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Article in *Acta Oto-laryngologica* · June 2005

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ORIGINAL ARTICLE

Sign language: Its history and contribution to the understanding of the biological nature of language

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Abstract

Conclusion. The development of conceptualization of a biological basis of language during the 20th century has come about, in part, through the appreciation of the central nervous system's ability to utilize varied sensory inputs, and particularly vision, to develop language. **Objective.** Sign language has been a part of the linguistic experience from prehistory to the present day. Data suggest that human language may have originated as a visual language and became primarily auditory with the later development of our voice/speech tract. Sign language may be categorized into two types. The first is used by individuals who have auditory/oral language and the signs are used for special situations, such as communication in a monastery in which there is a vow of silence. The second is used by those who do not have access to auditory/oral language, namely the deaf. **Material and methods.** The history of the two forms of sign language and the development of the concept of the biological basis of language are reviewed from the fourth century BC to the present day. **Results.** Sign languages of the deaf have been recognized since at least the fourth century BC. The codification of a monastic sign language occurred in the seventh to eighth centuries AD. Probable synergy between the two forms of sign language occurred in the 16th century. Among other developments, the Abbey de L'Épée introduced, in the 18th century, an oral syntax, French, into a sign language based upon indigenous signs of the deaf and newly created signs. During the 19th century, the concept of a "critical" period for the acquisition of language developed; this was an important stimulus for the exploration of the biological basis of language. The introduction of techniques, e.g. evoked potentials and functional MRI, during the 20th century allowed study of the brain functions associated with language.

Keywords: Deaf education, history, linguistics, monastic signs, sign language, Socrates

Introduction

The human being has survived, in the Darwinian sense, through the development and, if compared to all other species, hypertrophy of language. The human central nervous system has evolved to allow for this specialization.

There is Paleolithic evidence that visual-based language occurred before auditory [1]. This hypothesis comes, in part, from evidence that there was linguistic communication before the voice/speech tract evolved into a form that allowed for articulated auditory communication [2]. Ontological data [3] demonstrate that the infant can utilize visual and auditory linguistic inputs equally. These, and other, streams of evidence indicate that human language is not dependent on any particular sensory input but can and does develop when there is appropriate

linguistic flux from any sensory modality. The enablement of language in the deaf relies on visual sensory inputs.

The ability of a congenitally deaf person to acquire language through a "non-traditional" sensory mode, vision, was not widely appreciated or recognized until the 16th century. The story of this belated recognition and utilization of the human central nervous system's intrinsic characteristics of redundancy and plasticity is the subject of this paper.

Indigenous sign language: fifth century BC to sixth century AD

The deaf utilized sign language from at least the 4th century BC, as evidenced by the statements of Socrates in Plato's *Cratylus* [4]:

"And let me ask another question: if we had no faculty of speech, how should we communicate with one another? Should we not use signs, like the deaf and dumb? The elevation of our hands would mean lightness; heaviness would be expressed by letting them drop. The running of any animal would be described by a similar movement of our own frames ..."

"Suppose that we had no voice or tongue, and wanted to communicate with one another, should we not, like the deaf and dumb, make signs with the hands and head and the rest of the body?"

An earlier depiction of sign language is represented by a fifth century BC Greek vase showing Philomela, whose tongue was cut by King Tereus of Thrace, using signs. Another early documentation of the use of visual communication is the Roman coin, the tessera, where fingers were used to show numbers.

Monastic signs and the deaf from the sixth to 16th centuries

The earliest known description of a hand alphabet is that of Saint Bede (fifth to sixth centuries) who developed or described a system for visual communication that was used by religious communities that had taken a vow of silence [5]. Saint Bonaventure (13th century), as noted in Melchor de Yedra's 1593 *Refugium infirmorum*, had developed a finger alphabet [6]. Hand signs were widely used, especially in the Benedictine communities. The promulgation and maintenance of this form of communication were probably the basis of the application of manual language to the deaf in the 16th century.

During the next centuries, there are occasional references to the use of non-verbal manual communication by the deaf. One of these was the recognition of the deaf's right to the assent of marriage by the Spanish King Alfonso X (13th century) [7]:

"Signs that demonstrate consent among the mute do as much as words among those who speak."

Another reference is that of Rodolfo Phrisii Agricola (15th century), who in his 1521 *De inventiune dialectica* noted a person " 'deaf from the cradle and by consequence mute' who could express his thoughts and understand those of others by way of writing" [7].

Application of signs for aid in teaching the deaf: 16th to 17th centuries

Up to the 17th century, the Aristotelian concept that hearing conveyed sound, which was assumed to be the basis of thought and by inference language, was the tenet by which the deaf, usually those with congenital or early-onset deafness, who could not speak, were considered uneducable. The religious canons were congruent with this concept of an inability to think or use language, as written in the Talmud [8]:

"A deaf-mute is not a responsible person, and, like a minor and an imbecile, he cannot acquire property, but 'for practical reasons' the Rabbis laid it down that to deprive them of anything they possess is robbery."

The Catholic Church continued this attitude, which had been amplified by the writing of Saint Augustine, quoting the Apostle Paul [7]:

"... born ... deaf, which defect, indeed, hinders faith itself, by the witness of the Apostle, who says, 'Faith comes by hearing'..."

The outcome of these concepts was that these deaf non-verbal people were considered unable to learn or achieve salvation.

The utilization and promulgation of vision as a basis and curriculum for deaf communication begins in the Benedictine Monastery of San Salvador at Oña in Burgos, Spain. The 16th century Benedictine, Pedro Ponce de Leòn, undertook the education of two brothers, Francisco and Pedro de Velasco, the children of the lord of Oña and the nephew of the constable of Castile. Typical of the time, their parents, Juan de Velasco and Juana Enriquez de Rivera, were consanguineous so as to preserve wealth. They had nine children, four of whom were deaf. The two deaf sisters, Juliana and Bernardina, entered a convent. The brothers probably entered the monastery of San Salvador at Oña in 1547–48.

De Leòn, the Benedictine, would have had knowledge of >360 different signs used for communication during periods of silence [9]. These signs were used to describe the activities of daily life, such as "... eating utensils, objects used in the mass, garments, food, and tools", as well as "... emotional states, dignitaries of the monastery ..." [7]. It has been suggested [7] that de Leòn also utilized the indigenous semantic "home" signs [10] that these brothers had acquired when living with their two deaf sisters. A motivation for this may be found in the will of their father, Juan de Velasco, in which he

petitioned the Emperor and was granted the right to allow his deaf sons to inherit his estates if his eldest hearing son should predecease them. This unusual provision would have been more sustainable if the deaf sons could communicate. The method of teaching involved use of the written word, a manual alphabet and the use of both the Benedictine signs and those indigenous signs that the children had developed. The education was successful, as attested by the ability of both boys to speak and to read and write in Spanish, Greek and Latin.

De Leòn educated other deaf children of the Spanish nobility, including at least one of the sisters of Francisco and Pedro, and recorded his method in a manuscript entitled *Doctrina para los mudos sordo*. This was known to exist up to 1821, after which it and its copies were lost or destroyed, although there may be one page remaining [11].

Systematic application and diffusion of sign language as an aid in the teaching of the deaf: 17th century

During the years after the death of de Leòn, deaf education, limited to the aristocracy, migrated from the monastery to the home. Amongst these teachers of the deaf was Manuel Ramírez de Carrión, the tutor of the congenitally deaf Alonso Fernández de Córdoba y Figueroa, who achieved a high level of success. Carrión, in 1615, was called to Madrid to teach the son of the deceased sixth Captain of Castile, Luis Fernández de Velasco, the grand nephew of de Leòn's two original pupils, Francisco and Pedro. Luis's mother, Juana de Córdoba, Duchess of Frias, needed to have her son educated to take communion so that he could be a "legal" person and thus she could be regent until he came of age. Thus great resource was invested in enabling him to communicate. Carrión's educational techniques included the use of finger spelling. He remained Luis's tutor for 4 years until he was called back to Alonso Fernández.

The new tutor was Jan Pablo Bonet (1579–1633), born near Zaragoza, who began his career as a mercenary and entered the service of de Velasco as a translator. He acquired his knowledge of deaf instruction by rooming with and observing the secretive Carrión. In 1620 he published the first book concerning the education of the deaf *Reduction de las letras y arte para enseñar a ablar los mudos* [12]. Bonet did not continue as a teacher but went on to become a state official. His book was of great importance as it was the first to widely disseminate the techniques of teaching the deaf by means of finger spelling, while deprecating the use of signs [7]:

"In any home where there are mutes . . . it is not well that those who talk to him use signs, nor that they permit him to make use of them."

There was, however, mention of the use of somewhat arbitrary signs, those for which the meaning is derived from agreement and not by resemblance to the word. One such use of this form of "genuine" sign was to explain verb tense [7]:

"For 'past' the hand moved back over the shoulder, and for 'future' the hand arched forward in front of the body."

Sir Kenelm Digby, the English ambassador to Spain, met the 13-year-old Luis and was amazed by the talent of this young person who could read and write not only in Spanish but also in Latin, Greek and other languages. Twenty years later, in 1644, Digby described Luis in his book entitled *Two Treatises: In one of which, the Nature of Bodies in the other, the Nature of Mans Soule, is looked into: In a way of discovery of the Immortality of Reasonable Soules* as an extraordinary deaf person who was highly educated, adept at lip reading and in all ways capable. Digby's book, which was reprinted, translated into German and widely disseminated, did much to inform the world of the possibility of educating the deaf.

The codification of sign language syntax, formation of a curriculum and open access: 18th and 19th centuries

The recognition of sign language as a complete language and the design and implementation of a curriculum to teach this language begins with Charles Michel de L'Épée. L'Épée, a Jansenist, was banned from preaching but found his vocation by chance when he met two deaf girls who were being taught through pictures. He felt that faith and salvation should not be dependent on hearing and could be achieved through signs. Using his father's house and his own funds, L'Épée established, in 1771, the first free school for the deaf. His first publication appeared in 1774 [13]. He established and published syntax for sign language.

The successor to L'Épée, in 1790, was the priest Roch-Ambroise Sicard, who had come to Paris to learn from L'Épée and then established a school for the deaf in Bordeaux. The Parisian school for the deaf and de L'Épée, major humane triumphs for France, were highly regarded by an aristocracy, soon to be eclipsed, who were empathetic with the education of these unfortunates. The National Assembly passed a law establishing the school for the deaf on 29 July, 1791 [14]. This was

dedicated to L'Épée and was sanctioned by Louis XVI, at that time a constitutional monarch and a virtual prisoner in the Tuilleries, a month following his arrest at Varennes. This was the first state-sponsored school for the deaf and was open to all. It was one of the last acts of Louis XVI, soon to be called "King of the French", and then simply "Louis Capet".

Sicard continued the work of de L'Épée during the early years of the French Revolution. Although politically conservative, Sicard was able to persuade the National Assembly that aid for the handicapped was part of the "natural duties" encompassed by the "rights of man". This was the foundation for our system of the care and education of all children, the basis for the concept of "The least restrictive educational pathway" [15].

Controversy: 19th to 20th centuries

During the 19th century, additional educational systems developed based philosophically on the premise that the deaf need to communicate orally and that the use of sign language would interfere with the development of oral language; sign language was the path of least resistance and the deaf child would not be motivated to learn to speak. Until the 1880s both educational systems, sign and oralism, coexisted. At the International Congress of Teachers of the Deaf held in Milan in 1880, dominated by oralists, a number of resolutions were passed. The ones with the most far-reaching consequence are as follows [17]:

- "I. The Congress, considering the incontestable superiority of speech over signs in restoring the deaf-mute to society, and giving him a more perfect knowledge, declares that the oral method ought to be preferred to that of signs for the education and instruction of the deaf and dumb.
- II. The Congress, considering that the simultaneous use of speech and signs has the disadvantage of injuring speech, lip reading and the precision of ideas, declares that the Pure Oral Method ought to be preferred."

Controversy and acrimony characterized the means of linguistic communication and the education of the deaf for most of the 20th century. Studies [16] have shown that outcomes of the totally oral educational process have been poor. Towards the middle of the 20th century there was a movement towards the incorporation of signs in combination with oral language, known as total communication. Today there is the possibility that early use of the cochlear implant may allow auditory-based language in many deaf children.

Conclusions

Vision alone is able to establish language. There are now tools, functional MRI, PET scans and the recording of evoked potentials, which allow the exploration of the physiological bases of language. It is no surprise that these techniques reflect the observations of Socrates ("of the deaf and dumb who have words without sound...") that the experiments of nature, the use of vision, for language acquisition have aided in the understanding of the biological bases of language. Language is an intrinsic property of the nervous system which is dependent on a sensory input, but not on any particular sensory input.

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