision and feedback than the eclectic group, who received supervision via consultation. The children in the intensive behavior treatment group initially received treatment in a DTT format. These skills were then generalized to more ecological settings (e.g., peer interaction, home). The children in the eclectic treatment group received treatment that involved many different components commonly used with children with autism, which included features of both TEACCH and applied behavior analysis. At the end of the study, Eikeseth et al. (2002) found significant treatment gains for the children in the behavioral intervention group in comparison to the eclectic group. Assessment measures demonstrated that children in the behavioral group scored higher in areas such as language comprehension and adaptive behavior relative to participants in the eclectic group.

Howard et al. (2005) also investigated the treatment differences between children with autism or pervasive developmental disorders not otherwise specified receiving intensive behavioral intervention and those receiving an eclectic treatment that incorporated TEACCH. The children in the intensive behavioral group received one-on-one treatment for 25–40 h a week across home, school, and community settings. This group had structured and unstructured lessons delivered by tutors trained by a special education teacher. A certified behavior analyst supervised the treatment team. The eclectic treatment group attended classrooms staffed with a teacher and four to eight assistants. The eclectic treatment involved a combination of approaches, including sensory integration therapy, TEACCH, and sporadic DTT sessions. The teacher received consultation from graduates who had completed coursework in applied behavior analysis. The children in the intensive behavioral group had significantly higher scores on a variety of daily living, verbal, and academic measures relative to the eclectic group. Both Eikeseth et al. (2002) and Howard et al. (2005) reported that the behavior treatment group attained scores in standardized tests closer to typical performance relative to those in the eclectic group.

A number of methodological concerns limit these preliminary comparisons: interventions were not equated in intensity and duration, procedural integrity measures were lacking, and participants were not randomly allocated to the intervention groups, to mention just a few. Some of these limitations are inherited to the TEACCH approach. For example, TEACCH does not involve a standardized curricula or a set of technologically defined procedures and is often presented as a heterogeneous, lifelong approach that is both a philosophy and a method and therefore not amenable to procedural integrity and standardized treatment outcomes (Hume et al., 2011). The proposed lack of accountability added to the preliminary negative findings by Eikeseth et al. (2002) and Howard et al. (2005) seem to lend little support to TEACCH as a comprehensive approach to teaching children with autism.

Other Treatment Comparisons

The learning experiences and alternative program for preschoolers (LEAP) is a packaged intervention with a blend of elements from applied behavior analysis and social learning theory and a strong emphasis on social skills and mainstream integration (Hollander, Kolevzon, & Coyle, 2011). Boyd et al. (2014) worked with teachers in classrooms to compare the relative efficacy of LEAP and TEACCH. The study had both strengths and weaknesses. In the positive side, the authors made an effort to evaluate treatment fidelity. By contrast, lack on randomization and significant differences in autism severity across groups were significant shortcomings. While the authors reported significant changes during follow-up in communication, autism characteristics, and other standardized outcomes after a minimum 6-month exposure to either intervention, the study failed to identify any differences across groups.

Panerai et al. (2002) compared TEACCH to integrated classrooms with support teachers. The key characteristic of an inclusive education is that the classroom and the teaching are not altered specifically for children with autism. In addition, the child may be supported by teacher aids and may receive additional intervention outside of the classroom environment (e.g., speech therapy). However, the integrated classroom group in the study was not exposed to any autism-specific teaching procedures, and the teachers lack any training for working with this population. This contrasted sharply with the TEACCH group in the study, which was led by teachers, specialized in working with children with autism. Children in the TEACCH group lived at the facility and went home at regular intervals. The children in the integrated group were at school during the day and went home at the end of the school day. The results showed larger improvements in the TEACCH group compared with the control group in all domains of the PEP. Panerai et al. (2009) extended their initial analysis by including a group of children who received TEACCH within a mainstream classroom and at home. According to the results, children in the TEACCH groups demonstrated superior performance in the PEP relative to children in the inclusive education group. However, the magnitude of the effect was modest (effect size <0.5; see Fig. 23.1). The lack of improvement for children in inclusive education in these two studies may be attributable, not to inclusive education per se, but rather to the absence of autism specific approaches.

In sum, Panerai et al. (2002, 2009) demonstrated that eclectic interventions that include components tailored to the needs of children with autism lead to superior albeit modest outcomes than simply including children with autism into mainstream classrooms. Moreover, Eikeseth et al. (2002) and Howard et al. (2005) were able to demonstrate large intervention effects of early intensive behavioral intervention well above an eclectic TEACCH group used as reference for comparison.

Treatment Acceptability

Treatment acceptability refers to consumers' perceived preference for a particular model. Acceptability is important in that it leads to greater client engagement and service demand. Brower-Breitweiser, Miltenberger, Gross, Fuqua, and Breitwieser (2008) assessed the treatment acceptability of applied behavior analysis-based intervention versus TEACCH by providing three children a choice between behavioral in one location and TEACCH intervention in another location. The children did not demonstrate a distinct preference toward any of the two interventions. Similar findings have been reported when teachers, parents, and administrators are identified as consumers (Callahan, Shukla-Mehta, Magee, & Wie, 2010).

Assessing the commitment, satisfaction, and burnout of practitioners of a given teaching model provides an indirect means of studying acceptability. According to Jennett, Harris, and Mesibov (2003), teachers using applied behavior analysis tend to be more committed to the underlying philosophy of the approach when compared to teachers using TEACCH. Moreover, the teachers that were more committed to a philosophy had higher personal efficacy and satisfaction ratings and were less likely to report burnout in relation to personal accomplishment. Coman et al. (2013) compared LEAP, TEACCH, and high-quality special education programs. They found that educators using LEAP were significantly more committed to the underlying philosophy; no such difference was found among TEACCH educators. Unsurprisingly teachers in high-quality special education programs showed similar level of commitment to both TEACCH and LEAP philosophies. There were no differences in reported burnout.

Summary

The literature reviewed here suggests that we should use caution before drawing any conclusions about the effectiveness of TEACCH as a comprehensive program, especially in comparison to alternative comprehensive interventions. The literature seems to be limited in two fundamental facets. First, there is a dearth of empirical research on the individual components of structured teaching and their combination (Mesibov & Shea, 2010). In the absence of such evidence, it is difficult to gain a clear understanding of the mechanisms underlying structured teaching and TEACCH more generally. Second, researchers and practitioners lack the tools to evaluate the integrity of the TEACCH-based intervention. The outcome research currently available suggests that, while TEACCH may be as acceptable for consumers as other competing models, it has not performed well in stand-alone treatment evaluations and does not compare favorably to alternative models.

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Positive Behavior Support

24

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History and Definition of PBS

For well over half a century, applied behavior analysis (ABA) has had a tremendous impact on the field of autism, contributing many of the tools and strategies that are now routine practice for individuals with autism spectrum disorder (ASD) who display problem behavior. Applied behavior analysis is specifically credited with the development of functional assessment, which is universally accepted as the "gold standard" of behavioral assessment. It has articulated principles of reinforcement and consequences, which are now firmly established as key determinants of behavior. Applied behavior analysis has also put forth learning theory, establishing the key principles and practices that promote skill acquisition. However, in the late 1980s and early 1990s, the emergence of specific social movements and ecological variables, such as the normalization movement, the inclusion movement, and the era of person-centered values created the need for a new approach to intervention that was more responsive to consumers (e.g., individuals with disabilities and their families) and more in line with community-based support efforts (Evans & Meyer, 1985; Horner et al., 1990).

Positive behavior support (PBS) emerged to fill this need. In one of the earliest writings on PBS, Carr (1997) articulated the need to focus on consumer goals pertaining to comprehensive lifestyle support, long-term change, and direct support to consumers themselves. Carr predicted that the field of applied behavior analysis would split into two branches in order to address this need. One branch of the field (still referred to as ABA) would maintain a traditional focus on conceptual purity, emphasizing elegant experimental control, and a microanalysis of cause and effect from a researcher's point of view. The second and newer branch (now referred to as PBS) would focus on ecological relevance, emphasizing meaningful outcomes in the form of lifestyle change, and prioritizing a broader analysis of systems and closer attention to practicality, as defined by non-researchers (i.e., consumers).

The first research monograph on PBS was published in 1999 by Carr and his colleagues in conjunction with the American Association on Mental Retardation (Carr et al., 1999a). In their review, the authors elaborated on the defining characteristics of PBS, referring to PBS as interventions that are designed to increase the probability of functional positive behaviors by way of building key skills (e.g., communication, self-management, and social skills) and changing key elements in the environment (e.g., activity

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patterns, choice options, prompting procedures). These changes often result in measurable improvements in social, vocational, and educational status (i.e., lifestyle change) and concomitant decreases in problem behavior. Thus, PBS refers to interventions that increase positive behaviors, promote lifestyle change, and result in decreases in problem behavior. Using this framework, the monograph attempted to answer several research questions including the following: "How widely applicable is PBS?"; "In what ways is the field evolving?"; "How effective is PBS and what factors modulate its effectiveness?"; and "How responsive is the PBS literature to the needs of consumers and non-researchers?" Following their review, the authors concluded that PBS was a viable approach to intervention that was widely applicable and could be implemented by typical intervention agents in typical settings (Carr et al., 1999a).

Over the years, PBS has shown steady and dramatic growth in its principles and procedures, and interventions are now more likely than ever before to focus on deficient contexts, rather than deficient repertoires (Koegel, Koegel, & Dunlap, 1996). The initial wave of studies that were reviewed in the monograph showed that PBS resulted in substantial improvements in problem behavior in approximately two-thirds of the cases, and these improvements were generally maintained over time (Carr et al., 1999a). Thus, PBS showed promise as an approach for working with students with serious disabilities, including autism spectrum disorder (ASD). However, as Carr and his colleagues (1999a) noted, there was still much work to be done. At the conclusion of their review, the authors suggested that the goals of PBS could most plausibly be met by an increasing emphasis on multicomponent interventions that are linked to assessment information, a broad reorganization of context (systems change), an emphasis on ecological validity (interventions involving typical agents and typical settings), an intervention in all relevant contexts, and the application of practices over protracted periods of time. These recommendations established the framework for a PBS movement, which resulted in the development of a new journal, the *Journal of Positive Behavior Interventions (JPBI)*, and the creation of a new professional organization, the Association for Positive Behavior Support (APBS), specifically dedicated to this work.

Critical Features of PBS

In 2002, Carr et al. published a key article in the *Journal of Positive Behavior Interventions* entitled, "Positive Behavior Support: Evolution of an applied science." This paper outlined nine "critical features" of Positive Behavior Support that now define this body of work. The nine critical features included (1) comprehensive lifestyle change and quality of life, (2) lifespan perspective, (3) ecological validity, (4) stakeholder participation, (5) social validity, (6) systems change and multicomponent intervention, (7) prevention, (8) flexibility with respect to scientific practices, and (9) multiple theoretical perspectives. In the decade or so since the paper was published, there have been several new contributions to the PBS literature that have illustrated and elucidated these features. A review of this progress will serve as the framework for the present discussion. In each of the sections below, critical features of PBS will be defined and illustrated by case studies and research examples from the literature. In addition, a discussion of measurement is presented within each feature to highlight the new data collection strategies that have evolved in order to capture the broader concepts of PBS. While this information is by no means exhaustive, it is meant to provide an overview of the work that has been done to advance this relatively new field of endeavor.

Comprehensive Lifestyle Change

Comprehensive lifestyle change is the first critical feature of PBS and is aimed at improving a variety of quality of life dimensions. These can include improvements in social relationships (e.g., friendship formation), personal satisfaction (e.g., self-confidence, happiness), employment (e.g., productivity, job prestige, good job match), self-determination (e.g., personal control, choice of living arrangements, independence), recreation and leisure (e.g., adequate opportunities, good quality of activities), community adjustment (e.g., domestic skills, survival skills), and community integration (e.g., mobility, opportunities for participation in community activities, school inclusion). The person's daily routines, schedules, and social interactions are thus important considerations. Outcome success emphasizes improvements in family life, jobs, community inclusion, supported living, expanding social relationships, and personal satisfaction.

Turnbull and Turnbull (1996) offered an example of lifestyle change in their discussion of JT, a 26-year-old man with autism and behavioral challenges. Here, the goals of intervention were not limited to behavioral change per se but were rather focused on lifestyle change. Treatment objectives were to have JT continue his paid work at a university as a clerical aide; to support JT in living in a home of his own, with roommates (university students) who were available to meet his personal support needs; to assist JT in using local public transportation to and from work; and to support JT in maintaining friendships and community connections at his favorite community spots–a local bakery, two jazz clubs, restaurants with live music, a church, a neighborhood grocery store, and a fitness center. The authors noted that for JT, the criteria for "assessing success" constantly changed in response to the complex ecology of his emerging lifestyle. Following a 6-year planning process referred to as Group Action Planning (Turnbull & Turnbull, 1996), JT worked a total of 30 hours per week at the university as a clerical aide; he moved to a home of his own along with two roommates from the university who each provided him with 12–15 hours of support; he learned to take public transportation to work; he joined a fraternity; and he made several friends in the community with whom he maintained regular contact.

In a second example, Malette, Mirenda, Jones, Bunz, and Rogow (1992) presented a series of case studies that evaluated lifestyle changes associated with a Lifestyle Development Planning Process for four individuals with severe disabilities and challenging behavior. The five-step lifestyle planning process included vision planning, assessing and remediating barriers to participation, assembling meaningful routines and schedules, developing specific intervention strategies, and evaluating effectiveness by way of developing a monitoring system. Following intervention, all four participants engaged in a greater number of integrated activities during the mid- and post-intervention periods, compared with baseline. Three of the four participants experienced gains of more than 200% in the number of preferred, integrated activities they performed at the end of the intervention period. The two adults in the study were engaged in the first integrated work opportunities of their lives and two children participated to various degrees in regular classroom activities in their neighborhood schools. Furthermore, all four participants experienced at least slight increases in their unpaid social networks and performed a greater number of integrated activities with people who were not paid to spend time with them. Finally, all four participants showed evidence of improved behavior and communication skills over the course of the intervention.

In an effort to evaluate lifestyle change, the field has seen an emergence of empirically validated measures designed to capture this complex ecology. For example, the *Resident Lifestyle Inventory* (Wilcox & Bellamy, 1987) measures the types of activities that are performed by an individual, how often each activity occurs, where each activity typically occurs, which activities are preferred, and the level of support needed for participation. *The Social Network Analysis Interview* (Kennedy, Horner, & Newton, 1990) elicits information about the persons who are socially important in the life of the target individual and the types and frequencies of activities in which persons in the social network typically engage with the individual. *The Program Quality Indicators Checklist* (Meyer, Eichinger, & Park-Lee, 1987) identifies the "most promising practices" in educational programs for persons with severe disabilities, as gleaned from a literature review and survey of nationally recognized experts in the field. It can assess the content of a plan's goals and objectives and track changes over time. *The Ecocultural Family Interview* (Weisner, Coots, & Bernheimer, 1997) assesses resources in the home environment, family connectedness, social networks, and leisure activities. Taken together, these tools represent a growing body of research aimed at measuring lifestyle change as an important feature of PBS.

Lifespan Perspective

The second critical feature of PBS is lifespan perspective. A lifespan perspective recognizes that efforts to achieve meaningful change occur over time. Thus, intervention is seen as a systemic process that evolves as different challenges arise during different stages of life (Turnbull, 1988; Vandercook, York, & Forest, 1989). Carr et al. (2002) noted that when one follows an individual over many years in changing life circumstances, deficient environments and deficient adaptive skills will almost certainly continue to emerge and be identified. Therefore, new PBS strategies may have to be added and old ones modified. In a truly comprehensive PBS approach, intervention never ends and follow-up is measured in decades, not months (Carr et al., 2002). Kennedy and Itkonen (1996) illustrated this principle in their discussion of social relationships across the life span. The authors suggested that support environments vary along a number of dimensions including the manner in which people with severe disabilities are grouped/clustered, the people who are contacted, the availability of specific types of activities, the emphasis and support available for social relationships, and the physical proximity to typical community settings. Each of these dimensions can facilitate or inhibit social relationships; therefore, interventions may vary greatly across an individual's life span and also within any group of people of a particular age.

The lifespan perspective has led to an increase in the number of longitudinal studies that have been done to evaluate the impact of PBS over time (Carr et al., 1999b; Dunlap et al., 2010; Lucyshyn et al., 2007). A case study by Jensen, McConnachie, and Pierson (2001) presented a 63-month evaluation of a 35-year-old man who moved from a developmental center into his own home in the community. At baseline, the man demonstrated a high level of problem behaviors that included self-injurious behavior (head hits), vomiting, assault, and property destruction. These behaviors occurred at a high frequency and posed an immediate danger to the participant and to others, requiring the use of mechanical restraints and medications. Following a comprehensive functional analysis of problem behavior, the team implemented a series of intervention phases that included the following: Phase I (7/95–4/96) involved providing community access to increase the man's activity level and provide an opportunity for him to control the environment. Phase 2 (5/96–11/96) involved teaching the man to appropriately request the use of a restraint chair since restraint was identified as a reinforcer. Phase 3 (11/96–10/97) involved moving to a home in the community, which was intended to further minimize the setting factors and antecedents for problem behavior. Phase 4 (10/97–2/98) involved introducing a new recliner to replace the restraint chair. Phase 5 (3/98–4/99) involved removing a medication that appeared to be exacerbating problem behavior. Finally, Phase 6 (5/99–10/99) involved moving to a second home in the community that was purchased by the man's parents. In the last 2 years of the study, the participant was reported to have had no injuries from self-injurious behaviors and no injuries to staff members. His vomiting ceased, and his medication to prevent it was discontinued. The authors reported that his quality of life improved significantly in other areas as well. Moving to his own home allowed him to participate in more community activities, to develop relationships, to participate in the hiring of support staff, and to have greater choice over activities, meals, and his own schedule. From a lifespan perspective, the PBS interventions that were implemented addressed known functions of problem behavior while at the same time responding to new developments and life changes that the man encountered over a period of several years.

In their longitudinal study, Carr et al. (1999b) applied a multicomponent PBS intervention over a period of 1.5–2.5 years with three adults with autism who demonstrated severe problem behavior. The results showed favorable outcomes on dependent variables (i.e., task engagement, problem behavior) that were maintained over time. Importantly, the authors described several changes in the participants' life circumstances, such as residential and employment status and recreational opportunities, as well as the need for follow-up assessments and adjustments to the intervention plans as time passed and new stressors influenced the participants' life situations. A more recent longitudinal study, conducted by Dunlap et al. (2010), involved a multisite evaluation of PBS across a 2-year period. The authors compiled multiple outcome measures from 22 participants in five areas of the country. They summarized information from nearly 20 different data sources and found modest improvements in nearly all of the participants' problem behavior and quality of life relative to baseline, with improvement generally maintaining over the 2 years of the study.

Since PBS is designed to produce or facilitate enduring improvements across the life span, there has been increased attention to the measurement of quality of life (Hughes, Hwang, Kim, Eisenman, & Killian, 1995). As a construct, quality of life pertains to the full breadth of a person's existence, across all settings and hours of the day, and for periods of years, rather than the usual weeks or months of intervention research. For the most part, quality of life has been evaluated using subjective rating scales, including the *Quality of Life Questionnaire* (Schalock & Keith, 1993), the *Quality of Life Evaluation* (Kincaid, Knoster, Harrower, Shannon, & Bustamante, 2002), and the *Family Quality of Life Survey* (Park et al., 2003). To illustrate, the *Quality of Life Evaluation* (Kincaid et al., 2002) uses a 5-point Likert-type rating scale (1 = much worse, 2 = somewhat worse, 3 = no change, 4 = somewhat better, 5 = much better) to evaluate changes in a person's life circumstances over the course of PBS interventions. The survey items tap a variety of quality of life changes including relationships, community contacts, satisfaction, expressive ability, willingness to try new things, skill acquisition, self-confidence, emotional stability, and general health and well-being.

Carr et al. (2002) recommended that measures of PBS capture three things: problem behavior, implementation of PBS plans, and quality of life changes over time. Recently, it has been suggested that a full battery of assessments, including standardized instruments, structured interviews, and checklists that are individualized on the basis of the participant's age, developmental status, and living circumstances, may be required (Dunlap et al., 2010). Thus, the development of an individualized "case portfolio" has been identified as a venue for collecting and analyzing data, with some instruments administered annually or semiannually, some periodically (i.e., on an as-needed basis), and some continually (e.g., contact logs, journals) (Dunlap et al., 2010). Here, quality of life was defined along six dimensions: (1) material well-being, which includes access to materials or activities that are preferred by the individual and may enhance the individual's pleasure or ability to function effectively; (2) health and safety, which includes health status, medication effects, safety risks, or physical disturbances; (3) social well-being and interpersonal competence, which refers to social networks, presence of friends, and capabilities for interacting; (4) emotional and affective well-being, which includes outward emotional response, evidence of happiness, mood, and emotional stability; (5) leisure and recreation, which includes activities that the individual engages in to occupy him/herself for pleasure; and (6) personal well-being, which includes self-sufficiency and independence, self-determination, and choice regarding personal belongings, activities, clothing, food, living arrangements, and relationships (Dunlap et al., 2010). The authors applied a 9-point Likert-type rating scale (1 = substantial deterioration; 5 = no changes relative to baseline; 9 = substantial improvement) to summarize and evaluate overall changes in quality of life before and after PBS strategies were implemented. This approach allowed information from multiple sources to be synthesized in a meaningful way, creating the potential for an ongoing analysis of quality of life changes across the lifespan.

Ecological Validity

Another critical feature of PBS is ecological validity. PBS addresses quality of life issues in natural contexts, including home, school, and community. In other words, PBS focuses on how the scientific principles underlying the PBS approach can be applied to real-life settings and situations as they pertain to a particular individual. This is what is referred to as ecological validity. Ecological validity involves examining whether typical intervention agents (e.g., parents, teachers) can carry out interventions in typical settings (e.g., the home, the school, the community, the workplace) where they support individuals with ASD (Carr et al., 2002). Singer (2000) has emphasized the need for service delivery systems to provide PBS in real-life settings. Interventions need to be evaluated in natural settings and implemented by typical intervention agents in those settings. This has also been referred to as "contextual fit." Crone and Horner (2003) defined contextual fit as the congruence between behavior interventions and the values, skills, resources, and routines of the individuals who will be implementing those interventions.

McLaughlin, Denney, Snyder, and Welsh (2012) conducted a review of studies published in the *Journal of Positive Behavior Interventions (JPBI)* to examine the extent to which family-centered interventions with contextual fit have appeared in the journal. Contextual fit was defined as (1) acknowledgement of the cultural and linguistic background of families; (2) collaborative partnership with families for assessment, planning, implementation, and evaluation of the behavior support intervention; (3) consideration of family ecology; (4) selection of family activity settings as contexts for intervention; (5) parents or familial caregivers' perspectives about acceptability, feasibility, effectiveness, sustainability, and satisfaction; and (6) family quality of life (McLaughlin et al., 2012). Their review included 18 research studies and demonstrated that family-implemented interventions were successful in teaching positive behaviors and decreasing problem behaviors in children with ASD. Furthermore, the studies that included maintenance data showed that positive outcomes were maintained over time.

Moes and Frea (2000) presented an elaborate case study that examined the issue of ecological validity. Their study described a PBS intervention with a 3-year-old boy named Matthew who had ASD and challenging behavior. The study compared the child and family outcomes when the intervention was directed solely by the interventionist (the prescriptive approach) or in collaboration with the family (the contextualized approach). The prescriptive approach included the use of standardized protocols and structured teaching formats to direct intervention efforts, while the contextualized approach included an assessment of settings, values, and beliefs to inform the process and increase compatibility between intervention elements and known family routines and practices (Moes & Frea, 2000). All assessment and intervention sessions took place in Matthew's home and were implemented by his parents and 4-year-old brother during routines in which he was expected to clean up after himself (e.g., putting toys away). The prescriptive treatment package included treatments derived from the literature, including functional communication training (i.e., requesting a "break"), extinction, and demand fading. The contextualized intervention incorporated family preferences gathered during assessment. For example, Matthew's parents indicated that they wanted to reward him for following through with parental requests, so a treatment component was built in to enable Matthew to earn a desired item/activity of his choice after spending 5 min cleaning up after himself. His parents felt that teaching Matthew to request "help" rather than "break" would be more helpful in guiding their interactions during the "cleaning up" routine. His parents also requested modifications to the prompt sequence used to facilitate cooperation. They reported some level of past success with a three-step prompting sequence, starting with a verbal prompt to complete the request, then a reminder of what could be earned (e.g., "If you pick up your shirt you can play with ____"), and then, if necessary, a verbal "count to 3" procedure ("1,2,3…") to foster cooperation. Finally, Matthew's parents wanted his older brother to be a part of the intervention; he was expected to model and follow the plan that was developed for his brother (Moes & Frea, 2000).

The results showed that in baseline, Matthew engaged in high levels of disruptive behavior and did not use functional communication. When the prescriptive intervention approach was implemented, Matthew began using the functional communication response to request a "break," but was not engaging in on-task behavior. The demand-fading procedure was then introduced, and Matthew's disruptive behaviors returned to baseline levels. At the end of intervention, his parents reported that they "couldn't tell" how well the plan fit in with their beliefs, values, goals, abilities, and needs (Moes & Frea, 2000). When the contextualized intervention was implemented, Matthew showed a decrease in disruptive behavior and an increase in on-task behavior (Moes & Frea, 2000). Furthermore, parent ratings indicated that both parents found the intervention to be highly compatible with their beliefs, values, goals, abilities, and needs (Moes & Frea, 2000).

Fox and Emerson (2001) described the need for examining the perceived value of outcomes by various stakeholders who participate in the intervention process. They found that reduction in the severity of challenging behavior was considered the most important outcome of intervention for a child/young adult living with his or her family in four out of seven stakeholder groups in the study. For adults living in group homes, only three out of seven stakeholder groups identified challenging behavior as the highest priority. Other outcomes that were considered "most important" included increased friendships, increased relationships, learning alternative ways of getting needs met, increased control, and empowerment (Fox & Emerson, 2001). The authors concluded that the evaluation of outcomes should maximize the "goodness of fit" between intervention, the evaluation of the intervention, and the beliefs of the stakeholders involved (Albin, Lucyshyn, Horner, & Flannery, 1996).

To address ecological validity, several researchers have begun to define and measure "goodness of fit" to evaluate whether a plan fits with the overall values and lifestyle of those who are implementing it. Albin et al. (1996) developed a *Goodness-of-Fit Survey* which includes 20 items that assess the degree to which a support plan is appropriately matched to the environment. The authors used a 5-point Likert-type rating scale (1 = not at all; 2 = not much; 3 = can't tell; 4 = well (much); and 5 = very well (very much)) to determine whether the plan applied to all relevant settings and social demands that the child encounters; whether the plan considered the caregiver's understanding, expectations, and comfort level with the child; whether the plan reflected the highest priority goals; whether the plan fit in with the daily routines and successes of the family; and whether the plan was feasible and sustainable over time. The *Self-Assessment of Contextual Fit* (Horner, Salentine, & Albin, 2003) is a second instrument that has been used to evaluate PBS plans at the statewide level (KIPBS, 2010). This 16-item scale uses a 6-point Likert-type rating (1 = strongly disagree; 2 = moderately disagree; 3 = barely disagree; 4 = barely agree; 5 = moderately agree; 6 = strongly agree) to evaluate eight dimensions of contextual fit, including knowledge of elements in the support plan, skills needed to implement the plan, values consistent with plan elements, resources available to implement the plan, overall support for the plan, effectiveness of the plan, best interest of the person, and efficiency of plan implementation. Thus, the inclusion of "goodness of fit" measures addresses ecological validity as a critical feature of PBS.

Stakeholder Participation

The next critical feature of PBS is stakeholder participation. Stakeholder participation assumes that all members of an individual's support team are relevant stakeholders (e.g., parents, siblings, neighbors, teachers, job coaches, friends, roommates, and the person with disabilities) and participate as partners to build the vision, methods, and success criteria pertinent to defining quality of life for everyone concerned. Stakeholders have an active role in providing valuable qualitative perspectives for assessment purposes; in determining whether proposed prevention strategies are relevant for all of the challenging situations that need to be dealt with; in evaluating whether the approach taken is practical and in line with the values, needs, and organizational structures related to the individual with disabilities and his or her support network; and in defining what outcomes are likely to improve the general quality of life and enhance the individual's personal satisfaction (Carr, 2002).

Vaughn, Dunlap, Fox, Clarke, and Bucy (1997) presented a case study that detailed a community-based intervention with a 9-year-old boy with significant disruptive and destructive behaviors. A collaborative team that included the boy's mother designed and implemented functional assessments and hypothesis-based interventions in three settings: a drive-through bank, a large grocery store, and a fast-food restaurant. Data showed that the interventions reduced problem behaviors in all three settings and that concomitant increases were observed in desirable mother-child interactions. The PBS procedures, which included the presentation of competing reinforcers in each environment (e.g., toys, picture book/schedule), were conducted by a parent who was also explicitly involved in the assessment process as well as the design and evaluation of the intervention program. Several other studies in the literature have demonstrated the efficacy of using natural supports, including parents (Clarke, Dunlap, & Vaughn, 1999), siblings (Walton & Ingersoll, 2012), teachers (Lee, Sugai, & Horner, 1999), and paraprofessionals (Feldman & Matos, 2013) as intervention agents. However, far fewer studies to date have incorporated community members as natural helpers.

The earlier example of JT (Turnbull & Turnbull, 1996) illustrates the potential role of natural helpers. JT's family engaged in a collaborative process referred to as Group Action Planning to design JT's PBS plan. The initial planning group consisted of JT along with his parents and his sisters, family friends, and a few friends from school. This initial group supported him in achieving employment and a home of his own. At that point, his job coach, a few coworkers, and his roommates became additional Action Group members. Later on, because JT deeply enjoyed music, the family included a music therapy teacher who in turn brought in dozens of musicians into JT's life. Finally, the family looked for strategic community leaders who were natural "matchmakers" with inclusive community opportunities. They reached out to someone from the church, who also happened to work at the local bakery and knew almost everyone in town. This person had keen communication skills and acted as a group facilitator. JT's planning team expanded from just a few professionals and parents to a rich and extensive arena of family, friends, and community citizens. These stakeholders were passionately committed to him. Collectively, they created a context for social connectedness and interdependent caring; they engaged in dynamic and creative problem-solving and took action steps in order to identify and achieve shared goals. In other words, critical people were present from all different environments in which JT participated so there could be coordination and sharing of responsibility. Over time, waitpersons understood how to provide additional support when JT seemed anxious at the restaurant he frequented; bus drivers knew how to get him home safely if he got on the wrong bus; and people in his neighborhood watched out for him to make sure he was OK.

A variety of similar planning and problem-solving processes have been articulated in the literature under the broad umbrella of person-centered planning. These processes include *Lifestyle Planning* (O'Brien, 1987), *Personal Futures Planning* (Mount, 1987; Mount & Zwernick, 1988), The *McGill Action Planning System* (Forest & Lusthaus, 1987; Vandercook et al., 1989), *Framework for Accomplishment/Personal Profile* (O'Brien, Mount, & O'Brien, 1991), and *Essential Lifestyle Planning* (Smull & Harrison, 1992). These person-centered planning activities share many similarities. Most of the approaches utilize group graphics (large paper and marker drawings) and facilitation techniques to involve groups in learning more about the person and his or her family and planning for a more positive future (Kincaid, 1996). In addition, these approaches share a commitment to five essential goals, outcomes, or valued accomplishments, which include (1) being present and participating in community life, (2) gaining and maintaining satisfying relationships, (3) expressing preferences and making choices in everyday life, (4) having opportunities to fulfill respected roles and to live with dignity, and (5) continuing to develop personal competencies. Mount (1994) addresses many of the benefits and limits of Personal Futures Planning. Benefits of the process include developing a positive view of the person, inspiring motivation in participants, empowering people with disabilities as well as their family and friends, involving and developing community relationships, and producing organizational change. However, as Mount (1994) pointed out, the integrity of the process is challenged if the emphasis moves away from what the person needs and wants and centers on what the system needs and wants. Mount argued that person-centered planning is not a process that can be standardized, implemented on a large scale, or molded to fit into the existing structures of a service system (Mount, 1994). Instead, it is designed to challenge systems to adapt to the unique needs of the person served. Kincaid (1996) summarized the process of person-centered planning as follows:

> The Personal Profile and Futures Plan initiate the approach, additional information is obtained through various activities, a comprehensive plan is developed, and the team or work group continues to work to accomplish the identified goals. (p. 464)

Because the process of person-centered planning is, in and of itself, difficult to standardize and measure, PBS interventionists have instead begun to evaluate stakeholder satisfaction as a means of assessing the person-centered planning process (Abery, McBride, & Rotholz, 1999). This approach has also been applied at the statewide level in the evaluation of PBS plans (KIPBS, 2010), using the *Person-Centered Planning Process Satisfaction Survey* (Abery et al., 1999). This survey uses a 4-point Likert-type rating scale (1 = not at all satisfied; 2 = a little satisfied; 3 = quite a bit satisfied; and 4 = completely satisfied) to evaluate 32 different aspects of stakeholders' experiences with person-centered planning. Items assess how well the focus person was prepared for the meeting and actively participating, how well the facilitator was prepared and able to draw others into the process, whether the meeting progressed at a comfortable pace, how responsive the facilitator was to the person's input and point of view, and how satisfied members of the group were with the outcomes of the planning process. Tools such as this hold promise for addressing stakeholder participation as a critical feature of PBS.

Social Validity

Social validity has been identified as another critical feature of PBS (Carr et al., 2002). Social validity refers to whether or not interventions are seen by intervention agents as *practical* (e.g., Can typical intervention agents carry out the strategies?), *desirable* (e.g., Do typical intervention agents view the strategies as being worthy of implementation?), and *appropriate* for the contexts in which they are to be implemented. Social validity has also been defined along the dimensions of whether intervention procedures effectively reduced problem behavior (e.g., Do stakeholders view the strategies as having made a meaningful difference in reducing problem behavior to acceptable levels?) and whether the strategies were effective in improving quality of life (e.g., Do stakeholders view the strategies as having made a meaningful difference in the lifestyle of the individual by increasing opportunities to participate in typical community settings?) (Carr et al., 2002).

An illustration of social validity can be found in the work of Kemp and Carr (1995). Their study detailed a multicomponent approach for remediating problem behavior in three adults with autism and severe problem behavior in a community workplace setting, specifically a greenhouse. They selected treatments based on hypotheses about the variables controlling the problem behavior. The multicomponent intervention included functional communication training (i.e., requesting help or a break), building rapport (i.e., delivering reinforcement noncontingently), making choices (e.g., choosing activities, materials), embedding demands (i.e., alternating between preferred and non-preferred tasks/steps), and building tolerance for delay of reinforcement. The results showed that following intervention, the participants demonstrated both an increase in time spent in the employment situation without problem behavior and increases in completion of work steps to task completion. Social validation of these results was provided by employment site management. Here, greenhouse managers were asked a series of questions designed to evaluate their confidence level in supporting the adults in the workplace before and after intervention. Managers used a 7-point rating scale (7 = very much/always, 4 = somewhat/sometimes, and 1 = not at all/never) to respond to five different items: (1) "I am confident that the job coach can control the employee's behavior"; (2) " I am confident that my coworkers are safe from harm"; (3)" I am confident that the greenhouse property is safe from harm"; (4) "The employee's behavior in the greenhouse is severe"; and (5) "The employee could make a productive contribution to the greenhouse." The social validity outcomes showed that the managers reported little confidence that the job coach could control the employees' behavior in baseline, but they reported near total confidence at the end of intervention. At the beginning of the study, the managers also reported little confidence that other workers were safe from harm, but they reported total confidence in coworker safety after intervention. Similarly, the managers reported little confidence that the property was safe in baseline and reported near total confidence following intervention. The managers also reported that they found the employees' behavior to be nearly always severe in baseline and almost never severe after intervention. Finally, in baseline, the managers reported little or no production by the employees. Following intervention, the employees were reported to be able to make a productive contribution "always." These results suggested that the intervention strategies were socially valid. That is to say, they were generally effective and acceptable to the greenhouse staff and therefore more likely to be implemented in the workplace.

In a second example, Binnendyk and Lucyshyn (2009) evaluated the effectiveness of a family-centered positive behavior support approach to the amelioration of food refusal behavior in a child with autism. The study was conducted with the child and his family in their home. It employed an empirical case study design with one meal routine, specifically, snack time. Following training and support with the child's mother, results showed high levels of child food acceptance, successful child participation in observed snack routines, and high parental ratings of social validity and contextual fit. Here, social validity was evaluated using a 10-item instrument with a 5-point Likert-type scale (1 = disagree, 5 = agree). Across four evaluations, the mother's average social validity rating was 4.6 (range = 4.3–4.8), suggesting that she consistently believed that the plan goals, procedures, and outcomes were acceptable. These improvements maintained up to 26 months post-intervention. Implementation was also associated with generalization of the child's eating behavior to new foods and to his father's supporting him during snack time. Child behavioral improvements were also associated with parental reports of gains in family quality of life.

Brief questionnaires and subjective rating scales, such as those described above, represent the current standard for evaluating social validity in PBS interventions. These ratings have been applied at various points during intervention and at the end of intervention to determine whether PBS strategies were reported to have made a difference. While most social validity ratings are administered in an interview or self-report format, Brookman-Frazee (2004) used real-time behavioral observations to examine social validity during treatment sessions. In her study, the author examined the effects of a clinician-driven model and a parent/clinician partnership on three mother-child dyads involving very young boys with autism and their caregivers. The author used four different Likert-type scales to assess social validity during treatment sessions. Two different 6-point Likert scales (0–5) were used to assess parent stress level and parent confidence during parent-child interactions, and two 6-point Likert scales (0–5) were used to assess child interest and affect during the parent-child interactions. Results showed that all three parents in the study demonstrated decreased levels of observed stress and increased levels of observed confidence during the parent-clinician partnership condition compared to the clinician-directed condition. In addition, all three children in the study demonstrated more positive affect during the parent-clinician partnership condition compared to the clinician-directed condition. The authors concluded that collaborative partnerships between parents and professionals had a positive impact on both child target behaviors and overall parent-child interactions and family quality of life. As such, these interventions were considered to be socially valid and therefore likely to increase treatment success and decrease attrition rates among parents participating in parent education programs.

Multicomponent Intervention and Systems Change

PBS emphasizes that efforts should focus on addressing problem contexts, not problem behavior per se. Interventions that directly address problem behavior may not be successful if the context within which the behavior occurs does not support the use of the intervention. For meaningful change to occur, systems need to be reorganized so that change can occur and be maintained. Achieving meaningful change depends on stakeholders sharing a common vision, ongoing training for staff, and motivation for people to adopt new or revised ways of looking at problem contexts (Knoster, Villa, & Thousand, 2000). Horner, Vaughn, Day, and Ard (1996) described an expanded way to look at contexts for problem behavior by including the role of setting events. They described setting events as events that momentarily change the likelihood of a target behavior at a later point in time. For example, if an individual is fatigued, they may be more likely to engage in problem behavior when presented with a task to complete. If the individual is not fatigued, it may be much more likely that the individual will successfully complete the task in the absence of problem behavior (Smith, Carr, & Moskowitz, 2016). Horner et al. (1996) described several ways in which setting events could be an important part of a multicomponent intervention for problem behavior. Interventions might include minimizing the likelihood that the setting event will affect behavior, for example, ensuring a good night's sleep for an individual who experiences increases in problem behavior when fatigued. Another strategy might be to neutralize the effects of the setting event. For example, if a student just had a fight on the playground and then became uncooperative after re-entering the building, the teacher might prompt the student to use a known relaxation routine before presenting an academic task. A third strategy might be to provide additional prompts to facilitate a desired behavior. This could involve a teacher following a direction with a prompt such as, "If you need help doing this, or if you need a break, tell me by…" (Horner et al., 1996).

A comprehensive systems change approach typically involves the use of multicomponent interventions, with treatment efforts simultaneously focusing on setting events, antecedents, skill building, and consequences. In illustration, Lucyshyn et al. (2007) presented a case study of a 5-year-old child, Katherine, who had autism and severe intellectual disability. Katherine and her family were followed for a 10-year period: 2 years in baseline, nearly a year and a half of intervention training and support, and 7 years of post-intervention. The participant was 5 years old when the study began and 15 years old when it concluded. The study targeted four different family routines at home and in the community: dinner, bedtime, fast-food restaurant, and grocery shopping. The intervention plan incorporated a variety of PBS strategies that included four different setting event strategies: ensuring that tasks and activities had meaningful outcomes, using a picture schedule, supporting friendships with nondisabled peers, and decreasing demands when ill. The intervention package also included five different antecedent strategies: providing advanced information about events that were stressful (e.g., tasks, changes, transitions, being alone); using natural positive contingencies to motivate cooperation; mediating delays using a preferred interaction, item, or activity; ensuring task success with instruction that matched her learning style; and using a "safety signal" to predict a break. To address skill building, the intervention included strategies to teach Katherine to use language to communicate her wants and needs, to participate in group activities, to wait or accept a delay, and to comply with "stop" and "come here" cues. Finally, consequence strategies included contingent praise for appropriate behaviors such as using language, making progress toward independence, calmly waiting, and accepting changes in routine. Planned ignoring of low-intensity behaviors was also included as a consequence-based strategy. Following parent implementation of the multicomponent plan, Katherine's problem behaviors decreased to zero or near zero levels, while successful participation in routines increased from 0% to 75% of routines observed. Most importantly, across 7 years of post-intervention measurement and brief support, these changes maintained and showed further improvement, with successful participation in routines reaching 100% of routines observed. In addition, implementation of the support process was associated with a broader range of meaningful and durable improvements in Katherine's behavior and quality of life from early childhood to middle adolescence. Katherine's parents also reported improvements in the family's quality of life and in their own personal health that went beyond the immediate focus of the study. As their skills, confidence, and success in supporting their daughter grew, the parents reported a decrease in family fragmentation and social isolation.

Given the noted importance of multicomponent interventions, a number of tools have been developed to assist PBS interventionists in identifying a broad range of factors that can affect problem behavior. One of the earliest devices to assess global influences was the *Setting Events Checklist* (Gardner et al., 1986), which is a 16-item checklist that identifies factors such as previous negative interactions, medication changes, and/or illness as potential setting events for problem behavior. Inspired by this work, Carr, Magito McLaughlin, Giacobbe-Grieco, and Smith (2003a) developed and used a *mood scale* to study the impact of environmental setting events. The mood scale contains a 6-point Likert-type rating of mood (0–1 = bad mood; 2–3 = neutral mood; 4–5 = good mood), followed by a series of open-ended questions aimed at identifying particular setting events that might be associated with bad or good mood. Similar rating scales have been used to evaluate the impact of biological setting events such as menses (Carr, Smith, Giacin, Whelan, & Pancari, 2003b) and fatigue (Smith, Carr, & Moskowitz, 2016). *The Contextual Assessment Inventory* (McAtee, Carr, & Schulte, 2004) identifies generic classes of contextual variables that might be associated with problem behavior. The inventory includes over 90 individual items that are grouped into categories, including aspects of the social and cultural environment that may influence problem behavior (e.g., negative interactions, disappointments); aspects of the task, activity, or routine underway (e.g., rigid, boring, difficult); aspects of the physical environment (e.g., discomfort, change); and aspects of the individual's physical condition or state of health (e.g., medication, illness, physiological states). For each item in the inventory, caregivers are asked to rate the likelihood of problem behaviors occurring in the presence of each factor (1 = never, 3 = half the time, 5 = always). The authors concluded that the CAI was an efficient, comprehensive, and comprehensible means of helping to identify context events that could be key components of a multicomponent intervention plan (McAtee et al., 2004).

Emphasis on Prevention

A PBS approach emphasizes the prevention of problem behavior. From a PBS perspective, "prevention" refers to intervening on problem behavior when the problem behavior is not occurring so that skill building can occur in an effort to prevent the behavior from occurring again (Carr et al., 2002). This definition of prevention includes in part an emphasis on the early intervention for problem behavior in young children with ASD, so that problem behavior later in life for those individuals can be prevented or minimized. The proactive approach of prevention can include interventions such as functional communication training (e.g., Carr & Durand, 1985), creating opportunities for choice making (e.g., Dunlap et al., 1994), and curricular revisions (e.g., Dunlap et al., 1991).

An illustration of prevention research can be seen in the work of Kay, Harchik, and Luiselli (2006). The authors presented a case study of a 17-year-old student with autism named George, who attended a public high school. George's drooling was reported to be interfering with his education and his social adjustment at school. His drooling was thought to be the result of a skill deficit; thus, one of the components of the intervention involved George participating in three pre-teaching sessions, where he was taught to follow the instructions "swallow" and "wipe your mouth" using a tissue. Verbal instructions, partial physical guidance, and praise were used during the pre-teaching sessions. Once George demonstrated mastery in following these instructions, additional intervention components were implemented. These interventions included the following components: (1) George's paraprofessional aide checked him every 5 min, and if his mouth was dry, he was praised and provided with an edible reinforcer; (2) if saliva was visible outside his lips, the aide requested George to wipe his mouth and swallow. The results showed that the intervention was associated with a steady reduction and eventual elimination of drooling across the three locations used in the study (classroom, community vocational site, and cooking class). Following the intervention, it was anecdotally reported by school staff that George received greater peer acceptance compared to pre-intervention.

In a second example, highlighting early intervention research, Reeve and Carr (2000) conducted a study that examined whether functional communication training (FCT) could be a means of preventing minor problem behaviors from escalating to more serious behaviors. The participants in the study were children with developmental delays between the ages of 33 and 60 months. These children were identified by parents and teachers as engaging in minor problem behaviors such as crying, whining, and light hitting when they wanted to gain someone's attention. The participants were assigned to one of two groups. Children in the FCT group interacted with adults who were trained to teach the children functional communication to request attention (e.g., tapping the adult on the arm, saying the teacher's name, or saying a phrase such as "Look what I've done"). The children in the second group, the expressive language training (ELT) group, interacted with adults who were not trained in FCT but were trained to teach general expressive language skills (e.g., labeling, answering questions). Data were collected on the frequency of functional communication use, intensity of problem behaviors, and frequency of problem behaviors. The results of this study indicated that the children in each group made few requests for attention during baseline. During intervention, the children in the FCT group used functional communication requests more often than children in the ELT group and did not show an increase in the frequency or intensity of problem behavior. On the other hand, all of the children in the ELT group showed increases in the frequency and intensity of problem behavior from baseline to intervention. Furthermore, after functional communication training (FCT) was implemented, there was a reduction in problem behavior in the ELT group. The authors concluded that functional communication training may have been effective in preventing increases in problem behavior in children who are at risk.

Prevention tools can be drawn from the applied behavior analysis literature and include "best practice" strategies for teaching and prompting. PBS interventionists are actively engaged in adapting these procedures to real-world community settings, using task analyses, incidental teaching, and a variety of strategies to program for generalization and maintenance across settings and intervention agents. However, since these strategies are not specific to PBS, they will not be articulated here.

Flexibility with Respect to Scientific Practices

PBS presumes different outcomes than its ABA predecessors. For this reason, Carr (1997) suggested the need for a new applied science that addresses consumer needs more systematically and more frequently. With respect to assessment, methods must be user-friendly, feasible in the community, and yield accurate information. PBS challenges researchers to adopt greater flexibility in their definition of what constitutes acceptable data (Schwartz & Olswang, 1996). Moving beyond observations, PBS challenges researchers to consider the acceptability of naturalistic observations, correlational analyses, and qualitative data, including case studies, interviews, subjective rating scales, logs, questionnaires, and self-report measures, many of which have already been described.

Flexibility in scientific practice was illustrated by Carr and Carlson (1993) who presented an approach for remediating severe problem behavior in three adolescents with ASD in a public community setting, specifically a supermarket. Here, the authors noted that traditionally, interventions for problem behavior would be evaluated using measures of frequency and time sampling. These measures are especially appropriate in home and school settings where parents or professional staff monitor the problems. In these settings, there is an understanding that problem behavior is likely to occur in baseline and must be tolerated, at least in the short run, for purposes of assessment. However, no such tolerance exists in a public supermarket. Instead, even a relatively small number of instances of property destruction or aggression against other patrons can result in expulsion from the store or police action. Also, caretakers who accompany individuals with disabilities to the store may be embarrassed by public displays of problem behavior and therefore unlikely to agree to monitor progress using frequency or time sampling measures. In light of these practical difficulties, Carr and Carlson (1993) suggested the need for alternative measures for use in public settings. Accordingly, they evaluated the utility of measures of latency to problem behavior and percentage of task completion as alternatives to measures of frequency and time sampling. The rationale for employing these measures was that, in the community, there would be less concern with overall rate or level of problem behavior and more concern with whether an individual could complete a shopping task in a reasonable amount of time and do so without engaging in problem behavior.

Multiple Theoretical Perspectives

While applied behavior analysis has played a major role in shaping the development of PBS, as PBS has evolved, other branches of psychology, including organizational management, community/ecological psychology, cultural psychology, biomedical science, and positive psychology, have made significant contributions as well (Carr, 2007). These branches of psychology deal with units that are larger than the individual (i.e., systems) and emphasize the importance of natural settings for research and intervention. Carr et al. (2002) identified three principles that have long characterized the above fields and have now become dominant within PBS as well. These are the following: (1) since people in community settings are interdependent, clinically significant change occurs in social systems and not just in individuals; (2) producing change is not simply a matter of implementing specific techniques; rather, change involves the reallocation of resources such as time, money, and political power; and (3) an individual’s behavior is the result of a continuous process of adaptation, reflecting the interface between competence (a property of individuals) and context (a property of environments). Therefore, a successful intervention must modulate the goodness of fit between competence and context.

These principles are highlighted in a case study presented by Clarke, Worcester, Dunlap, Murray, and Bradley-Klug (2002) who used a multicomponent intervention to address the problem behavior of a 12-year-old student named Mindy. Mindy was diagnosed with ASD and attended a public school. During assessment, the student’s intervention team identified specific pre-academic activities as well as transition routines involving physically moving from one location to another location that were associated with the occurrence of problem behavior. The team developed a multicomponent intervention for each of the targeted activities and routines. For example, Mindy resisted a routine assembly activity that required her to place color-coded foam forms onto matching colored pegs. The intervention involved providing an alternate assembly activity that was more functionally relevant and meaningful to Mindy and could serve as a bridge to other, more functionally relevant activities. In this case, Mindy was given a new activity of assembling a McDonald's Happy Meal kit. This activity was then used as a bridge to the functional skill of matching (e.g., matching plastic chicken nuggets with their containers) and eventually to transitioning to the cafeteria. Additional components that were included in the intervention were minimizing distractions for 5 min before making the transition, inviting a preferred peer to assist Mindy with making the transition, including a preferred activity (a tape player) for Mindy to enjoy during the transition, and providing Mindy with a preferred object to hold while walking to the cafeteria. The results showed that problem behavior occurred during a mean of 44% of intervals across all activities during baseline, which decreased to a mean of 11% during intervention. For transitions, problem behavior decreased from an average of 75% during baseline to 31% during intervention. Follow-up data 1 year after the study was initiated were consistent with the levels of problem behavior achieved during intervention. Here, interventions for Mindy's problem behavior recognized that clinically significant change needed to occur in Mindy's school. Change involved the reallocation of resources such as time, money (items), and people (peers, school personnel). Ultimately, Mindy's progress came as the result of a continuous process of adaptation to better balance Mindy's level of competence with the complex contexts (e.g., work skills, cafeteria) that she encountered.

In a second example, Reichle et al. (1996) described a model for training early intervention staff who work with preschoolers who engage in challenging behavior. These authors noted that staff tend to assume that the children will "outgrow" these behaviors. This can result in staff not addressing lower-level challenging behaviors, which may result in a worsening of these behaviors as the children grow older (Reichle et al., 1996). Noting the lack of preservice training for staff who will eventually work with individuals with challenging behavior, Reichle and his colleagues proposed a training program that focused on preventive intervention rather than reactive intervention strategies. This program emphasized the need for a transdisciplinary approach to addressing challenging behavior and described how universities and school districts could work collaboratively to improve services through longitudinal technical assistance, preservice and in-service coursework, and on-site training in the prevention of problem behavior.

Cultural Sensitivity and PBS

While cultural sensitivity has not been formally identified as a "critical feature" of PBS, as PBS is applied to a wider variety of ethnic, racial, social, and religious groups, there has been a call for increased consideration of cultural diversity in the development and application of PBS interventions (Carr, 2007). Carr (2007) identified three sets of cultural issues that are relevant to the future of PBS: cultural relativism, cultural values, and cross-cultural competence. Each of these will be described in turn.

In terms of cultural relativism, Carr (2007) noted that problem behavior cannot be fully understood without considering such things as the values, beliefs, and norms of the ethnic, racial, religious, or social groups to which an individual belongs. Draguns (1997) stated that abnormal behavior concepts vary across cultures. This implies that a challenging behavior needs to be assessed in relation to its cultural context. Since the way problem behavior is defined can vary across cultures, failure to examine the cultural context and how a particular culture defines the problem behavior can lead to ineffective interventions and low consumer acceptability of the intervention. As an example, Delgado Rivera and Rogers-Adkinson (1997) described how withholding eye contact when interacting with a person in authority is typically seen as respectful in Hispanic-American and African-American groups. Similarly, among Asian-American groups, eye contact with strangers may be seen as disrespectful (Delgado Rivera & Rogers-Adkinson, 1997). Therefore, promoting eye contact in certain situations when working with these cultural groups may be seen as going against cultural norms.

Regarding cultural values, Carr (2007) described how the PBS approach has largely been developed within English-speaking Western culture. This would suggest that PBS interventions might reflect the values of this culture, such as autonomy, self-reliance, and independence. If these goals are ascribed to an individual from a different culture where values such as group identity and mutual dependency are valued, these goals may be seen as going against what the culture values. This could then result in low consumer satisfaction with the goals. In a description of culturally sensitive person-centered planning, Callicott (2003) stated that self-determination, which is a hallmark of person-centered planning, may be an unfamiliar concept to another culture and may be in opposition to putting family first. In such situations, person-centered planning can provide an opportunity to discuss expectations and discuss the belief systems of the target individual, the family, and the community (Callicott, 2003).

Lastly, Carr (2007) emphasized the need to have competence in working with a wider variety of cultures other than White, middle-class groups, and such things as family structure, customs, and child-rearing practices will come to play a more important role in determining PBS interventions. For example, when working with a family from a culture where extended families rather than nuclear families may be the norm, interventions will need to consider including extended family members in assessment and intervention. Using semistructured interviews, Zionts, Zionts, Harrison, and Bellinger (2003) found that African-American parents of children with disabilities wanted sensitivity training for teachers working with children from low socioeconomic levels. They reported that they wanted teachers to spend time in the communities where the children reside in order to better understand what the families' lives and challenges are outside of school (Zionts et al., 2003).

To illustrate the role of cultural factors, while summarizing the critical features of PBS, a final case study will be presented. Magito McLaughlin, Mullen James, Anderson Ryan, and Carr (2002) presented a case study of Christos, a Greek immigrant in his early twenties who was multiply diagnosed with autism spectrum disorder, seizure disorder, and bipolar disorder. Christos was unique in that he was of European descent and not a native speaker of the English language. In addition, he experienced medical and psychiatric illnesses, in addition to ASD. Christos was born in Greece, and as a young child, he lived with his family in a Greek enclave in Queens, NY. At the age of 19, the intense nature and severity of Christos' problem behaviors resulted in his placement in a residential treatment center out of state. At the center, Christos was heavily medicated and provided with two staff at all times to address his intense tantrums and destruction of property. At age 23, Christos returned to New York for adult services due to changes in funding regulations that no longer allowed him to remain in an out-of-state placement.

Christos moved to a temporary crisis home on Long Island with 15 other individuals who had severe problem behavior. While living at the residence, his problem behaviors became more intense and more frequent. Staff attempted to exert control over Christos' behavior by bribing him with food to gain his cooperation. This resulted in serious health issues, including becoming overweight and developing high cholesterol. Physical and mechanical restraint procedures were also used several dozen times per month to keep Christos and others safe from harm. His problem behavior prevented him from engaging in classroom activities at his day program and from accessing the community at large.

A year later, Christos moved into a smaller community residence with six other men who also had a history of autism and severe problem behavior. His behaviors remained intense, and this became more and more of a concern since Christos was now living in an otherwise quiet neighborhood. A neighbor eventually filed a complaint with the state office on developmental disabilities, and the state office mandated that Christos be removed from the home.

Following the mandated change in placement, the agency responsible for providing services made a decision to intervene using a positive behavior support (PBS) approach. A support team including Christos and his family, clinical staff, and direct staff workers who had a positive rapport with Christos convened to create solutions based on Christos' needs. The team recommended that Christos temporarily return to the crisis residence, so they could conduct an intensive assessment of his behavior. Central to the team's approach was a reframing of Christos' problem behavior: his "noncompliant" behavior was viewed as having "unmet needs." Instead of trying to exert power over Christos' behavior, a functional behavior assessment (FBA) was conducted to identify specific contexts that supported and maintained problem behavior. By addressing these contexts, a multicomponent intervention plan could be developed to reduce problem behavior and improve his overall quality of life.

As an initial part of the PBS approach, a functional behavior assessment interview was completed, and it indicated that the primary motivation for problem behavior was escape from unwanted events. The next priority addressed by the team was to identify the contexts and environments that Christos was looking to escape. Using a method similar to that described by Carr et al. (1994), the team identified five general contexts in which problem behaviors were most likely to occur. These included (1) group situations/crowded environments, (2) traditional staffing patterns (wherein the staff's role was to guard and protect, rather than teach and befriend), (3) physical and chemical restraints, (4) limitations to physical mobility, and (5) lack of access to community activities (Magito McLaughlin et al., 2002). The team utilized person-centered planning to brainstorm solutions to each of the five contexts identified. The results of this process are summarized in the table below.

Problem behavior context	Solution
Group situations/ crowded environments	Have Christos live alone and work with a small group of support staff
	Have Christos engage in individualized community-based supports instead of traditional day program supports
Traditional staffing patterns	Hire staff from the local Greek community who could engage Christos in cultural activities (e.g., speaking in Greek, cooking/eating Greek food)
Physical and chemical restraints	Encourage communication to express needs
	Develop a positive rapport with staff
	Increase opportunities to exercise self-control (e.g., take a shower to cool down when angry)
	Implement medication changes to decrease side effects (e.g., sedation, hunger)
Limitations to physical mobility	Support verbal communication (e.g., to leave a situation, to be alone)
	Provide healthy snack options that were freely available
Lack of access to community activities	Use of a photo communication board so Christos could choose preferred community activities
	Develop a community presence with staff support by introducing Christos to local community destinations (e.g., churches, parks, Greek restaurants)
	Facilitate ongoing contacts with family members who are still living in the Greek community
	Create respected roles (e.g., part-time work, strengths-based activities, preferred activities)

Prior to these interventions, Christos demonstrated episodes of aggression, self-injury, and property destruction between 350 and 1,100 times per month. After PBS was implemented to address specific problem behavior contexts, Christos' problem behavior episodes decreased to as few as 100 episodes per month. In addition, time spent in the community following the person-centered plan increased significantly (Magito McLaughlin et al., 2002).

Magito McLaughlin et al. (2002) pointed out that Christos' story illustrated how individuals with problem behavior might not benefit from large groups or system-oriented services. The authors showed how "thinking outside the box" and utilizing positive behavior support strategies that address problem contexts could meet the unique needs of this complex young man. Furthermore, Christos' story highlights the critical features of PBS. Comprehensive lifestyle change was accomplished by way of a planned move out of the group home and to a home of his own. In addition, there was a renewed emphasis on culturally relevant community membership. Christos was a young man who was forced to transition from an out-of-state school where he was in a highly controlled environment to an adult service placement in New York that was ill-prepared to manage him. A lifespan perspective necessitated the provision of different treatments under different circumstances. Christos' PBS plan was ecologically valid in that the interventions were matched to hypothesized variables. Relevant stakeholders, including Christos' parents, family members, and support staff, participated in a person-centered planning process to identify relevant contexts and solutions. Social validity was ensured in that interventions were readily able to be carried out by staff. Multicomponent intervention was accomplished through a simultaneous effort to adjust staffing, housing, communication, coping skills, and medication. An emphasis on prevention was illustrated by the use of creative scheduling (Brown, 1991), choice (Dunlap et al., 1994), and communication (Carr et al., 1994), as opposed to crisis management and physical restraint. Flexibility with respect to scientific practices was evidenced by designing teaching strategies that were simple and user-friendly. Multiple theoretical perspectives were achieved by carefully weaving cultural factors (i.e., Greek staff, food, community) throughout the PBS intervention plan. Despite many layers of complex needs, PBS stood as a beacon of hope for Christos and his family. This new approach to intervention illustrated a broader lifestyle perspective; it was more responsive to Christos' needs and more in line with the community-based support efforts that were underway. As a result of PBS, Christos continues to live in the community today and participates in self-directed services to further improve his quality of life.

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Psychotropic Medications as Treatments for People with Autism Spectrum Disorder

Alan Poling, Kristal Ehrhardt, and Anita Li

Introduction

To be diagnosed with autism spectrum disorder (ASD) according to the criteria described in the current version of the *Diagnostic and Statistical Manual of Mental Disorder* (*DSM-V*), a person must exhibit restricted, repetitive patterns of behavior and deficits in social communication and social interaction (American Psychiatric Association, 2013). The reported prevalence of ASD has increased over the last 30 years, probably due to increased public awareness of the condition and broadening of the diagnostic category (Elsabbagh et al., 2012). For example, the Center Disease Control (2016) indicates that 1 in 150 children was identified with ASD in 2000, but 1 in 68 was so identified 12 years later.

Many people diagnosed with ASD exhibit challenging behaviors that are not part of the defining features of the disorder, as well as the kinds of behavioral excesses and deficits required for the diagnosis (Huete, Schmidt, & Lopez-Arvizu, 2014; Matson & Nebel-Schwalm, 2007a). Moreover, some people diagnosed with ASD exhibit behaviors similar to those required to meet the diagnostic criteria for other disorders, including attention deficit/hyperactivity disorder (ADHD), oppositional defiant disorder (ODD), and intellectual disability (ID) (Charman et al., 2011; Lecavalier, Kaat, & Stratis, 2014; Matson & Nebel-Schwalm, 2007b). Helping people with ASD change their behavior in desired ways is an invaluable strategy for enhancing the quality of their lives, and professionals from many disciplines use the tools of their trade in attempts to do so. Psychotropic drugs, which are medications prescribed with the intent of improving mood, cognitive status, or overt behavior, are the behavior change tools of psychiatrists and other physicians. It is unsurprising that they frequently prescribe such drugs for people with ASD. This chapter provides a skeptical appraisal of this practice.

The Prevalence of Pharmacological Interventions

Several studies have examined the prevalence of psychotropic drug use in people with ASD. Findings differed across studies, with prevalence rates ranging from 19.5% (Witwer & Lecavalier, 2005) to 65% (Schubart, Camacho, & Leslie, 2014), but most found that approximately 40–50% of sampled individuals were receiving or had received at least one psychotropic medication (e.g., Aman, Lam, & Collier-Crespin, 2003; Croen, Najjar, Ray, Lotspeich, & Bernal,

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2006; Goin-Kochel, Myers, & Mackintosh, 2007; Green et al., 2006; Gringras, 2000; Langworthy-Lam, Aman, & Van Bourgondien, 2002; Logan et al., 2015; Sheehan et al., 2015; Williams et al., 2012; Witwer & Lecavalier, 2005). Although most researchers examined only relatively young people with ASD, substantially higher prevalence rates have been reported in adults compared to children and adolescents (Park et al., 2016; Seltzer, Shattuck, Abbeduto, & Greenberg, 2004; Tsakanikos et al., 2006). Additionally, lower levels of social competence and adaptive behavior, like the presence of challenging behaviors, are associated with increased likelihood of pharmacological treatment (Myers & Johnson, 2007).

It is not unusual for people with ASD to simultaneously receive two or more medications intended to improve their behavior, a practice we will term polypharmacy. For example, in a study of 33,565 children with ASD conducted by Spencer et al. (2013), 35% of the individuals were prescribed two or more psychotropic medications simultaneously, while 30% of them were prescribed a single drug. Very similar results were reported by Schubart et al. (2014), who examined psychotropic drug use among Medicaid-enrolled children and adolescents with ASD in 41 states over a 4-year period. They "found that 65% of children with ASD were prescribed one or more psychotropics and approximately 30% were prescribed medications in more than one class with at least a 60-day overlap" (p. 634). As a third example, Mandell et al. (2008) used Medicaid claims to examine the psychotropic medications prescribed for 60,641 children with ASD. They found that 56% of them received at least one such medication and 20% received three or more (data for two or more drugs were not reported).

Clearly, the use of medications in an attempt to improve the behavior of people with ASD, and thereby benefit them, is widespread. An important, and obvious, question is "why is this so?" Matson and Konst (2015) provided a partial answer, which we expand in the next section.

Drug Treatment as Evidence-Based Practice

Professionals in medicine, psychology, and other helping disciplines agree that widespread adoption of evidence-based practice is the cornerstone of effective clinical treatment (e.g., APA Presidential Task Force on Evidence-Based Practice, 2006; Institute of Medicine, 2001; Montori & Guyatt, 2008). Although there is no consensus as to what, exactly, constitutes evidence-based practice, it is widely acknowledged that clinicians should select and administer treatments for a given problem based on three factors. Those factors are (a) their own training and expertise, (b) the characteristics and preferences of the client being treated, and (c) the scientific evidence supporting the effectiveness of various treatments for the problem at hand.

Pharmacology is a major part of medicine, and medical doctors from all specialties receive extensive training in selecting drugs to deal with diverse health issues, arranging appropriate doses of those drugs, monitoring their effects, and altering treatment as appropriate to achieve desired outcomes (e.g., by altering dosage or changing to another medication). Psychiatrists are specialists in the use of psychotropic drugs, but many other physicians also have the training and experience necessary to use drugs as tools for managing behavior. In so doing they are operating within the ethical and legal boundaries of their discipline and are offering what is often the only tenable treatment option given their training and the limited time they have to spend with individual clients. It is natural and appropriate for physicians who are asked to help in improving someone's behavior to prescribe psychotropic drugs, regardless of whether or not the clients are diagnosed with ASD. In so doing they are using tools that are both familiar and arguably the best at their disposal.

Although some people with ASD are old and competent enough to make legally binding decisions, in most cases treatments for people with ASD are sought and selected by their parents or legal guardians. There are five obvious reasons for parents and guardians to view pharmacotherapy as a preferred option for dealing with behavioral challenges. One is that pharmaceutical companies have been hugely successful in convincing the public at large that most behavioral challenges are the result of underlying biochemical anomalies that respond favorably to drug treatments (Whitaker, 2010). A second, related reason is that viewing challenging problems as the result of an underlying neurochemical issue, rather than as learned behaviors, frees caregivers of the nagging fear that they are responsible, albeit unintentionally, for the occurrence of those behaviors. A third is that insurance companies, and Medicare, typically pay for pharmacological interventions, while other intervention strategies may not be covered. A fourth is that drug treatments are easy to administer, especially when compared to alternatives such as behavior-analytic interventions. A fifth is that a concerned individual looking for an effective treatment for any of a range of challenging can easily find endorsements for pharmacological interventions.

If, for example, a parent consults the National Autism Center's (2011) well-regarded book, *A Parent's Guide to Evidence-Based Practice and Autism*, she or he will learn that risperidone (Risperdal®) is an effective for treating "core symptoms [of ASD] (generally), maladaptive behavior, hyperactivity, irritability" (p. 54). In addition, methylphenidate (Ritalin®) is deemed an effective treatment for addressing the symptoms of "inattention and hyperactivity (but response rate may be lower in children with ASD)" (p. 53). Given these endorsements, and the other reasons for favoring drug treatments, it is perfectly reasonable for parents to support administering one of these drugs to their children.

Irritability: Creation and Treatment of a Make-Believe Disease

Even though risperidone is classified as an effective treatment for the core symptoms of ASD in *A Parent's Guide to Evidence-Based Practice* (National Autism Center, 2011), no medication is currently approved by the US Food and Drug Administration (FDA) for treating the defining behavioral features (i.e., "core symptoms") of autism, and, as discussed in the section entitled "Research Findings," there is no compelling evidence that any medication is effective in this regard.

Two drugs, risperidone (Risperdal®) and aripiprazole (Abilify®), are FDA approved for treating "irritability" in children and adolescents diagnosed with ASD (United States Food and Drug Administration, 2006, 2009). "Irritability" is a shorthand label for several forms of challenging behavior, including crying, self-injury, aggression directed toward others, and property destruction. The term is commonly used in articles evaluating drug effects in people with ASD but rarely used in other contexts. Its popularity in the drug literature stems from the widespread use of a particular behavior rating scale, the Aberrant Behavior Checklist (ABC; Aman, Singh, Stewart, & Field, 1985), to index drug effects.

The ABC is a 58-item symptom checklist that is completed by a caregiver. The instrument was first used with children and adults diagnosed with cognitive impairment (and then termed "mental retardation"), but it is now widely employed to study drug effects in people with ASD. Each item is scored on a four-point scale (0, not a problem; through 3, problem is severe in degree). The items are categorized into five subscales revealed through factor analysis: (1) *irritability, agitation, and crying* (commonly termed "irritability," 15 items), (2) *lethargy and social withdrawal* (16 items), (3) *stereotypic behavior* (7 items), (4) *hyperactivity and noncompliance* (16 items), and (5) *inappropriate speech* (4 items). Although the ABC is easy to use and is reported by its developer to be a reliable and valid behavior rating instrument (Aman, 2002), it is also a crude instrument that yields ordinal data and provides no detailed information about how a person with ASD is behaving. Moreover, it provides data that are based on raters' subjective opinions and memories and provides no information about contextual variables that affect behavior.

Perhaps the worst problem in using "irritability" to describe certain kinds of challenging behaviors emitted by people with ASD is that one can all too easily reify the term and then assert that it *causes* the occurrence of the behaviors the label was initially used to describe. It appears, in fact, that FDA administrators did exactly this when they approved risperidone for treating people with ASD. Consider the full prescribing information for risperidone (Risperdal®), which includes the following statement:

> RISPERDAL® [risperidone] is indicated for the treatment of irritability associated with autistic disorder in children and adolescents aged 5–16 years, including symptoms of aggression towards others, deliberate self-injuriousness, temper tantrums, and quickly changing moods [see Clinical Studies (14.4)]. (downloaded from http://www.accessdata.fda.gov/drugsatfda_docs/label/2009/020272s056,020588s044,021346s033,021444s03lbl.pdf.

Note that risperidone is indicated for the treatment of "irritability associated with autistic disorder" and that "aggression towards others, deliberate self-injuriousness, temper tantrums, and quickly changing moods" are specifically described as *symptoms* of that irritability. In fact, there is no evidence for the existence of "irritability," save for the behaviors described as symptoms of it (e.g., self-injury). Irritability is not a disease or a behavior disorder, and it is utter foolishness to contend that risperidone, or any other psychotropic drug, alleviates "irritability" in people with ASD, which in turn reduces their challenging behavior.

In most cases, challenging behaviors emitted by people with ASD are operant responses controlled by their consequences. For example, a review of 173 studies in which functional assessment techniques were used to isolate environmental variables related to the challenging behavior of people with ASD revealed that, in most participants, attention or escape from demands maintained the responses of interest (Matson et al., 2011). In such cases, operant conditioning, not an internal state of irritability, was responsible for the challenging behaviors. Although researchers and clinicians frequently discuss drug effects on "irritability" (e.g., Elbe & Lalani, 2012), doing so is at best misleading.

Behavioral Mechanisms of Drug Action

What psychotropic drugs actually do is to perturb neurochemical processes. These perturbations sometimes influence an individual's sensitivity to environmental events, and in such cases it is possible to specify the drug's behavioral mechanism of action. In contrast to neurochemical mechanisms of drug action, which relate to the effects of drugs in the brain, behavioral mechanisms of action refer to the stimulus functions of drugs in the context of operant and classical conditioning and to the effects of the drugs on the capacity of other stimuli to control behavior.

The stimulus properties of drugs involve their ability to serve as conditional stimuli, unconditional stimuli, discriminative stimuli, positive reinforcers (conditioned or unconditioned), and negative reinforcers (conditioned or unconditioned). Drugs also can serve as motivational operations, increasing or decreasing the reinforcing or punishing effects of certain other stimuli. In addition, they can alter sensitivity to particular dimensions of reinforcement (e.g., amount, probability, delay), influence sensory acuity (hence discrimination), and elicit responses incompatible with required operants. Finally, drugs and their effects can be described in statements (rules) that alter behavior through rule governance. These and other behavioral mechanisms of drug action are described elsewhere (Poling & Byrne, 2000).

Little is known regarding the relation between behavioral mechanisms of action and the beneficial (as well as adverse) effects of psychotropic medications in people with autism (Poling, Ehrhardt, Wood, & Bowerman, 2010), but some recent progress has occurred. To determine behavioral mechanisms of drug action, one must first identify the environmental variables which typically regulate the behavior in question. Functional analysis (and functional assessment in general) provides a tool for doing so and has been used in a few studies to examine the variables controlling challenging behavior and how risperidone interacts with those variables (Crosland et al., 2003; Valdovinos et al., 2002; Zarcone et al., 2004). Unfortunately, those studies failed to disclose a characteristic behavioral mechanism of drug action for risperidone. In many participants, the environmental variables controlling destructive behavior could not be isolated. In some participants, however, the functions of the response class were apparent, and risperidone appeared to produce consequence-dependent effects, specifically, to weaken escape-maintained responding.

A more recent study that used analogue functional analysis and other methods to examine the effects of several drugs on the rate and function of problem behaviors exhibited by four children with ASD also revealed that atypical antipsychotics often reduce escape-maintained responding (Valdovinos, Nelson, Kuhle, & Dierks, 2009). In this study, rates of problem behaviors exhibited by two students decreased in the demand condition (where responding was escape-maintained), but not in other conditions, when risperidone or olanzapine was discontinued.

In another recent study, Danov, Tervo, Meyers, and Symons (2012) examined the effects of aripiprazole on the problem behaviors of four people with severe developmental disabilities, one of whom was diagnosed with ASD. Aripiprazole "had some apparent differential effects across behavioral function and behavioral topography for 3 of 4 participants" (p. 286), but not for the participant with ASD, whose behavior worsened in all conditions when the drug was administered. The reason for the difference in drug effects across participants is not clear, but the results of this and other studies suggest that, as others have argued (e.g., Schaal & Hackenberg, 1994; Thompson, Egli, Symons, & Delaney, 1994), functional analysis methodology may be useful in isolating behavioral mechanisms of drug action. Discerning such mechanisms may prove useful in consistently matching clients with ASD to effective pharmacological interventions, a task which is currently impossible.

ASD and Comorbidity: Dual Diagnosis

Although progress is being made in understanding how brain structure and function differ in people who are and who are not diagnosed with ASD, current knowledge is inadequate to provide a sound rationale for the use of pharmacotherapy (Bethea & Sikich, 2007; Buxbaum & Hof, 2013; Thompson, 2007). That is, there is no known disease process that is responsible for the behaviors that lead to a diagnosis of autism, or for co-occurring challenging behaviors, which can be corrected by administering a drug with a particular mechanism of action. At this point in time, the only valid justification for prescribing behavior-modifying drugs for people with ASD is sound empirical evidence that such drugs are effective. As Heute et al. (2014) point out, "psychopharmacological interventions may be used to treat [all behaviors indicative of] an entire suspected psychiatric disturbance, a specific behavior as a symptom of a psychiatric diagnosis, or a behavior occurring in the absence of a psychiatric diagnosis" (p. 735).

A drug would be used to treat a psychiatric disturbance in a person with ASD if that person was to be dually diagnosed, that is, properly identified as having both ASD and a recognized psychiatric condition (e.g., one identified in *DSM-V*), such as schizophrenia, a mood disorder, an anxiety disorder, or ADHD. As noted previously, many people with ASD also are concurrently diagnosed with ADHD, ODD, or ID (Charman et al., 2011; Lecavalier et al., 2014; Matson & Nebel-Schwalm, 2007b). Matson and Konst (2015) suggest that, while psychotropic drugs are generally overused to treat people with autism, "the use of pharmacological interventions is appropriate for some symptoms of co-occurring psychopathology such as anxiety, depressions, and schizophrenia" (p. 35). That may be true, but it is important to recognize that the behavioral characteristics that cause a person to be diagnosed with ASD also make it hard to diagnose comorbid conditions (Mason & Scior, 2004; Shaw, Bruce, Ouimet, Sharma, & Glaser, 2009), and studies reveal that drugs are commonly prescribed in an effort to reduce challenging behaviors (Bamidele & Hall, 2013; Canitano & Scandurra, 2011; Medeiros, Kozlowski, Beighley, Rojahn, & Matson, 2012; Tureck, Matson, Turygin, & Macmillan, 2013; West, Waldrop, & Brunssen, 2009). Unfortunately, these responses are rarely defined carefully or measured precisely, and, as Matson and Konst contend, "...a very large segment of psychotropic drug use involves prescribing for extremely vague and/or ill-defined target behavior" (p. 35).

Limitations of Published Research

Researchers have been rightly critical of the quantity and quality of drug studies involving people with developmental disabilities, including ASD, for more than 40 years (e.g., Sprague & Werry, 1971; Gadow & Poling, 1988; Matson et al., 2000). The number of studies examining the effects of psychotropic drugs in people with ASD has increased greatly in recent years, and the quality of research in this area arguably has improved with time. For example, the number of studies of children with ASD that used a randomized between-group design with a placebo-control condition, which is typically (but not necessarily wisely) considered as the "gold standard" in clinical psychopharmacology, increased dramatically from 1981–1990 to 2001–2010 (Siegel & Beaulieu, 2012). Nevertheless, as regularly emphasized in reviews of the literature and other articles (e.g., Courtemanche, Schroeder, & Sheldon, 2011; Farmer, Thurm, & Grant, 2013; Matson & Hess, 2011; Mohiuddin & Ghaziuddin, 2013; Poling et al. 2010; Siegel & Beaulieu, 2012), many published studies are not methodologically strong, and several important research questions have not been adequately addressed. These limitations are understandable given the practical and ethical challenges that are an inevitable part of conducting drug research with a protected population, but they also seriously limit the conclusions supported by the current research base. Ten limitations of the research base are considered in this section. It should be noted that other limitations, such as failure to standardize drug dosages and studying heterogeneous and ill-defined samples of people with ASD, are also significant.

1. *There are no long-term studies of the value or adverse effects of drug treatments.* People with ASD often receive one or more psychotropic medication for years, even decades, but no studies have examined drug effects over such long periods. Given that psychotropic drugs are often prescribed for children with ASD, whose brains and bodies are rapidly developing, long-term studies are especially important. As others have noted (e.g., Anderson et al., 2007; Haddad & Sharma, 2007), almost nothing is known about the long-term side effects of antipsychotics in young people with ASD, even though these drugs are widely used and are known to produce several adverse effects. Relevant research is both badly needed and difficult to conduct.
2. *The possibility of gender differences in drug effects has been largely ignored.* Although there are differences in the behavior of males and females with ASD (Rivet & Matson, 2011), gender often influences drug effects (Poling et al. 2009), and the importance of examining possible gender differences is widely recognized in psychopharmacology (Volkow, 2005–2008), the usual practice in drug studies involving people with ASD is to include relatively few female participants and to aggregate data across females and males.
3. *The effects of psychotropic drugs in people past young adulthood remain to be determined.* Although ASD is nearly always a lifelong condition, people with ASD continue to emit challenging behaviors as they age (although the form of the behaviors often changes with time), and as drugs are frequently prescribed in response to those challenging behaviors, researchers have paid very little attention to drug effects in older people with ASD (see Dove et al., 2012). Most published studies involve children, and Dove et al. found only eight studies of medications that focused on 13- to 30-year-olds with ASD, four of fair quality and four of poor quality. Given the quantity and quality of the studies examining drug effects in adolescents and young adults with ASD, no compelling conclusions can be drawn concerning the value of pharmacotherapy in this

population. Even less can be concluded regarding the value of psychotropic drugs for older people with ASD, including those who are elderly, because relevant research is lacking. The absence of research examining the effects of pharmacotherapy in older people with ASD is vexing, given that data reported by Shimabukuro, Grosse, and Rice (2008) indicate that "individuals with an ASD are utilizing increasingly intense pharmacotherapy to control behavioral symptoms as they grow older" (p. 550).

4. *Very little is known about the effects of polypharmacy*. As noted, people with ASD often receive two or more psychotropic drugs simultaneously. There are very few data to provide empirical support for this practice. For instance, a recent review of polypharmacy involving risperidone or aripiprazole in combination with other drugs revealed that few relevant articles have appeared, and none of them provide compelling support for commonly used drug combinations (in press).
5. *Drug treatments are rarely compared to alternative treatments*. Other interventions, notably those characteristic of applied behavior analysis, have proven useful in reducing the kinds of challenging behaviors that are commonly treated with psychotropic drugs, but head-to-head comparisons of the two intervention modalities rarely, if ever, appear. For example, research shows that both risperidone and behavior-analytic interventions can be effective in reducing challenging behaviors, but a review indicates that no direct comparison of risperidone and a nondrug treatment has appeared (Weeden, Ehrhardt, & Poling, 2010a). Moreover, different research strategies are typically used to evaluate behavior-analytic and pharmacological interventions, which make it nearly impossible to compare findings across studies.
6. *The effects of combinations of psychotropic medication and non-pharmacological interventions are largely unknown.* People with ASD often are simultaneously exposed to both pharmacological and non-pharmacological interventions (which are often behavior-analytic) with the same intended outcome, typically the reduction of challenging behavior (Frazier, 2012). As Courtemanche, Schroeder, and Sheldon (2011) point out, very little is known about the effects of such combinations. They provide an excellent discussion of strategies for examining drug combinations and the importance of doing so.
7. *Measures of desired and side effects are often weak*. As Zarcone, Naolitano, and Valdovinos (2008) discuss, one of the most important issues in designing a drug study is determining which behaviors to measure and the best way to measure them. Checklists and rating scales, such as the ABC, are used to index beneficial changes in behavior in most studies that examine drug effects in people with ASD. Although they are widely accepted and easy to use, such assessments yield limited information and have been soundly criticized. For example, Huffman, Sutcliffe, Tanner, and Feldman (2011) found that the Clinical Global Impression (CGI) scale was the most commonly used general measure of drug effects in the 89 studies they evaluated (it was used in 23 of them), even though, as they note, "its shortcomings have been recognized in criticisms of the scale on semantic, logical, and statistical grounds and in recommendations for its improvements [references omitted]" (p. 63). Alternatives to the ABC and CGI for quantifying drug effects are sorely needed and summarized elsewhere (e.g., Gadow & Poling, 1988; Zarcone et al., 2008). Moreover, as Matson and Hess (2011) emphasize, side effects are rarely assessed adequately, even though such effects can be quite serious. They offer a number of useful suggestions for improving the measurement of side effects.
8. *Data analysis is often weak*. Three separate issues bear mention. One is that inferential statistics, in which group means (e.g., on the irritability subscale of the ABC) for a placebo and drug group (or condition) are compared, are widely used in an attempt to

determine whether drug treatment produced a beneficial change in behavior. Statistical significance is not the same as clinical significance, which must be assessed using a social validation procedure (Poling & Ehrhardt, 1999; Poling, Methot, & LeSage, 1995). A second is that the number of participants in many studies is relatively small, which compromises the power of statistical analyses. A third is that meaningless data are sometimes analyzed, as when researchers consider total ABC scores rather than subscale scores (e.g., Fung, Chahal, Libove, Bivas, & Hardan, 2012; Thompson, Zarcone, & Symons, 2004).

9. *The potential for bias to affect findings is high in many studies.* As Matson and Konst (2015) point out, many studies of the pharmacological treatment of people with ASD are funded by the companies that manufacture the drugs being evaluated. Such funding automatically raises the issue of researcher bias, both intentional and unintentional. Knowledge of the conditions to which individual participants are exposed is another source of potential bias, and it is conventionally controlled through the use of double-blind conditions, in which neither the participants in a study nor the researchers (or others) who evaluate them know whether particular participants are receiving drug or placebo when data are collected. These controls are absent in open-label drug trials, which should always be viewed with extreme skepticism, especially in view of data suggesting that placebo responses are especially strong in studies of participants with ASD (Sandler & Bodfish, 2000). Even when a placebo is given, it may be easy to tell whether or not a participant is receiving active medication, because such medication produces obvious changes in that participant's physiological status or behavior. In such cases, an active placebo, that is, a substance that produces some detectable effects similar to those of the medication of interest, but has no psychotropic action, should be used (Khan & Brown, 2015; Moncrieff, 2015). Unfortunately, studies of drug effects in participants with ASD that compare medication to an active placebo have not appeared.
10. *Predictors of positive responses to drugs have not been isolated.* Studies repeatedly show that there are important individual differences in how people with ASD respond to a given psychotropic drug, even when the dose for each is equivalent (or optimized) and the condition being treated appears to be comparable. For this reason, researchers should routinely distinguish "responders," who are people who respond favorably to a drug, from "nonresponders," who fail to benefit from the medication, and many (but by no means all) do so. When this is done, a significant proportion of patients inevitably proves to be nonresponders. For example, in a study of the effects of risperidone in adults that used scores on the Clinical Global Impression of Improvement scale to index drug effects, 8 of 14 participants who received risperidone were rated as responders, defined as people whose scores were "much improved" or "very much improved" when they received risperidone (McDougle et al., 1998). It stands to reason that the patients who responded favorably to risperidone differed in some important way or ways from patients who did not benefit. If empirical variables that reliably distinguish responders from nonresponders could be identified, then it would be possible to accurately match patients to effective treatments, which is the essence of sound clinical practice. Although researchers have searched for valid predictor variables at several levels of analysis and have made some progress, as in the studies (previously overviewed) suggesting that antipsychotic drugs weaken escape-maintained behavior, it is not presently possible to accurately predict individual responses to a given medication. Until this is accomplished, if ever, it is imperative that every treated individual's response to medication be carefully monitored, as discussed in the section entitled "Everyday Medication Monitoring."

Research Findings

Hundreds of studies have examined the effects of various drugs on the behavior of people with ASD. Although there are serious limitations to this body of research, as discussed in the foregoing section, "Limitations of Published Research," published findings support some conclusions, and dozens of scholarly reviews have summarized these findings. Table 25.1 lists 18 peer-reviewed reviews, all published in the past decade. Readers seeking informed summaries of the published literature are advised to consult these sources. Useful information is also available in book chapters and books not specifically devoted to the psychopharmacology of autism (e.g., Huete et al., 2014; Thompson, 2007) and in a good but somewhat outdated book concerned solely with the topic (Tsai, 2001). It is important to recognize, however, that authors differ from one another with respect to their general orientation toward pharmacological interventions, with some being more skeptical than others. Moreover, there is no consensus concerning the specific characteristics that enable a drug evaluation to yield creditable findings (Courtemanche et al., 2011; Higgins & Green, 2006); therefore, reviewers can legitimately differ with respect to the weight they assign to the findings of particular studies and the conclusions that they draw from them. Despite these considerations, the conclusions of most reviews are similar. Based on our reading of these reviews and most of the original articles upon which they are based, it is our opinion that the following conclusions are justified at this time.

A Wide Range of Medications Have Been Evaluated, Inadequately

In descending order of frequency, the drug classes most commonly prescribed for people with ASD appear to be antipsychotics, antidepressants, stimulants, and anticonvulsants (Bertelli, Rossi, Keller, & Lassi, 2016). Multiple drugs from each of these classes have been evaluated in one or more studies. In addition, drugs from many other classes, several with no recognized psychotropic applications, have also been examined. For example, a review by Bertelli et al. summarized the effects of the following drug classes (and individual drugs): antipsychotics (risperidone, palperidone, aripiprazole, clozapine, olanzapine, quetiapine, ziprasidone, and asenapine), antidepressants (tricyclics, notably clomipramine, nortriptyline; serotonin-specific reuptake inhibitors, notably fluvoxamine, fluoxetine, sertraline, citalopram, escitalopram, venlafaxine, trazodone, and mirtazapine), anticonvulsants and mood stabilizers (valproic acid, topiramate, levetiracetam, and lamotrigine), central nervous system stimulants (methylphenidate and atomoxetine), other compounds (clonidine, guanfacine, naltrexone, and secretin), new frontier pharmacotherapy (cholinergic drugs, notably tacrine, rivastigmine, galantamine, donepezil, and mecamylamine; glutamatergic agents, notably *d*-cyclosterine, amantadine, memantine, acamprosate, arbaclofen, and bumetanide), melatonergic agents (melatonin and agomelatin), and oxytocin.

That list comprises 42 individual drugs. Published studies are inadequate to support compelling conclusions about the benefits or risks of the vast majority of them. Nonetheless, regardless of the drug evaluated or what it is prescribed to treat, most original investigations report a beneficial outcome in at least some patients, and many reviews echo these reports. For example, methylphenidate is often reported to be effective in treating "hyperactivity," although some reviewers view the supporting evidence as compelling (e.g., Huffman et al. 2011), while others view it as suggestive (e.g., Siegel & Beaulieu, 2012). Such disagreements make it clear that extant data are inadequate to provide adequate guidance for physicians who are contemplating the use of psychotropic medications to treat a person with ASD, even if they are familiar with the relevant studies and committed to the use of scientifically verified practices.

As Heute et al. (2014) point out, "...psychiatrists are challenged with basing their understanding of medication utility on a less than optimal body of research and more often on case study reports, and sometimes must refer to

Table 25.1 Summary of published reviews in the last 10 years (listed alphabetically)

Published reviews	Drug or drug classes	Demographic[a]	Target symptoms[b]
Aman et al. (2014)	Atomoxetine	Children (19 or younger)	Hyperactivity
Baribeau and Anagnostou (2013)	Multiple drug agents	Children and adults	Social communication
Broadstock, Doughty, and Eggleston (2007)	Multiple drug agents	Children and adults	Core symptoms of ASD
			Comorbid symptoms
Dove et al. (2012)	Multiple drug classes	Adolescent and young adults (13–30 years old)	Core symptoms of ASD
			Comorbid symptoms
Doyle and McDougle (2012)	SRIs	Child and adults	Core symptoms of ASD
	Antipsychotics		Comorbid symptoms
Elbe and Lalani (2012)	Antipsychotics	Children and adults	Irritability
	Misc. drug agents		
Fung et al. (2012)	Aripiprazole	Children (4–18 years old)	Sensory abnormalities
Ghanizadeh (2012)	Atomoxetine	Children and adults	ADHD symptoms
Krishnaswami et al. (2011)	Secretin	Children (12 or younger)	Core symptoms of ASD
McPheeters et al. (2011)	Multiple drug classes	Children (12 or younger)	Challenging and repetitive behaviors
Mohiuddin and Ghaziuddin (2013)	Multiple drug classes	Children and adults	Hyperactivity
			Irritability
			Aggression
Parikh, Kolevzon, and Hollander (2008)	Multiple drug agents	Children and adolescents	Aggression
			Self-injurious behaviors
Preti et al. (2014	Oxytocin	Children and adults	Emotion recognition
			Eye gaze
Reichow, Volkmar, and Bloch (2013)	Methylphenidate	Children	ADHD symptoms
	Atomoxetine		
	Clonidine		
Rossignol and Frye (2014)	Multiple drug agents approved for Alzheimer's disease	Children and adults	Core symptoms of ASD
			Comorbid symptoms
Roy, Roy, Deb, Unwin, and Roy (2015)	Naltrexone	Children	Core symptoms of ASD
			Comorbid symptoms
Siegel and Beaulieu (2012)	Alpha-2 agonists	Children (18 or younger)	Core symptoms of ASD
	Antipsychotics		Comorbid symptoms
West et al. (2009)	SSRIs	Children	Core symptoms of ASD
			Comorbid symptoms

[a] Demographics as reported by the authors in the review
[b] Target symptoms and/or areas as reported by the authors in the review

reported results and clinical trials of medications used in the general population for similar symptoms to guide their decisions" (p. 736). They assume, for example, that people with ASD can experience all of the psychiatric conditions (or behavior disorders) exhibited by other people and that the presence of ASD does not fundamentally alter how a person with a given psychiatric condition, such as depression of ADHD, responds to medication. Both assumptions are reasonable. But, as discussed previously, it is hard to diagnose comorbid psychiatric conditions in people with ASD, and medications are usually prescribed to reduce specific challenging behaviors in people with ASD, not to reduce established symptoms of recognized psychiatric conditions (e.g., *DSM-V* criteria for specific disorders). Put simply, the rationale for prescribing most psychotropic drugs for people with ASD is weak, and the common practice of using polypharmacy to manage supposed coexisting psychiatric conditions in people with ASD is fraught with difficulty.

No Drug Significantly Improves the Core Symptoms of Autism

Although a few authors might disagree, most people who reviewed the relevant literature reached conclusions similar to the two that follow, as do we:

> In summary, despite their widespread use, there exist no medications that are specific to the core symptoms of autism. At best medications result only in modest symptomatic response. (Mohiuddin & Ghaziuddin, 2013, p. 652)
>
> [T]his review finds that there are no definitely effective or efficacious pharmacologic treatments for the core symptoms of autism. (Farmer et al., 2013, p. 310)

No medication that substantially reduces the core symptoms of ASD is currently available, but researchers continue to search for one. Like everyone concerned with the well-being of people with ASD, we hope they find it soon.

Antipsychotic Drugs Often Reduce Challenging Behaviors in Children and Adolescent

Although several antipsychotic drugs appear to reduce challenging behaviors, the evidence is best for risperidone, unsurprising because the drug has been approved for a decade for reducing such behaviors. As noted, many but not all children and adolescents treated with appropriate doses of risperidone show substantial reductions in challenging behaviors, such as self-injury, temper tantrums, and aggression directed toward property and other people. This outcome can be of great value to the treated individuals and those who love and care for them. There is also substantial evidence that aripiprazole, also approved for reducing challenging behavior, is often effective.

Antipsychotic drugs can produce a range of troublesome and potentially serious side effects, including sedation, weight gain, metabolic changes, and motor disturbances. Although antipsychotic drugs are often efficacious, we agree with McPheeters et al. (2011), who contend that “caution is warranted regarding their use in patients without severe impairments or risk of injury” (p. 1319).

Secretin Is Useless

Although secretin, which is a gastrointestinal peptide, was once a popular treatment for young people with ASD, several methodologically sound studies show beyond reasonable doubt that it is of no value whatsoever (Huffman et al., 2011; Krishnaswami, McPheeters, & Veenstra-Vaderweele, 2011).

Everyday Medication Monitoring

As noted, there are substantial differences in how what appear to be similar people with ASD respond to a particular psychotropic drug. Some are responders, others nonresponders, and, moreover and importantly, there are substantial individual differences in the form and severity of the side effects produced by a given drug and dose. Moreover, people with ASD, and especially children, may not be able to self-monitor and report the effects of medications to their physicians and other caregivers. Given these considerations, every person with ASD who receives a psychotropic medication should be carefully monitored to ensure that they are receiving significant benefit from it.

We have repeatedly argued (e.g., Poling, 1994; Poling & Ehrhardt, 1999; Poling, Laraway, Ehrhardt, Jennings, & Turner 2004; Poling, Methot, & LeSage, 1995; Weeden, Ehrhardt, & Poling, 2010b), and argue again, that accountable, hence appropriate, pharmacotherapy requires that (a) treatment goals (i.e., the desired changes in target behaviors) are clear and in the participant's best interest, (b) treatment procedures (i.e., who does what to whom) are unambiguous and implemented with fidelity, and (c) treatment decisions (i.e., whether the intervention is continued, altered, or terminated) are made on the basis of actual changes in target behaviors and other relevant characteristics of the participant (e.g., evidence of significant side effects). In fact, caregivers who are committed to using evidence-based practice – and all of them should be so committed – have two essential obligations. One is to select interventions based on scientific evidence indicating that those interventions *are likely to be effective* in the patients that receive it. The other is to provide compelling evidence that the interventions *actually are effective* in the patients that receive them.

As Sprague and Werry (1971) emphasized many years ago, every prescription of a psychotropic medication is in essence an experiment in which the physician and other caregivers hypothesize that administering a specific drug will produce a desired change in one or more aspects of a client's behavior. They hope and expect that the hypothesis will be confirmed but must collect relevant data to validate their expectation. If they do not, patients may be exposed indefinitely to interventions that fail to help, and may even hurt, them.

Depending on the desired effects of the drug in question, in a particular situation, checklists, rating scales, interviews, and direct observations may be useful in quantifying drug effects. Good assessment procedures are easy to use, provide a meaningful index of the behaviors of clinical concern, and are acceptable to parents, other relevant caregivers, the prescribing physician, and (insofar as possible) the person with ASD. Several articles provide good coverage of issues relating to quantifying the behavioral effects of drugs in people with ASD in clinical research (e.g., Arnold et al., 2000; Courtemanche et al., 2011; McDougle et al., 2000; Matson & Nebel-Schwalm, 2007a; Zarcone et al., 2008), and the same general issues pertain to the everyday assessment of medication effects. It is beyond our purpose to discuss these issues, but four points are worth making. First, some people with ASD lack sufficient communication skills to participate in certain types of assessments. Second, people are inclined to see (and report) what they expect (and hope) to see, so the potential for observer bias affecting results is always a consideration.

Third, some of the strategies necessary to collect important data are invasive and will not be well tolerated by some people with ASD. For instance, when patients are prescribed an antipsychotic, like risperidone, their blood lipids and fasting blood glucose should be regularly monitored (Panagiotopoulos, Ronsley, Elbe, Davidson, & Smith, 2010) with blood collections. But, as Elbe and Lalani (2012) indicate, "for some children with autism spectrum disorder, attempts at blood collection can lead to severe behavioural outbursts and intervention may be required to complete appropriate monitoring" (Davit, Hundley, Bacic, & Hanson, 2011, p. 145). Rather than arranging such an intervention, caregivers may simply forego the monitoring.

Fourth, most physicians are not trained in behavioral assessment, and even those who are well trained do not have the time to collect relevant data. Therefore, if physicians' decisions regarding the behavioral effects of psychotropic medications are to be data based, other people must collect appropriate data. We have suggested that behavior analysts, by virtue of their training and professional functions, are in an especially good position to collect such data (Poling & Ehrhardt, 1999; Weeden et al., 2010b), but, regardless of who actually collects data, it is essential that all concerned parties decide before medication is prescribed what the drug is intended to do and how its effects will be measured and evaluated. Strategies for detecting possible untoward drug effects should also be selected at this time. Collecting multiple measures of drug effects in different situations, such as at home and at school, is typically desirable, because challenging behaviors are often situation specific. Having multiple individuals collect data also is desirable, because doing so reduces (but does not eliminate) the likelihood of observer bias confounding results.

The rigor with which drug effects can be assessed in different individuals with ASD varies substantially, depending on the situation and the caregivers involved. In our experience, it is common to have little or no formal assessment. That is, no data relevant to drug effects are collected, and the value of the intervention is assessed based on the global impressions of parents, teachers, or other caregivers. It is unsurprising that this is the case – most people are not committed to data-based decision-making and even those who are may find it difficult to collect appropriate information regarding drug effects. It is also unfortunate.

Consider the study by Zarcone et al. (2004), summarized previously. In that study, risperidone did not appear to reduce destructive behavior in 3 of 13 participants. Nonetheless, the parents of two of three of the persons with ASD who did not show a beneficial response to the drug during functional analysis sessions elected to continue their children on medication after the study ended. Zarcone et al. noted that "They [the parents] felt that although their children continued to engage in some destructive behavior, the intensity was reduced, and the medication was helpful in reducing behaviors that were not captured by the functional analysis, such as hyperactivity, perseverative, and obsessional behavior" (p. 319). This may be the case, but it is not clear whether risperidone actually improved aspects of the children's behavior not adequately captured by the researchers' assessments or whether the parents *believed* there were improvements where none really existed. This distinction is far from trivial because risperidone can produce a range of significant adverse effects. Therefore, people who do not receive real and direct benefit from risperidone should not receive it. The same is true of all other psychotropic medications.

Concluding Comment

For more than half a century, prescribing psychotropic drugs for people with developmental disabilities has been a common, and controversial, practice. It remains so today, although the focus has largely shifted from the effects of such drugs in people with ID to their effects in people with ASD. It is sadly ironic that many of the same concerns that were expressed years ago, as in reviews of the literature by Baumeister and Sevin (1990) and Matson et al. (2000), remain relevant today. Consider the following comment on the methodology of published studies involving people with ID (once termed "mental retardation"), which appeared more than three decades age:

> Thirty-nine articles (1970–1982) on drug effects in mentally retarded participants were evaluated on 14 methodological dimensions. Methodological shortcomings were evident in most, but not all, studies. The relative scarcity of methodologically sound studies has significant implications for clinicians, whose decisions concerning drug use with the mentally retarded should be data-based. (Poling, Picker, & Wallace 1983, p. 110)

As we have discussed, methodological limitations also characterize recent studies of the effects of psychotropic drugs in people with ASD. It is easy to bemoan the shortcomings of the research that has appeared, but it is hard to improve upon it because funding to support relevant studies is limited. Moreover, both practical and ethical considerations limit the kind of work that can be done. Evidence adequate to support strong conclusions concerning the value of many psychotropic drugs commonly prescribed for people with ASD will not appear soon, if ever. Nonetheless, such drugs are routinely prescribed. In the absence of such evidence, the known adverse effects of many medications, and the availability of safer and better-documented alternative treatments, a good case can be made that psychotropic medications are routinely overprescribed for people with ASD (Matson & Konst, 2015; Matson & Hess, 2011).

Early in this chapter, we discussed some of the reasons why psychotropic drugs are so often prescribed for people with ASD. The best reason, of course, is that some members of this population derive benefits from a drug treatment that no other intervention can provide. Prescribing medication is the primary tool that physicians have available to improve the mood, cognitive status, or overt behavior of people with ASD, and this tool is neither intrinsically good nor bad.

Appropriate drug treatment requires that the right people receive medication and that their medication regimen is managed to produce optimal benefit. When this occurs, a psychotropic medication can provide quick, effective, and cost-efficient benefits. Ensuring that it occurs consistently is a worthy goal for everyone who cares for people with ASD.

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Current Status and Future Directions

26

Rachel L. Goldin and Johnny L. Matson

Introduction

The preceding chapters provide a comprehensive overview of the many factors associated with the treatment of individuals with autism spectrum disorder (ASD). Current practices and service deliveries are discussed along with implications for future clinical practice. As the field of ASD research advances, and our understanding of the disorder and co-occurring conditions improves, our practices must progress as well. It is estimated that only 50% of individuals with ASD demonstrate substantial positive gains as a result of evidence-based interventions (Stahmer et al., 2011). Researchers must capitalize on the recent discoveries about the genetics and neuroscience of ASD, along with the significant increase in the number of well-designed and controlled treatment studies, to develop more effective developmental and behavioral interventions. The purpose of this chapter is to highlight directions for future research and clinical practice.

Heterogeneity and Pretreatment Characteristics

Response to treatment among individuals with ASD is varied (Bailey, 2014; Damiano, Mazefsky, White, & Dichter, 2014; Stahmer, Schreibman, & Cunningham, 2011). Much of the heterogeneity observed in response to treatment can be attributed to the heterogeneity of the disorder itself. Exploring variables that predict response to treatment is an important area of research. Some predictive variables identified include age, time of symptom onset, intellectual quotient (IQ), language skills, and level of functioning (Harris & Handleman, 2000; Perry, Blacklock, & Dunn Geier, 2013). Findings from this line of inquiry suggest that children with typical intellectual functioning, who a milder presentation, and who begin treatment by age 4 respond the best to early intensive behavioral intervention (Dawson, 2008; De Giacomo & Fombonne, 1998). However, research explaining why less able children have poorer treatment outcomes is almost nonexistent.

In order to fill this gap in knowledge, focusing research attention on pretreatment characteristics that influence response to treatment is recommended. Pretreatment characteristics related to differential treatment outcomes include child (e.g., age, sex, race, level of functioning), family (e.g., SES, level of education, level of support),

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and practitioner (e.g., training, openness, cultural sensitivity) variables (Stahmer et al., 2011). Such findings have a multitude of implications. The presentation of certain characteristics can be used to guide a child into a treatment that will have the greatest degree of effectiveness and reduce time spent on ineffective treatment. Also, it will allow for individualization of treatment procedures to improve treatment outcomes, which in turn can impact family and child attitudes and adherence to treatment. Finally, focus can be shifted to studying the children who have the poorest response to treatment and determining how treatments may be redesigned to meet their needs. Given the heterogeneity of ASD, it is clear that one method of treatment will not be effective for all. Research is needed to determine characteristics that predict treatment response so that clinicians can further individualize treatment methods to meet the specific needs of their patient an improve prognosis.

Developmental Differences over the Lifespan

ASD is a lifelong disorder. Expectations for behavior and skills change throughout development; thus, interventions appropriate for children are often not appropriate for adolescents or adults. As such, treatments must be adapted as individuals with ASD not only face changes in societal expectations and demands (e.g., independent living, transition out of school, developing relationships) but also experience changes in their biological and mental development. Symptoms of ASD often change in presentation and severity as an individual moves into adolescence and adulthood, requiring modification of existing services and supports (Bailey, 2014; Maglione et al., 2012).

Most treatments for ASD to date are developed and researched for children (National Autism Center, 2015). Though early intervention during childhood is associated with significant improvements in prognosis (Sallows, Graupner, & MacLean Jr, 2005; Smith & Iadarola, 2015; Smith, Klorman, & Mruzek, 2015; Warren et al., 2011), continuation of treatment is needed to maintain progress made and address new developmental challenges. Skills learned in childhood may not be sufficient for adolescence and adulthood. For example, in childhood, treatment generally addresses social development and academic skills. In adulthood, however, independence skills and vocational training are necessary. Thus, focusing on developing treatments for all stages of life is critical.

One way of tackling this would be to identify important developmental milestones throughout the lifespan and use those to guide intervention development. Intervention methods should assist an individual in learning developmentally appropriate skill sets. That being said, specific treatment goals and methods should be individualized according to the level of functioning and severity of symptoms, which vary widely among individuals with ASD. ASD requires lifelong management and researchers must create treatment strategies that pertain to all stages of development.

Adult-Specific Interventions

As discussed above, ASD persists throughout the lifespan. Seventy percent of individuals with ASD are under the age of 14 but are quickly approaching adulthood (Autism and Developmental Disabilities Monitoring Network Surveillance Year 2008 Principal Investigators & Centers for Disease Control and Prevention, 2012). Despite this, few studies to date have included participants above the age of 20 (Jang et al., 2014). In a review of individuals with ASD included in ASD research, Jang et al.(2014) found that only 20% of the studies included participants 20 years or older. Further, in a review of interventions for adults with ASD, only 13 of 1,217 studies identified could be classified as randomized controlled trials. Most of the other studies were either single-case design or nonrandomized controlled trials (Bishop-Fitzpatrick, Minshew, & Eack, 2013). This is problematic for many reasons, but especially because federally mandated special education services are terminated when an individual with a disability reaches age 21, leaving them with few easily accessible service options.

In a review of available interventions for ASD released by the National Autism Center, as part of their National Standards Project (NSP), only two interventions were categorized as either established (i.e., sufficient evidence of effectiveness) or emerging (i.e., some evidence of effectiveness) for adults (National Autism Center, 2015). The only established interventions are behavioral interventions, and the only emerging interventions are vocational training interventions. For comparison, 14 established and 18 emerging interventions were listed for children. Established interventions include behavioral interventions, cognitive behavioral intervention package, comprehensive behavioral treatment for young children, language training (production), modeling, natural teaching strategies, parent training, peer training package, pivotal response training, schedules, scripting, self-management, social skills package, and story-based intervention. Emerging interventions include augmentative and alternative communication devices, developmental relationship-based treatment, exercise, exposure package, functional communication training, imitation-based intervention, initiation training, language training (production and understanding), massage therapy, multicomponent package, music therapy, picture exchange communication system, reductive package, sign instruction, social communication intervention, structured teaching, technology-based intervention, and theory of mind training (National Autism Center, 2015). From this report, it is clear there is disproportionately more attention going into treatment for children than adults.

Interventions designed for adults may need to vary from those designed for children not only in the content but also in the focus. For adults, some important areas of treatment focus should include vocational training, independent living, transition out of school, and sexuality (Bishop-Fitzpatrick et al., 2013; Damiano et al., 2014). When designing treatments for adults, researchers should take into account that the treatment decisions often may come from the adult rather than their family, as is common when treating children. As more and more individuals with ASD move into adulthood, treatments designed specifically for the needs of adults will become increasingly more important. It is imperative that professionals working in this field focus on developing evidence-based treatments and supports for adults with ASD.

Gender Discrepancy in Research

The majority of research on treatment effectiveness has been conducted with male-dominated samples. This factor may be attributed to the 4:1 ratio of males to females with ASD and/or to the higher estimated sex bias in individuals with higher IQs (e.g., below average IQ is often an exclusionary criterion for participation in research studies; Fombonne, 2009; Halladay et al., 2015). More males with higher IQs are available for research, and as such, females may be excluded to increase homogeneity of research samples or to deal with concerns about statistical power. Since most research is male dominated, there is limited research into possible gender differences in the brain basis of ASD. This also has implications for the generalizability findings on research effectiveness (Bailey, 2014).

There is a growing body of research indicating that there may be differences in the behavioral and cognitive phenotypes of females with ASD, especially those considered higher functioning. This knowledge further underscores the need to focus on including more females in ASD research. Males and females often face differing developmental and environmental challenges, and thus the emphasis and implementation of treatment may need to be different (Bailey, 2014). One way to addressing this issue would be to identify documented differences observed between males and females with ASD. This information could serve as a starting point for figuring out how treatments might need to be adjusted based on gender. For example, a higher percentage of females diagnosed with ASD fall on the lower end of the IQ distribution but show lower rates of repetitive behavior (Lai et al., 2012; Mandy et al., 2012; Volkmar, Szatmari, & Sparrow, 1993).

On the other hand, females with ASD who fall in the average IQ range are found to exhibit better functional social behavior and language abilities than male peers with similar IQs (Head, McGillivray, & Stokes, 2014; Lai et al., 2011).

Halladay et al. (2015) noted that in research conducted on populations without ASD, inherent sex differences are acknowledged, and these differences are seen as different baselines for comparison. This technique may be useful for studying individuals with ASD. Additionally, little research exists comparing females with ASD to those without, meaning we know little about the influence of being a female. Gaining this understanding is vital for further improving treatment practices, along with developing treatments that address the unique challenges facing females with ASD. Factoring gender into interventions may be a means to improving treatment outcomes.

Inclusion of Minorities in Research

Despite a consistent prevalence of ASD across racial and ethnic groups, significant racial and ethnic disparities in regard to early diagnosis and access to services exist (Begeer, Bouk, Boussaid, Terwogt, & Koot, 2009; Mandell, Listerud, Levy, & Pinto-Martin, 2002; Mandell et al., 2009; Mandell & Novak, 2005; Zamora, Harley, Green, Smith, & Kipke, 2014). This may be partially attributable to the lower rates of recruitment and retention of minority populations in research (Zamora, Williams, Higareda, Wheeler, & Levitt, 2016). Zamora et al. (2016) note three common research practices that perpetuate the exclusion of minority populations in studies: (1) exclusion of non-English-speaking participants, (2) research samples that lack representation of minority populations, and (3) classification of Latinos and other nonwhite participants as "other." Other issues that may impact research participation of minority include barriers to participation (e.g., child care, travel expenses), active participation invitation, and location of research site (Wendler et al., 2006). Remediating these issues and increasing the diversity of research samples are crucial as published studies guide what services are most widely available.

In order to improve the treatment of individuals with ASD from minority populations, researchers must better understand how minority populations perceive, seek, and respond to treatment. For example, when conducting research with minority populations, community-based strategies (e.g., partnering with community agencies) for recruitment, arranging for child care and transportation, bilingual research staff, providing research material in the native language of participants, and providing a flexible schedule are recommended. This has the potential to improve not only recruitment and retention but also improve research integrity (Brown, Fouad, Basen-Engquist, & Tortolero-Luna, 2000; Zamora et al., 2016). By diversifying research samples, a better understanding will be gained on how multicultural issues impact treatment response and how culture must be integrated into treatment development and implementation (Dyches, Wilder, Sudweeks, Obiakor, & Algozzine, 2004).

Impact and Management of Comorbidities

The rate of co-occurring symptoms in individuals with ASD is around 70% (Matson et al., 2013; Simonoff et al., 2008). Despite this high rate, little research is available on interventions for comorbid symptoms in individuals with ASD (Damiano et al., 2014). Treating comorbidities and secondary symptoms in individuals with ASD can provide symptom relief, allow for more targeted treatment, motivate the individual and/or family for further treatment, and improve quality of life. However, treatments that are effective in the typically developing population may not produce similar outcomes in individuals with ASD. For example, reduction of symptoms of inattention and hyperactivity in response to stimulant medication is reported to be poorer in children with ASD than peers with ADHD only. This may indicate that mechanisms underlying ADHD are not the same in individuals with ASD compared to those with ADHD. When studying treatment outcomes, different neurobiological substrates or additional mechanisms must be considered in the context of ASD (Bailey, 2014; Damiano et al., 2014). In order to best study this phenomena, it has been suggested that recruitment be based on the target mechanism, rather than behavioral criteria (Damiano et al., 2014). For instance, recruitment should focus on impaired emotion regulation or social processing. This approach stems from the NIMH's Research Domain Criteria (RDoC) initiative. RDoC aims to move away from the current practice of grouping observable symptoms for defining diagnoses and instead developing a classification system for disorders that is dimensional and links to neurobiological systems. The application of RDoC for treatment in clinical settings is far off; however, it has the potential to shape how mental health issues are categorized and diagnosed. This inevitability will have an impact on research. Regardless of whether researchers pursue the RDoC initiative or continue using more traditional techniques, studying interventions for comorbid conditions will rely on sound methods for defining the target population and recruiting the sample.

Pharmacology

Currently, no drugs are approved by the Food and Drug Administration (FDA) to treat the core symptoms of ASD (Damiano et al., 2014). Risperidone and aripiprazole are the only two drugs approved by the FDA for use in ASD but both are approved only to treat irritability. The dearth of research on drugs to treat the core symptoms of ASD can be attributed to several factors, one being that ASD onsets in childhood. Studying the effectiveness of drugs in pediatric populations is difficult due to the complex developmental pathways, which poses a problem for the development of biological treatments. In addition, the heterogeneity of the disorder makes it unlikely that one treatment will be effective to all or even a majority of individuals with the disorder (Damiano et al., 2014). Further, diagnosis based on social communication, which is very context dependent, along with our limited understanding of the pathophysiology of ASD and the unclear link between etiology and clinical presentation, adds to the difficulty of developing pharmacological treatments for ASD (Damiano et al., 2014). Volkmar (2001) also noted that studying medication effectiveness in individuals with ASD frequently suffers from sampling issues as a result of diagnostic uncertainty, different associated comorbidities, and differences in symptom expression.

Another reason developing pharmacological treatments for ASD that is so difficult is the current lack of animal models expressing multiple characteristics of ASD. Having robust animal models is a necessary starting point for the development of effective and safe medications (Metz, Mulick, & Butter, 2005). Animal models that currently exist only exhibit some of the characteristics of ASD, and thus findings are not generalizable. Metz et al. (2005), for example, note that no animal models address why children with ASD in a typical family environment fail to attain language normally, because no other animal learns to talk. As such, medication use in this population has targeted reducing stereotypies, aggression, and self-injurious behaviors but has not been found to be effective for treating the core features of ASD (e.g., social and communication deficits). Therefore, medication may be useful as part of a treatment plan to reduce problem behaviors so that individuals with ASD may be more responsive to behavioral interventions (Metz et al. 2005; Volkmar, 2001).

Until more is known about the neurobiology of ASD, behavioral interventions should always be the primary intervention method, but medication may be a useful adjunct treatment. As the field progresses, genes that are associated with ASD are being discovered and have the potential to provide information on the pathogenesis of the disorder (Volkmar, 2001). Though this research is still in the early stages, it provides better opportunities for researching pharmacological treatments for ASD that may address the core features of the disorder.

Conclusion

A half century ago, ASD was underdiagnosed and considered untreatable. Major advances in treatment have been made in recent years; however, large service gaps remain; what works for some individuals does not necessarily work for others, and many unsubstantiated treatment practices are still occurring. Diversifying study samples (e.g., race, gender, age) is a critical component of decreasing service gaps. The more we know about factors that affect compliance with, perception of, and response to treatment of ASD, the more individual professionals can reach and help. Additionally, ASD is not just a childhood disorder. ASD persists through the lifespan, and as a result, supports and services are needed as an individual ages. It is important that treatment not only continue into adolescence and adulthood but that it is modified to meet the differing needs and expectations as a person ages.

Similarly, ASD is a heterogeneous disorder varying in symptom presentation and severity. One treatment is not effective for all. Acknowledging the heterogeneity of ASD and the need for highly individualized and targeted intervention is key to achieving the highest rate of success for the most individuals. Treatment methods such as applied behavioral analysis (ABA) are highly effective when individualized. With greater knowledge on how specific characteristics (e.g., IQ, language abilities, multicultural issues) impact treatment outcomes, professionals will be better equipped to choose intervention that meet the needs of their client depending on where they are developmentally (i.e., mentally and physically) and their level of functioning.

Providing the best care possible is only achievable through conducting well-designed research and using evidence-based treatments. Unfortunately, the field of ASD has been flooded with unsubstantiated, controversial, and fad treatments. The nature of ASD (e.g., lifelong, variable prognosis, impacts many areas functioning, impacts the entire family) leaves caregivers very susceptible to unsubstantiated treatments that are advertised as cures or to produce immediate effects. Additionally, most people are not trained in identifying evidenced-based interventions and the principles of scientific inquiry. Research on ASD is progressing at a rapid rate with new lines of inquiry emerging through the advancement of techniques for studying the brain and genes associated with ASD. It is important that professionals continue to educate themselves and follow the progress of the field of ASD closely. We will not move forward unless we look for new and more effective treatments, but it is essential that new treatments be viewed critically and subjected to the rigors of scientific testing. It is the role of professionals to guide individuals with ASD and their caregivers toward evidence-based treatments that best meet the needs of that specific individual.

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