Oral language and sign language:
possible approaches for deaf people's language development

Lingua orale e lingua dei segni:
approcci possibili per lo sviluppo del linguaggio nei sordi

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Abstract

Deafness is a sensory impairment which strongly affects the normal acquisition and development of linguistic abilities. Deaf people are severely hindered in the development of oral speech because they do not have direct access to the linguistic input and many of them do not acquire much more than the rudiments of oral communication. While hearing children acquire easily and naturally a spoken language, deaf children might acquire in the same way a sign language, exploiting the visual modality. This study investigated the general linguistic competence in Italian of four different groups of deaf individuals (orally-trained children with cochlear implants, native signers, non-native signers and deaf foreigners adolescents and adults), by using a standardized picture matching task, in order to determine the level of their linguistic competence. Results revealed that most deaf individuals showed a performance comparable to that of very young hearing children. Cochlear implanted children performed significantly better than all the other groups, and the less accurate performance was that of foreigner deaf students, who often have not any kind of underlying language. Despite the better performance of cochlear implanted children, who generally do not use the sign language, the best solution to approach the oral language would appear to be the combination of oral training and sign language, in order to be able to communicate with both the deaf and the hearing communities. The school system in this sense should find some strategies in order to help deaf foreigners to get access to the grammar of the oral language. ⏮

Abstract

La sordità è una minorazione sensoriale che incide gravemente sulla normale acquisizione del linguaggio e sullo sviluppo delle abilità linguistiche. Le persone sorde, non avendo accesso diretto all'input linguistico, sono limitate nel loro sviluppo della lingua orale tanto che molti non acquisiscono che i rudimenti della comunicazione orale. Allo stesso modo dei bambini udenti, che acquisiscono spontaneamente e naturalmente la lingua parlata, i bambini sordi possono acquisire la lingua dei segni, che si serve del canale visivo.

Questo studio esamina la competenza linguistica dell'italiano, in quattro differenti gruppi di individui sordi (bambini con impianto cocleare, segnanti nativi, segnanti non nativi e sordi stranieri adolescenti e adulti), studiata attraverso la somministrazione di uno specifico test standardizzato di misurazione della competenza linguistica, e che si avvale dell'associazione di immagini a frasi. I risultati provano che molti soggetti sordi mostrano una prestazione paragonabile a quella di bambini udenti molto più giovani. I bambini con impianto cocleare mostrano una prestazione considerevolmente migliore che negli altri gruppi, mentre la prestazione meno accurata è stata data dagli studenti sordi stranieri i quali spesso non possiedono nessuna lingua di base. Nonostante la prestazione migliore è risultata essere quella dei soggetti impiantati, che generalmente non usano la lingua dei segni, la migliore soluzione per un efficace approccio alla lingua orale, sembra essere la combinazione di apprendimento della lingua orale e uso della lingua dei segni, al fine di comunicare con la comunità sorda e la comunità udente. In tal senso il sistema scolastico dovrebbe trovare le strategie più adeguate per aiutare i sordi stranieri a sviluppare la grammatica della lingua orale del paese che li ospita.

Key words: *deafness, oral training, sign language, Italian, school teaching, language acquisition, language learning.* ⏮

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Introduction

Children acquire language spontaneously and effortlessly. They do this in a surprising way and they are able to master completely the language to which they are exposed within a period of few years.

Children have innate language-specific abilities that allow language acquisition to take place in the first years of life during which environmental exposure is fundamental to stimulate this innate ability [1], [2], [3]. It is therefore necessary for this innate component to be stimulated within a specific period, known as 'critical period', the end of which is identified with puberty, or otherwise it becomes more difficult to acquire a language naturally [2]. Some cases of late exposure to linguistic input have indeed confirmed the critical period hypothesis, as is the case of Genie [4], who lived confined in a small room for almost thirteen years. During her confinement she received no auditory stimulation and therefore she could not acquire her language as an infant. She began to learn her first language late, at adolescence and even if over a period of years she improved greatly, her mental grammar remained quite undeveloped.

Also deafness inevitably affects the normal development of speech and language acquisition, since it drastically reduces both the quantity and quality of linguistic input available and accessible to the deaf person. Thus, this has severe consequences on cognitive and linguistic development [5], which in most cases persist even after a long rehabilitation process. Various studies investigating linguistic competence of deaf people found that, although these individuals might easily learn the lexicon of a language, they mainly experience difficulties with most morphosyntactic properties of the Italian language ([6], [7], [8], [9], [10], [11], [12], [13], [14]). The most frequent errors in written and spoken language, as well as in comprehension and production tasks are omission or substitution of determiners, clitic pronouns, prepositions, incorrect use of number and gender agreement, incorrect use of verbal morphology, omission of copulas, omission and/or substitution of auxiliaries and modal verbs. Deaf learners show preference for shorter sentences and are less successful in structures that violate the noun-verb-noun constituency, like in relative clauses. Also passive constructions are seldom used by deaf people.

Information and culture, which are transmitted very largely through language both in the spoken and written modality, are in most cases precluded to deaf people, since the difficulties they experience do not only depend on sensory deprivation but also on lack of linguistic competence.

Deaf people might acquire and develop naturally a sign language in which meaning and linguistic information is not acoustically conveyed, but conveyed using signs which combine simultaneously hand shapes, orientations, positions and movements of hands, arms, body and facial expressions. These languages exploit the visual modality and for this reason they represent the most natural languages of deaf communities. Indeed, when deaf people interact with each other within their community, it is natural that they use the sign language as the primary means of communication [15]. As a consequence, the only possibility deaf children have of being exposed to a kind of language is the use of sign language. Sign languages are spoken by small groups of individuals. They have the same characteristics as oral languages, i.e. they have their own grammar and they vary cross-linguistically (for instance, we mention the American Sign Language (ASL), the British Sign Language (BSL), the Estonian Sign Language (ESL), the Indo Pakistani Sign Language (IPSL)).

On the other hand, deaf individuals are surrounded by hearing people communicating via an oral language, which they have to learn and use in order to avoid isolation from the "world" around them. Hence, both the sign language and the oral language are essential for the deaf individual in order to have an effective communication system with both hearing and deaf populations.

This study aims to explore the acquisition and development of the Italian language by four different groups of deaf individuals, in order to identify the main difficulties experienced by these populations in interpreting different types of sentences of the Italian language, by using a standardized comprehension test. We would like our results to help provide information to account for the difference, in performance, between the four groups in order to awaken, as many people as possible, to the problems raised by deafness in the teaching of oral languages.

Deafness in Italy and across the world

In Italy, approximately one out of 1000 people is born with a hearing loss [16]. Over 94% of deaf children have hearing parents and the remainder are children born to deaf parents [17].

Educationally, deaf people constitute a very heterogeneous group. Those who are born deaf or whose deafness occurs before the age of two or three may be described as 'prelingually deaf'. Deafness occurring after that period is defined as 'post-lingual' deafness. Then, we distinguish those who know and use Italian Sign Language (henceforth LIS) and those who do not, those who are trained orally and those who have approached the language either through the bimodal method or through bilingual education (see the next section for a detailed description of these approaches).

Deaf people born to deaf parents acquire sign language as their first language (native LIS signers), whereas oral language might constitute for them the second language and is usually learnt after a period of intensive training. They usually do not wear cochlear implants. Native LIS signers form part of the 'Deaf Community' and are mostly proud of their language and of their culture. For their children, they claim their right to have a "language of communication" as well as a "language of scholarly education". Only 5-10% of deaf children can learn sign language naturally from their deaf parents. Generally most deaf children are born to hearing parents and are not exposed to sign language from birth. Hence, for them, it is difficult to determine their first language (either oral or signed), if they actually have any. Indeed, they could be considered as having no actual first language, or only a partial one, depending on the degree of hearing loss and, eventually, on the age of first exposure to sign language. There are deaf children that approach sign language after 3-6 years old (early signers). They learn it from other deaf children when they begin school, in a special school or residential schools where deaf students are introduced in classes with other deaf students, but also live in a boarding arrangement for a long period.

There are also many deaf people that approach sign language after 12 years old (late signers). Deaf people who are not exposed to a sign language early or until adulthood, never do as well as those who learned it as children [18]. In 1990, Newport's study on the acquisition of language and of American Sign Language (ASL) in adulthood, revealed that the ASL of people exposed after 12 years old has more flexible morphological rules if compared to the ASL of native or earlier speakers. In the same way, in Italy we can find people with different levels of linguistic competence of LIS depending on the age of introduction to this language and on the LIS level of the people with whom the subject interacts.

A phenomenon that is characterizing Western Europe is that the society is undergoing a radical change due to the emigration of poor populations to rich countries. Schools have to host an increasing number of foreign children, among whom a high number are disable individuals. The presence of deaf foreigners has consequently raised other problems on the correct way of providing them with linguistic competence and to get them integrated both in the hearing and in deaf communities. Unfortunately no data exist, to our knowledge, on the problems raised from this phenomenon and on the linguistic competence of deaf foreigners learning Italian. As a consequence of their different family background, from a linguistic, social, economical and cultural point of view, their linguistic competence, both in Italian and in the sign language, feels the effect of all these variable.

Basically, the factors that influence deaf individuals' language development are numerous and complex; among them is the age of the onset of deafness and its detection, the severity of hearing loss (*mild,* from 26 to 40 dB, *moderate* from 41 to 70 dB, *severe* from 71 to 90 dB and *profound* greater than 90 dB) the age of the first intervention, the parents' linguistic background (whether they are native signers or not), the parents' choice on the approach providing the child with the linguistic input, the degree to which parents simplify the input to the child and the quality of parent-child interaction. According to the educational philosophy of parents, a deaf child may receive language input consisting of oral speech, some form of manual coded language or sign language [19]. Nonetheless, the linguistic input that is given to deaf children is often poor [20]. In the case of deaf foreigner, to all these variables that deeply influence the language development of deaf individuals, the different socio-economic status and linguistic background compound their difficulties in the acquisition of any language. For this reason, in our study, we also want to investigate the linguistic competence in Italian of a group of deaf foreigners, who have been living here for some time, in order to determine whether their performance differs from that of deaf children born to Italian parents. Nevertheless, in our experiment we have observed that Italian linguistic competence, in Italian, of deaf foreigners, that have lived in Italy since they were 6, can be comparable to the Italian deaf children born to hearing parents.

Linguistic background and methods for developing language

The level of linguistic competence a deaf child manages to reach in their own language is influenced by many variables, among which the type of input they receive and the way in which they have access to it play an important part, also strongly depending on the parents' linguistic background. At present, various language learning methodologies are available to make language accessible to deaf people:

1. the oralist method
2. the use of Sign Language
3. the bimodal method
4. bilingual education
5. logogenia

1. *Oralist method.* This method employs exclusively written and spoken language without any use of signs. It aims at developing acoustic training, by means of cochlear implants or conventional hearing aids. Conventional hearing aids are external devices helping the deaf children to exploit their residual hearing, and mainly to develop lip-reading, which forms the basis of communication. The cochlear implant is instead a device that is surgically implanted in the inner ear (in the cochlea) and is activated by an external device, worn outside the ear. Conventional hearing aids and cochlear implants have different functions. While the former usually amplifies sounds, the latter stimulates the auditory nerve, thus allowing deaf individuals to receive sounds. It is worth pointing out that due to the high cost of cochlear implants, these devices are mainly used in rich countries. Parents who choose this kind of approach basically exclude the teaching of sign language because they believe that avoidance of sign language and oral speech presentation would result in improved spoken language acquisition.

2. *Use of sign language*. Sign language is a visual-gestural language, which is considered a full-fledged natural language. Linguistic research has demonstrated that it has the same degree of expressiveness and grammatical complexity as any other language in the world [21] and the development of grammar rules in sign language follows the same processes as acquisition of an oral language by hearing children.

As already explained in the previous paragraph, sign language represents the first language for deaf children, mainly for those born to deaf parents. Sign languages are the most natural languages of deaf communities and, if we consider that they are spoken by a small group of individuals, they are comparable to local languages. Those who use exclusively sign language tend to reject the oralist method of teaching language.

Recently, the new professional figure of deaf educator, with specific competence in teaching sign language to the deaf children and their family, has been introduced. In some cases, however, many families are discouraged from learning the sign language. Indeed they want to remove the handicap eliminating all that can make it evident [31].

3. *Bimodal approach*. It combines the oral and the visual-gestural modalities, but is fundamentally based on a unique language (in the case in point, Italian) [22] [23]. Thus, in interactions, words are accompanied by signs, maintaining the word order of the oral language and, for those functional elements that have not an equivalent sign (i.e. articles, prepositions, plurals, inflected morphemes), deaf people use some invented signs and the fingerspelling alphabet. Those who support this approach [22], [23], [24], [25] claim that the use of the visual-gestural modality may be useful to improve the acquisition of a spoken language [26] .

4. *Bilingual Education*. Bilingualism involves the knowledge and the regular use of two or more languages to the same level. In the case of deaf individuals, it consists in the simultaneous exposure to both oral and sign language. The main assumption of bilingualism is that there is the possibility of deaf children acquiring a sign language in the same way as hearing children acquire an oral one, therefore this will undoubtedly bring them some advantages in the developmental process and in the development of an oral language. Hence, deaf children will be able to meet their own needs, that is, to communicate early with the people surrounding them, developing cognitive abilities, acquiring knowledge of the world and getting acculturated into the world of the hearing and of the deaf.[27], [28], [29], [30], [16], [31], [32], [33], [34].

5. *Logogenia* [9]. This method is strictly written and exploits the reading ability of the children, to teach them some properties of the language, making use of strategies like minimal pairs and commands. This method substitutes the sentences they cannot hear with written sentences for them to read. Since it exploits the reading ability, it can only be adopted at a later stage in language development, at a point when this ability is available in the deaf child.

Independently from the intervention approach adopted, every deaf individual seems to be unique as far as their level of competence, both in oral and in sign language. Each of these interventions gives different results also depending on the person and the intuition of the speech therapist and/or educator.

Deafness and school education

The outcome of speech therapy varies cross-individually, also depending on the educational system adopted and on the way language is taught at school. Indeed a good teaching method might help the deaf person to develop good linguistic abilities.

Deafness raises important problems as far as the learning of Italian and the educational system selected to help to teach oral language to deaf people.

Deaf individuals may be introduced in normal schools, in which they attend classes with hearing peers, or in special schools, in which all students are deaf [16].

The main problem deriving from the introduction of deaf people into hearing classes concern the need for them to communicate and to get integrated with the other (hearing) students, as well as to learn the subjects taught at school. Unfortunately, in most cases the Italian school is not adequately equipped to meet deaf people's requirements. Indeed educational tools and programs are mainly conceived for hearing students rather than for deaf ones, who are often treated as mentally retarded, risking isolation from the rest of the class.

In special schools, the situation is far from being better. Although LIS is largely accepted in this type of school as means of communication, it is nonetheless not taught formally, i.e. most teachers do not use it during classes, because they are not native signers, nor have they attended courses in order to learn it. Teachers and school tutors are not adequately trained to teach to deaf people. They use total educational systems that rely on lip-reading and only sometimes they use some signs of LIS, action theatre, reading of textbooks with images, study of grammar to support the oral language. Moreover, educational programs do not differ from those in normal schools, since school subjects in both cases are taught orally, with strong consequences on the actual comprehension of the topics presented during classes.

LIS is used by children and students to interact with their schoolmates and friends in informal situations. Sometimes, non-native LIS students use instead a sort of pidgin language. Pidginization is a process occurring as consequence of "relative access to the target model, the lack of mutually intelligible language among interlocutors, an immediate need for communication, and interruption of access to one's native language" [35], that is, a code using the most common LIS signs and many iconic signs, but without any specific rules.

The advantage of attending a special school is that deaf students may easily communicate with their peers, but the disadvantage is that they may feel excluded from the hearing community and from its social rules.

Sometimes, special schools attendance may take place very late, after the failure of methods devoted to oral training, again with heavy consequences on the development of linguistic abilities.

Among the different methods to help deaf people approach oral language, the most accessible form providing deaf people with grammatical information to access the oral language, is represented by the written modality, however, written language has some limitations, since it is an artificial system, which excludes every kind of phonological information [12].

Some system are based on the study of grammar (e.g.[36]). These involve the mastery of specific metalinguistic abilities, namely a certain degree of knowledge of the grammar and of the rules governing it, and a maturity in the mother tongue in order to understand the description of language. In this case, the early use of a sign language would probably help the deaf person to reflect on the rules governing grammar, in order to apply them in the acquisition of the oral language.

Grammar and linguistic information might be conveyed through intensive reading [37] [32].Nonetheless, reading a text also requires certain abilities, namely to be able to carry out semantic analysis of the natural language and to make semantic inference; to have syntax knowledge in order to be able to build the relationship between the sentence constituents; to identify time, places and participants involved in the action; to understand the figurative sense; to identify the most important elements and capture the core idea of the text (for more information in Italian see [38]). The mastery of these abilities requires a high degree of linguistic competence.

For the teacher, it is very difficult to set and to control the ability in every child, and to thoroughly consider every component that plays a role in the reading. For deaf children, it is very frustrating to read a text and not to understand it or to misunderstand it. It is necessary to pay a lot of attention

to calibrating the difficulty of the text and how interesting the text is for the children.

Many teachers also adopt grammar texts and teaching methods for foreign learners. Nonetheless, again a mother tongue is needed to transfer the knowledge from the first language to the second language. The problem arises mainly because often deaf people cannot transfer such information due to the lack of a first language. For this reason, a mere communication skill, like the use of a sort of pidgin language, is not sufficient to develop language and linguistic rules.

Our aim is not to discuss here the functionality of these methods, which sometimes also produce excellent results, but we want to point out the necessity of being aware that all the above mentioned systems are thought in order to offer the language in an alternative way to the natural one. The artificiality of these systems has consequences on the level of linguistic competence achieved by the deaf individuals.

Experimental study: methodology

Participants

Thirty-seven deaf individuals participated in this investigation. They were differentiated into groups of deaf children using a cochlear implant (CI, N=10; age range: 7;11-10;8; mean age: 9;2), a group of deaf adolescent native signers of the Italian Sign Language (NATIVE LIS, N=7, age range: 13;-17;6; mean age: 15;11) ([13] Grosselle, 2008), a group of non-native signers, earlier or late learners of the Italian Sign Language (NON-NATIVE LIS, N=10; age range 15;10-24;6; mean age: 18;10) and a group of foreign deaf individuals (FOREIGNER, N=10; age range 13;0-24;10, mean age: 17;0).

In the CI group, all participants had profound hearing loss. They were deaf since birth and had hearing parents. They had been trained orally and they had never been exposed to the Italian Sign Language. They were fitted with hearing aids within the second year of life and/or they were fitted with cochlear implants within the third year of life. At the time of testing, they were receiving speech therapy two to three times per week and they were attending primary schools in hearing classes. None of the children had associated disabilities. The table (1) contains a summary of each child's most relevant data.

Table 1 – Participants in CI group

ID	AGE	PARENTS	USE OF LIS	SPEECH THERAPY (in years)
S10	10;8	HEARING	NO	9
S11	7;11	HEARING	NO	7
S12	9;0	HEARING	NO	8
S13	9;6	HEARING	NO	9
S14	9;6	HEARING	NO	9
S15	8;10	HEARING	NO	8
S16	9;5	HEARING	NO	8
S17	9;9	HEARING	NO	9
S18	9;3	HEARING	NO	8
S19	8;1	HEARING	NO	7

In the NATIVE LIS group, all participants were profoundly deaf since birth, born to deaf parents. They were native speakers of the Italian Sign Language and were hosted in a residential school for deaf people, in Padua. Two of them habitually used conventional hearing aids. The most relevant data concerning this group are shown in the table (2):

Table 2 – participants in the native LIS signers group

ID	AGE	LIS COMPETENCE	PARENTS
S1	15;9	NATIVE	DEAF
S2	16;1	NATIVE	DEAF
S3	16;11	NATIVE	DEAF
S4	15;5	NATIVE	DEAF
S5	16;5	NATIVE	DEAF
S6	17;6	NATIVE	DEAF
S7	13;7	NATIVE	DEAF

In the NON-NATIVE LIS group, all participants were deaf since birth, born to hearing parents. They were exposed to the Italian Sign language very late and they managed to achieve relatively good competence in it. Some of them received speech therapy when they were younger. They wore hearing aids only at school during classes. The most relevant data concerning this group are shown in the table (3):

The group of foreign deaf individuals was a heterogeneous group including people ranging in age between 13;0 and 24;10 years. They were deaf since birth, born to hearing parents. They mainly came from the Eastern Europe and belonged to families that were not able to provide for them. Most of them had been living in Italy for at least two years. They arrived here at different ages, some of them arrived

Table 3 – participants in the non-native LIS signers group

ID	AGE (Y;M)	YEARS OF LIS USE	LIS COMPETENCE	SPEECH THERAPY (IN YEARS)	PARENTS
S20	15;10	10	VERY GOOD	6	HEARING
S21	16;2	7	VERY GOOD	6	HEARING
S22	17;5	14	VERY GOOD	1	HEARING
S23	18;3	7	VERY GOOD	NO	HEARING
S24	19;0	12	VERY GOOD	10	HEARING
S25	19;5	5	GOOD	10	HEARING
S26	19;6	10	GOOD	14	HEARING
S27	20;6	16	VERY GOOD	NO	HEARING
S28	24;6	18	GOOD	5	HEARING
S29	18;2	13	VERY GOOD	2	HEARING

here when they were very young (about 5 years old) and others arrived when they were between the age of 10 and 20. Four of them attended school in hearing classes. With their hearing peers, they attended practical subjects (musical education, technical drawing, physical education and drawing), they then followed differentiated teaching during English, mathematical and sciences. Six students attended instead a special school for the deaf. They wore hearing aids only during classes. They showed difficulties in getting integrated into classes with hearing students because of the lack of communication skills both in Italian and in sign language. Moreover, because of their low communication skills, it was not possible to obtain some data concerning their hearing loss and their experience. The available relevant data concerning this group are shown in the table (4):

Procedure

All participants were tested individually in one or more sessions, in a quiet place. Deaf children using a cochlear implant were tested by the speech therapist and the second author during their individual speech therapy sessions, while the individuals included in all the other groups were tested by the first author at their school.

For children with cochlear implant, the test was presented orally, while for the other deaf groups the written modality was preferred. Sentence stimuli were presented on separate strips of paper in order to avoid difficulties due to incorrect lip-reading.

Each participant was presented with some pictures and after the stimulus was read, the participant had to point to the correct picture. For implanted children, the sentence was read by the experimenter, whereas for the other groups, the stimulus was read autonomously by the participant. Before beginning the experiment, the correct comprehension of lexical words was verified in order to make sure that participants were familiar with the names and verbs presented in the experimental trials.

Table 4 – participants in the foreign deaf group

ID	AGE (Y;M)	YEARS IN IT	LIS COMPETENCE	SPEECH THERAPY (IN YEARS)	PARENTS
S30	18;2	2	VERY GOOD	3	HEARING
S31	13;0	2	VERY LITTLE	2-3	HEARING
S32	17;2	2	LITTLE	1	HEARING
S33	17;11	2	VERY LITTLE	UNKNOWN	HEARING
S34	24;10	4	VERY GOOD	NO	HEARING
S35	17;8	5	LITTLE	NO	HEARING
S36	15;0	5	VERY GOOD	2	HEARING
S37	16;3	4	LITTLE	NO	HEARING
S38	14;8	8	GOOD	3	HEARING
S39	15;7	10	GOOD	3	HEARING

Materials and score attribution

The test used to assess the linguistic abilities of these participants is a standardized test known as TCGB (Test di Comprensione Grammaticale per Bambini 'Test of Grammatical Comprehension for Children') [39]. The test TCGB is standardized on hearing people and it is used to assess the development of children's comprehension abilities from 3;6 to 8 years. Unfortunately, at least in Italy, there are not linguistic tools elaborated for and standardized on deaf people. Nonetheless this tool is useful in order to provide a picture of language evolution in terms of linguistic age. Through response scores for each sentence typology, it is possible to identify the processes and the strategies underlying some aspects of the Italian grammar and to identify vulnerable linguistic areas.

The test includes 76 sentences and, for each trial, four pictures were shown to participant.. After the stimulus is proposed, subjects were invited to point to the picture that correctly matches the sentence, out of the four possible choices.

Eight different sentence typologies were investigated: items containing locative complements (e.g. *La palla è tra il tavolo e la sedia* 'the ball is between the table and the chair'), items testing verbal and nominal inflectional morphology (e.g. *camminano* '(they) walk', *bambino* 'child.masc'), affirmative active sentences (e.g. *la mamma lava* 'the mum washes'), negative active sentences (e.g. *il bambino non dorme* 'the child does not sleep'), affirmative passive sentences (e.g. *il cane è morso dal bambino* 'the dog is bitten by the child'), negative passive sentences (e.g. *la mela non è presa dalla bambina* 'the apple is not taken by the child'), relative clauses (e.g. *il babbo tiene il palloncino che il bambino rompe* 'the dad holds the balloon that the child breaks'), sentences containing dative complements (e.g. *il babbo porta le sigarette al bambino* 'the dad brings the cigarettes to the child')

For each response, an error score is attributed. Scores were attributed in the following way. Each correct response was attributed 0 scores. If after the first administration, the participant failed to provide the correct response, the sentence was proposed again. When at the second administration, the participant pointed to the correct picture, a score of 0.5 was assigned. When they pointed again to the incorrect picture, a score of 1.5 was attributed. The final total score was obtained by summing all partial scores.

For each of the sentence typologies investigated as well as for the overall performance, the TCGB manual provides normative data collected from typically-developing children.

On the basis of these data, it was possible to attribute a linguistic age to the participants of this experiment.

Results

The total scores of each participant in each group are shown in the table (5), also including the mean score and the standard deviation for each group.

The comparison of our results with normative data shows that in the CI group, in most cases, the performance is comparable to that of children from 5;6 to age peers. In the NATIVE LIS group, the overall performance was comparable to that of

Table 5 – Total TCGB scores for each participant in each group

CI GROUP		NATIVE LIS GROUP		NON-NATIVE LIS GROUP		FOREIGNER GROUP	
ID	***TCGB***	***ID***	***TCGB***	***ID***	***TCGB***	***ID***	***TCGB***
S10	8,5	S1	15,5	S20	32	S30	15,5
S11	6	S2	4	S21	16,5	S31	54,5
S12	13,5	S3	15,5	S22	40,5	S32	58
S13	4,5	S4	16	S23	46,5	S33	69
S14	0,5	S5	6,5	S24	20,5	S34	32
S15	8,5	S6	11,5	S25	24,5	S35	66
S16	2	S7	21,5	S26	29	S36	46
S17	0,5			S27	27,5	S37	73
S18	1,5			S28	34	S38	34
S19	3,5			S29	28,5	S39	35,5
M	**4,9**	**M**	**12,9**	**M**	**30,0**	**M**	**48,4**
SD	**4,24**	**SD**	**6,04**	**SD**	**8,91**	**SD**	**18,85**

children ranging in age from 5 to 7;6. In the NON-NATIVE LIS group, the performance was comparable to that of children younger than 3;6 till the age of 5;6. In the FOREIGNER group, the performance was comparable to that of children younger than 3;6 till the age of 5;5. Although the participants in the CI group and those in the NATIVE LIS Signers group show the same linguistic age, it is worth pointing out that the chronological age of the former group is much lower than that of the latter group (cf. Tables nr, 1 and 2.)

Statistical analyses were performed using the SPSS statistical software package. We ran a between-group analysis in order to compare the performance of each of the four groups against the others, by using the non-parametric Mann-Whitney test for independent samples, since the assumption of normal distribution of the population was not met in this case. We carried out various comparisons, trying all possible combinations between pairs of groups. The analysis revealed that the CI group is the most accurate. The CI group performed significantly better than the NATIVE LIS group (U=9.000 p=0.011), the NON-NATIVE LIS group (U=.000 p=.000) and the FOREIGNER group (U=.000 p=.000). The NATIVE LIS group, which achieved the media total score of 12.9, performed significantly better than the NON-NATIVE LIS group (U=2.000 =.001) and the FOREIGNER group (U=3.000 p=.002). Finally, we found that that the NON-NATIVE LIS group performed significantly better than the FOREIGNER group (U=18.500 p=.017). On the basis of these analyses, it is possible to establish a classification of the four groups from the one that showed the most accurate performance to that showing the less accurate performance: implanted children, native LIS signers, non-native LIS signers and foreign deaf students.

Discussion

The present study provided evidence confirming previous data on the difficulties experienced by deaf people in the use of functional elements and in the acquisition of some properties of the Italian language.

The analysis of responses revealed that the deaf children included in the CI group mainly follow the same pattern of performance of typically-developing children as far as the choice of responses is concerned. Hence, structures that develop at a later stage in hearing children, i.e. passive sentences, relative clauses, resulted more problematic than other structures for some children with cochlear implant.

Some interesting remarks are found in the performance of NATIVE LIS signers, NON-NATIVE signers and in the FOREIGNER group, for whom we identified nonetheless a quite common pattern of response. The fact that the test is not standardized on deaf individuals highlighted that these groups chose some response strategies that are not observed in hearing children. The most interesting aspect was that they mainly relied on linear word order or errors due to different kind of interferences which will be analyzed in detail in this paragraph.

The lack of linguistic competence in deaf people leads them to adopt different strategies to interpret sentences.

The most important difficulties shown by deaf people are found in the interpretation of passive sentences, especially the reversible ones (e.g., *la mamma è presa in braccio dal bambino* 'the mother is picked up by the child', *or il cane è morso dal bambino* 'the dog is bitten by the child', or *il cane è tirato dal bambino* 'the dog is pulled by the man'). Passive sentences are structures with non-canonical word order, in which the patient/beneficiary of the sentence becomes the linear subject, whereas the agent becomes the indirect object, introduced by the preposition 'by'. When both nouns can potentially be the subject of the sentence, meaning is conveyed not by semantic plausibility, but by syntactic structures and functional elements. Reversible passive sentences proved to be extremely problematic for all groups of deaf individuals, also including cochlear implanted children, who nonetheless performed overall significantly better than the other groups, Many deaf children are trained to comprehend passive sentences and in most cases they are able to correctly interpret irreversible passive sentences, in which the linear subject might be an inanimate noun (e.g. *la mela è mangiata dalla bambina* 'the apple is eaten by the child.fem'). However, in most items, either passive or active reversible sentence, the interpretation of a sentence is mediated by knowledge of a world labelled by linguistic knowledge and it is not a spontaneous answer. Hence, for instance, if the sentence "the child bites the dog" is grammatically correct, in the knowledge of world, it is less common than "the dog bites the child".

Many of them are not able to derive the meaning of the sentence using functional words. Therefore, they only consider the lexical words, by omitting functional words, and adopt specific strategies to

interpret the experimental sentences. For example, to interpret these sentences the deaf groups strongly rely on the linear word order. The two sentences containing the preposition *tra* (between) may help to explain this phenomenon. Indeed, in the two items *la palla è tra il tavolo e la sedia* (the ball is between the table and the chair) and *Il bambino è tra il babbo e la mamma* (the child is between the father and the mother), most participants pointed to the image in which the order of the objects was respectively: ball-table-chair and child-father-mother. Hence, the order of the objects in the picture reflects the linear order of the words in the sentence. This explanation was also provided by the participants, when at the end of the task they were asked to give a reason for their choice.

In another experimental trial, the understanding of the prepositions *da* (from) and *a* (to) was investigated, and in this case a different strategy was adopted. In the sentence *l'uccellino vola dalla casa al nido* 'the bird flies from the house to the nest', a participant explained that since the nest is the bird's home, the bird was flying towards it. She pointed to the correct picture, an image in which the bird moves toward the nest, in this case the presence of the building (the house) was not important. So the correct answer is due to a different interpretation respect to the grammatical sense.

These two examples show that only through lexical words and semantic plausibility, these participants try to derive the meaning of the sentence, on the basis of some knowledge of the world, independently of the syntactic information conveyed by functional (semantically empty) words. These meanings are nonetheless not shared by any other speaker.

As [12] pointed out, the lack of specific functional elements or inflectional forms in deaf people's written productions does not means that these people do not have any mental grammar. Linguistic rules and grammatical categories are present in the deaf, and the difference in production, between deaf and hearing children, could be due to the fact that they adopt linguistic properties which are not grammatical in Italian, but are available in other languages.

There are cases in which, the sentence interpretation does not depend on the level of linguistic competence reached in Italian, but it is due to interferences of the LIS. A positive interference is found, for examples, in those sentences investigating verbal inflection, namely those requiring the identification of an action which is concluded (e.g. Il bambino ha fatto il bagno 'the child has had the bath'). In LIS, the conclusion of an action (perfect tense) is realized with a specific sign after the verb, meaning 'done, finished', which is co-articulated with the labial word *fatto* (done, finished). This phenomenon is also confirmed by the fact that a participant belonging to the foreign group, who has been living in Italy since 2007, and above all having little knowledge of LIS, did not choose the correct picture. The picture, that was used to investigate the perfect past tense, was also used to ascertain if participants understood the present and future tenses. The positive LIS interference in the perfect tense is confirmed by the fact that, thanks to the word "fatto", the participants are able to distinguish the perfect tense from the other tenses and, for this reason, they provided the correct response. In the case of perfect tense without the word *fatto*, participants responded with incorrect answers to each tense (present, past and future tense).

Another type of error might be due to the graphical similarity of some Italian words, namely that between *tra* (between) and *tre* (three), which caused some confusion in the mind of the participants and hindered them from giving the correct response. Another case of graphical interference is due to the homophony and homography between the past participle of the verb *leggere* (to read), which is *letto* (read.PastParticiple), and the word for 'bed' (*letto*), in the stimulus *Il libro è letto dal bambino* 'the book is read by the child'. By trying to find the correct picture matching these sentences, some participants asked the experimenter where the bed was, thus proving that they had not understood the sentence meaning. Often, the inflected form of the verb causes some comprehension problems, because deaf people are not able to attribute the correct grammatical category.

More generally, when the unknown words were too many in order to understand the sentence, and participants were not able to establish some kind of relationship between the elements of the sentence, those whose performance was comparable to children younger than 3;6 years, pointed randomly to the pictures or avoided giving any response.

All these above mentioned strategies suggest that when deaf children read a text, they try to interpret it by using every piece of information they have at their disposal, leaving functional elements out of the computation.

When teaching to deaf children, it is necessary to take into consideration all these specific problems shared by most deaf populations.

Conclusion

This study has demonstrated that deafness is a considerable obstacle to natural language acquisition and to the mastering of many properties of the Italian language. For deaf people, and especially for those who have been exposed late to a language, the development of grammar seems to be extremely problematic both in the oral language and in the sign language. If the use of cochlear implant seems to be the best device for children to achieve good competence in the oral language, in some cases the mastering of the oral language is not yet comparable to that of hearing peers. For deaf people, it is evident that language acquisition is a non-natural process, taking place through intensive training and hard teaching, which represents an artificial and non-natural system.

We cannot talk about acquisition of language, which involves knowledge in the natural process of absorbing and it is context-dependent. In deaf people, we can mainly talk about language learning, which requires a deliberate method of achieving knowledge involving both the active participation of the learner and a systematic method of teaching; if the former is a natural and spontaneous process, the latter requires strength of will.

The study of oral language often requires a lot of effort. For this reason, probably the best solution is the use of a bilingual approach, that is, sign language guarantees the activation of the core grammar which is necessary to gain linguistic competence in the oral language. Indeed, the linguistic competence an individual has in sign language might be transferred into oral language, through the language provided by hearing people. It would be necessary to find easier methods in order to help deaf individuals to approach the oral language.

At the moment, we cannot expect deaf children to achieve a linguistic competence comparable to that of hearing people. Deaf children usually have to undergo intense training in oral language and consequently, they do not manage to live all the experiences that hearing children have with reading fairy tales, playing sport, playing games, etc. The use of the LIS makes it possible for deaf children to satisfy their communication needs and, at the same time, to develop linguistic competence in oral language, through a specific training program.

Acknowledgments

We thank all our deaf participants, their families, their speech therapists, educators and teachers.

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