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Linguistic treatment of relative clauses in an adult deaf LIS signer: A case study

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"Quello che molti ignorano è che il nostro cervello è fatto di due cervelli. Un cervello arcaico, limbico, localizzato nell'ippocampo, che non si è praticamente evoluto da tre milioni di anni a oggi, e non differisce molto tra l'homo sapiens e i mammiferi inferiori. Un cervello piccolo, ma che possiede una forza straordinaria. Controlla tutte quelle che sono le emozioni. Ha salvato l'australopiteco quando è sceso dagli alberi, permettendogli di fare fronte alla ferocia dell'ambiente e degli aggressori. L'altro cervello è quello cognitivo, molto più giovane. È nato con il linguaggio e in 150mila anni ha vissuto uno sviluppo straordinario, specialmente grazie alla cultura."

R. Levi Montalcini

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General introduction

The idea to write my master thesis on the linguistic treatment of deaf individuals started to take shape when I attended the classes of languages for the hearing impairment and clinical linguistics.

The starting point of this work were the researches of Thompson & Shapiro (1994), Levi & Friedmann (2009) and D'Ortenzio (2015), which have been essential guide lines during all the period I worked on this project. Later professor Volpato suggested that I could conduct the linguistic rehabilitation on an adult deaf LIS signer, since no one before did it, and I decided to put myself to the test.

From November 2015 to December 2016 I had the opportunity to use Italian Sign Language with the two hearing impaired people who kindly participated to the tests and made my research possible.

This thesis is divided into five chapters: in the first one the issue of the language acquisition is presented. The steps and condition of typical language development are compared with the outcome of an acquisition process in condition of impoverished input. Studies demonstrating the existence of the critical period for spoken and signed language are reported (§1.2) and the complex question of the acquisition of the L1 in deaf people is introduced (§1.3.2).

The second section deals with the derivation and acquisition of the passive clauses: firstly a cross-linguistic perspective is given, then the attention is focused on typical acquisition of the Italian passive (§2.4); lastly, the issue of the acquisition of passive clauses by deaf subjects is presented (§2.5).

Chapter 3 regards the syntactic structure and the acquisition of relative clauses. As in the preceding section, the constructions in question are described and then discussed from a cross-linguistic point of view; later the acquisition of Italian relative clauses is examined in typically developing children (§3.2.2) and in SLI (§3.3.1), DD (§3.3.2), and hearing impaired children (§3.3.3).

The fourth part presents a series of experiences of linguistic treatment conducted on different types of population: aphasic individuals with agrammatism (§4.2.1), subjects with Specific Language Impairment (§4.2.2) and the case study of D'Ortenzio (2015) (§4.2.3), who carried out a linguistic intervention on an Italian child fitted with cochlear implant. Moreover, some authors of the studies mentioned in this chapter made assumptions about

which compromised construction it is recommendable to work first in order to witness to improvements in not treated structures too.

Chapter 5 is the core of the work, as it is dedicated to the experiment I carried out, and it can be divided in two parts: in the first one the participants, material and procedure used in the comprehension and production tests on passive and relative clauses are described (§5.2). The data collected from this first competence evaluation are reported and discusses in respect also to the control group. Considering that findings revealed that the syntactic skills of only one deaf adult were seriously damaged, the linguistic intervention was planned for him and it is explained in detail in the second part of the chapter (§5.3). Since one of the goals of this thesis was to verify whether generalization effects of the intervention can occur also in constructions not directly treated, the rehabilitative sessions focused on the relative but not on the passive clauses. After the linguistic treatment the subject was tested again to examine whether positive effects occurred, and another assessment was carried out a month later to check whether the post-teaching improvements were maintained. Therefore the performance of the subject in the three times he was tested in the comprehension and production of passive and relative clauses are compared and the efficacy of the treatment is discussed.

Chapter 1

LANGUAGE ACQUISITION

1.1 Language as a natural faculty

Language acquisition is a natural process that takes place following the same steps and the same stages in every human being, independently of the language of exposure and its modality, oral or signed (Guasti 2007). According to Innateness Hypothesis this process occurs thanks to an innate device everybody is endowed with (Chomsky 1965; Pinker 1997). This capability to acquire the language is based on the Universal Grammar (UG), a set of knowledge and operations that determines the shape of the rules and the possible structure of different languages. The UG is made up of universal abstract rules, named principles, and of a set of rules, the parameters, that account for the variation among languages. The existence of principles explains why all languages share categories such as noun, adjective, verb; the parameters, conversely, are activated or inhibited according to the language of exposure. For example a child growing up in an Italian speaking environment sets the word order parameter as SVO, whereas a German one as a SOV.

This innate language knowledge has to be supposed because of the great gap between the quantity of data (input) which we are exposed to since birth and the achieved competence (output). In fact, it is not possible to think that children achieve such a good competence only through imitation of adults' language because at two they already produce sentences they have never heard before or pronounce new words (Guasti 2007), and they make mistakes that an adult would not, for example in Italian 'prenduto' instead of 'preso' (Chesi 2006). At the same time, they never make mistakes in word order when they start combining words, thus showing a knowledge of syntax (Nespor 2001). This issue is known as poverty of the stimulus and it asserts that all the abstract knowledge that the speakers have cannot be extracted only from the input nor have been taught explicitly. The mere language experience is unsuitable and inadequate to reach a good competence: in everyday spoken language, lapsus and

incomplete and ungrammatical sentences often recur; enunciations we are exposed to are finite, meanwhile we are able to understand and produce a potentially infinite number of sentences; eventually, we acquire knowledge of our language even if we don't always have positive evidence.

Furthermore, let us consider that adults often speak to children using a particular linguistic register that researchers call "motherese" ("mammese", in Italian): this language is characterized by an exaggerate prosody (to emphasize some parts of word or sentence), repetitions and the use of simple structures and concrete words. Even though at the beginning simplified structure of the standard language is used, within the fifth year children master a large amount of the mother tongue language structures. Thus, the ability of speaking a language is based on an innate Universal Grammar, made of principles and parameters, and on the experience of the language (or languages) of the environment subjects are exposed to, and from these elements children develop the grammar of that language (Haegeman 1996). In spite of the strong stress on the innate aspect of the language, the Innateness Hypothesis also asserts that the surrounding environment plays a relevant role, given that it is the language we are exposed to that implicates the activation of its own parameters, according to the received input. However, the environment does not shape men, but ensures the activation of linguistic structures genetically inherent.

As further proof of the fact that the environmental linguistic information are not the only necessary element of communication, there are evidences of subjects who acquired a language even though the input was deteriorated and impoverished.

1.1.1 When the input is impoverished

Blind children can interact with the surrounding environment through hearing and touch but, since their sight is compromised, they cannot see what it refers to while pointing at or asking them to direct their attention to something saying "Look.." (Guasti 2007). However, it has been proved that, despite of a short delay in the combination of the first words, within 36 months they are at the same level of non-blind children of the same age, and who are able to understand the meaning of vision verbs (Landau & Gleitman 1985, quoted in Guasti 2007). It is obvious that a blind child interprets "look" in a different way from the non-blind child: the first one "see" with the hands, and it is thank to these that he can explore the space and gets an idea of it; the second one, instead, relies on its eyes. Thus, blind subjects cannot acquire the

language and the meaning of the words grounding in the adults ostension: according to Landau & Gleitman it is the syntax of the verb, with the way and order it expresses its arguments, that fosters the language acquisition. All this explains the reason why an extralinguistic impoverished input does not prevent these subjects from acquiring the language, because the learning process begins by associating words to their concrete contingencies (Gleitman & Landau, 2013).

In 1986 Chomsky investigated the language ability of three deaf-blind subject who used the Tadoma method to communicate. This method implicates that the deaf-blind individual places his/her hand on the face and neck of the speaker, in order to 'capture' the articulatory movements derived from speech production. The data analysis revealed that the tactile sense is an adequate channel for the communication of language information, and that it is sufficient, as hearing and sight are, to foster language acquisition and development. The important role played by touch and movement for deaf-blind children has been pointed out also by Wheeler & Griffin (1997). They demonstrated that movement is a key aspect that helps deaf-blind children in the acquisition of concepts. The intersection and similarity of language and touch can be found, according to Mazzeo (2003) in three dimensions: i) touch, as spoken action, is open to do a lot, but *per se* is not ready to do much; ii) touch, as spoken language, is performative: when we touch something, we don't just perceive it but we manipulate it, and when we talk we create and modify relations; iii) as language, the touch is a social sense because it needs someone who teaches what to do.

Another example of language development in spite of an inadequate input is reported by Singleton & Newport (2004), who studied a 7 year old deaf child, Simon. His deaf parents have been educated with the oralist method and were not so fluent in the American Sign Language (ASL). At school Simon did not use sign language and his parents were the only ones to give him signed input, even if imperfect, since they learned it when they were teenagers. By analyzing the linguistic performances of the two parents it emerged that they made much more morphological mistakes than the son, who showed a competence more similar to the one of the deaf peers who acquired sign language from native parents. This result suggests that Simon had been able to master regular structures despite of the weak input given by his parents, and, so, that children are able to organize linguistic data in a regular and systematic way, creating more complex grammatical construction where input is lacking.

Even Goldin-Meadow & Mylander (1998) come to a similar conclusion through a study of profoundly deaf children educated with the oralist method and coming from two different cultures, American and Chinese. Hearing parents of these subjects did not know sign

language, therefore they could not give any signed input to their sons, but the latter developed a gestural communication system, known as "homesign", to interact with their parents or other people. This gestural system used by children showed a grammatical structure which could not been deduced neither from oral language, since they were deaf, nor from a signed language, as they were not in contact with. Moreover, despite cultural differences, all the involved children introduced linguistic structures in this gestural system. The language faculty is, therefore, irrepressible in the human being and it emerges also in a contest with little input. According to the Estonian biologist and philosopher J. J. Von Uexküll (1864-1944) we do not have to tie ourselves to the "abstract" aspect of the thought processes, namely relegating them to activities, analyzed in a sterile lab context, which happened in our brain only; on the contrary, these processes are to be considered in their realization on physical level, they are a functional body answer to the surrounding environment. And such is the language: an intrinsic human property that men realize reacting to the surrounding environment and adapting themselves to the kind and quality of the input they receive.

1.1.2. From pidgin to language

Not all the communicative systems can be defined languages. Indeed, different animal species, such as dolphins, bees, birds, use particular codes to communicate between them, but they cannot be defined 'idiom'. Even the primates that have showed good skills in imitating the human language in various experiments are not able to acquire its distinguishing features. The domestic gestural system used by children in Goldin-Meadow & Mylander (1998) was not regularized too. To understand how a language from a gestural system can arise, let us examine how Nicaraguan Sign Language born. In Nicaragua, deaf people did not have the possibility to study in appropriate schools, so they were often isolated and they developed a domestic gestural system to communicate with family members. Finally, in 1979 thanks to the election of Sadinist group, the educational system has been reformed and school for deaf people has been established. The first deaf students did not share a common signed language to build relationships, but they adapted everybody's domestic gestures to give shape to a mutually comprehensible system. In this first stage we talk about pidgin, a communication system with a reduced grammar that comes into being when speakers of different languages use an adapted language to establish a contact. The following generation children generated complex grammar rules and embellished the previous unrefined pidgin, activating, this way, a

creolization of the language. In the Nicaraguan Sign Language (LNS) of the new generation, among other elements, it has been introduced a modular use of space which cannot be deduced from the oral language and that confirm the independence of the signed language from the spoken language.

Another interesting instance of a sign language spontaneous birth took place in Negev, a region in Israel (Sandler et al. 2005). In the small community living in that area there is a high incidence of profound prelingual deafness caused by the fact that community members get married even if they are related by blood. The geographical isolation of the community and the high number of deaf people promoted the diffusion of ABSL (Al Sayyid Bedouin Sign Language) among normal-hearing and hearing-impaired people (Sandler et al. 2005). Those deaf individuals are well integrated and live a normal life thanks to the fact that many hearing people know and can communicate with ABSL (Russo Cardona & Volterra 2007).

In North Australia we witnessed to a likewise interesting phenomenon concerning two oral idioms. Until 70s - 80s, in this area, population used to speak two languages, the Creole, a kind of English developed there from a pidgin, and the Gurindji, a language of the West area of the region. The previous generations used to speak the one language or the other depending on the social context, but by the years children of the following generations gave life to a 'mixed language', the Creole-Gurindji: from the first they took syntax and verb tenses, whereas from the second they took noun morphology and the majority of lexicon (McConvell & Meakins 2005).

All things considered, children can involve Universal Grammar in learning both oral and signed languages (Corballis 2008).

1.2 The critical period

In the previous paragraphs we have always referred to the language ability in children. If we assume that it is an innate and biologically determined skill, indeed, we have to presume that like others biological functions it must have a critical period, that is a time slot in which this ability can and has to be acquired. Overstepped this time span, it can be either learned in a non-optimal way or not learned at all (Guasti 2007). In 1967 Lenneberg, developing an idea of Wilder Penfield of ten years before, hypothesized that, as other biological processes do, the acquisition of the first language (L1) is characterized by a critical period. His proposal was based on the fact that after cerebral damages children showed a definitely better linguistic

recovery than teenagers and adults. This idea was also supported by the results of studies conducted on children who have grown in social compromised situations and that were exposed lately to the language because of the difficult circumstances. It has been revealed that people who came in contact with the language within the end of the critical period obtained a good recovery; on the contrary, subjects who have already overpassed the age limit acquired a rather elementary language. Lennenberg identified the beginning of the critical period at about 2 years, assuming that it was not possible to acquire the language before, because the organism was not mature and developed enough, while the end coincided with the beginning of adolescence. Today, thanks to studies on the acquisition of a second language (L2), we know it is more appropriate to talk about various critical periods (or sensitive period, speaking about the second language) depending on the linguistic component we consider. Moreover, it has been proved that the acquisition process starts from the birth, someone claims even in the last months of pregnancy, but it still remains not so clear at what age the critical period (or periods) has to be considered closed. As a matter of fact, studies revealed the existence of many critical periods with different time slot for different linguistic abilities (Ruben 1997; Meisel 2013; Friedmann & Rusou 2015), the application of critical period in both oral and signed languages, and that it has more influence on the L1 rather than on the L2 (Mayberry 1998).

Researchers in many studies found a great variability in children's language performance, and many hypotheses have been proposed in order to explain the data. The two main theoretical hypothesis are the maturational hypothesis and the continuity hypothesis.

Borer & Wexler's proposed the maturational hypothesis in 1987. They claimed that, since birth, children have some principles of UG but others have to develop like other biological systems do. If we assume that linguistic abilities reside in brain and that a large amount of cerebral aspects mature after birth, it is likely that even linguistic properties must develop hand in hand. This viewpoint can explain the reason why all the children follow the same steps in the language acquisition process, and why they learn structures following a certain order even if they receive a messy input. Thus, Borer & Wexler hypothesis maintains the assumptions of the Innateness Hypothesis, which recognizes that children are born gifted with a UG and highlights the maturational aspect of the language system, namely, that children's language device is not fully developed and thus, for maturational reasons, their grammar con be substantially different from adults' one.

On the other hand, the continuity hypothesis affirms that children base their production on the

UG of adults and that non-standard utterances are consistent with universal principles anyway (Chesi 2006).

Generally, normally-hearing children born in hearing families, and are surrounded by an environment in which they hear a spoken language. Therefore it is difficult to obtain clearer information about the critical period. Deaf children of hearing parents, instead, are not exposed to the surrounding spoken language, and the age when they learn a signed language depends on the various circumstances. This situation of uniqueness has been exploited by Mayberry (1998): since signed languages are real languages, the more or less linear process of language acquisition can throw light on the issue of critical period. Considering the results of many of her experiments, Mayberry comes to a series of conclusions:

- it exists a critical period for signed languages too.
- Acquiring a L1 late is very different from learning a L2. As a matter of fact people who acquire a second language can rely on its mother tongue which has been acquired in early childhood. On the contrary, people who were born with a hearing impairment and learn a signed language as L1 only when they start going to school, they acquire their L1 after early childhood. Thus, the effects of the critical period are stronger in the acquisition of L1 than of L2.
- The effects of the critical period seem to be present in every linguistic levels (phonology, morphology, lexicon, syntax, pragmatics).
- Critical period's effects in L1 are found in the processing of structures, both simple and complex, in people who learn them late.
- The consequences of the critical period on L1 are everlasting.

Friedmann & Rusou (2015) reaffirm the fact that different linguistic domains have different critical periods. In particular, they proved that while new words can be learned in adult age, for syntax and syntactic movement the input of the first life year is essential. During this period, the baby uses the information he obtains from the prosody, the phonology and the words frequency to build up his syntax. Friedmann & Rusou reached this conclusion consequently to a series of studies on hearing-impaired children. Nevertheless, the authors underline the fact that not all subjects with hearing impairment show difficulties with the language domain; indeed, some of them have normal language and syntax. The key factor of a proper language development is the age when children can make use of an appropriate linguistic input: the sooner they receive it, the better their knowledge is. Important predictors

of a standard and appropriate linguistic development are the age when the diagnosis of hearing impairment occurs and the beginning of focused activities of intervention (Friedmann & Szterman 2006; Friedmann & Haddad 2014; Friedmann & Rusou 2015).

The data collected from deaf children show that once the brain has reached a certain age, it does not make available language acquisition processes anymore, and that the critical period comes to an end, no matter if there have been necessary time and input for the formation of a proper grammar.

1.3 Linguistic acquisition steps

As it has been said before, cross-linguistic studies showed that all children have a homogeneous and uniform process of language development, despite the individual variability, because they follow the same steps in the same order.

From the very first days, infants are able to distinguish between mother tongue and a foreign one, and they do that using the prosodic information of the speech flow around them. In particular, it is the rhythmic structure of the input to help them in this task, between the fourth and fifth month they are even able to distinguish languages belonging to the same rhythmic class, like English and German or Italian and Spanish. The rhythm of a language is given by the time organization of the vowels, to which infants are particularly sensitive, and of consonants, and so the syllabic structure of that language plays a relevant role in the acquisition process (Nespor 2001; Guasti 2007).

It is not only the rhythm which lets languages to be distinguished but also sounds they select for the words formation. As a matter of fact, infants have to understand which sounds has a distinctive value in their idiom, so which phonemes could compose the words. This ability of sounds discrimination remains over the years, but only for those phonemes that are characteristic of the language the child is exposed to. The acquisition of the phonological system of a language involves, therefore, a selection, on the basis of the input, only of the phonemes with distinctive character in the language they are exposed to, and this selection is fundamental for the following acquisition of lexicon.

In order to acquire words, children have to be able to catch them in the continuum of the spoken speech, and this happens around 7-8 months, when they already know some words. To segment the speech flow they rely on three kinds of information: i) the prosodic structure of the words, that is syllabic structure and accent; ii) phonotactic constraints, that is which series

of sounds are allowed at the beginning, inside and at the end of the words; iii) distributional regularities: the child notices that some syllables co-occur together more often than others, and he or she uses this information to assume that these syllables belong to the same word (Guasti 2007).

Before the child has enough competence to produce language, some months have to pass, during which the baby starts getting out of the information given by the speech flow. These first life-months are necessary for the development and the maturation of cerebral and phono-articulatory structures of the child. From the fourth life-month, the larynx goes down, the oral cavity stretches and enlarges and the organs designated to phonation start maturating. These mutations make the child able to control the breathing flow, to modulate the intonation and accents, and to emit longer sounds. At 4-5 life-months appear the first vowels that the baby can modulate in pitch and intensity (Guasti 2007).

Once the vocal apparatus is ready, the child starts producing the first sounds.

For reasons of clarity and concision, it is possible to identify three phases of language production: the babbling, the production of single words and the production of many words (Chesi 2006).

The babbling period starts between 6 and 9 life-months and it is characterized by the production of sequences of the same syllable (bababa, dadada). At the beginning, sounds are various but later, at about 8 months, children prefer distinctive vowels and consonants of the language of exposure, of which they reflect also the rhythm and the prosodic features. The babbling is more connected to central cognitive structures rather than to the maturation of the phonatory apparatus, since even children who are exposed to a signed language start babbling at the same age of hearing children (Singleton 1989; Petitto & Marentette 1991).

This step is very important because the child listens to its production and tries to adapt them to the ones of the linguistic input he or she receives.

Next step, which goes from 10 to 20 life-months, is characterized by the production of single words; it starts at the end of the first year of life, gradually replacing the babbling, and it continues during all the second year. In this period the child, in addition to words, starts using also intentional communicative gestures in order to refer to or indicate people and objects. However, if the child uses a word, he or she does not necessarily articulate the corresponding gesture, and vice versa. Caselli et al. (1994) affirms that, in this initial step, this indicates an equipotentiality between vocal and gestural modality, both of them representative of the language faculty. Capirci et al. (2005) analyzed the early stages of language development of

three children between 10 and 23 months of age, and their findings indicate that there is a continuity between the production of the first actions, the first gestures and first words that children produce. Only later normal-hearing children gradually abandon the use of gestures in order to dedicate their attention to verbal communication. During this phase, predicates and functional words are barely present, or even absent, but holophrastic expressions appear, namely, single words that stand for entire statements are used to interact with people (for example "food" instead of "'I want food" or "Give me food", or "mum"[1] to say "where is mum?" or "mum's" or "here is mum"), but they have a particular meaning depending on the context.

The last step, between 18 and 24 life-months, is characterized by the production of many words the child starts combining in a more and more complex way, thus generating the first sentences, even though holophrastic expressions are still present. Since the very beginning, elements are combined following the word order parameter of the language the child is exposed to. If this order parameter has been already set, it probably means that the child has already acquired syntactic facts from phonological information like rhythm and prosody (Nespor 2001). Here, in fact, we talk about phonological activation of the syntax (Guasti 2007). These first compositions are easy and basically built with lexical elements, whereas functional elements (prepositions, auxiliaries, etc) appear later, so the language of this phase is often called "telegraphic". Moreover, between 18 and 20 life-months, a phenomenon known as "explosion of the vocabulary" takes place, and it refers to the fact that the child rapidly learns a large amount of new words.

1.3.1. Language acquisition in deaf children

In 1991 Petitto & Marentette conducted a study to examine in depth the activity of babbling, that many experts asserted to be characteristic of spoken languages and strictly connected to maturation of mechanisms of movements responsible of speech. If this was right, sign languages should follow an acquisition path different from oral languages, and thus it has to be marked by different periods and structures. On the other hand, if babbling was a consequence of the development of language ability located in the brain, and of the capacity to express different types of linguistic signals, thus it should occur in languages, no matter

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[1] Example from "Elementi di psicologia del linguaggio" (2009: 26).

their modalities.

Deaf infant motor activity has been analyzed and compared to the one of a group of hearing infants, and two types of movements were found: some of them can be ascribed to the normal exciting motor activity, whereas others presented the same characteristics of vocal babbling of hearing infants: the use of a subgroup of movements, the syllabic organization of those movements based on their own signed language, and their non-referential use. Therefore Petitto & Marentette affirmed that we have to talk about manual babbling. Such as the vocal babbling, manual babbling experiences the linguistic environment where it occurs: the configuration of the hand and infants' movements are related to the ones of the sign language they are exposed to, like rhythm and duration of their production. Deaf children, moreover, start producing their first signs by the first year of life, namely when hearing children start producing their first words.

The similarity of time, structures and use of babbling, both vocal and manual, led the authors to conclude that there is a common language ability at the bases of the acquisition of oral and signed languages, and the modality of this ability is determined only after the birth, according to the linguistic input provided by the surrounding environment.

Further studies show that both in deaf and hearing adults Wernicke area activates in tasks of comprehension of linguistic material (Petitto et al. 2000), and this fact demonstrated that brain is sensitive to the abstract pattern of natural languages, which are acquired, understood and produced irrespective of their modality (Petitto 2000; Petitto et al. 2004). The profound connection between language and gesture, as underlined by Iverson & Thelen (1999), is highlighted by the fact that the motor and linguistic activities are controlled by common cerebral mechanisms. This explains the reason why subjects with damages on those cerebral areas which control movements, can still do gestures, that instead depend on the system that controls language, during language production; furthermore, this fact explains why gestures can facilitate lexicon recovery of aphasic patients (Pashek 1997). Nevertheless, Mayberry et al. (2011) demonstrated that the processing of vocal or signed linguistic material takes place in the same cerebral areas only if the examined language has been acquired in the first months of life. In 2012 Pénicaud and colleagues conducted a study on deaf-from-birth subjects: results suggest that the lack of early language exposure influences not only the functional, but also the anatomic organization of the brain.

1.3.2 The question of L1 in deaf people

Deaf population in Italy is not homogeneous. Even though only 1‰ of the population has a hearing impairment, there are many variables that influence and/or determine the language of those subjects: how old children are when they become deaf and the age in which deafness is diagnosed; the degree of hearing loss; where the lesion is located (outer, medium or inner ear); the type of hearing aids (conventional, digital or cochlear implant) and the use or not of them; the nature of the input they are exposed to (vocal or signed language) which is determined also by parents (hearing ones, deaf and signer ones, oralist-educated deafs) and by parents' linguistic background; the type of rehabilitative method (the oralist method, the use of the sign language, a mixed method or bilingual education) (Grosselle 2008; Bertone & Volpato 2012). Thus, the process of language acquisition in deaf children happens in a more contorted way than the normal-hearing population, since all these factors can be involved in it.

Only 5% of Italian deaf population has both deaf parents and was born in an environment more suitable, under some aspects, and ready to receive them. Indeed in these families the diagnosis of hearing impairment, the recourse to hearing aids or cochlear implant and, sometimes, the logopedic treatment are usually done earlier than what happens in hearing families; furthermore, the infant is immediately surrounded by an environment in which he or she receives a signed language input, and the language acquisition process is not compromised because it uses the visual-gestural canal that is intact. The same happens in families in which one parent has hearing impairment and the other has not, where the knowledge and the attention for the auditory deficit give more guarantees so that the language acquisition process can be brought to a successful conclusion. But for normal-hearing parents, with any knowledge of deafness and its related world, the arrival of a deaf son or of an occurrence that caused his hearing impairment are circumstances to which they are not prepared. In such situations the diagnosis is usually done late, as well as the application of hearing aids and of the logopedic treatment, and this entails negative consequences on the language acquisition: all the linguistic input they have been provided before proper measures were adopted get lost, because it exploits the 'wrong' sensorial canal, the auditory compromised one. Moreover, hearing aids and cochlear implants are not always followed by a real recovery and tangible improvements, because the cochlear implant doesn't make the auditory deficit disappear (Bosco 2013), and in these cases hearing-impaired individuals are turned to sign language as last hope.

In Italy, the strong delay of usage of Italian Signed Language (LIS) has been, and sometimes still is, impeded by the idea that "the sign kills the word". For long time, on the bases of false belief, it has been thought that was inadvisable providing a signed language to deaf subjects because it would have distract, when not even impede, them from learning the oral language. Recent studies have instead revealed that the opposite is true, namely, deaf subjects that learn sign language are fostered in learning the spoken language (Mayberry 1993; Kuntze 1998; Jiménez, Pino & Herruo 2008; Bertone & Volpato 2009), and that bimodal bilingualism, deriving from the use of acoustic-vocal and visual-gestural modalities, enhances not only the language, but also the social and psychological development of the hearing-impaired child (Caselli, Maragna & Volterra 2006). Furthermore, a deaf subject that handles Italian spoken language and LIS has the necessary instruments to well integrate in the deaf community, to which he/she belongs to, and in the hearing one that surrounds him/her.

Therefore, if a person masters a L1 is facilitated in learning a L2, and if s/he already knows a sign language can more easily learn an oral language. But there are also people that have not a language. In fact the most serious and more and more frequent case is the one of deaf people that don't succeed in acquiring even a L1, as reported by Ajello et al. (2001) and Bertone & Volpato (2009). It is a delicate matter that concerns foreign deaf individuals that don't know their native country language, neither spoken nor signed. Therefore these subjects don't have a native language on which rely to acquire a L2, and instead of learning a language through a natural process they have to learn by heart the rules by an explicit method, as usually happens with a second language, without really internalizing them.

The language faculty is also responsible of the growth of cognitive capacities, and a delay in its acquisition implies limits on the ability of comprehend and learn the written language (Kuntze 1998).

1.3.3 Typical language difficulties of deaf individuals

In his work of 2006 Chesi analysed a corpus of productions of hearing impaired children (aged 6-17) and described them finding out regularities and characteristics in the structures they produced. His aim was to organize the individuated forms and to underlie their syntactic properties in order to throw light on the logic that leads deaf individuals to ungrammatical productions.

The literature reports that in many tests it emerged that hearing impaired subjects have difficulties that are typical of young normal hearing children; moreover their productions often contain atypical forms that are not detected in hearing children.

Caselli et al. (1994), Ajello et al. (2002) and Chesi (2006) noted that the written productions of deaf individuals have some characteristics, which we summed up in the following points:

- they usually have a scarce and rigid vocabulary;
- deaf individuals have problems with the deteminants: they tend to omit or replace the articles, and instead of using clitics they repeat the DP. Guasti et al. (2014) found that the production of clitics is particularly challenging, but Chesi (2006) reported that when they occur, they are usually in pre-verbal position, indicating that they distinguish the finite and non-finite form of the verb;
- errors frequently regard the use of the preposition, which are omitted or replaced;
- hearing impaired subjects have difficulties with the inflectional node (IP) and thus with the agreement relationship between the verb and the subject: they often use the non-marked form of the verb, namely the 3rd person singular, and difficulties are observed with auxiliary and modal verbs too. Deaf individuals produce also subordinate clauses at the infinitive form rather than the finite: this happens because they barely know the verbal morphology, but trying to replace the morphological information they add personal pronouns and adverbs;
- in respect to hearing adults, deaf subjects produce shorter sentences and use simpler syntactic constructions, and this reflects their problems at the CP level;
- the difficulty with the CP and IP nodes can account for the anomalous *consecutio temporum* of their production.

In sum, the deaf individuals tend to generate not marked clauses, in the sense that they prefer to use more unmarked and undetermined forms, a choice that allows them to avoid morphological and syntactic obstacles.

Through this brief overview we tried to reflect how complex and multifaceted is the issue of language development in hearing-impaired individuals, and it explains why in Italy one can meet deaf subjects with extremely different language competences, determined, among others different variables (listed in the incipit of §1.3.2), by the age of exposure to a proper linguistic input.

THE PASSIVE CLAUSES

2.1 Introduction

Passive clauses are independent sentences in which verbal morphology and grammatical functions change. From a functional point of view, passives direct the attention to the element which is not topical in the less marked active construction (Keenan & Dryer 2007). Constituents of the active sentence are moved in order to obtain the passive form, but their thematic roles stay unvaried: the patient in the active sentence has the same thematic role in the passive one, and the agent of the active form is expressed in the passive sentence with a PP called by-phrase, when required by the context. Italian and English, among other languages, build the passive form through this periphrastical mechanism:

(1a) La bambina accarezza il coniglio.
    The girl caresses the rabbit.

(1b) Il coniglio è accarezzato dalla bambina.
    The rabbit is caressed by the girl.

Given the examples above, in (1a) '*la bambina*' 'the girl' is the subject of the verb '*accarezza*' 'caresses', but in (1b) it occurs with the by-phrase that tells who did the action. The object of the active phrase in (1a), '*il coniglio*' 'the rabbit', is moved to subject position in (1b) with the role of patient. But changes occur also at the verb level: in fact it is not enough to move NPs to obtain a passive clause. In Italian the auxiliary verb '*essere*', 'to be', or '*venire*', 'to come', has to be introduced and then followed by the past participle of the lexical verb. But let us consider the example[2] below:

(2) La porta è chiusa.
    The door is closed.

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[2] The example is taken from Volpato, Verin & Cardinaletti 2014.

This sentence has a twofold interpretation: it can be consider an *adjectival* passive or a *verbal* passive. Adjectival passive implies a stative reading, namely, it describes the state of door, that is closed. Verbal passive, instead, express a precise result of an event, and so that the door was closed by someone. But according to the auxiliary used in Italian, the sentence in (2) can be unambiguously read: to the auxiliary '*essere*' 'to be' is associated a stative reading if the sentence appears like in (2), whereas '*venire*' 'to come', followed or not by the by-phrase, leads only to the eventive interpretation, as in (3a); also (2) can be an eventive passive if it includes also the by-phrase, as shows (3b):

> (3a) La porta viene chiusa (da Maria).
>
> The door comes closed (by Maria).
> The door is being closed (by Maria).

> (3b) La porta è chiusa da Maria.
> The door is being closed by Maria.

Moreover, the choice of the auxiliary verb in Italian has implications also on the aspectual interpretation of the action expressed: '*venire*' 'to come' is usually preferred for eventive reading and in the present tense, but the same interpretation is given by the auxiliary '*essere*' 'to be' when it co-occurs with the by-phrase with any tense (Belletti & Guasti 2015).

As far as acquisition of passive clauses is concerned, cross-linguistic studies agree that they are fully mastered when typically developing children are 5-6 years old, but some differences can occur according to whether we refer to long or short passive (Fox & Grodzinsky 1998), weather the verb is an actional or a non-actional verb, and whether the past participle of the lexical verb is interpreted as adjectival or resultative (Belletti & Guasti 2015).

2.2 The derivation of passive

In the previous paragraph we said that to form a passive the constituents have to move. In particular, the internal argument of the verb has to raise to the subject position of the sentence, but actually this kind of movement cannot occur because the internal object is merged in the internal argument position, and raising it would cross over the external argument merged in a higher position. This restriction on the movement is determined by the locality principle of Relativized Minimality (Rizzi 1990), according to which a relation between X and Y cannot be established if intervenes an element Z of the same type of the formers, as illustrated in (4):

(4)   … X… Z… Y…

*How do you wonder [who behaved ___]?

   X   *Z   Y

In (5), instead, the relation is possible because Z has the feature [-wh]:

(5) How do you think [John behaved ___]?

    X   Z   Y

Therefore the movement of α can't overtake an element of the same type of α in three conditions:

(i)   when α is a head, it can't overtake another head;

(ii)   when α is a *wh-* element, it can't cross over another *wh-* element;

(iii)   when α is a NP, it can't pass another NP.

Let consider the clause in (6) and its passive derivation from the active form showed in the tree diagram (figure 1).

(6) Il bambino è pettinato dal papa.

Figure 1 displays the tree structure of the active form of the sentence (6), where the internal DP cannot cross over the external DP.
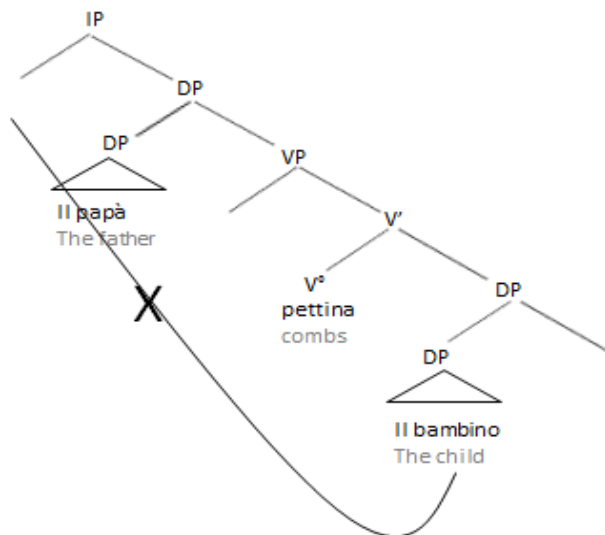
The syntactic tree shows that the climb of the verb internal argument, the DP '*il bambino*', cannot take place because it crosses over a constituent with the same feature, the DP '*il papà*', and this is not allowed for the Relativized Minimality Principle. To overcome this glitch and

to explain how we derive passives, Collins (2005) proposed the Smuggling Theory: the verb's internal argument is not moving alone, rather it forms a sort of block with the VP; in doing so, the chunk becomes richer in features and, consequently, with different characteristics from the external argument '*il papà*'. Then this chunk raises the structure: the verb reaches the head position of the IP, whereas the internal argument goes in Spec IP. Furthermore, Collins adds the projection VoiceP, between IP and VP, where is settled the preposition da/by used to introduce the agent. The figure below illustrates the structure according to the Smuggling Hypothesis.

Figure 2 represents the tree structure of the passive clause in (6) according to the Smuggling Hypothesis.
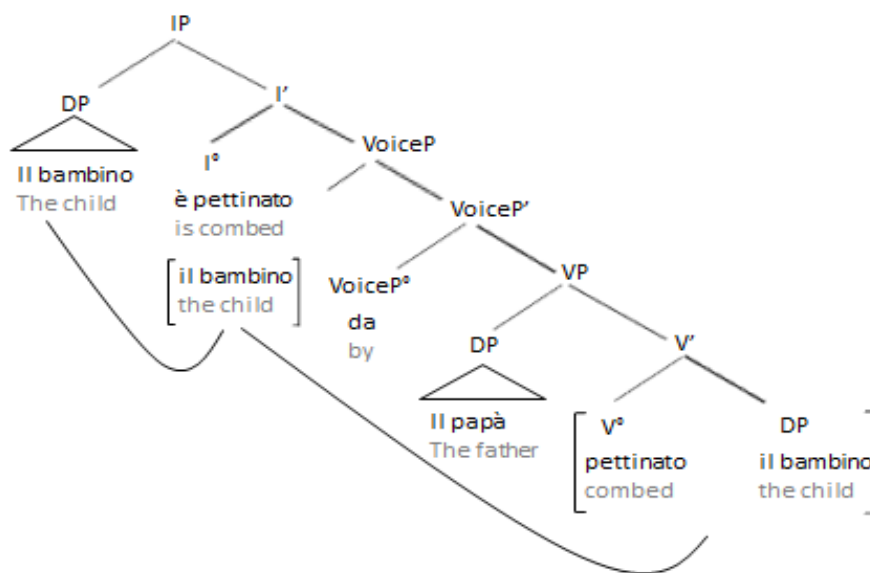

Thus, the passive is not derived only by moving the DP since also the VP raises the structure. Two A-chain are established, and each of them assigns the θ-role to the corresponding argument.

2.3 Acquisition of passive in typically developing children

Many studies investigated the acquisition of passive by children, especially in English language, and researchers presented many hypotheses. In this wide debate scientists examined many aspects of passive clauses, in order to shed more light on this issue, and they focused their attention on three main aspects: (i) long and short passive clauses, (ii) the actional or

non-actional verb involved in the sentence, (iii) the adjectival or resultative interpretation of the verb's past participle. Consequently, numerous accounts were given to justify the obtained results. But before investigating the question, let us better define the aspects as listed above.

Researchers distinguish between long and short passive, where the former occurs with the by-phrase, whereas the latter does not. The second clarification regards actional and non-actional verbs. The former group include verbs (like 'to look', 'to listen') that express the purpose or the refuse to intervene, that is to say that they describe actions; the latter (like 'to see', 'to hear'), on the other hand, refer to situations in which the agent cannot decide to take part in it or not, because they do not depict actions (Valesio 1971). As far as the interpretation of the verb is concerned, we introduced it a little in §2.1. The adjectival or stative interpretation of the verb is given when the past participle is read as an adjective, and this option conveys a stative meaning because it describes a state, a condition of the constituent to which it refers. On the other hand, a verbal or eventive reading is the result of considering the past participle as the head of a VP, and it underlines the result of an event or that that event took place.

Since researchers wanted to know when this kind of clauses are acquired in children, they conducted many studies. Moreover, when they found passive clauses in children's speech, they wished to understand if they built them as adults do.

There is a general agreement over the delayed acquisition of passive clauses in children, that reach a good competence only around 5-6 year old, even if passives, derived in a different way from English, in some languages are acquired even before, in early childhood. For example, Allen & Cargo (1996) found that in Inukitut language passives sentences are very frequent and some language-specific characteristics, like the rich verbal inflection and the use of head movement as a strategy to derive words, enable 2;0 year old children to produce such constructions. Or in Sesotho, a Bantu language, for instance, the acquisition of passive seems to be facilitated by the fact that adjectival and verbal passives have distinct syntactic structures, and children acquire it early, by at least 2;8 year (Demuth 1989).

Studies conducted on English language found that short passive are very frequent both in children's and adults' speech; on the other hand, long passives rarely occur in adults' speech, and this lower input was thought to influence the scarce children's production of those constructions (Slobin 1968; Horgan 1978).

De Villiers & de Villiers (1978) claim that truncated passives are acquired earlier than full passive sentences because the former are less complex from a computational point of view, and they serve as base to later and progressively build the longer sentences. In fact, short

passives are easier to understand than long passives (Slobin 1968; Budwig 1990; Fox & Grodzinsky 1998), and their frequency of usage increase with age (Marchman et al. 1991). Additionally, Maratsos et al. (1985) found that even if 4-years old children hardly comprehend passives with non-actional verbs, they do understand those containing actional verbs, despite the fact that both type of sentences share the same syntactic structure.

In 1987 Borer & Wexler elaborated the Maturational Hypothesis to give to all these consideration a shape inside the same frame. The authors claimed that the problem's core lies in maturation of A-chains: children first acquire truncated passives, that they treat as adjectival phrases not involving A movement. Then, thanks to a maturation of the children's syntax and cognitive capacity, they learn to comprehend and produce full passives, and so to use A-chains. However, Marchman et al. (1991) tested a group of 108 children between the ages of 3;1 and 11;11 to explore when they use passives and which form they prefer. Results showed that it is true that younger children turn to passive less than adults, but to do so they must already possess some knowledge about those structures. The 67% of the children in the 3 years old group produced at least one passive, indicating that the difference between adults, older children and them is only in frequency of usage, not in possessing or not the structure. Moreover, researchers suggested that children's difficulty in dealing with passive could rely on a pragmatic level, in the sense that they don't understand that they could use a passive sentence in a certain context, but this has nothing to do with their ability to generate the passive structure. Thus, it seems that children can produce long passives already at 3 years old, but they have to be given the right context.

Fox & Grodzinsky in 1998 presented a work whose results were against Borer & Wexler's maturation of A-chains. First of all they demonstrate that children can successfully produce sentences containing A-chains. In fact, any time that children compose a sentence in which the subject precedes an auxiliary, and this frequently happens in 4 years old children's speech, an A-chain is created: the subject, generated within the VP, has to raise in the IP domain in order to precede the auxiliary. Moreover Crain, Thornton & Murasugi (1989)[3] observed that 3 and 4 years old children produce passives with auxiliary *get*, an inaccusative verb, involving a NP-movement in the derivation, and so an A-chain in their representation. Since the verb *get* assigns a θ-role, contrary to auxiliary verbs, and since children show to be able to handle passives with this verb, this means that the difficulty does not lie in the verb *get* itself nor in

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[3] Paper presented at the 12th Annual Boston University Conference on Language Development in 1989 but published only in 2009. In the list of references is reported the 2009 as year of publication.

assigning θ-roles. Thus Fox & Grodzinsky (1998) conducted an experiment whose results demonstrated that children's problems with passive clauses stems from the presence of the by-phrase: once that this is eliminated, percentages of accuracy drastically increased. They examined a group of 13 children ranging in age from 3;6 to 5;5 and they tested their production and comprehension of active and passive sentences (full and truncated, with auxiliary get/be) with actional and non-actional verbs. They found that children's performance in active and passive clauses with actional verbs was perfect, while non-actional verbs provided a different scene: non-actional truncated passives were not perfect but above chance (86,5%), whereas non-actional full passives were at chance but with a definitely lower score (46,1%). They did not show difficulties in get-passives and be-passives. They made mistakes in non-actional full passive clauses, while they did not once the by-phrase had been removed. The authors suggested that children have problems only with non-actional passives, and that these problems arise only when the by-phrase is present. They started from the idea that in English the by-phrase assumes two different but confusable syntactic functions: in some contexts it can co-occur with the agent, that they called 'affector', of the action conveyed by the verb; but in other situations it has the purely grammatical function of realizing the external argument of the passive verb. When children face actional passives, they interpret the object of *by* as the agent, and in this kind of sentences θ-transmission of the role is not involved in the computation of the structure. On the other hand, when young participants are presented with non-actional full passives, they fail to interpret the by-phrase as the element that expresses the external argument because θ-transmission is a difficult operation for them.

On the other side Babyonyshev et al. (2001) argued that Fox & Grodzinsky's evidence which underlined the difficulty was due to some properties of θ-transmission could be exactly the presence of an A-chain. Indeed, the researchers tested 38 Russian-speaking children ranging in age from 3;0 to 6;6 on their ability to use genitive of negation with unaccusative verbs, a Russian very frequent construction that involves A-chain, and they found difficulties with that construction, but the performance improved gradually as children grew older. Thus Babyonyshev et al. concluded that children's late use of the structure investigated is due to a maturation of factors not linked to the input they receive. The idea is that children produce unaccusative verbs, but they treat them like unergatives, and in doing so they avoid the creation of A-chains. Thus, because children have problems with the acquisition of passives and unaccusatives, structures that lack external argument and create A-chains, the authors claimed that these troubles can derive only from a delay in language maturation. Indeed, the

fact that children produce structure as adults doesn't mean they syntactically represent them in adults' manner.

This account was further supported by another study on Russian language by Babyonyshev & Brun (2004). Russian language has two aspectual forms of the same lexical verb, and both can be used to derive a passive. This property allowed the authors to investigate how 8 Russian children (2;6-3;9 age) use the passive. The researchers found that even if children received an input richer of imperfective verbal forms, they still preferred to create passive constructions using perfective verbs. This asymmetry in the passive construction was explained with the fact that in Russian the passive perfective form, but not the imperfective one, is homophonous with the adjectival passive form, and thus these children may be using the adjectival passive conveying the same meaning of the perfective passive.

Hirsch & Wexler in 2006 came to the same conclusion after a comparison between children and adults' performance on passives. They found that children have difficulties even in short non-actional passive, contrary to Fox & Grodzinsky's results, giving the idea that the deficit in passive structures is more general. Thus, they also claimed that the poor children's performance can be justified only from a maturational account.

But other point of views have been advanced in order to explain children's behavior with passive sentences. According to Bencini & Valian (2008) the paucity of those structures in the spoken input can be responsible of their deficit, rather than a real inability to generate passive syntactic representation. To verify if actually children do have a syntactic abstract representation of passives the authors used a syntactic priming task, that is "the tendency to repeat aspects of syntactic structures across otherwise unrelated sentences, such that prior processing of a particular syntactic structure facilitates subsequent processing of the same structure. Such priming occurs from comprehension to production and vice versa, as well as within modalities, suggesting that it taps into representations that are modality-independent" (Messenger et al. 2012). It follows that to be primed to reproduce a specific syntactic construction, that construction has to be already mastered. They tested 53 English-speaking children (from 2;11 to 3;6 years) and they found that participants in giving answers were influenced by the type of priming they received: they were more likely to comprehend and produce active forms after active primes than after passive ones, and they understood and uttered more passive sentences after passive primes rather than active primes. The same tendency was not found in control group, who was not given priming sentences. The children's data in the comprehension task suggest that they do have an abstract syntactic

representation of passives, though at this stage it seems to be not enough to produce them too. Thatcher et al. (2008) did a priming experiment too, and as Bencini & Valian they saw that 3- and 4 year old English-speaking children were influenced by the prime that authors gave, active or passive, but they noticed that the verb type, actional or non-actional, had no effect nor on children nor on adults control. Thatcher et al. opted to investigate also the verb type in order to verify if the acquisition of passive structure can be determined by verb semantic, and they found that it is not, though they could not explain children's poor performance on non-actional passives in the comprehension task.

Since Bencini & Valian's children received full passive prime only, it was not clear if they had a shared abstract syntactic representation for both short and full passives. In 2011 Messenger, Branigan & McLean did a priming syntactic test, including short and full passive prime, on a group of 16 children (age range 3;4-4;10). Since they were more likely to produce long passives after short passive primes, the authors evinced that to behave like that children had to have an abstract syntactic representation common to short and long passives. The fact that Bencini & Valian (2008) and Messenger, Branigan & McLean (2001) demonstrated that 3- and 4 years old children do have a syntactic representation for verbal passive clauses which stands against what Savage et al. (2003) claimed, that in early childhood their representation is highly influenced by lexical items.

2.4 Acquisition of passive in Italian typically developing children

As far as acquisition of passive clauses in Italian language is concerned, until today studies are not so numerous as they are on English-speaking individuals. Children around age 5 seem to comprehend passive clauses as adults do (Volpato et al. 2013; Volpato, Verin & Cardinaletti 2015), but the use of syntactic priming method revealed that already at 3-4 year children can produce, and thus comprehend, passive structures (Manetti 2013); Volpato, Verin & Cardinaletti (2014, 2015) had the same results from a description-picture matching task that investigated the aspect of the production .

2.4.1 Comprehension of passive clauses in Italian

Volpato et al. (2013) wanted to assess Italian-speaking preschool age children's comprehension of passive clauses. Their analysis included different factors that may be

involved in this type of sentence (actional/non-actional verbs, presence/absence of the by-phrase, '*essere*' 'to be'/'*venire*' 'to come' auxiliary verbs) in order to establish if they influenced passive structures acquisition in early childhood. Results showed that children's percentages of accuracy increased with age and revealed an asymmetry between actional and non-actional passives, namely, children by age 5 better comprehended actional passives. Conversely, we have to wait until children are approximately 6 years old to observe an adult-like comprehension of non-actional passive clauses. More interestingly, children did largely comprehend sentences with auxiliary '*venire*', that allows only eventive reading, providing evidence that 3-and 4 year old children can handle verbal passive structures. Any significant difference was detected between '*essere*'[4] and '*venire*' passives, suggesting that children do build A-chain to interpret passives as eventive.

Manetti (2012), reported in Belletti & Guasti (2015), investigated the comprehension of passive clauses in Italian-speaking children using three different experimental methods: a Truth Value Judgement task (60 subjects, age range 4;1-6;11), an Act-out task (three groups of 33 children ranging in age from 3;5 to 5;11) and a Picture-Matching task (two groups from 3;5-4;6). Results from the three tasks are interesting for their coherence: it's always the youngest group that shows difficulties with the passive clauses provided, whereas around age 4;6 children seem to comprehend passive structures well.

These studies revealed that between age 4 and 5 children reached an adult-like comprehension of passives, irrespective of the auxiliary ('*essere*' 'to be' or '*venire*' 'to come') used (*contra* Borer & Wexler 1987; Hirsch & Wexler 2006). As far as the type of verb is concerned, passives with actional verbs are comprehended earlier than those with non-actional, and this can be related also to the difficulty of adequately depicting them. Finally, children generated both short and long passives, and this discards the possibility that their deficit with passive structures lies in the presence of the by-phrase as Fox & Grodzinsky (1998) claimed.

2.4.2 Production of Italian passive sentences

The production of passive clauses in preschool Italian-speaking children (age range 3;5-4;6) was explored by Manetti (2013). The author made three experiments. In the first one 12

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[4] Only one group of participants, age range 4;9-5;5, experienced some difficulties in '*essere*' passive clauses. The authors suggested that this could be due to the ambiguity of auxiliary '*essere*' in Italian: it can convey either a stative, a resultative or an eventive connotation. Nevertheless, the positive performance in '*venire*' passives leads to the conclusion that children do acquire passive sentences very early.

children, ranging in age from 3;5-4;6, were asked to describe transitive actions painted on cards in response either to a neutral question ('*Che cosa succede?*' 'What is happening?'), or to an agent-oriented question ('*Che cosa fa X?*' 'What is X_{agent} doing?'), or to question referring to the patient ('*Che cosa succede a X?*' 'What is happening to $X_{patient}$?'). Answering the third type of question children could choose between two possible structures in Italian, both of which topicalize the patient (that is the internal argument): a passive with the by-phrase or a pronominalized structure. The purpose was to analyze children's answers in neutral and in patient-oriented context. The second and the third experiment were done using a syntactic priming approach. In fact, children had again to describe transitive actions but after having been exposed to active or passive prime. In doing so, following in Bencini & Valian's (2008) footsteps, Manetti investigated if the provided active or passive prime increased the possibility of using that construction in describing the pictures, and then she compared children's data with adult control performance.

In figure 3 we reported an example of the card used in experiment 1. In this case to the patient-oriented question '*Che cosa succede al re?*' 'What happens to the king?' children might give different answers: a passive clause (7a), an active sentence with a clitic pronoun (7b) with or without the lexical object topicalized in left (7c) or right (7d) peripheral sentence position.

(7) a. (Il re) viene/è leccato dalla mucca
   (The king) comes/is licked by the cow

   b. La mucca lo lecca
   The cow him.Cl licks

   c. Il re, la mucca lo lecca
   The king, the cow him.Cl licks

   d. La mucca lo lecca, il re
   The cow him.Cl licks, the king

Figure 3 displays a card used in the first experiment by Manetti (2013).

Results of this task showed that children never uttered passive sentences, not even in patient-oriented conditions, where they preferred simple transitive SVO structures (26%), actually more suitable to describe a situation than to answer the question, or sentences containing a pronoun (67%), like those in (7b, c, d). In contrast, after questions on the patient, adults answered with passives in 90% of cases, while they rarely formulated SVO sentence (5%). But after neutral and agent-oriented question both groups preferred active SVO clauses: to answer the former children choose this strategy at 65% and adults did at 97%; to the latter children used an SVO in 54% of cases and adults in 81%. Thus, in agent-oriented and neutral question none of the groups choose passive clauses as a possible answer. Differently, this was the overwhelming strategy in adults' group in response to patient-oriented question, while children never used it in that context. This fact suggests that children spontaneously do not decide to generate passive clauses even though the right context is provided; rather, they avoid them eliciting active structures with clitic pronouns. The same tendency to use SVO clauses or clitic pronouns to refer to the topic patient was detected in 75 monolingual Italian children (age range: 3;5-6;2) by Volpato, Verin & Cardinaletti (2014), while adults had a striking preference for passive clauses. Nevertheless, Volpato's youngest participants produced at least few passives, with the exception of the older children (G4, 5;2-6;2): G1, the youngest group (3;5-4;3) had a percentage of passives of 14%, G2 (4;4-5;1) of 2% and G3 (5;1-6;0) of 38%.

From these two studies we can evince that if children have a certain freedom in elicitation tasks, they prefer to avoid passive structures, generating instead active clauses with pronominal object.

However, the presence of little percentages of passives collected by Volpato, Verin & Cardinaletti (2014) witnesses that at least some components of passive structures are available

to 3 year old children. Indeed, the 42% of this passives produced by G1 contained the auxiliary '*essere*' and the 58% the auxiliary '*venire*', and this fact indicates that they don't consider participles as adjectives but they can give them an eventive interpretation. Thus these data suggest that the A-chains are available to children in early childhood, against what Borer & Wexler claimed in the Maturational hypothesis (1987).

In experiment 2 and 3 Manetti (2013), through a syntactic priming paradigm, explored if 36 Italian-speaking children (age range: 3;6-4;6) can utter passive clauses after having been exposed to them. In particular, in task 2 '*venire*'-passives were provided, whereas in test 3 children were given '*essere*'-passive priming. The choice of testing separately the auxiliaries was address to find if children could correctly interpret unambiguous passive with '*venire*' and ambiguous '*essere*'-passives. The material consisted of cards depicting transitive actions, and with these cards the experimenter and the children had to play a game. The experimenter described his or her card (the prime one, like in figure 4a) and then child had to do the same with his/her own card (like figure 4b). In describing the card the experimenter gave active primes, that were SVO clauses, or passive primes, that were full passive sentences with '*venire*' or '*essere*' auxiliary, respectively in experiment 2 and 3. The prime effect was measured on the children's card description, in relation to the active or passive prime provided by the experimenter.

Figure 4a. Prime card   **Figure 4b. Experimental card**

Active prime: La rana picchia il re

         The frog hits the king

'*Venire*'-passive prime (experiment 2): Il re viene picchiato dalla rana

         The king comes hit by the frog

'*Essere*'-passive prime (experiment 3): Il re è picchiato dalla rana
The king is hit by the frog

In both experiments 2 and 3 it was found a significant syntactic priming effect for active and passive utterances. Indeed, active prime promoted the production of active SVO sentences (+33% in experiment 2 and +22% in experiment 3), and passive structures were fostered by passive primes (+19% in experiment 2 and +14% in experiment 3). It was found that children also produced construction with an object pronoun irrespective of active and passive prime and of the auxiliary, and the use of object clitic pronoun was noticed also by Volpato, Verin & Cardinaletti (2014, 2015).

These results revealed that Italian children aged from 3;6 have competence enough to produce long verbal passives, although they are still far from having an adult-like proficiency. Indeed, the fact that children produced more passive clauses after '*venire*'-passive primes strengthens the evidence that young children do produce verbal passive, as pointed out also by Volpato, Verin & Cardinaletti (2014, 2015), because '*venire*' 'to come' does not entail an adjectival interpretation as '*essere*' 'to be' does; however, the common mistake of assigning inverse θ-roles to the arguments underlines the complexity of passive structures. These data contrast with the claim that in early childhood children's passives are adjectival because they are not capable of generate a verbal passive representation (Borer & Wexler 1987; Hirsch & Wexler 2006); rather, results endorse that children's early passives resemble the adults' ones.

The fact that children produce fewer passives than adults has been pointed out to be due to the paucity of these sentences in the spoken input: actually, they are typical of the formal and written language, and children might have little experience of it. This is also bolstered by the evidence that children generated active sentences with an object pronoun, a pragmatically correct strategy that is often preferred to passive clauses in colloquial contexts, and by SVO utterances, a strategy that gradually decreases as children grow older (Volpato, Verin & Cardinaletti 2014).

Thus, even if children spontaneously tend not to produce passive sentences, under appropriate conditions 3-and 4 year old children do, and this demonstrates that they know how to generate passive structures, as previously found in English children by Bencini & Valian (2008).

2.5 Passive clauses in Italian Deaf subjects

Much research has been conducted to investigate morphosyntactic abilities of deaf Italian

people (Volterra & Bates 1989; Fabbretti, Volterra & Pontecorvo 1998; Caselli, Rampelli & Volterra 1994; Volterra, Capirci & Caselli 2001; Ajello et al. 2002; Chesi 2006; Bertone et al. 2011 among others), but as far as we know only Franceschini (2013) focused only on passive clauses with a longitudinal study on two hearing-impaired twin children, and no studies has been done specifically to assess Italian deaf adults' competence in passive structures. We have some data about Italian deaf adolescents from Bertone et al. (2011): the authors investigated the ability to comprehend Italian language in 6 deaf Italian adolescents, aged from 15;5 to 17;6, whose mother tongue was Italian Sign Language (LIS). In particular, researchers used Cipriani & Chilosi's TCGB[5] standardized test that investigates the comprehension of the most frequent structures of Italian language: locative clauses, flexional clauses, affirmative and negative active clauses, affirmative and negative clauses, relative and dative clauses. The TCGB test revealed that the deaf adolescents had the language competence comparable to normal-hearing children between 5;0 and 7;6 years.; thus they were compared with a group of children of that chronological age.

The authors found that deaf adolescents obtained the lowest percentage of accuracy in affirmative and negative passive structures, with a mean percentage of 67% and 72% respectively. In these type of clauses the experimental group concentrated the majority of mistakes. These mistakes were unattended if we consider adolescents' chronological age, but actually they were qualitatively and quantitatively in line with the language age they showed to have reached and that was comparable with the control group. Results highlighted a significant delay in the development of oral language that is typically observed in deaf people.

As far as the interpretation of passive clauses is concerned, Bertone et al. claimed that it could not be influenced by a strategy of LIS, because Italian Sign Language lacks a specific construction for generate passive clauses. Indeed, in LIS passive structures are possible only with certain transitive verbs characterized by a direction and a movement that link the agent with the patient/beneficiary of the action expressed, and a change in these two parameters can determine a reversal of θ-roles. Moreover, deaf people know that auxiliary '*essere*' 'to be' is involved also in the formation of compositional tenses, and that auxiliary '*venire*' 'to come' is also a verb of movement. Taking account of these considerations, it is evident that the acquisition of Italian passive, that they find mostly in written texts, is difficult for this

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[5] The TCGB test is used to assess the comprehension of children (within the age range of 3;6- 8;0) of Italian's main structures and permits to determine the language age of the child tested. Since Italian lacks a specific instrument to assess the comprehension in deaf children, authors used TCGB to determine the language age of the participants in order to compare them with a control group with the same linguistic knowledge.

population, and they don't even have a similar LIS structures that could work like a positive transfer. To interpret the clauses provided by the authors both the groups used extralinguistic cues, like the word order, the probability or not that the represented event could happen, or other elements that are usually associated to particular structures (for instance, the passive morphology in passive clauses).

However, data did not show negative influence of Italian sign language to the learning process of the oral language, and this is consistent with the outcomes of the studies reported in §1.3.2. Furthermore, the strategies to which deaf adolescents recurred were used also by the normal-hearing children, and this fact suggests that both follow a common pattern in the development of language comprehension abilities.

Chapter 3

THE RELATIVE CLAUSES

3.1 Introduction

Relative clauses can be restrictive or appositive. The former type is interpreted within the scope of the DP, and relative clauses of this type semantically individuate and refer to a particular (set of) element of a group; they are subordinate structures that modify a nominal element, and the information they give is necessary and enough to identify the referent speakers are talking about. The latter type differs in not being read under the scope of the determiner, and these constructions only add information about the noun they follow and that they refer to (Alexiadou et al. 2000).

In this section and in this research our attention will be devoted to restrictive relative clauses.

In Italian, these structures have a gap, notated as [__], within the relative clause, in correspondence to the argument position of the relative head inside the relative structure (Belletti & Guasti 2015). According to the original position of the relativized element, we can label different relative sentences as subject relative clauses (SRC) (8a), object relative clauses (ORC) (8b), and object relative clauses with post-verbal embedded subject (ORp), an allowed option in Italian (8c). When the relative head and the post-verbal subject have the same number features (that is, they are both singular, as in (8d), or both plural), the sentence is ambiguous and it can also be read as a subject relative clause.

Finite relative clauses, namely subject and object relative clauses, are introduced by the complementizer '*che*', that corresponds in most cases to the English 'that', while indirect relative clauses like (8e), in which the relative head corresponds to a prepositional phrase, are introduced by a relative pronoun set in the PP (Belletti & Guasti 2015):

(8) a. I bambini$_1$ che [__]t_1 abbracciano la mamma
         the children   that   hug   the mother

     b. Il bambino$_1$ che la mamma abbraccia [__]t_1
         the child   that the mother   hugs

     c. I bambini$_1$ che abbraccia [__]t_1 la mamma
         the children   that hug   the mother

     d. Il bambino$_1$ che [__]t_1 la mamma abbraccia
         the child   that   the mother   hugs

     e. Il bambino$_1$ con cui   la mamma passeggia [__]t_1
         the child   with whom   the mother walks

The mechanism that permits to dislocate an element from its original position to another one in the sentence is called syntactic movement (Friedmann & Szterman 2006). When a constituent moves, it leaves a trace or a silent copy behind, notated as *t*, in the original position where it was generated, and it is coindexed with the moved element (t_1); in examples (8a)-(8e) traces are coindexed with the respective relative head, indicating that there is a link between them. In particular, the dependency that holds between the relative head and its corresponding gap inside the relative clause is a movement (long-distance) dependency, because the relative head move to the left peripheral position of the sentence, in the CP. As far as the thematic role is concerned, the verb assigns the θ-role to the trace of the moved constituent and the trace, in turn, transfers the thematic role to its antecedent, namely the moved element, by the chain consisting of the trace and its antecedent, as illustrated for (8b) in figure 5.

Figure 5. Syntactic tree of an object relative clause
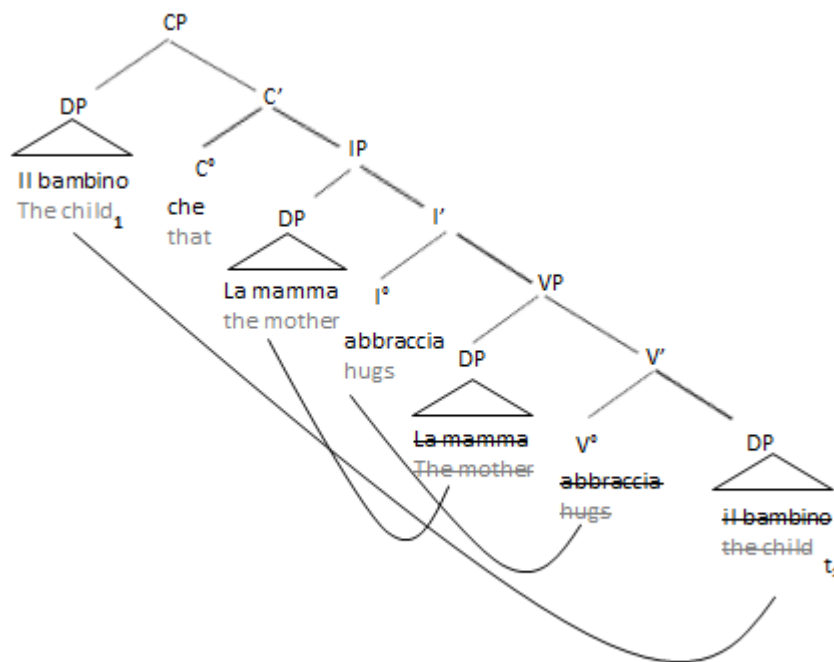
Thus, relative clauses are difficult structures for many reasons: they are introduced by the complementizer '*che*'; there is a long-distance dependency between the position internal to the subordinate and the external position in the main clause; they contain a gap, namely the position where the moved element is interpreted; in subject relative clauses, the canonical word order SVO is preserved and the A-bar syntactic movement is short; on the other hand, object relative clauses are characterized by the marked word order OSV (or OVS) and by a long syntactic movement.

Numerous Italian dialects permit the generation of relative clauses with a resumptive pronoun instead of the gap inside the relative clause. In many varieties of Italian these pronouns are clitic pronouns, and they are typical of the informal register and the colloquial speech (Belletti & Guasti 2015). Since also in other languages it is possible to build relative clauses with resumptive pronouns (for Brazilian-Portuguese see Grolla 2005; for Hebrew see Friedmann & Szterman 2006; for Persian see Rahmany, Marefat & Kidd 2014; for Slovene see Hladnik 2010; for Welsh see Willis 2000, a. o.), it has been evinced that the presence or the absence of these pronouns is the reflection of the activation or inhibition of a UG parameter. But it is important to note that even among those languages that allow resumptive pronouns there are different rules for their distribution: they cannot appear everywhere indistinctively, because they are submitted to specific-language constraints that allow or disallow them from certain positions (Sells 1984). When resumption takes place, the dependency holds between the head

of the relative clause and the corresponding pronoun (Belletti & Guasti 2015), as examples in (9):

(9)   a. Hayiti roce lihiot yeled she-safta malbisha oto
            Would-1sg want to-be boy that-grandma dresses him
            I would like to be *a boy₁* that grandma dresses *him₁*

                                                    (Hebrew, Friedmann & Szterman 2006:63)

         b. To je človek,   ki   ga   iščejo
            this is man.nom C>rel he.acc.cl look>for-3pl
            This is *the man₁* they are looking for *him₁*

                                                    (Slovenian, Hladnik 2010: 28)

Because of their structural complexity, relative clauses are among the hardest syntactic constructions to acquire: they are learnt fairly late by typically developing children, and they are acquired later and with more difficulty by atypically developing subjects, like, for instance, children with SLI (Specific Language Impairment), hearing-impaired children, and children with developmental dyslexia (DD). But in every language development condition, an asymmetry between subject and object relative clauses has been repeatedly found: SRCs are acquired earlier and with no effort by children when they are around 3;6 years old; on the contrary, ORCs are mastered later, around age 5, and this asymmetrical situation is long lasting, since also adults parse OR structures slower than SR sentences, especially when the former have an inanimate subject paired with a verb that could also be paired with an animate subject (Traxler et al. 2002; Traxler et al. 2005). Thus, the manipulation of animacy features of NPs in the relative clause revealed that those features can affect the comprehension and production of relative sentences.

Another explanation could be that SRCs and ORCs involve a different working memory load, since in ORCs the DP-filler '*il bambino*' of the gap of the relative clause has to be kept in mind for a longer time (8b) than in SRCs (8a).

Other researchers claimed that the source of complexity of ORCs depends on the intervention of the lexical subject in the syntactic relation that has to establish between the relative head and the gap in its original position (Rizzi 1990, 2004; Friedmann, Belletti & Rizzi 2009), as figure 6 shows (see §2.2).

Figure 6. The lexical relative head and the lexical intervener make the object relative clauses difficult.

Relative head-DP$_1$ [DP-subject.........................(DP) $_1$]
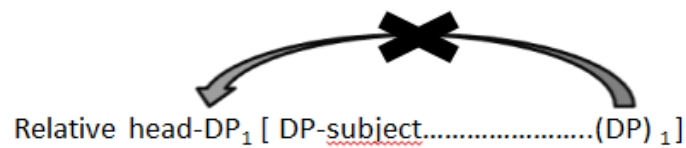
In the next sections some studies on typical (§3.2) and atypical (§3.3) relative clause acquisition will be presented. Studies on typical acquisition of relative clauses can help to shed light on the origin and the locus of the deficit in individuals with atypical language development.

3.2 The acquisition of relative clauses in typical development

Several studies on numerous languages investigated the acquisition of relative clauses, and the asymmetry between SRCs and ORCs was repeatedly found across languages in both comprehension and production. This disparity has been claimed to be due to intervention effects, beside the working memory computational overload and the different syntactic complexity these structures are characterized by. In section 3.2.1, some cross-linguistic evidences will be briefly reported, while section 3.2.2 will focus on relative clause findings on Italian. In the final section (§3.3) the acquisition of Italian relative clauses in situation of atypical language development is explored.

3.2.1 Cross-linguistic studies on relative clauses

In 1979, de Villiers and her colleagues conducted an act-out experiment on 114 English monolingual children ranging in age between 3 and 7. The authors provided the children with 9 different type of relative clauses in order to investigate all the possible combinations of the 3 roles (subject, direct object, indirect object) that both the NPs, that is the head of the relative clause and the NP inside the relative, may assume. Moreover, two particular factors were analysed: the first was the embeddedness, that is the position of the relative clause in the sentence, which changes according to the element that it modifies in the main clause: centre-embedded relative clauses interrupt the main sentence, while right-branching relatives do not; the second important factor was the focus, namely the role of the relative head in the relative

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clause. Findings showed that relative structures are better and better comprehended with increasing age of children and that embeddedness and focus are both significant, pointing out that they have to be taken into account in preparing the material and in analysing the test results. Indeed, in general children found sentences with the relative head in subject role easier than those in which the head played the role of object, and both these conditions were easier than clauses with an indirect object relative head (de Villiers et al. 1979). This comprehension study, thus, confirmed the typical asymmetry between SR and OR.

Later, a study by Goodluck & Tavakolian (1982) started from what de Villiers and colleagues found, namely, that SR are less difficult to interpret than OR for 4-and 5-years-old children. They assumed that the +/-animacy features of the direct object in the relative sentence can partially determine the major complexity of OR clauses. To assess children's comprehension of relative clauses the authors used a task similar to the one of de Villiers et al. (1979), in which participants had to act out sentences by manipulating toys. Children scored a higher percentage of correct responses in inanimate relatives than in animate ones, supporting Goodluck and Tavakolian's assumption that animated direct object increase the children's processing load. This idea was further confirmed by the fact that intransitive relatives, that do not require an object, were highly comprehended, more than transitive relatives. Moreover, the fact that they were able to handle objects in main clauses and in infinitival complements showed that there was no impairment in comprehending objects *per se*. Thus, in interpreting relative clauses children have to interact with complex factors as syntactic structure, transitivity of the complement sentence, and features (+/- animacy) of the object in the subordinated clause. Authors claimed that the interpretation of relative clauses with an animate objects may request an effort too intense for children's young and not yet mature computational system. According to the Conjoined-Clause Analysis (proposed by Tavakolian in 1981), children cannot properly process relative clauses because their grammar lacks recursion within the NP, and consequently they analyze complex structures as conjoined simple clauses. But Goodluck & Tavakolian (1982) added that children's difficulty could partially arise also from the assessing method used. Keeping the attention on the methodological issue, Hamburger & Crain (1982) suggested that the act-out task, like the one used by de Villiers et al. (1979), violated certain aspects of pragmatic and semantic use of language. Correa (1995) went deeper in criticizing the task, claiming that «*task instructions bias children for the search of two syntactically/semantically independent actor/action/object (NVN) relationship. This bias can make children overlook the presence of the relative marker (that), whose perceptual function is crucial for the correct parsing of the sentence*» (Correa

1995:186). The second objection concerned children's acted-out response: the experimenter cannot know whether the clauses were properly parsed as RCs, or if children just read them as two conjoined structures. The third problem is that the task required two conflicting demands from the child: s/he had to convert the metalinguistic 'game with language' into a concrete 'game with toys' s/he was provided by the experimenter. Thus Correa (1995) developed another task to assess children's comprehension of relative clauses: they were given a precise context in which RCs can be interpreted as noun modifiers also from a pragmatic point of view, and so avoiding the problems that can stem from an inadequate (null) context. This new act-out test was used on 80 English-speaking and Portuguese-speaking children (age between 2;6 and 6;5) and embeddedness, focus and animacy features were manipulated and investigated. Despite children spoke different languages, results suggested that (i) in both groups the relative structures were well comprehended by age 5, (ii) that SRCs are better understood than ORCs, and (iii) that clauses containing three animate NPs were more difficult than those with two animate nouns.

Correa's study was noteworthy also because the two examined languages did not share processing constraints, that eventually could have explained the similar performance of English and Portuguese children. With these findings, it was demonstrated that in acquiring languages with different structures, the children process relative clauses recurring to the same interpretative strategies.

In a more recent research Kidd & Bavin (2002), following the procedure proposed by Correa (1995), made an experiment on 42 English-speaking children (age range: 3;0-5;6) to investigate their comprehension of relative clauses. By analyzing children's results and errors across age-groups, developmental changes underlying relative clause acquisition were observed: the correct comprehension of RCs increased with age as well as the accuracy in centre-embedded structures, which were found to be more difficult than right-branching ones: the main clause of the latter occurs before the relative clause, and thus it is closed and interpreted once that the relative pronoun has been found. Conversely, the former require to identify the complex relationship between the noun and the modifier before the main clause is closed.

According to the Minimal Chain Principle (MCP) (De Vincenzi 1991), the asymmetry between subject and object relative clauses is the reflection of the more complex relation that is at the basis of the ORCs. Indeed, the movement of the relative head is shorter and more local in SRCs (like 8a, repeated in 10a) than in ORCs (like 8b, repeated in 10b), which

consequently are more difficult to process.

(10) a. Il   bambino$_1$ che [__]t_1 abbraccia la   mamma

     the child   that   hugs   the mother

   b. Il   bambino$_1$ che   la   mamma abbraccia [__]t_1

     the child   that the mother   hugs

These findings confirm that English relative clauses are acquired around age 5, but studies conducted on Romance languages and on other languages that have a similar RC pattern, like Hebrew, revealed that these structures are mastered even around age 4.

As far as the French language is concerned, Labelle (1996) explored the acquisition of French relatives in order to catch the mechanism children use to derive these structures. Labelle analyzed a corpus of data that involved many French dialects of children from age 3 to 7, and she came to the conclusion that no syntactic A-bar movement took place in children's relative clauses because of the absence of pied-piping and of the abundance of resumptive pronouns, a strategy not allowed in standard French. Labelle's account was contradicted by Guasti & Cardinaletti (2003) research that showed that actually children derivate relative clauses through the movement mechanism present also in adults' grammar. Other evidences in support to Guasti & Cardinaletti came from Bentea & Durrleman (2014) from a study on RCs and wh-question (*who/which*) comprehension in 72 French-speaking children (age range 4;10-9;10). Like previous studies on English, they found a subject/object asymmetry in the investigated structures, but a further analysis revealed that the asymmetry emerged both in relative clauses and in *wh*-questions when [+NP] objects were involved as a relative head or as a part of *which* questions respectively. The fact that children got a positive score in [-NP] object constructions put in evidence that A-bar movement was not the main source of difficulty in comprehension: in line with the account of Friedmann, Belletti & Rizzi (2009) for Hebrews RCs, Bentea & Durrleman claimed that for children A-bar dependencies are more difficult when an element with [+NP] features cross over an intervening subject with the same [+NP] features.

Friedmann, Belletti & Rizzi (2009) found that Hebrew-speaking children struggled only in ORCs and in *which*+NP questions, and thus authors argued that a stricter version of Relativized Minimality (Rizzi 1990) operating in children is what prevent them from an adult-like competence in A-bar dependencies. The child's weaker computational system has not the

capacity to distinguish the features of the NP moved element from the features of the intervening NP subject when they share some feature[6], and so when there is lexical restriction. Indeed, this stricter Relativized Minimality Principle operating in children requires not just distinct features, but it imposes that featural specification of the relative head and of the NP subject has to be disjoint, otherwise the relation between the trace and the moved element cannot be built. Figure (7) and (8) depicts what happens in object relatives with a full NP relative head and in *which*+NP questions respectively.

Figure 7. Lexical restriction in object relatives with lexical relative head.
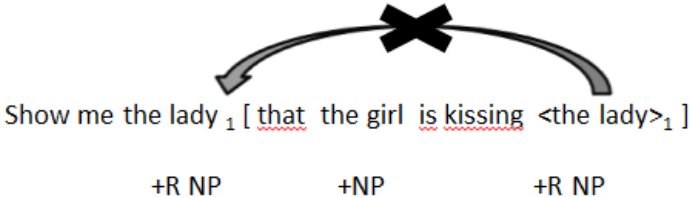
Figure 8. Lexical restriction in *which*+NP object questions.
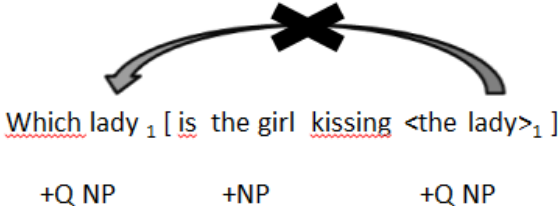
On the other hand, not lexically restricted A-bar constructions, like *who* questions and free object relatives («*Show me the one that the boy is wetting*», Friedmann, Belletti & Rizzi 2009: 74), were unproblematic for children. Adults, oppositely, handled all structures with any difficulty and the Relativized Minimality Principle was never violated: since the relative head has more featural specifications than the intervener, they can easily cope with constructions like ones in figure (7) and (8). Data from Haendler at al. (2015) supported this view: the participants' performance was better on object relative clauses with a full DP head and a pronominal embedded subject rather than in object relative clauses with both relative head

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[6] Gordon et al. (2001) observed the subject-object comprehension asymmetry too, and they also noted that when relative clauses contained two NPs of the same type, they were worse comprehended than those with two NPs of different type. They claimed that the data collected support a conception of working memory in which the similarity of the NPs can create an interference effect and so it plays an important role in sentence-complexity effects.

and embedded subject expressed with full DPs.

Friedmann, Belletti & Rizzi (2009) account was refined by Bentea, Durrleman & Rizzi(2016) in a study that focused on the features that provoke lexical restriction, on the condition in which these features have an impact in ORCs processing and on the relation between children's working memory capacities and the complexity of A-bar structures.

A group of 61 French-speaking children, ranging in age from 4;9-11;10, was tested on the comprehension of object questions and object relative clauses. Findings from object questions and ORCs headed by *ce* reveal that the lexical restriction [+NP feature] plays an important role in modulating comprehension, but the same is not valid for ORs headed by *celui/celle*, and this implies that the concept of lexical NP feature need to be further examined and refined.

The general frame obtained by analyzing data across age groups and A-bar structures shows that the performance is better when the NP target relative head and the intervener have disjoint featural specifications; indeed, the most demanding constructions are those in which the feature [+NP, +animacy] of the intervener are enclosed in the set of feature of the relative head. On the other hand, comprehension improves when an inanimate lexically restricted relative head crosses an animate subject, but a significant enhancement in animacy mismatch condition was not detected in bare *who* and *what* questions. Thus, authors claim that this supports the idea that the animacy effect depends on whether the expressed feature specifications are associated or not with a [+NP feature]. Furthermore, this study made evident that memory resources and comprehension of A-bar dependencies are strictly connected, since the increase in working memory capacities, as children grow older, promote the correct comprehension of object *wh-* questions and object relative clauses (Bentea, Durrleman & Rizzi. 2016). Finney et al. (2014) affirm that working memory storage and attention focus switching are what underpins children's comprehension of object relative clauses: thanks to the former, the child can retain both NPs involved in the relative clause and then reactivate the first NP from memory in order to integrate it into the ongoing spoken structure; the latter supports the reactivation of the first NP, since the child has to switch the attentional focus away from the developing language process to memory retrieval.

The studies presented above and many others (for Hebrew see Friedmann & Novogrodsky 2004; for Hungarian see Kas & Lukácz 2012; for studies on Italian see §3.2.2) repeatedly found the asymmetry in comprehension of subject and object relative clauses, but for the sake of completeness it's noteworthy a research carried out by Mak et al. (2006) on university

Dutch-speaking students, in which this asymmetry was not detected. Mak and colleagues justified their findings claiming that in analyzing relative structures the animacy features interacts with topichood and verb semantics, and this view can account also for the common preference for SRs over ORs many times reported (for more details see Mak et al. 2006).

As far as production is concerned, cross-linguistic studies found that subject relative clauses are easily produced by children, whereas object relatives pose a problem, and SRCs are often produced instead of ORCs: this pattern was found in data from Italian and French (Guasti & Cardinaletti 2003) and English (McDaniel, McKee & Bernstein 1998) among others. When children produce ORCs, besides gap object relatives, they utter also ORCs with resumptive pronouns and with resumptive DP, even when these strategies are not permitted by their mother tongue. For instance, in Hebrew language, ORs with resumptive pronouns are grammatical, but resumptive DPs are never allowed; on the other hand, in the colloquial register of Italian we can hear object relatives with resumptive pronouns, but this strategy together with resumptive DPs is not an allowed option in Italian standard form. The fact that children recur to linguistic options they never heard in spoken input, but that are common in other languages, is a strong evidence of the existence of the UG and of its supports in language acquisition process. Indeed, it seems that they explore UG strategies even though they are not typical of their L1.

In the next section we will turn our attention to the comprehension and production of relative clauses in Italian-speaking individuals.

3.2.2 The acquisition of relative clauses in the Italian language

A pilot research on children's acquisition of Italian subject and object restrictive relative clauses was led by Utzeri (2007). She examined two groups of Italian-speaking individuals, 41 children (age from 6 to 11) and 30 adults (age from 15 to 73), and she compared data of both groups from two elicitation tasks (a preference task[7] and a picture description task[8]) using the same experimental paradigm of Friedmann & Szterman (2006). The analysis of the

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[7] The experimenter presented two options and the child had to manifest his/her preference. The options were meant to induce the child to formulate SRCs or ORCs.
[8] The experimenter showed two different pictures and described them with simple sentences to the child. Then the participant was asked about one of the characters and the role it played in each picture, in order to make the child produce a relative clause.

two groups' production confirmed the general cross-linguistic pattern in which subject relatives are unproblematic both for adults and children, while results from object relative clauses were unexpected: children's percentage of ORs was definitely higher compared to the adult group's one: 22% against 1%. When ORCs were targeted, adults changed the sentence structure eliciting SRCs, but maintained the original meaning, while children recurred to different strategies: ORCs with gap, ORCs with resumptive pronouns and ORCs containing resumptive DPs. The first relativization strategy is actually the only one permitted in the Italian standard language, while the second one is allowed in colloquial situations. But the use of resumptive DPs is never attested at any level of the Italian language, and thus one could wonder where these children did catch this relativization pattern. The answer is, again, that they are probably exploring one possibility of UG, since languages like Korean and Hindi can built ORCs with resumptive DPs (Rizzi 2005) . When children produced ORCs with gap, they preferred the pattern OSV instead of OVS, because in THE case of match conditions, that is, if both the object and the subject were singular, the generated sentence could be interpreted as a SRC (11a) or as an ORCs (11b):

(11) Il bambino che   pettina la mamma
        the child   that   combs   the mother

(11) a. The child who is combing the mother   (Subject Relative Clause)

(11) b. The child who the mother is combing   (Object Relative Clause)

In avoiding ORCs, both groups revealed a strong preference for turning them into SRCs and in doing so they used the same strategies, even if in different percentage. In general, ORCs were turned into SRCs mainly through passivization: instead of the target ORC '*il bambino che la mamma copre*', 'the child that the mother wraps up', the sentence '*il bambino coperto dalla mamma*', 'the child that is wrapped up by the mother' was uttered, and this type of sentences are known as Passive Object Relatives (PORs) (Belletti 2014). A limit of Utzeri's study is that she did not divide accurately the data per age, but she was the first who discovered that children ranging in age from 6 to 11 prefer to avoid the production of ORCs transforming them into SRCs especially through passivization.

Contemori & Belletti (2013), extending a previous study (Belletti & Contemori 2010), investigate more in detail PORs to seek their emergence in the language learning process. Also in these works the asymmetry between subject and object relatives emerges, in which the production of the former is generally significantly higher than the latter. As far as ORCs is concerned, the strategies children adopt are similar to those of the children of Utzeri's study

(2007): ORCs with gap and preverbal subject and object relatives with reduced head (expressed with a demonstrative pronoun). The interesting fact is that children often produce PORs instead of eliciting target ORCs, and this behavior is typical of the oldest participants. Contemori & Belletti (2013) report three types of passivization used (si-fa causative clauses, copular passives, and reduced passives) and notice that the use of passivization strategies in response to the elicitation of an object relative clause increases as children grow older. The same tendency was found also in Guasti et al. (2012) by analyzing data from two groups of children, aged 5 and 9 respectively. On the other hand, adults in Belletti & Contemori (2010) and in Contemori & Belletti (2013) made an extreme use of PORs, eliciting target ORs only between 3% and 10% of the target cases.

The group of 5-year-old children tend to produce relative clauses with reduced head, while 9 years olds more often opt for passive relatives. Guasti et al. (2012) suggest that the choice of different strategies observed in the two groups can be due to the different availability of syntactic operations as age increases. In particular, depending on the syntactic capacities children have at a certain age, they try to solve the interference effects predicted by Friedmann, Belletti & Rizzi (2009) differently. According to Collins' Smuggling approach (2005), the instruments to derive passives are not yet acquired at age 5, and for this reason younger children prefer to reduce the NP lexical restriction of the object head in order not to violate Relativized Minimality Principle and to bypass interference effects of the preverbal embedded subject. The 9-year-old children, instead, can better handle the smuggling syntactic mechanism, and its use is the most efficient and the most economical solution in answer to object relative elicitation. Indeed three advantages can be list:

I. with smuggling it is possible to derive sentences that are appropriate to the context through more local steps instead of the single long movement required by ORCs;

II. the movement of the VP chunk permits to avoid interference effects with the lexical subject and, at the same time, to maintain the original meaning of the sentence;

III. it generates SRCs instead of the more complex ORCs.

This explains why, once passive is acquired, that is after age 5, the use of PORs increases and the production of object relatives decreases. The figures below visually report the operations that occur in a passive object relative (9) and in an object relative with gap (10). The former is characterized by more than one movement of the relative head, but they are short and local, and there is only one subject-verb agreement relation that takes place thanks to the smuggling operation.

Figure 9. Syntactic tree of a passive object relative (POR).
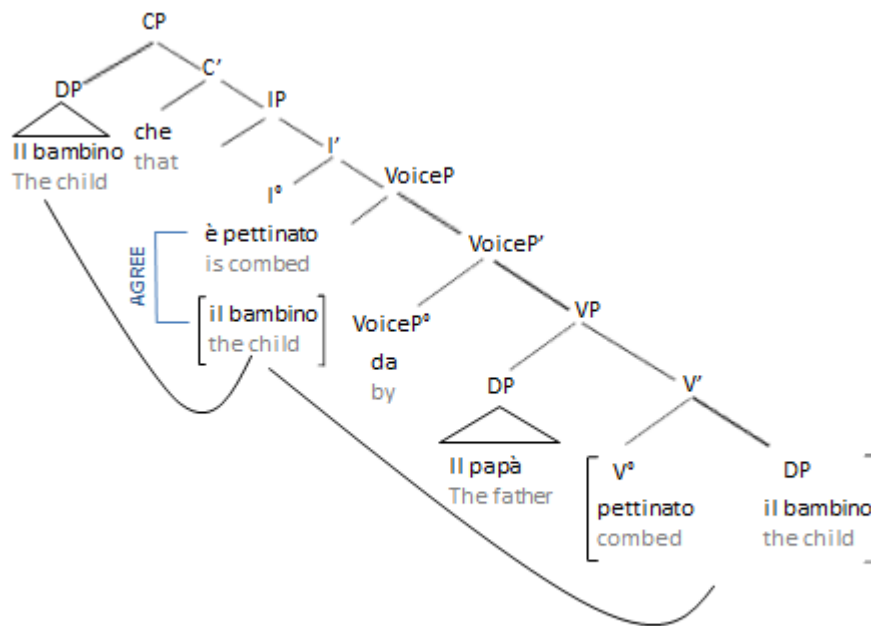
In the OR with gap (figure 10), instead, the relative head has to do a long movement, crossing the lexical subject on the way, in order to reach the SpecCP position. Moreover, since the subject moves to the pre-verbal embedded position, a second agreement relation Spec-head has to be established in addition to the subject-verb agreement. This explains why in earliest stages of language acquisition the ORCs are preferred over passive relative clauses: the presence of a robust agreement relation between the embedded subject and the verb, which takes place both under AGREE and in the Spec-Head configuration, lead the youngest children to opt for this construction since the passive is not available yet (Volpato & Vernice 2014).

Figure 10. Syntactic tree of an object relative showing the two AGREE relations that take place.
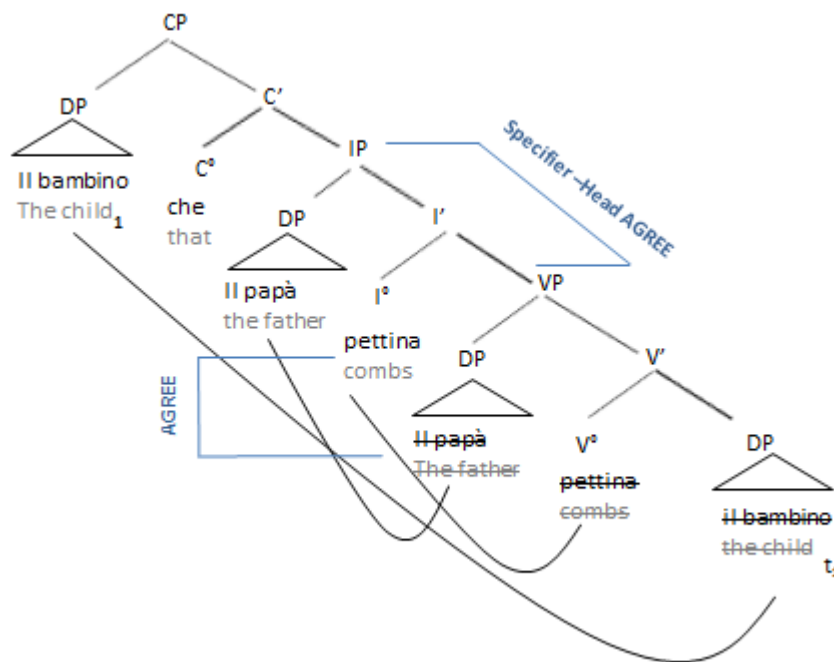
Guasti et al. (2012) showed that the mismatch in animacy is a feature that helps in early stages of language maturation, but it is not relevant any more in a fully developed computational system. Thus, older children resemble adults syntactic competence not only because they increasingly resort to PORs, but also because they are less and less sensitive to the animacy feature.

In another study Belletti & Contemori (2012) showed that a crucial factor in facilitating children's good performance in ORCs seems to be the use of a pronominal element as the subject of the relative clause. In this specific condition, children elicited ORCs with no special difficulty. Thus, it appears that object relatives are better produced if a pronominal instead of a lexical subject is used, overt or null.

As far as the comprehension of relative clauses by Italian-speaking children is concerned, many studies confirmed the same subject/object asymmetry noted also in other languages (see §3.2.1).

Adani (2008) tested 116 children in the age range 3-7, then divided into smaller age groups. The relative clauses of the experiment included all animate referents in mismatch conditions: the relative head was always singular while the embedded NP was plural. Results indicated that SRCs are better comprehended in all age groups, while ORCs are more problematic, but the performance get better as age increases. Additionally, ORCs with post-verbal subjects, the

most complex structures, were poorly comprehended by all groups and only the older one got more accurate scores.

Arosio, Adani & Guasti (2009) proposed a picture selection task to 139 children (age range from 5;3 to 11;3) in order to test the comprehension of ORCs in two particular (unambiguous) conditions: the relative head and the preverbal subject of the relative clause matched in number; in mismatch number condition with the subject in post-verbal position. Again, the subject/object asymmetry emerged from data analysis, with a better performance in the SRCs. Furthermore, the ORs disambiguated through the position of the subject, namely those in which the subject was in pre-verbal position, were better comprehended than ORCs disambiguated through number agreement. The former seem to be already mastered at age 5, while the performance in the latter resembles the adults competence only when children are at least 11 years old. The difference between the two types of ORCs is interpreted to be due to the fact that the operation of checking morphosyntactic agreement features is acquired later than the assignment of θ-roles. Bearing in mind the assumption that the parser tries to close the dependencies as soon as possible, in ORCs with pre-verbal subject the NP in the relative clause immediately receives the θ-role of external argument because it is set in a position where the reanalysis of the arguments can still be easily made; on the contrary, in ORCs the verbal agreement with post-verbal subject entails that the reanalysis of thematic roles occurs only when the role assignment already took place.
Thus, ORCs disambiguated through number agreement are the most complex structures because all the operations have to be reanalyzed (Arosio, Adani & Guasti 2009; Arosio, Guasti & Strucchi 2011).

Volpato (2012) conducted a study aimed to investigate whether and how the marked plural features influence the comprehension of relative clauses in hearing-impaired and in normal-hearing children. The comprehension abilities of the group of 13 normal-hearing children, ranging in age from 5;0-7;9 was assessed through the agent selection task elaborated by Volpato in 2010. The results revealed that the normal-hearing children were more accurate in subject than in object relatives, both with preverbal and post-verbal position, confirming once again the subject/object asymmetry. Moreover, children performed better in mismatch conditions, showing that their sensitivity to number features helps them in the comprehension process.

Despite the fact that children's performance in off-line tasks does not always resembles the

adult's one, Contemori & Marinis (2014) found that in on-line language processing tasks children ranging in age from 6;0-8;11 show a processing system that is qualitatively similar to the adults' one.

Contemori & Belletti (2013), after testing children's production, investigated whether and from which age children comprehend the relatives they uttered in the production task, namely, passive object relatives (of different types), object relatives with gap and ORCs with resumptive clitic pronoun. The data analysis showed that active ORCs, with gap or resumptive pronoun, are the hardest structures, while all the types of PORs are correctly comprehended at all the ages tested (6;5-8;10). Results confirm that children comprehend what they produce.

The results of the studies reported above indicate that children, ranging in age from 3 to 7, all experience the same difficulty in processing object relative clauses, and these findings are in line with cross linguistic literature on the acquisition of relative clauses, since also children acquiring the Italian language early and well master SRCs, while ORCs take longer to be learnt. This asymmetry is interpreted in terms of intervention (Friedmann, Belletti & Rizzi 2009) and in terms of the Relativized Minimality Principle (Rizzi 1990, 2004), as we already discussed in §3.2.1.

As a consequence of the two accounts proposed, researchers conducted other studies manipulating morphosyntactic features in order to try to find out which are those that make the production and comprehension of RCs more complicate.

Adani et al. (2010) examined the comprehension of center-embedded object relative clauses in which number and gender features of the subject and object DPs were manipulated. The study was conducted on 50 Italian-speaking children, divided in three groups according to their age (5-7-9), through a four-picture selection task. Children's comprehension of ORCs under number and gender match and mismatch conditions was investigated. Findings revealed that the youngest children (age 5) were significantly less accurate compared to the other two older groups, and that all groups were more accurate in number mismatch condition than the match one. Overall, the number manipulation conditions were more accurate than the gender conditions: the improvement caused by the gender mismatch condition is milder than the one provoked by the number mismatch. The importance of the number feature emerged in this research connects to the results of Arosio, Adani & Guasti (2009). As far as the gender feature is concerned, Belletti et al. (2012) compared its effect in Hebrew and Italian children's comprehension of relative clauses. The authors found that gender mismatch distinctly fostered

the comprehension of ORCs in Hebrew-speaking children, whereas it did not significantly helped Italian children's comprehension. This demonstrated that the gender feature has a potential effect that is modulated by its morphosyntactic status that differs in each language, independently of its richness and widespread or not presence in the given language.

Adani et al. (2010) suggested that the results they found can be interpreted in terms of the featural approach to Relativized Minimality proposed by Friedmann, Belletti & Rizzi (2009) by the assumption that inside the DP structure there is a hierarchical representation of the various morphosyntactic features: as far as the Italian language is concerned, the number feature is a prominent head in the functional structure of the NP, and its prominence is exploited by the computational system in checking the dissimilarities that are relevant for the locality principle, making a milder intervention in mismatch conditions, especially for older children; on the other side, since the gender mismatch was not followed by a significant improvement in comprehension, the gender feature appears to be less prominent inside the DP functional structures, not playing a relevant role in the computation of the dissimilarity relevant for featural Relativized Minimality.

Belletti et al. (2012) added that the main characteristic determining the status of a specific feature is whether that feature is among those that trigger the syntactic movement, and that are those to which the locality principle is sensitive. Therefore, a given feature can syntactically influence the principle in some languages, but the same feature can be inactive in others. This is exactly what Belletti et al. (2012) witnessed in comparing Hebrew and Italian languages.

But if the number mismatch helps the comprehension of object relative clauses, the same is not true for the production. The results from studies discussed above (Belletti & Contemori 2010; Contemori & Belletti 2013; Guasti et al. 2012) showed that children seem not to be sensitive to number feature manipulation on the DP of the relative clauses, and they recurred to different answering strategies. Therefore, it seems that children in experimental contexts tend to follow the path of an optimal derivation and computation that, for Italian language, turned out to be the passive. The only time span in which the passive is not the favourite structure is when children are still too young to produce it because they have not already well mastered it. In fact, Guasti et al. (2012) found that the younger group (age 5) preferred to produce object relatives with a pronominal head (instead of a lexical one) and a lexical subject in the relative clause (for example, 'Quello che i gatti lavano', 'The one that the cats washes'). Nonetheless, the use of a pronominal head permits to avoid a Relativized Minimality effect, since the pronoun has not the +NP feature that the subject of the relative sentence has.

In this section many studies and results on the comprehension and production of relative clauses in Italian language were presented. The next paragraphs will concern the acquisition of the same structures in Italian but in atypical language development conditions, with particular attention to how the deaf population behave in learning relative clauses (§3.3.3).

3.3 The acquisition of Italian relative clauses in atypical language development

3.3.1 Children with Specific Language Impairment (SLI)

In 2010 Contemori & Garraffa investigated the comprehension and production of relative clauses in four SLI children (age range: 4;5-5;9) using various paradigms: repetition, picture description and preference tasks. Two control groups were selected, one matching the age (TD-I) of the SLI children and another one of a younger age (3;7-3;10) (TD-II).

The comprehension of RCs by TD-I and SLI children was similar, with the well-known subject/object asymmetry in favour of the subject relatives. However the SLI group had lower percentages of accuracy in ORCs compared to SRCs, which, instead, seem to be mastered before the former. The same asymmetry was not found in the younger control group, and this is not a surprising data giver their young age and the difficulty of the task for their age.

As far as production of relative structures is concerned, the performance of the SLI and typically developing groups clearly differed: while the TD groups were characterized by a homogeneous trend, SLI children were unable to produce the targeted structures, even if they seemed to have mastered SRCs in comprehension. Moreover, SLI fairly frequently gave no answers when they were expected to uttered subject or object relatives, whereas TD groups rarely resorted to this option. It is noteworthy the fact that SLI children, unlike TD children, scored a lower percentage of SRCs, that usually appear in children's speech around age 2-3, replacing them mainly with declarative clauses, and these utterances can be interpreted as instances of complementizer omission. Thus, SLI group seemed to understand at least SRCs, but showed difficulties in the comprehension of ORCs and in production of both structures. But since comprehension and production are related syntactic aspects, Contemori & Garraffa (2010) argued that SLI children comprehend the relative clauses through a linear strategy,

where the first NP they find is interpreted as the agent. This strategy makes them choose the correct answer in subject relatives, but then they fail in understanding ORCs. On the other hand, the fact that the younger children produce relative clauses supports the idea that they correctly comprehend relative clauses. A further evidence of the presence of a deficit was visible from the answering strategies adopted by the groups: if the TD groups resort to a variety of strategies, such as declaratives or ORCs with a clitic pronoun, and also PORs as they grew older, the SLI children in half of the cases gave no response, and many times produced simple declaratives instead of subject and object relative clauses.

The repetition task also reported a major difficulty for SLI children, who widely uttered simple declarative clauses instead of SRCs and ORCs; on the contrary, TD-I and TD-II were at ceiling.

Hence, even though SLI deficit emerges more clearly from the performance in production, it seem reasonable to think that their comprehension is also impaired (Contemori & Garraffa 2010).

Adani et al. (2014) investigated if children with grammatical SLI are able to take advantage of number morphology to facilitate the comprehension of relative clauses, as typically developing children showed to do in Adani et al. (2010). A group of 12 children aged 9;5-16;0, all having a diagnosis of SLI, was compared to a grammar control group and to a vocabulary control group. The groups were tested on the comprehension of subject and object relative clauses with the relative head in match and mismatch conditions. The data analysis reported that all groups are more accurate on SRCs than ORCs, and that for all groups the mismatch condition is more accurate than the match condition, in both sentence types. The SLI children performed less accurately than control groups, and when they chose the wrong answer they often used the linear word order strategy to interpret SRCs, while TD groups did it less often.

The main result of the study is that grammatical SLI children, even though their ability to comprehend movement-derived sentences is defective, can take advantage of the number morphology to interpret relative clauses.

In a cross-linguistic perspective, many studies conducted on SLI children acquiring a variety of other languages found similar results, confirming that SLI population has difficulty in handling relative clauses (Håkansson & Hansson 2000 for Swedish; Stavrakaki 2001 for Greek; de López, Olsen & Chondrogianni 2014 for Danish; Friedmann, Yachini & Szterman

2015 for Hebrew; Rakhlin et al. 2016 for Russian, a.o.)

3.3.2 Children with Developmental Dyslexia (DD)

Since Developmental Dyslexia is usually thought to be a language disorder specifically related to phonological processes that impairs children's comprehension, some studies investigated if and how much DD affects also the production of syntactic structures.

The production of relative clauses by children with DD was examined by Pivi & Del Puppo (2014) with an elicitation and a repetition task. Four groups participated to the study: 116 TD children of age between 6 and 10; 10 adults (19-30); 6 children (8;3-9;9) with Developmental Dyslexia; 7 children between 6;6-9;7 age who were thought to have DD.
The familiar subject/object asymmetry emerged across all the groups, confirming that ORCs are more difficult for children because of the Relativized Minimality effect and that they are avoided, when possible, because of the more computational effort they imply. DD children produced less ORCs than TD children, and they differed from TD also for the fact that they produced SRCs with resumption and declarative clauses instead of the relatives required by the task. Moreover, they highly avoided ORCs through the production of resumptive or SRCs. The authors suggested that the use of a resumptive DP in subject position in subject relatives can be a symptom of linguistic disability and a strategy to face the difficulty with the syntactic movement, as it happens with ORCs.

Guasti et al. (2015) followed the idea that DD may affect different aspects of the language system, and not only those related to oral language, and in order to verify this view the authors tested the relative clauses and the *wh-* questions through elicitation tasks on Italian-speaking children with DD. The RCs task was submitted to 24 children (age range 7;8-12;2) and to a control group of typically developing children of the same chronological age (CA). The children saw video-recorded stories and then they had to describe the characters using relative clauses. The factors that authors manipulated are sentence type (subject and object relatives) and animacy of the object (animate and inanimate). The results were in line with what Pivi & Del Puppo (2014) found: the DD group was less accurate in the production of relative clauses, especially in ORCs, and all the groups showed the subject/object asymmetry. The DD children tried more often to simplify the RCs than the CA group, because the former

produced less target responses and more relative clauses with reduced head, namely with a demonstrative pronoun. Moreover, the DD group tended to place the subject in pre-verbal position, while the control group place it in post-verbal position. In general, the analysis revealed that half of the children with DD had difficulty in the production of object relatives and their oral language problems was underlined also by their choice of a more rigid word order. Overall, the authors found that all the children with developmental dyslexia had some problems with oral language to different degree, and many of them seemed to have the same difficulties that are usually displayed by SLI children, thus meeting the criteria of Specific Language Impairment, and this fact suggested that the two disorders can co-occur.

3.3.3 Children with hearing-impairment

In the recent years some studies examined the comprehension and production of Italian relative clauses in hearing-impaired (HI) children.

A study conducted by Volpato & Adani (2009) focused on the comprehension of subject and object relative clauses in 8 children with hearing impairment fitted with the cochlear implant (CI) (age range 6;10.9;3), and then they analyzed how much the CI group differed from 24 typically developing children divided into three control groups on the basis of morphosyntactic abilities, of receptive vocabulary and of chronological age respectively. The authors investigated SRCs, ORCs and ORps in which animate nouns and transitive verbs was used. In the trials, the relative head was always singular while the embedded DP was always plural, and the verb could agree or with the former, thus generating a SRC, or with the latter, making an ORC or an ORC with post-verbal subject. The participants saw a picture with three characters (like figure 11) and had to point to the correct one after listening to the test stimulus.

Figure 11. Sample of experimental picture used by Volpato & Adani (2009).
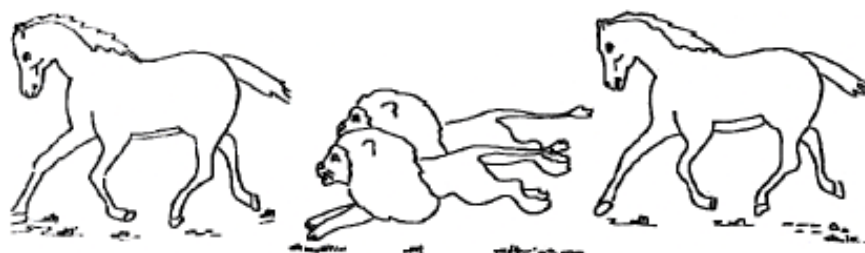
The data analysis pointed out the typical gradient of difficulty found many times across languages, namely SRCs are better comprehended than ORCs, and ORCs are easier than ORps. Nonetheless, the hearing impaired children were less accurate than all control groups. By examining the individual performance of the HI children, it emerged that all the children performed above chance in SRCs, whereas 3 out of 8 scored above chance in ORCs conditions and only 1 children of 8 did in ORps. Thus, subject relatives are unproblematic for hearing individuals as well as for cochlear-implanted children; on the other hand, object relative clauses, and especially ORps, are the hardest to interpret, and this complexity is even greater in the HI population. The fact that cochlear-implanted children performed better in OR clauses than in ORp clauses cannot be explained only by the Relativized Minimality principle. Volpato and Adani claimed that this result can be accounted for by the way the subject-verb agreement takes place. Indeed, in ORCs the agreement is robust because it is double-checked, since there is the AGREE relationship between the subject in the VP and the verb in the IP projection, and the Spec-head local checking when the subject moves to SpecIP (figure 12a). On the contrary, in ORCs with post-verbal subject the agreement is more fragile because there is only the long distance AGREE relation between the verb in I and the subject in the lower part of the syntactic tree, as in figure 12b.

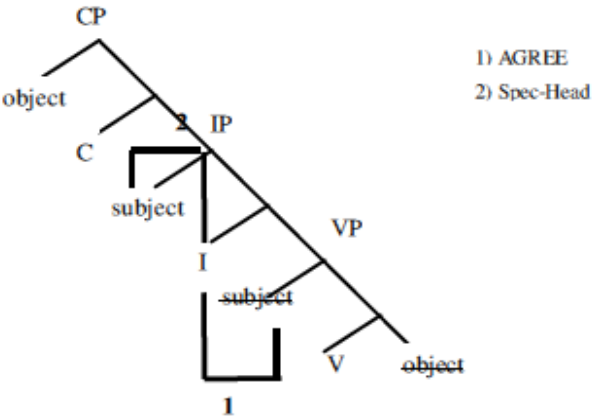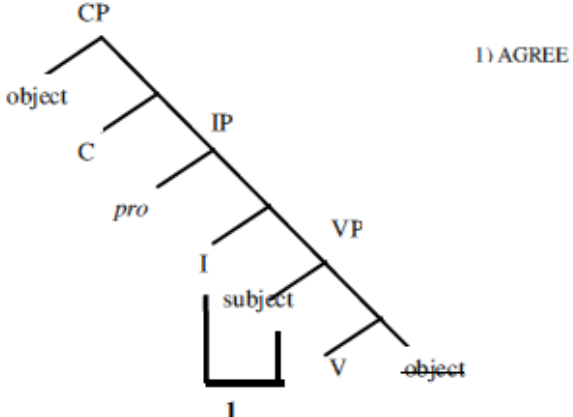**Figure 12a. The double agreement occurring in ORCs.**

Figure 12b. The unique agreement occurring in OR with post-verbal subject.

Moreover, ORp structures compel to keep in memory the number morphology of the verb until the post-verbal subject is encountered (Volpato & Adani 2009). Thus, it seems that HI children interpret these sentences as subject relative clauses using the cue of the word order (SVO).

A group of 13 hearing-impaired children with cochlear implant, ranging in age from 7;9-10;8, was later tested by Volpato (2012) in order to examine whether and how the marked (plural) number features influence the comprehension of relative clauses in this population. In contrast with the findings from typically developing children of Adani (2008), Arosio, Adani & Guasti (2009) and Adani et al. (2010) (presented in §3.2.2), the children tested by Volpato (2012) did not show any improvement in ORCs comprehension under mismatch conditions, and, oppositely, they performed better in match conditions. The lower accuracy of HI group to number cues is explained also by the attraction phenomena proposed by Kayne in 1989 (adapted to Italian language): the subject with plural number features can be followed by the unmarked singular verb when the head of the relative is also not marked (singular). The preference for the singular features over the plural ones in populations with damaged or atypical developed language is reported also by Chesi (2006), according to whom the number featural specifications are underspecified on verbal plural forms. All this linguistic facts clarify why an object relative clause like (12) is read as a SRC (Volpato 2012).

(12) *La gallina*   che   i pulcini   *becca*(~~no~~)   <la gallina>
    the hen   that   the chicks   peck   <the hen>
     SG   PL   SG

Thus the low accuracy of HI children suggests that the deficit is in their ability to compute plural morphosyntactic cues.

As far as production of relative clauses is concerned, Volpato & Vernice (2014) examined the ability of 13 children fitted with CI (age 7;9-10;8) to produce subject and object relatives in order to verify if and to what extent they differ from groups of normal hearing children with the same morphosyntactic abilities, the so called linguistic age (LA), (age 5;0-7;9), with the same chronological age (CA) (age 7;5-10;3) and the same auditory age (AA), that is the duration of CI use (age 4;11-9;4). The authors created a preference task inspired by Friedmann & Szterman (2006): children saw two pictures that the experimenter described;

then the participant was asked to express his/her preference for one of the images and to do it s/he was forced to elicit a relative clause. The following is a sample of an item used by the authors to make children utter a SR clause (figure 13):

(13) *Ci sono due disegni. Nel primo disegno, I bambini accarezzano il gatto. Nel secondo, i bambini colpiscono il gatto. Quali bambini ti piacciono (di più)? Inizia con 'Mi piacciono i bambini...' oppure 'I bambini...' Target: '(Mi piacciono) i bambini che accarezzano/colpiscono il gatto'.*

There are two pictures. In the former, the children are stroking the cat. In the latter, the children are hitting the cat. Which children do you like? Start with 'I like the children…' or 'The children…' Target answer: '(I like) the children that are stroking/hitting the cat'.

Figure 13. Sample of a picture used to elicit subject relatives.
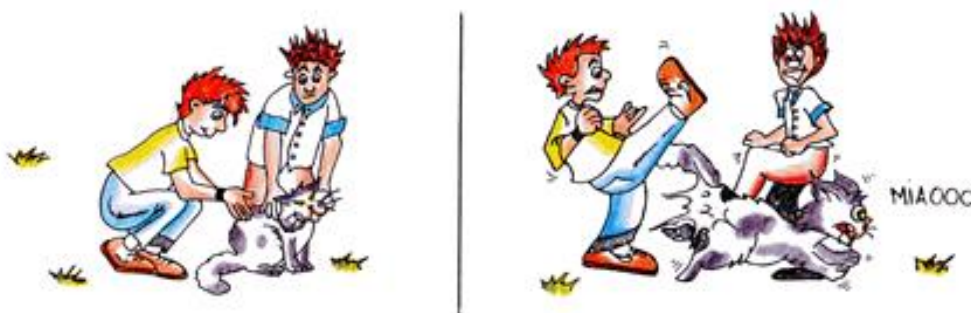
All the experimental sentences were semantically reversible and contained transitive verbs and could have singular or plural head DPs. In this study, the number features of the DPs of the relative clauses were manipulated in order to verify if they influenced or not the accuracy of the performance.

In general, all the children tested, normal-hearing and hearing-impaired, produced better subject relatives than object relatives, but the HI group was less accurate in both types of sentences. By analyzing HI children's data, Volpato & Vernice (2014) found a significant correlation in SR production scores with the length of use of CI predicting the accuracy in the elicitation of subject relatives, and so children that used CI longer were found to be more accurate than children that used CI for a shorter amount of time, but this was not valid for OR clauses.

An important finding of this research is that when ORCs were targeted, hearing-impaired

children show an intermediate behavior between the peers (CA group) and the younger children matched for morphosyntactic abilities (LA): CI children produced PORs in 26% of the cases, while CA and LA groups did in 42% and 14% of the cases, respectively; object relatives were correctly uttered by the HI children in 23% of the cases, by CA children in 15% of the cases and the LA group produced them in 33% of cases. This percentages show that, even though cochlear-implanted children had lower scores in ORCs than the CA peers, the fact that the CI group produced many PORs is an evidence that they have a very good competence in Italian and, consequently, which they can reach a language competence similar to the children of the same age. Despite this positive fact, the answering strategies adopted by CI children show the traces of a delay of exposure to the linguistic input. Indeed, they produced ungrammatical sentences, linear SVO sentences, they replaced the complementizer with other *wh-* elements ('*dove*' 'where' instead of '*che*' 'that') and they built clauses with inverted theta-roles, strategies that are typical of people with hearing impairment and of younger children. Another hint of the atypical language acquisition of HI children is the absence of causative constructions. Nonetheless, at the individual level CI children were not homogeneous, with some participants producing ORCs and none PORs, and in this they resembled the behavior of the youngest typically developing children.

The results reported by these studies conducted on hearing-impaired children are consistent with cross-linguistic findings[9]: the asymmetry between subject and object relatives is given mainly by the fact that OR clauses are the hardest to acquire, in particular the ORCs with preverbal subject, and thus they appear later (sometimes they are hard even for 9 years old children) than SRCs, which are already processed around 3-4 years. The account proposed by Friedmann, Belletti & Rizzi (2009) is thus valid also for hearing impaired individuals: it explains why SR clauses are easier to compute than OR clauses and can justify the better performance in ORCs when the subject of the relative clause is a pronoun. As far as the manipulation of the number features of the DPs are concerned, Volpato (2012) demonstrated that hearing impaired children are less sensitive to number features and, oppositely, in respect to the normal hearing children, they were more accurate in match conditions. Volpato's findings put in evidence the difficulty HI children have in the morphosyntactic domain.

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[9] Many studies on hearing impaired children acquiring other languages have been conducted: Friedmann & Haddad-Hanna (2014) explored the comprehension of relative clauses in Palestinian Arabic-speaking HI children; Friedmann & Szterman (2006) tested Hebrew-speaking HI children; see Friedmann, Szterman & Haddad-Hanna (2010) for a comparison between Hebrew-and Palestinian Arabic-speaking children with hearing impairment.

It has been reported that children often produce PORs instead of lexically headed OR clauses, and since this is the preferred strategy adopted by adults, this means that children tend to conform to the adult's behaviour. Indeed, the frequency of PORs increases as children grow older, from age 5 on. The CI children studied by Volpato & Vernice (2014) used PORs too, even though at first glance these constructions could seem harder for them: in fact HI children resort to PORs because this type of sentences allow to avoid intervention effects that stem from lexically headed object relatives.

The many studies reported above demonstrated that relative clauses are among the hardest syntactic structures to acquire in typical development conditions, hence it is not surprising that children who grow in atypical language situations find really hard to master those constructions.

THE LINGUISTIC APPROACH TO THE TREATMENT OF SYNTACTIC DEFICIT IN VARIOUS TYPES OF POPULATIONS

4.1 Introduction

In the recent twenty years numerous and different studies and experiments on the linguistic treatment of syntactic deficits have been conducted on various populations, all having in common the difficulty of comprehending and producing particularly complex syntactic structures, namely those that present a non-canonical word order derived from the movement of an element of the sentence: relative clauses, *wh-* questions, and passive clauses. The first attempts to recover these structures did not achieve the expected outcomes of generalization of the benefit to other constructions that were not directly treated. Later research demonstrated that it is more fruitful to propose a session that begins with the treatment of the most complex structures and then finishes with the easiest ones instead of a rehabilitation based on the opposite work order (Thompson & Shapiro 2007). This conclusion was reached thanks to the fundamental work of Thompson & Shapiro (1994), who conducted a study on a group of adults with Broca aphasia and in which, for the first time, attention was payed to the underlying syntactic structures of the sentences that need to be recovered. Following this particular approach, later studies have been done on aphasic subjects (Chinellato 2003; Ferroni 2009; Stadie et al. 2008; Thompson et al. 2003; Thompson & Shapiro 1994, 2005 among others), on subjects with Specific Language Impairment (SLI) (Levi & Friedmann 2009; Ebbels & van der Lely 2001), and recently also on a hearing-impaired child with a cochlear implant (IC) (D'Ortenzio 2015).

In this chapter some studies that focused on this issue will be presented.

4.2 The linguistic treatment of the syntactic deficit

The fact that it is possible to influence the course of language development was demonstrated by Roth (1984), who assessed whether language learning process can be accelerated in young children. The 18 participants (age range 3;6-4;6) were explicitly taught the linguistic structures they had not acquired yet, in particular four types of relative clauses, through a toy manipulation task. At first the relative structures were divided and presented as two coordinated sentences; subsequently the experimenter pronounced the same sentence while she acted out the situation with puppets. Roth found that this method can improve the comprehension of relative clauses in young children.

The turning point in the linguistic treatment field was marked by the work of Thompson & Shapiro (1994) on aphasic subjects with agrammatism. This study was later followed by many others, that gradually refined and enhanced it. In section §4.2.1 some studies on aphasic individuals are presented; the section §4.2.2 presents experiences of linguistic treatment on SLI subjects and in §4.2.3 a case of linguistic intervention on an Italian hearing impaired child with a cochlear implant is reported.

4.2.1 Studies on aphasic individuals

Numerous attempts of linguistic rehabilitation have been conducted on aphasic patients, and it has been showed that they can be easily rehabilitated in the production of sentences that were particularly complex and problematic for them. Nevertheless no much attention has been payed to the characteristics of the structure that underlays the sentences taken into account, and consequently the expected generalization effects were not obtained. Indeed, many experiences based the treatment mainly on the superficial realization of the sentence, rather than on the underlying structure and processing, in which the deficit could be located. Since the superficial realization of a sentence is the result of an underlying linguistic representation, Thompson & Shapiro (1994) made the hypothesis that a rehabilitation method based on the properties of the sentence could result in a generalization effect among those types of clauses which share similar linguistic characteristics. In other words, if the treatment is set on the teaching of linguistic or grammatical rules, on processes and representations featuring more than one sentence type, it can potentially provoke an improvement in the production not only of the treated structures, but also of those that are influenced or dependent to similar linguistic rules.

Thompson & Shapiro (1994) conducted a research on subjects with Broca aphasia, and they concentrated on the effect of a linguistic kind of rehabilitation of the production of complex structures in which the canonical word order was modified by the movement of a nominal phrase (NP). In particular, the first study was devoted to the elicitation of different types of *wh-* questions, with *what* and *who*, in which the NP object raises to the position of SpecCP thanks to the A-bar movement. The first set of questions, the most complex one, was composed of clauses with the structure NP-V-NP-PP, like 'The man is giving the money to the boy', and the target question that was expected to be uttered was 'What$_i$ is the man giving$_{ti}$ to the boy?' (Thompson & Shapiro 1994). The second set contained sentences with transitive verbs with their direct object, like 'The man is fixing the car' (NP-V-NP), and that call for the elicitation of questions like 'What$_i$ is the man fixing$_{ti}$?'; the third group, finally, included clauses containing the copula, with the structure NP-V(copula)-NP, like 'A dictionary is a book', in order to promote the production of question like 'What$_i$ is a dictionary$_{ti}$?'. In this first study the researchers' aim was to investigate the role of the complexity of the sentence, where the complexity was given by the number of phrasal nodes involved in the tree structure of the clauses. During the session treatment, the authors worked on the most complex sentences, those that involved four nodes, and then they assessed whether also the easiest sentences improved for a generalization of the learnt rules effect.

In the second experiment, the production of *wh-* questions ('Who did the girl hit?') and cleft sentences ('It was the boy who the girl hit') was investigated: despite the evident difference in their surface realization, they have a similar linguistic representation and both involve *wh-* movement. Next to these sentences, also passive clauses were studied, but the latter entail an A-movement, and this was done in order to better observe the phenomenon of the generalization of the rules learnt during the rehabilitation: indeed, since *wh-* questions and cleft sentences are derived through the *wh-* movement that moves the direct object from an argument position to SpecCP position, and thus not to an argument position any more, the generalization effect should be seen only between these two structures, with no implications in the production of passive clauses exactly because they are based on a different type of movement (A-bar movement) (Thompson & Shapiro 1994).

During the treatment period the subjects were explicitly taught to recognize the verb and the arguments to which it assigns a thematic role through the tree representation of the clauses taken in exam. Furthermore, some notions on what happens inside the structure of the sentence to give a certain surface representation as outcome was given. Sentences were treated one type by one, and in the meantime the situation of the examined participant was

continuously supervised in order to verify whether or not what s/he learnt got generalized to other sentence types.

The analysis of the data from the two studies revealed that for all the participants the linguistic treatment had positive consequences in the acquisition of the sentences that were the focus of the recovery. Moreover, for both the participants of the first experiment, the authors found a generalization effect of the rules and the linguistic principles to less complex structures which were not treated, when the target of the treatment were not constructions of the same type but the more complicated ones. The fact that the effect of generalization of the learnt rules augmented in a kind of treatment that starts from the most elaborated structures is in line with Eckman, Bell & Nelson (1988), who found benefits in adopting this pattern in teaching English as a second language. Furthermore, this result goes against what the previous literature on the treatment of aphasic subjects recommended, namely, to start with the easiest construction to finally arrive to the most demanding ones.

Thompson & Shapiro (1994) also noted that there was a generalization effect among types of sentences, that is between the *who/what* question of the first experiment and between the *who* questions and the cleft sentences in the second task: the authors claimed that this was possible because the selected sentences had in common similar underlying structures and because they rely on analogous linguistic principles to derive their surface representation. This generalization effect was detected, in both the tasks, only in the sentences derived through *wh-* movement but not in those that involve the movement of a NP: this confirms what the authors hypothesized in the beginning, namely that generalization processes can occur only between similar constructions, and it also confirms that the treated structures and those to which the learnt rules were extended are disciplined by the same linguistic principles.

Friedmann, Wenkert-Olenik & Gil (2000) conducted a study on an adult who was diagnosed as Broca's aphasic with agrammatism. Starting from the fact that this type of subjects shows difficulty with the verbal inflection, with complex sentences (like relative and subordinate clauses), and that they avoid the production of wh-questions or they make mistakes in producing them, the authors examined which of these abilities should be first recovered following the Tree Pruning Hypotesis (TPH). According to this account, the agrammatic subjects' deficit resides in their incapacity to build the syntactic tree till the highest nodes, and this makes their tree "pruned". This explains why the operations related to the highest nodes of the syntactic structures are compromised, like verbal inflection, *wh-* questions, and embedded clauses, while those concerning the lowest nodes are preserved (subject-verb

agreement, for instance).

According to the linguistic theory, if a well formed node is present, the nodes occupying a lower position in the syntactic structure have to be present too, while the presence of a node in the inferior part of the tree is not a guarantee of the presence of the upper nodes. From the point of view of the possible therapies that can be carried out on agrammatic individuals, the fact that the upper projections necessarily entail the presence of lower nodes has interesting implications: in fact, this suggests that the rehabilitation of constructions that require nodes high in the projection will imply an improvement not only in the access of the treated nodes, but also of the lower ones that were not directly involved in the rehabilitation process. Vice versa, a treatment session that starts from the recovery of the lower nodes of the projection does not ensure positive outcomes on the higher nodes. This was the very issue that Friedmann, Wenkert-Olenik & Gil (2000) investigated: starting from the treatment of *wh-* interrogative clauses that occupy a high position inside the syntactic structure, they examined if also an enhancement of the syntactic abilities involved at a lower level takes place, such as the embedded clauses and the temporal node.

The observation was conducted on a 30-year-old Hebrew-speaking adult with Broca's aphasia with agrammatism: this involves a non-fluent discourse with short sentences and for the most part ungrammatical, a paucity of verbal forms and an almost always incorrect production of *wh-* questions and embedded clauses.

His ability to produce *wh-* interrogatives was assessed before and after the treatment period through an elicitation task. Furthermore, he was provided with other completions, elicitation, repetition and picture-description tests, both before and after the treatment, in order to supervise his competence in the verbal inflection, in verbs retrieval and in embedded clauses.

The treatment, which aimed to the correct production of *wh-* clauses, included four question types (*who*, *what*, *when* and *where*). At the beginning the use of each of the *wh-* element was explained, and then the treatment method developed by Thompson & Shapiro (1994) was adapted to the Hebrew language, dealing with the identification of the θ-roles assigned by the verb and training the subject on the insertion and movement of *wh-* elements in the sentence. For all the treatment period long the authors did not work on any other syntactic ability of the subject.

Before the treatment of the production of the *wh-* questions, the subject correctly elicited only 15 questions out of the 62 provided by the experimenters; after the treatment period the ability of the individual to properly generate *wh-* questions clearly increased (57/62 grammatical utterances) (Friedmann, Wenkert-Olenik & Gil 2000). But positive effects of the linguistic

treatment have been observed also in the lower nodes of the syntactic tree: the correct production of the verbal inflection increased as well as the verbs retrieval (and, consequently, this ability is thought to be linked to the capacity to correctly project the syntactic tree). The subject significantly improved in the production of embedded clauses, which imply the use of other nodes of the syntactic structure that are lower than those required in the interrogatives. Even though the study has been conducted only on one individual, the data collected by Friedmann, Wenkert-Olenik & Gil (2000) suggest that if treatment is focused on the highest nodes of the syntactic tree, it can enhance structures that need lower nodes and that were not directly treated in the linguistic rehabilitation period. Therefore, the authors concluded that it is better to treat *in primis* the most complex clauses in order to witness to a chain improvement in the simpler structures.

In 2007 Thompson & Shapiro conducted a study in order to analyse which role the complexity of the clause plays in the treatment of damaged syntactic structures in aphasic and agrammatic people. In the study the authors considered the structural complexity from a theoretical point of view, they summed up the results of other previous treatment experiences, and finally, they analysed the clinical impact that the syntactic complexity account can have. The elements that can determine or not the structural complexity are: the number of clauses expressed, which depends on the number of verbs that appear; the number of dependences in the clause; the order of the elements in the sentence and the distance between the significant components in the clause. But the structural representation of each sentence depends on two linguistic operations: *merge* and *move*.

Merge is the syntactic operation that combines two elements in order to obtain a third one, the node, and more nodes together contribute to the building of the syntactic structure. In this procedure a relevant role is played by the argument structure of the verb, determined by the verb lexical meaning. In order to generate a grammatical clause, it is necessary that all the arguments required by the verb are present and that they all receive a thematic role.

The *move* operation, instead, permits to take an element already merged in the structure and to merge it again in another position inside the same structure, leaving a copy or a trace of it in the original position. Therefore the clauses derived by movement are more complex than those that do not include it. The most difficult movement for aphasic subjects with agrammatism are the *wh-* and the NP movement (Thompson & Shapiro, 2007). The *wh-* movement raises an element to the SpecCP position, while the NP movement stops the element to SpecIP, as figure 14 shows, as it was already reported in previous chapters.

Figure 14 displays *wh-* and NP- movements.
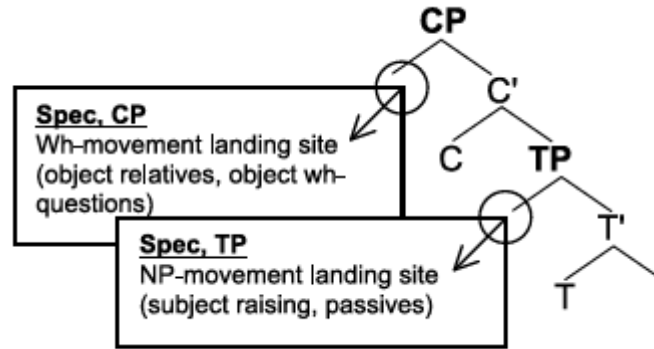
Both *wh-* and NP movements imply a repositioning of the sentence elements, thus determining a new superficial order. Nonetheless, since the element moved through *wh-* movement has to occupy the SpecCP position, the distance between it and its trace, or copy, in the original site is longer than that involved in the NP movement. This fact makes the sentences derived through *wh-* movement the most complex structures.

After the two types of movement, the elements reach the high positions SpecCP and SpecIP, respectively of the syntactic tree. Across the studies, many researchers noted that the nodes highest in the structure are the most compromised in aphasic subjects, and this very fact was what made Friedmann elaborate the Tree Pruning Hypothesis.

Thompson & Shapiro (2007) analyzed the role of the syntactic complexity in the linguistic treatment with the goal of finding out which rehabilitative order gives positive results on many structures, without working on all the impaired ones.

By analyzing cases of aphasic subject treatment (Thompson, Ballard & Shapiro 1998; Thompson et al. 2003), the authors reported that generalization effects take place among clauses derived through *wh-* movements, but these effects do not spread to structures derived by NP movement, and vice versa. This is not surprising, since the two movements have different natures, A-bar and A, respectively. But the complexity effects in learning and generalizing the linguistic principles are notable: indeed, the aphasic subjects who practiced on the most complex structures then generalized what they learned to the not treated clauses, showing more generalization effects than individuals who trained simpler constructions.

Thompson took part in many linguistic treatments on aphasic patients, and in Thompson et al. (2003) she reported that the 70% of the individuals treated for the production of the most

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complex *wh-* structures showed positive effects of generalization to the simpler sentences; on the contrary, only the 14% of those who were trained only in the production of *wh-* questions were able to generalize to constructions that include subordination.

The generalization seems to follow the order relative clauses > cleft sentences > *wh-*interrogatives. From this framework the authors proposed the Complexity Account of Treatment Efficacy (CATE) as follows:

«Training complex structures results in generalization to less complex structures when untreated structures encompass processes relevant to (i.e., are in a subset relation to) treated ones».

(Thompson et al. 2003: 602)

Furthermore, this study reported that after the treatment the subjects produced, on average, longer sentences and a higher amount of verbs with a correct argument structure. This suggests that the use of lexical and syntactic properties involved in the treated constructions can have a positive impact also on numerous different structures.

The Complexity Account of Treatment Efficacy (CATE) account predicts different results in respect to the Tree Pruning Hypothesis (TPH).

According to TPH the rehabilitation of the production of elements that occupy positions in the upper part of the syntactic tree, like CP and TP, entails the reestablishment of the lowest projections. Since the NP movement, unlike the *wh-* one, takes place in the lower part of the syntactic representation, according to this approach working on the upper nodes, therefore on *wh-* constructions, would imply positive generalization results also to sentences involving the NP movement. However, in her studies Thompson never witnessed a similar behaviour.

The CATE approach, instead, can account for the absence of this 'cascade' generalization pattern from higher to lower nodes: in order for the aspects learnt during the treatment to be applied to other contexts, it is necessary that the elements focus of the treatment and those to which the generalization has to occur are linguistically related (Thompson & Shapiro 2007). Hence, the lack of generalization of the *wh-* movement to the NP movement is due to the fact that the two operations are different in their nature. The important thing is to develop a hierarchy of the structures that has to be treated, from the more complex to the easier ones, considering many variables: the number of propositions, the characteristic of the argument structure of the verbs, the grade of embeddedness, the distance between the moved element and the position where it is interpreted.

The complexity effect, even though it seems to go against intuition and not to be conventional, seems to guarantee better results and to maximize the number of treatment sessions, since enhancement is visible in grammar, content and efficiency of the spontaneous discourse (Thompson 2008).

Stadie et al. (2008) conducted an intervention study on a group of 7 aphasic individuals with agrammatism (age range 33-67); all of them were speakers of German. The linguistic treatment focused on the production of non-canonical sentences: relative clauses, *who-* questions and passive clauses. After the treatment session, improvements have been detected in all sentence type, even though they did not perfectly fit the accounts described above, CATE and TPH. In fact, the patients who were trained on the production of relative clauses showed a generalization effect to the passive structures, and this evidence is not in line with the CATE account, but it can be explained by the TPH. On the other hand, among the participants who received treatment on the production of the object relative clauses, two individuals did not show any generalization to the production of *wh-* questions, and this does not agree nor with the CATE nor with the TPH.

Although the findings completely or only partially fit one or more accounts, the important fact is that the production of impaired structures by aphasic subjects can be improved, and positive effects can be reflected also in other linguistic components and be maintained after the treatment has concluded.

4.2.2 Intervention on subjects with Specific Language Impairment (SLI)

In 2001 Ebbels & van der Lely proposed a meta-syntactic therapy, using a coded visual system, on four children aged from 11;8 and 12;9 with SLI diagnosis, both in production and comprehension. The passive clauses and the *wh-* interrogatives were the target sentences of the linguistic intervention. The paradigm proposed by Ebbels & van der Lely (2001) used a coded system of shapes, colors and arrows to explicitly teach grammatical rules, in particular the syntactic ones, which are the most compromised, to the SLI participants.
Initially the production and comprehension of passive clauses and *wh-* interrogatives were tested; then, since the children had difficulties in those structures, the authors proceeded with their rehabilitation. The rules that govern the formation of passives and interrogatives were

explained visually, using the coded visual system.

The linguistic intervention gave positive results for all the children, although variations among the subjects were detected.

This study is noteworthy because it takes advantage of the intact visual ability of the participants to teach them the rules that they could not naturally, and unconsciously, acquire, deducing them from the linguistic flow they were surrounded by.

A syntactic treatment intervention on a SLI Hebrew-speaking boy was conducted by Levy & Friedmann (2009). The participant was 12;2 years old and the tests revealed that he had a syntactic SLI. At the beginning the authors ascertained his syntactic competence through a series of tests: it was found that he had difficulty in comprehending and producing structures that entailed syntactic movement, namely, relative clauses, topicalized sentences, *wh-* object questions and clauses with the movement of the verb, an option available in Hebrew language. The linguistic intervention was based on the preserved syntactic knowledge of the boy, in order to take advantage of them for the assimilation of the new rules: starting from the intact verbal argument structure, Levy & Friedmann based the treatment on the explicit teaching of the syntactic theory.

At the beginning they dealt with the least impaired constructions and later with the most damaged, but without treating the *wh-* interrogatives, in order to assess if the rehabilitation of clauses derived by the same type of movement entails a generalization to not treated structures, but that include the same movement.

Improvements in all the treated constructions took place right after the rehabilitation period, and they were maintained even after 10 months. Interestingly, the authors witnessed an enhancement also of the *wh-* questions, although they were not directly involved during the sessions.

Ebbels & van der Lely (2001) and Levy & Friedmann (2009) with their works demonstrated that the linguistic treatment can be effective also in SLI subjects and it allows them to recover, at least partially, the competence in particularly hard structures.

4.2.3 The case study on a hearing impaired child with CI

Starting from the above mentioned studies, D'Ortenzio (2015) applied a linguistic treatment

on a hearing impaired child fitted with cochlear implant. The goal was to verify if an intervention based on the explicit teaching of the syntax can be a valid method to recover those structures that are particularly difficult for deaf people.

The constructions that had to be rehabilitated were subject relative clauses, object relative clauses with a pre-verbal subject and object relatives with subject in post-verbal position, both in production and in comprehension.

The child involved in the research was 8 years old; at the age of 24 months he received the diagnosis of bilateral sensorineural hearing loss, and he was immediately fitted with conventional prosthesis; the child received the cochlear implant when he was 31 months.

The child did few standardized tests that aimed at assessing his knowledge of nouns, verbs, morphology and syntax. He was also tested on the comprehension and production of relative clauses and he was later compared to a control group of normal hearing children. Before the treatment his percentages of accuracy in the production task were 83% in subject relatives and 0% in object relatives; the percentages of accuracy (in each condition) in the comprehension task are reported in table 1 (D'Ortenzio 2015):

Table 1 reports the % of accuracy in each sentence type before the treatment.

SR	SG_PL	100%
	PL_SG	100%
OR	SG_SG	83%
	PL_PL	100%
	SG_PL	83%
	PL_SG	100%
ORp	SG_PL	67%
	PL_SG	83%

The shape of the treatment was inspired by the model proposed by Levy & Friedmann (2009). D'Ortenzio (2015) planned 7 sessions of 75 minutes, and divided them into 4 phases:

I. the explicit teaching of the verbal argument structure and of the thematic theory;

II. the explicit teaching of the syntactic movement;

III. review of what have been done in sessions I and II;

IV. assessment of what the child learned during the precedent sessions.

The material used in the rehabilitation included intransitive, reversible transitive, non-

reversible transitive, and ditransitive verbs.

In the first phase the child composed sentences and then analyzed their argument structure and identified the θ-roles, he did exercises of grammaticality judgement and had to recognize the verbs and the theta-roles of subjects/agents and objects/themes in a simple test, at the beginning, and then in a more complex one.

The second stage was devoted to the syntactic movement and it required 3 sessions to explain the structure of SRCs, ORCs and ORps. Initially the difference between reversible and non-reversible transitive verbs was introduced; then, the treatment of the relative clauses started from the easiest to the most problematic ones, namely, from subject to object relatives, and object relative clauses with post-verbal subjects as last. As Levy & Friedmann (2009), cards of various colours were used, and each colour was associated to a specific grammatical category: noun, verb, external argument of the VP; the complementizer '*che*' 'that'; trace. With these cards the child had to compose SVO sentences and then, by moving the cards, relative clauses.

In the third phase a review of all it was learned in phases I and II was done, and in stage IV the child was again tested on the production and comprehension of relative clauses, in order to verify if improvements occurred after the linguistic sessions. As far as production is concerned, the child obtained 100% of accuracy both in subject and object relative clauses. The comprehension before the treatment was not as deeply impaired as production was, but enhancements have been detected also in this aspect, as illustrated in table 2.

Table 2 reports the % of accuracy in each sentence type before and after the linguistic intervention.

		Before	**After**
SR	SG_PL	100%	100%
	PL_SG	100%	100%
OR	SG_SG	83%	100%
	PL_PL	100%	100%
	SG_PL	83%	100%
	PL_SG	100%	100%
ORp	SG_PL	67%	100%
	PL_SG	83%	100%

Before the treatment, the child produced also ungrammatical sentences, mainly when object relatives were targeted, but thanks to the linguistic sessions he passed from a 0% to a 100% of

accuracy in ORCs.

The child tested by D'Ortenzio (2015) was tested again five months later, and the results of this assessment were reported by Volpato et al. (2015). After this span of time the child was still at ceiling in the comprehension of subject and object relatives, and ORCs with post-verbal subject were correctly comprehended in 92% of the cases (he made only one mistake). High percentages of accuracy were maintained in the production task too, with 100% of correct SRCs and 92% of ORCs. The correct object relative clauses produced were built with a clitic pronoun in 84% of the times, while those with gap in the 8%: the use of clitic pronouns is a strategy that allows the child to build correct ORCs with less effort at the working memory level, and at the same time it demonstrates that the child still knows the syntactic structure of object relatives.

D'Ortenzio's work (2015) showed that the syntactic abilities of a hearing impaired child with CI could be enhanced through a brief period of linguistic rehabilitation, and this suggests that a lot can be done to and recovered in deaf population. Moreover, the further assessment conducted five months later by Volpato et al. (2015) confirmed the efficacy of the linguistic treatment both in comprehension and production of relative clauses.

Experiences of linguistic treatment on linguistic deficits, like aphasia and SLI, are more numerous than those done on hearing impaired individuals, that are still too scarce. The positive effects obtained by the studies reported in this chapter demonstrated that this is the right way to go, and that the syntactic deficit can be diminished, in some cases, and completely treated in others.

Chapter 5

THE CASE STUDY

5.1 Introduction

The original project of this research was to test two adult deaf signers of LIS in their ability to comprehend and produce relative and passive clauses. The expectation was to find both the constructions impaired, since it is well known that deaf individuals have difficulty in handle them, and the purpose was to conduct a linguistic treatment on both the subjects in order to verify whether an explicit syntactic teaching could be effective also on hearing impaired individuals not fitted with CI. But in the first steps of this investigation, namely, after the tests done at the beginning aimed to assess the competence of the participants, unexpected data were collected from one of the two adults (S1 and S2 henceforth): S1 obtained very high percentages of accuracy in all the tests he did (§5.2.4), and therefore his syntactic competence did not need to be recovered. Consequently, all the attention had been devoted to the linguistic rehabilitation of S2's syntactic knowledge, since he scored very poorly in the tests. Hence, this chapter is divided into two main sections: in the first one (§5.2) the participant, the tests and the preliminary results are presented; in the second part (§5.3) the linguistic treatment on S2 is described in detail; moreover, since S2 was tested twice after the syntactic rehabilitation (the first time right after the conclusion of the sessions, and another time a month after the therapy), the results from both the assessment are reported and discussed (§5.3.2, §5.3.3).

5.2 Assessing the competence of S1 and S2 in passive and relative clauses

5.2.1 Participants

S1 is a 27-year-old deaf adult. He was born with a moderate/profound hearing loss from normal hearing parents. He stopped wearing auditory prosthesis 12-13 years ago. S1 learnt

Italian Sign Language when he was 6 years old.

S2 is 33 years old and became deaf at age 3;6 because of meningitis. He has a profound hearing loss. The members of his family are all normal hearing; he used auditory prosthesis until he was 15 years old, then he mostly communicated with LIS, which he learnt around age 7.

Both subjects are male, and the reported age refers to the first time they were tested. They both live in the province of Verona and, as far as education is concerned, they have the high school diploma.

In the comprehension and production of passive and clauses S1's and S2's results were compared to the data of the control group (CG) of Cardinaletti & Volpato's (2015) study. The group was composed of 17 adults (age range 20-23) who came from different Italian regions.

The data collected from comprehension and production of relative clauses by S1 and S2 were compared to those of the control group of 16 normal hearing adults, ranging in age from 20 to 33 (mean age 24;11), presented in Volpato (2010). All the subjects of the control groups were recruited at the Language Sciences Department of the University of Venice and they all came from the Veneto region.

5.2.2 Materials

The comprehension of passive clauses. The comprehension of passive clauses was assessed through the sentence-picture matching task of Verin (2010), which was adapted from a version elaborated for the Greek language by Driva & Terzi (2008). The experimenter showed a sentence and the participant had to select among three photos the correct one that matched with the sentence. The test used is composed of 40 passive stimuli and 10 filler sentences. The experimental clauses included transitive reversible actional and non-actional verbs and four animate characters (the two parents with their two children, Marco and Sara). The trials had different characteristics: 24 contained actional verbs (like '*inseguire*' 'to chase' and '*baciare*' 'to kiss'), 16 non-actional verbs (like '*annusare*' 'to smell' and '*sentire*' 'to hear'); 20 trials contained the auxiliary '*essere*' 'to be' and 20 '*venire*' 'to come'; half of the stimuli included the by-phrase and the other half did not. Figure 15 is an example of filler sentence. The experimenter asked "*In quale foto Sara ama l'orsacchiotto?*" "In which picture is Sara loving the bear?", and the participant was supposed to indicate the third photo.

Figure 15: example of a picture of a filler sentence.

In figure 16, an example of experimental stimulus is given: to the question "*In quale foto Marco è/viene spinto da Sara*" "In which picture is Marco being pushed by Sara?" the participant could choose the correct answer (picture number 1) or do two types of mistake: in pointing to the second picture he selected the same characters but with reversed theta-roles, while in the third picture the agent changed.

Figure 16: example of an experimental picture.
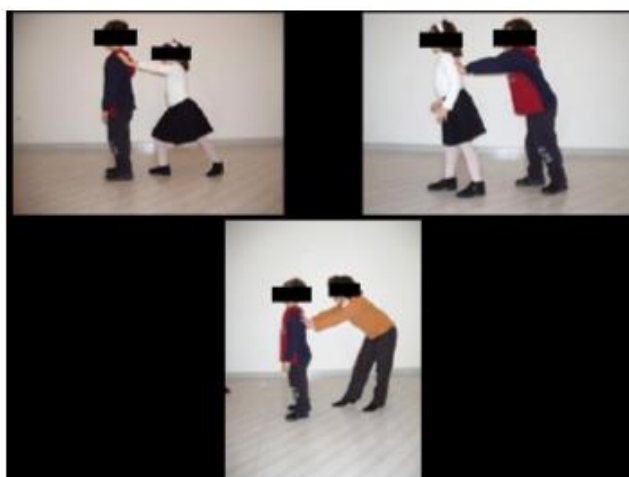
The production of passive clauses. The production of passive structures was tested by using a picture description task in which the pictures were the same of the comprehension experiment. The participant saw two pictures and the experimenter asked him/her a question about the patient (Verin 2010). The subject was asked 36 questions: 12 trials to elicit passive clauses with actional verbs, 12 trials with non-actional verbs and 12 filler sentences. The

transitive verbs and the characters used were the same of the comprehension task.

The first picture depicted an action with two characters, the other one showed the same action but with the same patient and different agents (figure 17), or with the same agent and different patients (figure 18). In the former type, namely, in the trials with the same patient, the by-phrase had to be necessarily expressed, since the possible agents were two; in the latter type, conversely, the by-phase was not a *conditio sine qua non* for the sentence to be clear. Examples of the trials are reported below.

(Stimulus figure 17)

(14)   Experimenter: *Nella prima foto Sara spinge Marco. Nella seconda foto, la mamma spinge Marco. Cosa succede a Marco nella prima foto?*
"In the former picture Sara is pushing Marco. In the latter, the mum is pushing Marco. What's happening to Marco in the former picture?"
Target: *Marco è/viene spinto da Sara.*
"Marco is being pushed by Sara"

Figure 17: item displaying the same action with fixed patient and different agents.
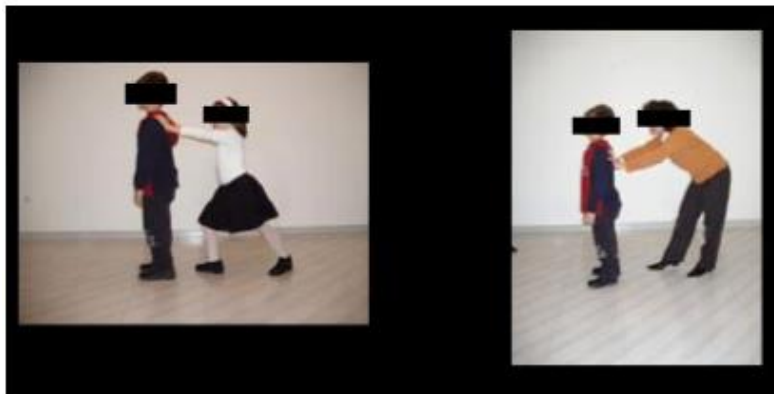
(Stimulus figure 18)

(15)   Experimenter: *Nella prima foto Sara imbocca la mamma. Nella seconda, Sara imbocca Marco. Cosa succede a Marco?*
"In the former picture Sara is feeding the mum. In the latter, Sara is feeding Marco. What's happening to Marco?"
Target: *Marco è/viene imboccato da Sara*
"Marco is being fed by Sara".

Figure 18: item representing the same action with fixed agent and different patients.

The comprehension of relative clauses. The agent selection task elaborated by Volpato (2010) was adopted with the aim of investigating the comprehension of relative clauses by S1 and S2. The participants had to look at two different scenes with the same two characters: the action performed was the same in both pictures, but theta-roles were reversed. The subject had to point to the correct referent out of four possible characters that matched with the sentence proposed by the experimenter. The test included 10 sentence typologies, each proposing 6 items: 12 ambiguous sentences (AMB), 12 subject relatives (SR), 24 object relatives having the subject in pre-verbal position (OR), and 12 object relatives with the subject in post-verbal position (ORp). 20 filler sentences (F) were also added. Examples of each condition are given in table 3:

Table 3: all the conditions tested.

AMB	AMB_SG_SG	La mucca che spinge l'elefante The cow that pushes the elephant
	AMB_PL_PL	Le mucche che spingono gli elefanti The cows that push the elephants
SR	SR_SG_PL	La mucca che spinge gli elefanti The cow that pushes the elephants
	SR_PL_SG	Le mucche che spingono l'elefante The cows that push the elephant
OR	OR_SG_SG	La mucca che l'elefante spinge The cow that the elephant pushes
	OR_PL_PL	Le mucche che gli elefanti spingono The cows that the elephants push
	OR_SG_PL	La mucca che gli elefanti spingono The cow that the elephants push
	OR_PL_SG	Le mucche che l'elefante spinge The cows that the elephant pushes
ORp	ORp_SG_PL	La mucca che spingono gli elefanti The cow that push the elephants
	ORp_PL_SG	Le mucche che spinge l'elefante The cows that pushes the elephant
F	SVO	La capra che mangia il gelato The goat that eats the ice-cream

An example of the picture provided to the participants is illustrated in figure 19, while figure 20 shows a filler image. In presenting figure 19 the experimenter provided the sentence "*Tocca il coniglio che colpisce i topi*" ("Touch the rabbit that hits the mice"), while figure 20 was introduced with "*Tocca la capra che mangia il gelato*" ("Touch the goat that eats the ice-cream").

The four characters of the experimental picture can tell about which type of referent the participant choose. When figure 19 represented a subject relative clause ("*Tocca il coniglio che colpisce i topi*" "Touch the rabbit that hits the mice") the choice could be: (i) the correct answer, the referent D, (ii) the reversed answer, the referent B, (iii) other error, referent A or

C. When the same picture was used for an object relative clause, the possible answers were: (i) B, the correct referent, (ii) the reversed referent D, (iii) the agent, referent A, instead of the head, (iv) the other referent, C.

Figure 19. Experimental picture.
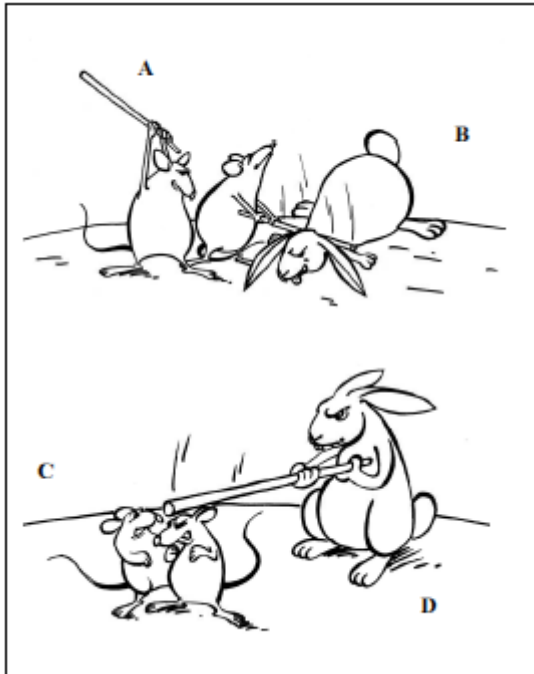
Figure 20. Filler picture.
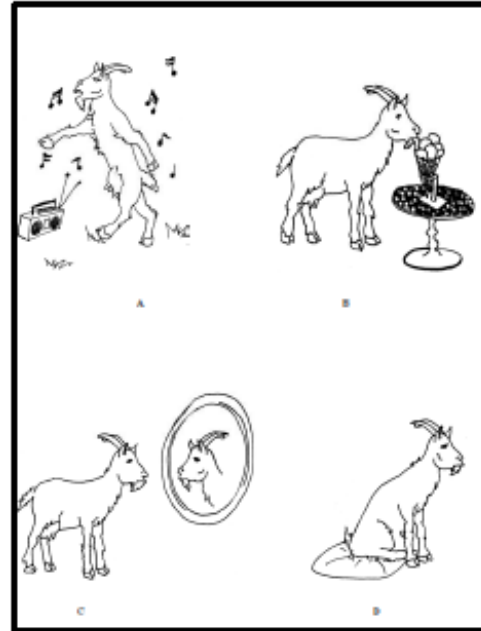
The experimental sentences contained either transitive verbs and animate subjects, or reversible verbs that could work for both the DPs, while intransitive verbs and inanimate subjects were used in filler sentences.

The production of relative clauses. The ability of the hearing impaired individuals to produce relative clauses was verified by using the preference task of Volpato (2010). The 36 trials were divided into 12 eliciting subject relative clauses, 12 forcing object relatives, and 12 filler sentences, which required the production of simple SVO clauses. The relative heads were singular in 12 items and plural in the other half of the cases.

In order to make the participant elicit a subject relative, a picture like figure 21 (that replicates figure 13) was shown and the experimenter provided the corresponding stimulus (with plural head):

(16)   Experimenter: "Ci sono 2 disegni. Nel primo i bambini accarezzano il gatto. Nel secondo, i bambini colpiscono il gatto. Quali bambini ti piacciono di più? Inizia con 'Mi piacciono i bambini…' oppure 'I bambini…'"

"There are two pictures. In the former, the children are stroking the cat. In the latter, the children are hitting the cat. Which children do you like? Start with 'I like the children…? or 'The children…'

Target: "(Mi piacciono) i bambini che accarezzano/colpiscono il gatto".

"(I like) the children that are stroking/hitting the cat".

Figure 21: picture used for the elicitation of a subject relative clause.

Figure 22 provides an example of a trial eliciting an object relative clause (with singular head):

(17)   Experimenter: "Ci sono due disegni. Nel primo il papà colpisce un bambino. Nel secondo il papà bacia un bambino. Quale bambino ti piace di più? Inizia con 'Mi piace il bambino…' oppure 'Il bambino…'"

"There are two pictures. In the former, the father is hitting a child. In the latter, the father is kissing another child. Which child do you like? Start with 'I like the children…? or 'The children…'

Target: "(Mi piace) il bambino che il papà colpisce/bacia".

"(I like) the child that the father is hitting/kissing".

Figure 22: picture used for the elicitation of an object relative clause.
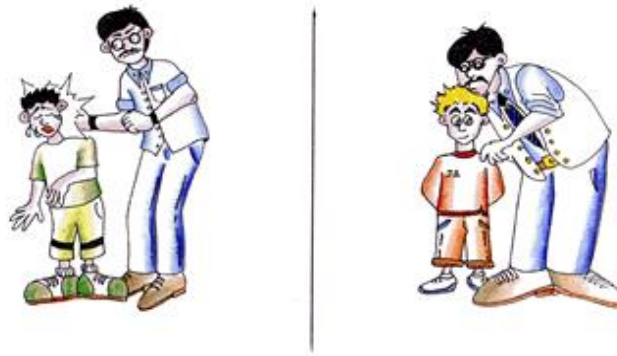
An example of a filler item is illustrated in figure 23:

(18) Experimenter: "Cosa fa il coniglio?"
      "What is the rabbit doing?"
      Target: "Il coniglio…"
      "The rabbit…"

Figure 23: example of filler picture.

5.2.3 Method

The two participants were tested individually from November to December 2015 in three sessions, each lasting about 1 hour. The administration of the tests was preceded by a familiarization and training moment. Both the familiarization and the test were presented in Italian Sign Language, but at the same time written instructions and stimuli were given, in order to avoid any misunderstandings[10] and to give the subjects the possibility to read again the trials before answering. Since S1 and S2 were tested in their competence in Italian, and they were evaluated in written comprehension and production.

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[10] Italian Sign Language has a different non-marked word order (SOV versus the Italian SVO) and often the same sign can have different interpretations.

5.2.4 Coding and Results

5.2.4.1 The performance on passive clauses

The comprehension of passive clauses. The responses to the comprehension task have been analysed according to their different characteristics, and the percentages of accuracy of each one are reported in table 4:

Table 4. Results from comprehension of passive clauses. The percentage in red refers to below chance performance.

	S1	S2	CG
Actional ESSERE	100%	100%	100%
Actional VENIRE	100%	92%	100%
Non-actional ESSERE	100%	75%	100%
Non-actional VENIRE	100%	63%	100%
Mean of accuracy	**100%**	**83%**	**100%**

Using the binomial distribution, a subject was considered above chance level when he gave the correct answer to at least 8 out of 12 items (67%) or when he always chose the wrong option ($p = 0.02$) in passive with actional verbs, both with auxiliary '*essere*' and '*venire*'; in passive with non-actional verb, with '*essere*' and '*venire*' auxiliary conditions, the participant was considered above chance level with 6 out of 8 correct items (75%) ($p = 0.01$). As far as the presence of the by-phrase is concerned, the subject was above chance ($p = 0.02$) with less than 2 correct answers or with more than 12 out of 20 items (60%).

In this task S1 performed at ceiling like the adults of the control group, while S2 was below chance in passive clauses with non-actional verbs and auxiliary '*venire*'. In the other conditions S2 was above chance, even though he reached 100% of accuracy only in passives with actional verbs with '*essere*' auxiliary verb. S2 correctly comprehended 95% of the passive clauses with overt by-phrase, while the accuracy decreased to 75% when it was not expressed. S1 and CG were at ceiling in both these conditions, as table 5 shows.

	S1	S2	CG
By-phrase expressed	100%	95%	100%
By-phrase not expressed	100%	75%	100%

When S2 pointed to the wrong character, in 100% of the time he selected the agent instead of the correct patient. By analysing his answers, it was noted that high percentages of errors were registered when the sentences contained some particular verbs: the non-actional '*sentire*' 'to hear' (50%) and '*annusare*' 'to smell' (33%), and the actional '*spingere*' 'to push' (17%).

Table 6: percentages of items in which S2 chose the agent instead of the correct answer and the verbs that registered a high percentage of mistakes.

	S1	S2
Agent error	0%	100%
Reversed role error	0%	0%
Other character error	0%	0%
Error with verb '*sentire*'	0%	50%
Error with verb '*spingere*'	0%	17%
Error with verb '*annusare*'	0%	33%

The production of passive clauses. S1 and S2 produced correct passive clauses with a mean level of accuracy of 21% and 0%, respectively. Among the target productions it was verified if the utterance contained the same verb used by the experimenter, if the auxiliary verb '*essere*' or '*venire*' was used, and if the by-phrase was expressed when compulsory. S1 and S2 were compared to the control group only for the use of the correct actional or non-actional verb, since adults do not have problems with the auxiliaries and in using the by-phrase. Table 7 shows the results of this task.

Table 7. % of accuracy of S1, S2 and CG in the production of passive clauses.

	S1	S2	CG
% of passive produced	**21%**	**0%**	
Actional	60%	0%	99%
Non-actional	40%	0%	65%

The deaf subject S1 was less accurate than the control group in maintaining the verb used by the experimenter in the passive sentence, with an accuracy of 60% in actional verbs and of 40% in non-actional verbs versus the 99% and 65%, respectively, of the CG. All the passive structures produced by S1 contained the auxiliary '*essere*'. On the other hand, S2 never uttered a passive clause.

The two participants more often resort to active structures by adopting different strategies. The most commons were:

- ✓ active clauses that involve the verb 'ricevere' 'to receive'(for example, '*La mamma riceve un calcio da Sara*' 'The mum receives a kick from Sara');
- ✓ simple SVO clauses ('*Marco dice qualcosa a suo padre con il megafono*' 'Marco says something to his father through the megaphone');
- ✓ sentences with a conjugated verb followed by an infinitive form ('*Il papà prova a dire una cosa a Marco*' 'The father tries to say something to Marco');
- ✓ other strategies.

The by-phrase was also present in the active clauses ('*Papà sembra non aver problemi a ricevere un abbraccio da Sara*' 'Dad seems not to have problem in receiving a hug from Sara') , and this was reported too, as the table below illustrates.

Table 8. Strategies used in the passive clauses production test by the two deaf participants.

	S1	S2
SVO	71%	52%
SVO with verb '*ricevere*'	11%	5%
Conjugated verb with infinitive	17%	21%
Others	0%	21%
Mean of use of active clauses	**71%**	**79%**

While S1 preferred the SVO strategy (71%), S2 recurred to a wider set of different constructions: 52% of time he generated SVO sentences, 21% of the active utterances contained a conjugated verb followed by an infinitive, and SVO sentences with the verb '*ricevere*' were 5%. It is noteworthy that S2 used the by-phrase in few of his productions (17%), suggesting that he understood who was the agent of the action, while S1 never added the by-phrase in his productions.

In the data analysis it was also counted when the verb, actional or non-actional, used by the experimenter was replaced by another verb, and if the new verb was actional or non-actional. As table 9 reports, when the experimenter used an actional verb in the question, S1 and S2 recurred to a different verb in the 42% and 50% of time ('*Mamma regge alla spinta di Marco*' 'Mum resists to Marco's push' instead of the target '*La mamma è/viene spinta da Marco*' 'Mum is/comes pushed by Marco'), respectively, and the percentages increased when the questions involved non-actional verbs (S1 91%; S2 100%). In the latter case, both participants preferred to use actional verbs, S1 in the 64% of time and S2 the 83%. On the other hand CG produced active SVO clauses only with passives involving non-actional verbs, namely 35% of the cases, and all these times they replaced the non-actional '*sentire*' 'to hear' with the actional '*parlare*' 'to speak'.

It is worth noting that neither S1 nor S2 produced active clauses with accusative clitic pronouns ('*Sara lo spinge*' 'Sara is pushing him'), a strategy that was largely adopted by typically developing children from 3;5-6;2 (Volpato, Verin & Cardinaletti 2014), and in this S1 and S2 behave like the group of adults of Volpato (2010).

S2, contrary to S1, made mistakes in conjugating the verbs, changed the subject and wrote ungrammatical sentences (table 9).

Table 9. Substitutions and mistakes made by S1 and S2.

	S1	S2	CG
Substitution of actional verbs	42%	50%	1%
Substitution of non-actional verbs	91%	100%	35%
Replacement of non-actional verbs with an actional one	64%	83%	100%
Error in conjugation	0%	9%	0%
Change of the subject	0%	17%	0%
Ungrammatical sentences	4%	17%	0%

Furthermore it was noted that when an actional verb was provided by the description and the question of the experimenter, S2 tended to 'break' the verb adopting a solution that involved the verb *ricevere* 'receive' followed by the semantic element expressed by the targeted verb. For instance, S2 elicited '*Papà sembra non aver problemi a ricevere un abbraccio da Sara*' 'Father seems not to have problems in receiving a hug from Sara'

instead of the expected answer '*Il papa è/viene amato da Sara*' 'The father is/comes loved by Sara'.

The complete list of passive sentences that S1 and S2 produced are reported in Appendix A.

5.2.4.2 The performance on relative clauses

The comprehension of relative clauses. Table 10 displays the percentages of accuracy of the experimental subjects in the comprehension task, while graph 1 illustrates the percentages of correct answers for S1, S2, and the CG group on each sentence condition.

Table 10: % of general accuracy in the comprehension of RCs by S1 and S2.

	S1	S2
AMB	100%	92%
SR	83%	83%
OR	100%	8%
ORp	92%	0%
Mean % of accuracy	**95%**	**38%**

We used the binomial distribution to check the scores corresponding to above chance performance for each sentence type. The probability to select the correct answers in ambiguous sentences was 50%, because there were 2 possible correct referents out of 4, and a subject was considered above chance level only if he selected the correct answer in all 6 items (100%) (p = 0.02). In the other conditions the participant had to choose the correct item out of 4 possibilities, with 25% of probability of responding correctly to SRs, ORs, and ORps. Each participant had to correctly answer at least 4 items (67%) for each type of relative clause in order to be considered above chance level (p = 0.03).

Compared to the CG group, neither S1 nor S2 was at ceiling, but S1's performance was good: he did not reach 100% of accuracy only in subject relatives (83% in both the DPs number feature manipulations) and in object relative clauses with a singular post-verbal subject and a plural relative head (83%). On the other hand, the serious deficit of S2 in comprehending relative clauses is clearly depicted in graph 1: he was above chance level only in ambiguous relative clauses with plural DPs (100%), and in subject relative clauses (SG_PL: 100%;

PL_SG: 67%). The comprehension of object relatives is severely compromised, since he select 2 correct items out of 36.

Graph 1. % of accuracy of S1, S2 and CG on each sentence condition (100% = 6 correct answers; 83% = 5 correct answers; 67% = 4 correct answers; 50% = 3 correct answers; 33% = 2 correct answers; 17% = 1 correct answer).
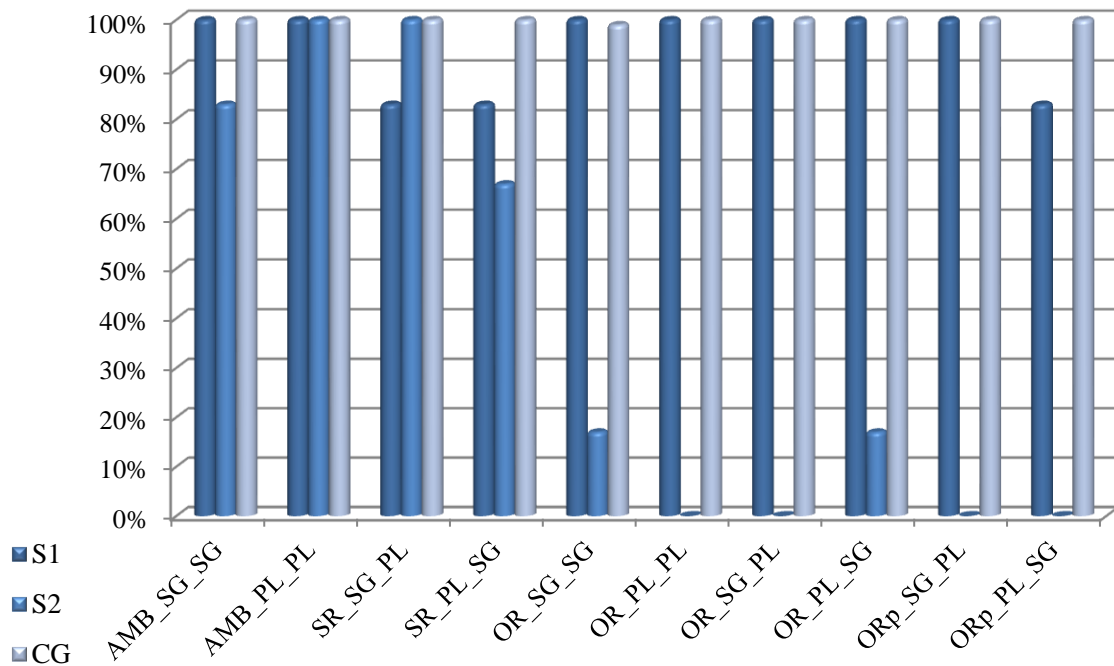
A further analysis of the errors the deaf subjects made was conducted. S1 made fewer mistakes than S2 (5% vs 62%). S1 always pointed to the reversible referent, while S2's errors were spread on the different categories of error: 42% of times S2 chose the agent, 39% the reversible character and 16% the other referent. The CG, instead, performed at ceiling, and only one participant gave an incorrect answer by pointing to the reversible referent in an ORC with singular match of the DPs.

Table 11: % of agent, reversible and other errors by S1 and S2.

	S1	S2
Mean of errors	**5%**	**62%**
Agent	0%	42%
Reversible	100%	39%
Other	0%	16%

The production of relative clauses. The percentages of target subject and object relative clauses produced by S1 and S2 together with the control group are reported in table 12.

Table 12: % of target relatives produced by S1, S2 and CG.

	S1	S2	CG
SR	92%	17%	98%
OR	8%	17%	0%

Once again the performance of S1 is more similar to the control group than to the other hearing-impaired participant: actually S1 correctly produced 92% SRCs and 8% ORCs, and the control group registered 98% of accuracy in SRCs and never elicited ORCs. The performance of S2 stands in contrast with these data: the subject correctly generated SRCs and ORCs with an accuracy of 17%.

In answering the questions of the task, some strategies were used by the participants to avoid the production of relative constructions. When subject relatives were targeted, S2 composed sentences without the complementizer '*che*' and the verb in the infinitive form in 90% of cases ('*Mi piace un bambino guardare una zebra*' 'I like a child to look a zebra'), and he recurred to SVO sentences only in 10% of items. On the other hand, S1 never adopted these strategies, and he opted for a passive relative[11] ('*Mi piace di più il bambino che è guardato*' 'I like the more the child that is being looked').

Table 13: answering strategies in SRCs.

	S1	S2
SVO	0%	10%
Passive relatives	8%	0%
Omission of '*che*' with infinitive	0%	90%

When the target was an object relative, the types of strategies adopted increased. Neither S1 nor the CG produced SVO sentences instead of relative clauses, while S2 did it the 10% of time. S1 mainly recurred to passive relatives ('*Mi piace di più il bambino che è baciato*' 'I like the more the child that is being kissed') (84%), as the control group (98%), while S2 mostly built sentences lacking the complementizer '*che*' and with the infinitive (70%), a strategy that he adopted to replace SRCs too.

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[11] S1 generated a passive relative when a subject relative was expected. This strategy is suitable and often used when object relatives are targeted, while it is not appropriate for subject relatives, because it causes a theta-roles reversal. However, S1's sentence is correct from a grammatical point of view.

Table 14: answering strategies in ORCs.

	S1	**S2**	**CG**
SVO	0%	10%	0%
Passive relatives	84%	0%	98%
Ambiguous relatives	8%	0%	2%
Omission of '*che*' with infinitive	0%	70%	0%
Other strategies	8%	20%	0%

The full list of relative sentences produced by S1 and S2 are reported in Appendix B.

5.2.5 Discussion

In this section, we compared the performance on comprehension and production of passive and relative clauses of two deaf subjects, S1 and S2, with a control group of normal hearing adults, in order to determine whether and to what extent their competence differ from hearing adult participants.

In the comprehension of passive clauses S1 performed at ceiling in all the conditions of the task, therefore he demonstrated to have normal-adult-like skills, while the frame emerging from the percentages of S2 revealed a compromised knowledge of the passive: actually he was at ceiling only in the comprehension of actional verbs with '*essere*' auxiliary, while the comprehension of non-actional verbs was the most compromised, especially with '*venire*' auxiliary, which was below chance level (63%). The major difficulty in interpreting passive clauses with non-actional verbs in Italian was found also by Manetti (2012) and Volpato et al. (2013) in children of age 5. Since children reach an adult-like comprehension of Italian passive clauses by age 5-6 (see §2.3.1), it is apparent that the competence of S2 in this field is seriously compromised.

The fact that S2 always made the mistake of pointing to the agent instead of the patient suggests that he could not understand the roles expressed by the verb in the passive form. It is noteworthy also that in passive clauses with the by-phrase S2 was more accurate than in those without it (95% vs 75%), and this disconfirms what Fox & Grodzinsky claimed (1998).

As far as the results from the production task are concerned, S1 obtained low scores in target passives and preferred to generate SVO sentences, while S2 never produced passive clauses, but among the adopted strategies he mainly recurred to SVO clauses too. The control group, on the other side, generated active clauses only when the passives contained '*sentire*' 'to

hear', a verb that has always been replaced by the actional '*parlare*' 'to speak'. The tendency to use SVO clauses to describe what is happening to the patient was detected also by Volpato, Verin & Cardinaletti (2014) in 3 to 6-year-old children, while adults recurred to passive constructions. Both subjects tended avoided to maintain the non-actional verbs used in the stimuli and they usually replaced them with actional verbs.

The mistakes in conjugating the verbs, the changes of subject and the ungrammatical sentences produced by S2, even though in low percentages, confirm his damaged competence. But we have also to consider that a source of the low accuracy of S1 and S2 might have been the format of production task. Indeed, it is hard to represent non-actional verbs through fixed images. Moreover passive constructions are not so frequent in spoken Italian: if we consider that both the deaf individuals have a more limited source of Italian language, the data collected are not surprising. Another factor that may have influenced their performance is the absence of a corresponding passive structure in Italian Sign Language.

S1 and S2 behaved similarly to the deaf adolescents of Bertone et al (2011), suggesting that they did not received not input enough to develop proper syntactic skills, and that at the same time they experienced the same delayed language development process. Moreover, as the students with dyslexia studied by Cardinaletti & Volpato (2015), S1 and S2 never produced sentences containing clitic pronouns, while active clauses with clitic pronouns were observed by Volpato (2014) in typically developing children.

In the relative clauses comprehension task, S1 had a higher mean of accuracy (95%) than S2 (38%). S1 was above chance level in all sentence types, showing an adult-like solid competence; S2, on the contrary, was above the chance level only in three sentence types: in ambiguous sentences with plural DPs and in subject relative clauses with number mismatch. His comprehension of object relative clause was severely impaired, and this is even more striking when we compare him to the control group. The strong asymmetry between subject and object relative found in S2 recalls the performance of Italian normal hearing children (Adani 2008; Volpato 2010, 2012, a.o.), of SLI children (Contemori & Garraffa 2010; Adani et al. 2014), and of hearing impaired children (Volpato & Adani 2009; Volpato 2010, 2012): the 33 year old subject (S2) is comparable to young children for his performance in the comprehension of relative clauses.

In choosing the wrong referent, S1 pointed to the character playing the reversed role; on the other hand S2 predominantly indicated the agent of the action (42%) and the reversible character (39%).

The production of relative clauses by S1 was similar for accuracy and strategies to the CG: in SRCs the means of accuracy were 92% and 98% respectively, while ORCs were rarely found (8% and 0%) and frequently replaced by passive relative clause. S1 was more similar to the CG for the answering strategies he used too: he tended to produce passive relatives, especially when ORCs were targeted, and this indicates that he properly mastered these structures. In S2 production subject and object relative clauses were hardly present, 17% in both, and this highlighted once again his syntactic deficit. His impaired language knowledge was evident also from the main strategy he adopted in order to avoid RCs, namely the omission of the complementizer '*che*' with the following verb in the infinitive form. None typically developing child, adolescent or adult would generate sentences of this type, which conversely are frequently produced by deaf individuals (Chesi 2006).

The analysis of the data revealed that S1 has a mature competence in passive and relative clauses, and even if his performance was not always at ceiling like normal hearing adults, a linguistic treatment for him would have been senseless. On the other hand, S2 syntactic skills were seriously compromised, and therefore a linguistic treatment was carried on. We decided to explicitly rehabilitate only subject relatives and object relatives with a pre-verbal embedded subject, but not the object relatives with post-verbal subject, in order to verify (i) whether improvements occur in the treated structures, (ii) if the eventual improvements are maintained for some time after the treatment sessions, (iii) and if enhancement takes place in passive clauses too.

5.3 The linguistic treatment on S2

Since S1 obtained high scores in all the test he had done, it was decided to conduct the linguistic treatment only on S2, whose performance, conversely, was particularly scarce. Hence, a linguistic rehabilitation program had been thought and prepared *ad hoc* for S2 taking as a paradigm the procedure and materials of Thompson & Shapiro 1994, Ebbels & van der Lely (2001), Levy & Friedmann (2009), and D'Ortenzio (2015).

The aims of the study are to verify (i) whether a linguistic intervention can be effective on an adult deaf subject signer of LIS, (ii) whether the potential improvements are still visible one month after the linguistic sessions, (iii) and to assess if the rehabilitation of relative clauses can induce positive effects on passive clauses too.

The treatment was carried out for seven weeks (from October to November 2016), where the

rehabilitative session took place once a week, for a total of seven meetings. In the next section, the program and the materials of each session are described.

5.3.1 The linguistic sessions

Each linguistic session was devoted to the explanation and teaching of a particular theme, and each time special working material was prepared for S2. All the material and exercises used are attached in Appendix C.

1) the topics of the first session were the argument structure of the verb and the simple SVO sentences.

   Cards of different colours were given to S2: white cards for nouns[12], 6 green cards for intransitive verbs ('*cenare*' 'to have dinner', '*litigare*' 'to argue', '*parlare*' 'to speak', '*dormire*' ' to sleep', '*cadere*' 'to fall', '*camminare*' 'to walk'), 6 red cards for reversible transitive verbs ('*abbracciare*' 'to hug', '*fotografare*' 'to photograph', '*spingere*' 'to push', '*baciare*' 'to kiss', '*rincorrere*' 'to charse', '*aiutare*' 'to help'), 6 non-reversible verbs on blue cards ('*pulire*' 'to clean', '*dimenticare*' 'to forget', '*sentire*' 'to hear', '*studiare*' 'to study', '*aprire*' 'to open', '*scrivere*' 'to write'), and 6 ditransitive verbs on the yellow ones ('*dare qlcs a qlcn*' 'to give sth to sb ', '*passare qlcs a qlcn*' 'to pass sth to sb', '*regalare qlcs a qlcn*' 'to gift sth to sb', '*mostrare qlcs a qlcn*' 'to show sb sth', '*insegnare qlcs a qlcn*' 'to teach sb sth', '*chiedere qlcs a qlcn*' 'to ask sb sth'). The nouns were chosen taking into consideration that S2 likes taking picture and sometimes he enjoys writing articles about Italian soccer matches. Before starting with the exercises, it was assessed if S2 knew the meaning of all the nouns and the verbs.

   The subject had to choose the cards he preferred in order to formulate a pair of sentences for each type of verb. The white cards with nouns were provided as a 'support', but S2 was free to compose sentences using nouns he thought by himself.

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[12] List of the nouns on the white cards: '*mamma*' 'mother', '*papà*' 'father', '*amico*' 'friend', '*bambino*' 'child', '*nonni*' 'grandparents', '*giornalista*' 'journalist', '*barista*' 'barman', '*maestra*' 'teacher', '*professore*' 'professor', '*segretaria*' 'secretary', '*impiegato*' 'employee', '*aiuto*' 'help', '*consiglio*' 'suggestion', '*poesia*' 'poem', '*regole*' 'rules', '*cane*' 'dog', '*animale*' 'animal', '*gatto*' 'cat', '*articolo*' 'article', '*saggio*' 'essay', '*appuntamento*' 'appointment', '*musica*' 'music', '*rumore*' 'noise', '*casa*' 'house', '*macchina*' 'car', '*informazioni*' 'information', '*pupazzo*' 'puppet', '*libro*' 'book', '*bottiglia*' 'bottle', '*carabiniere*' '(italian) police' , '*scatola*' 'box', '*paesaggio*' 'landscape'. They could be used both in the singular and in the plural form, in the masculine and in the feminine form.

By using the cards, it was shown to S2 that Italian allows sentences to have the subject in post-verbal position, and the following examples were provided:

a) La sera telefona Gianni.
   In the evening calls Gianni.

b) Sono arrivati molti ospiti.
   Have arrived many guests.

Later, S2 was asked to highlight the verb drawing a box around it, and to circle who was doing the action (the agent). After these operations, the experimenter addressed S2's attention to the fact that in some sentences (those with intransitive verbs) no more operations were possible, while in other clauses there still were elements without boxes of circles: the subject underlined them, and the experimenter made him note that those elements were essential for the full sense of the sentence.

Therefore it was explained the concept of verb argument structure, which specifies which elements of a sentence are compulsory.

In order to verify if S2 did comprehend what was explained about the verbal argument structure, sentences containing mistakes at the level of the argument structure were presented to the hearing-impaired subject: he was asked to judge if they were correct or not, and to correct the mistakes.

2) The second session started from the sentences S2 produced in the first one, briefly recalling what was explained about the verbal argument structure. By comparing different sentences, it was pointed out to S2 that the verbs establish different semantic relationships that differ from one sentence to another. These semantic relations are called thematic roles, and they are assigned by the verb on the base of its argument structure. The thematic roles of agent and theme, in particular, have been explained to S2.

In order to put the theory into practice, an exercise was proposed to the subject: he had to complete 8 sentences (2 with intransitive verbs, 2 with ditransitive verbs, 2 with reversible transitives and 2 with non-reversible transitives). In the first sentences only the conjugated verb was given, preceded and followed by as much gaps as the arguments required by the verb in question. S2 had to fill the gaps in order to obtain full sense sentences. In the second part of the exercise the subject was asked to do the same, but only the verbs were given, and any cue about the number of necessary

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arguments was provided. Examples of the first (19) and second type (20) of sentences are given below.

(19) a. _____ viaggia
_____ is travelling

b. _____ lavano _____
_____ are washing _____

(20)   a. dorme
is sleeping

b. mangiano
(they) are eating

Later, together with S2 we analysed the sentences containing reversible and non-reversible transitive verbs and the difference between the two types has been explained.

3) The third linguistic session focused on subject relatives, after having briefly recalled the thematic theory. The sentences S2 wrote in the second session were copied on white cards, each reporting a constituent of the clause. Starting from the simple clause and by moving the cards, it was shown to S2 how to derive a subject relative clause, and therefore the coloured cards '*che*' 'that', in orange, and '*t/traccia*' 't/trace', in pink, were introduced. It was explained that when the subject moves, it leaves a trace behind him to mark its original position. The original position was highlighted with the pink card '*traccia*' 'trace', while another pink card with the letter 'T' was set under the constituent once it reached the new position; the same colour of the two cards 'T' and 'traccia' means that they are linked. In order to obtain a relative clause, the main clause '*mi piace/mi piacciono*' 'I like' was added at the beginning.

In this session, S2 was asked to transform, when possible, the SVO sentences he created in the previous session into subject relative clauses. The experimenter showed him how to do this exercise using the example in (21), while figure 24 illustrates some sentences turned into SRCs by S2.

(21) (SVO) I bambini mangiano la pizza.
　　　　　The children are eating pizza.

(SR)　Mi piacciono i bambini_T CHE __T mangiano la pizza.
　　　I like the children_T THAT __T are eating pizza.

Figure 24: the material and the procedure used to explain to S2 the syntactic movement through which SR are derived.

After having turned SVO sentences into SRCs (see Appendix C), a more abstract exercise was proposed. A list of 16 verbs[13] was given to S2: he had to compose SVO sentences and then to transform them into SRCs, but he had to do this operation writing directly on the paper, without the help of the cards.

In this exercise S2 wrote also some appositive relative clauses, like '*Mi piace Luisa che lava la tovaglia*' 'I like Luisa that is washing the tablecloth'. Actually, appositive relative clauses were not the goal of this exercise, but S2 was free to choose the nouns, and few of these structures occurred.

4)　The forth session was dedicated to object relative clauses, but only ORCs with pre-verbal subject were explicitly trained.

During the linguistic treatment, the possibility to have the subject in post-verbal position was mentioned only when SVO clauses were considered. Oppositely, when relative clauses, especially ORCs, were explained to S2, the possibility to find the subject in post-verbal position was not introduced. This was done on purpose, in

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[13] The list of verbs was composed of 8 verbs from the material of the relative clause test ('*lavare*' 'to wash', '*inseguire*' 'to chase', '*fermare*' 'to stop', '*spingere*' 'to push', '*tirare*' 'to pull', '*salutare*' 'to greet', '*guardare*' 'to look', '*sporcare*' 'to dirty'), while the remaining 8 were new ('*rompere*' 'to break', '*accompagnare*' 'to accompany', '*incontrare*' 'to meet', '*asciugare*' 'to dry', '*spaventare*' 'to scare', '*invitare*' 'to invite', '*applaudire*' 'to clap', '*chiamare*' 'to call'). This verb selection aimed at rehabilitating the underlying structure of the relative clauses, but at the same time we wanted S2 to learn how to deal not only with the verbs he found in the tests, but also with new ones.

order to verify if S2 could adopt this strategy on his own, without being explicitly taught.

The exercises of this session were similar to the ones of the third session: firstly S2 transformed SVO sentences into object relative clauses, with the help of the cards, like in the sample below (22); later he was asked to invent SVO sentences containing the verbs provided, and then to turn them into ORCs, but without the helping cards.

(22) (SVO) I bambini mangiano la pizza.
    The children are eating pizza.

 (RO) Mi piace la pizza$_T$ CHE i bambini mangiano __$_T$.
   I like the pizza$_T$ THAT the children are eating__$_T$.

S2 noted that SVO sentences containing intransitive verbs could not be transformed into object relative clauses.

The second exercise was interesting because S2 produced two relative clauses with a post-verbal subject, one with the mismatch and the other with the match of number features of the DPs. The mismatch condition assure an unambiguous interpretation of the sentence, while (in Italian) a structure with the match of number features of the DPs sometimes can have a twofold reading, as a subject relative clause or as an object relative clause with the subject in post-verbal position.

5) In the fifth linguistic session we recalled the SVO order, touching upon the possibility of Italian to have the subject in post-verbal position, and the thematic theory.

After this brief theoretical introduction, a short text was presented to S2, who had to circle the agent, to underline the verb and to highlight the arguments of each sentence. The participant had also to indicate how many arguments were required by the verbs, and he used the arrows to link the verb with its arguments. The text was an adapted version of "The winter and the Spring" of the Ancient Greek fabulist Aesop. The fable was slightly modified, simplifying some constructions and introducing few relative clauses (see Appendix C).

Despite the adjustment, the structure of the fable was still too complex for S2, because he found very difficult to accomplish the exercise. The text turned out to be too long and demanding, and from the second half of the fable S2 had difficulty even on finding subjects and verbs, suggesting that he got lost in all the rules and aspects

he had to consider. For this reason an extra session was planned, and with S2 we worked on another text in the seventh session.

Figure 25 illustrates the fable "The Winter and the Spring" on which S2 worked. He used the arrows to link the verb to its argument/s, and the number over the verbs indicate how many arguments it required.

L' INVERNO E LA PRIMAVERA

6) The core of the sixth session was the review of relative clauses. 5 SVO sentences were taken from the adapted fable of the previous meeting, and S2 was asked to turn each simple clause into a SRC and an ORC starting with '*Mi piace/piacciono*' 'I like'. Then he had to explain how he obtained the two constructions. An example of this task is reported in (23):

(23) (SVO) Le persone e gli animali calpestano l'erba.
The people and the animals are treading on the grass.

(SRC) Mi piacciono le persone e gli animali che calpestano l'erba.
I like the people and the animals that are treading on the grass.

(ORC) Mi piace l'erba che le persone e gli animali calpestano.
I like the grass that the people and the animals that are treading on.

Later, a group of 16 relative clauses was presented to S2: in the 8 SRCs and 8 ORCs the number features of both the DPs were manipulated, in order to have singular and plural match and mismatch conditions. The order of the relative clauses was randomized. S2 had to read the relative clause and to turn it into the base SVO form. In (24a) and (24b) it is possible to find some examples of SRC (in singular match condition) and ORC (in mismatch condition), respectively.

(24a) (SRC) La polizia che insegue le macchine.
             The police that is chasing the cars.

     (SVO) La polizia insegue le macchine.
             The police is chasing the cars.

(24b) (ORC) Gli stivali che il contadino sporca.
             The boots that the farmer is dirtying.

     (SVO) Il contadino sporca gli stivali.
             The farmer is dirtying the boots.

7) The seventh session was added because of the difficulty S2 showed in the fifth, when he had to work on a text. Another adapted fable of Aesop was proposed, "The wolf and the shepherd". The aim of this session was the same of the fifth, namely to find agent, verb and arguments of each clause, and this time S2 worked on the text with no particular difficulty. The system of circles, lines and arrows was the same of the fifth session.

Figure 26: the fable "The wolf and the shepherd" analysed by S2. He used the arrows to link the verb to its argument/s, and the number over the verbs indicate how many arguments it required.

Il lupo e il pastore
(Esopo)

Un lupo seguiva un gregge di pecore, ma senza attaccarle. All'inizio il pastore guardava il

lupo come un nemico e lo controllava. Ma il lupo continuava a seguire le pecore, e non

provava a rubarle, così il pastore si convinse che il lupo era suo amico. Un giorno il pastore

fu chiamato in città e decise di lasciare le pecore in custodia al lupo che sembrava buono.

Ma il lupo approfittò dell'occasione: si lanciò sul gregge e uccise le pecore. Poi il pastore

ritornò, vide le pecore che il lupo aveva ucciso e pensò: - Sono uno sciocco! Non dovevo

lasciare al lupo le pecore che amavo tanto!

Allo stesso modo, le persone perdono le cose che danno agli uomini malvagi.

5.3.2 The first assessment after the linguistic treatment

When the linguistic treatment was completed, the comprehension and production of relative clauses was assessed again, in order to verify whether and to what extent improvements occurred. Moreover, the test on the comprehension and production of passive clauses was administered again with the aim of determining if enhancements took place in these construction too, as a reflection of the linguistic sessions.

5.3.2.1 The performance on passive clauses

The comprehension of passive clauses. S2 was tested again on the comprehension of passive clauses after concluding the linguistic rehabilitation. In comparing his performance before and after the treatment, the mean of accuracy remained almost the same, 82% in respect to the previous 83%, and if some entries registered higher percentages, others decreased: in non-actional verbs with auxiliary '*essere*' and '*venire*' the subject was below chance level with 63%. The subject comprehended 90% of the passive clauses containing the by-phrase and 80% of passives without by-phrase.

Table 15: the results of S2 from passive comprehension test before and after the linguistic treatment. The percentage in red refers to below chance performance.

	Before	After
Actional ESSERE	100%	100%
Actional VENIRE	92%	100%
Non-actional ESSERE	75%	63%
Non-actional VENIRE	63%	63%
Mean of accuracy	**83%**	**82%**

Table 16: % of accuracy in comprehension of passive clauses with and without by-phrase.

	Before	After
By-phrase expressed	**95%**	**90%**
By-phrase not expressed	75%	80%

A further analysis on the type of errors revealed that S2 selected the agent 83% of the times and the character playing the reversed role 17%, while before the treatment he only made the agent mistake. The verbs with which S2 had more difficulty were the non-actional '*sentire*' 'to hear' and '*annusare*' 'to smell', with a percentage of error of 67% and 33% respectively. It seems that an improvement occurred, since the actional verb '*spingere*' 'to push' did not cause particular problems any more.

Table 17: % of sentences in which S2 selected the agent and the character playing the reversed role, and the verbs that registered a high percentage of mistakes.

	Before	After
Agent error	100%	83%
Reversed role error	0%	17%
Other character error	0%	0%
Error with verb '*sentire*'	50%	67%
Error with verb '*annusare*'	33%	33%

The production of passive clauses. In table 18 it is evident that a slight improvement in the production of passive structures took place. From no passive sentence produced, S2 registered a percentage of accuracy of 21%, in which the auxiliary '*essere*' was preferred (60%) over

'*venire*' (40%) and the by-phrase was generally present when compulsory (80%). The percentage of accuracy in actional verbs is the same of the non-actional verbs (40%), but in one case (20%) S2 used an actional verbs instead of the target non-actional verbs.

Table 18: results from the passive production test before and after the linguistic treatment.

	Before	**After**
Mean of accuracy	**0%**	**21%**
Actional	0%	40%
Non-actional	0%	40%
Use of non-target verb	0%	20%

The production of passive constructions was avoided through active clauses (95%): the most used strategy was SVO sentences (50%), 33% were SVO clauses built with the verb '*ricevere*' 'to receive', while the infelicitous strategies found before the rehabilitation distinctly decreased, as table 19 depicts. S2 added the by-phrase to the 40% of active clauses, as reported in table 20.

Table 19. Strategies used by S2 in the production of passive clauses before and after the period of linguistic treatment.

	Before	**After**
SVO	52%	50%
SVO with verb '*ricevere*'	5%	33%
Conjugated verb with infinitive	21%	5%
Others	21%	11%
Mean of use of active clauses	**79%**	**95%**

Table 20: % of use of by-phrase in active clauses.

	Before	**After**
By-phrase	17%	40%

The subject tended to change the verb used by the experimenter, but a remark on this fact is necessary: S2 used to 'break' the actional verb proposed by the experimenter using the verb '*ricevere*' 'to receive' followed by an element that expressed the lexical meaning of the original verb (33%). For instance, he produced the sentence '*Marco riceve il cibo da Sara*'

'Marco is receiving the food from Sara' instead of the target '*Marco è/viene imboccato da Sara*' 'Marco is/comes fed by Sara', where the meaning of the target actional verb '*imboccare*' 'to feed' is split into '*dare il cibo a*' 'to give the food to', and since this form is turned into '*ricevere il cibo da*' 'to receive the food from' by S2, this suggests that he understood the action and the roles represented in the picture. On the other hand, when the experimenter used non-actional verbs S2 replaced them 83% of time, and always with actionals.

The percentage of errors in conjugating the verbs fell to 0% (vs 9% before the treatment sessions), and changes of subject and ungrammatical sentences decreased as well (8% vs 17% and 4% vs 17% respectively).

Table 21. Substitutions and mistakes S2 made in the production of passive clauses right after the treatment sessions.

	Before	**After**
Substitution of actional verbs	50%	75%
Substitution of non-actional verbs	100%	83%
Replacement of non-actional verbs with an actional one	83%	100%
Error in conjugation	9%	0%
Change of the subject	17%	8%
Ungrammatical sentences	17%	4%

The sentences produced in the passives production test by S2 are attached in Appendix D.

5.3.2.2 The performance on relative clauses

The comprehension of relative clauses. The general percentage of accuracy of S2 in the comprehension of RCs slightly improved after the linguistic treatment, as results in table 22 demonstrate. Graph 2, instead, displays the percentage of accuracy in each sentence type.

Table 22: % of general accuracy of S2 in the comprehension of RCs before and after the linguistic treatment.

	Before	After
AMB	92%	83%
SR	83%	100%
OR	8%	17%
ORp	0%	0%
Mean of accuracy	**38%**	**43%**

Graph 2: % of accuracy of S2, before and after the treatment, and CG on each sentence condition (100% = 6 correct answers; 83% = 5 correct answers; 67% = 4 correct answers; 50% = 3 correct answers; 33% = 2 correct answers; 17% = 1 correct answer).
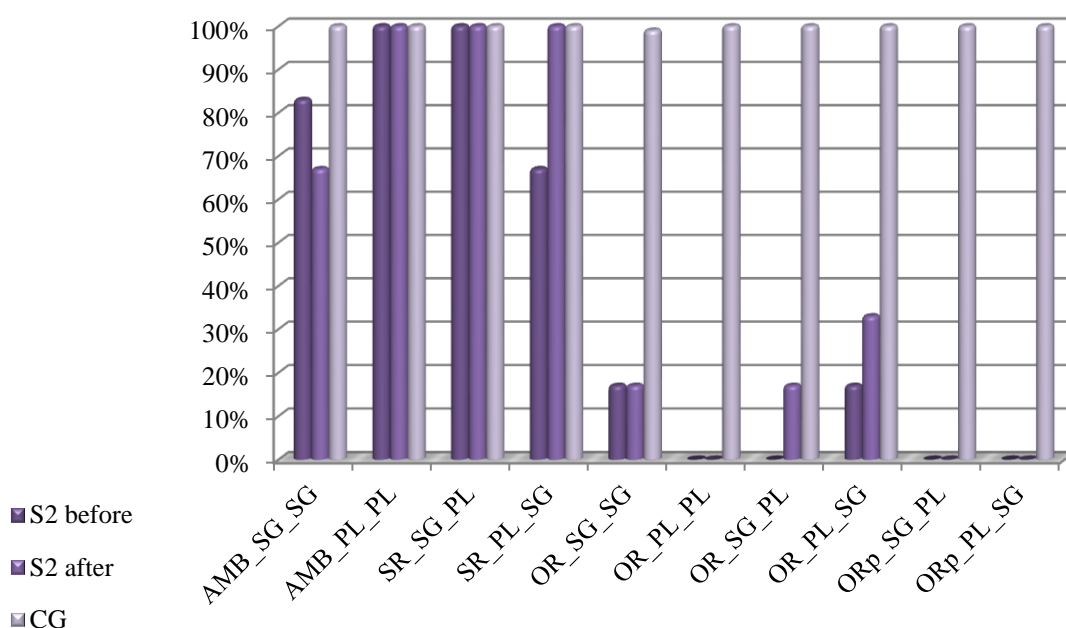
Despite the mild increase of accuracy, S2 was still below chance level in the same sentence types he was before doing the treatment. Object relative clauses were the most compromised, but few items were correctly comprehended, even though not enough to be considered above the chance level.

An interesting view was given by the errors analysis: S2 chose the agent character 94%, and no reversible error was detected. This stands in contrast with the mistakes he made before participating in the linguistic sessions, when he made errors from all the categories. These findings suggest that now he is more precise in individuating the agent of the verb of the relative clause, since the reversible character was no longer chosen.

Table 23. Types and % of errors S2 did the first time he was assessed after the linguistic treatment compared to the results collected before.

	Before	After
Agent	42%	94%
Reversible	39%	0%
Other	16%	6%
Mean of errors	**62%**	**57%**

The production of relative clauses. Right after having completed the linguistic treatment, the relative clauses correctly produced were 96%, a very high percentage compared to S2's score before doing the treatment. SRCs registered 92% mean of accuracy and ORCs were at ceiling, and this is an unusual asymmetry, as well as it is unusual the error S2 made, since he generated an ORC instead of the target SRC. It is noteworthy also that 25% of the ORCs consisted of object relatives with a post-verbal subject.

Table 24. % of target relatives produced by S2 before and after the treatment.

	Before	After
SR	17%	92%
OR	17%	100%
Mean of accuracy	**17%**	**96%**

The productions of S2 from this second assessment are attached in Appendix D.

To sum up, the data collected right after the end of the intervention show a more positive frame than before: as far as passive clauses are concerned, the mean of accuracy in the comprehension task was 82%, while the target passives produced were 21%, which is not a high percentage for an adult, but it can be considered a good score if we compare it to the 0% of the first time S2 was tested. The comprehension of relative clauses increased a bit in respect to the previous performance (43% vs 38%), while the target subject and object relative clauses produced after treatment were 92% and 100% respectively, with a mean percentage of accuracy of 96%, which is definitely high in respect to the 17% registered before the linguistic sessions.

5.3.3 The second assessment after the linguistic treatment

5.3.3.1 The performance on passive clauses

The comprehension of passive clauses. In table 25 the results in comprehension of passive clauses of S2 before, right after, and a month after the linguistic treatment with those of the control group are compared. The 78% accuracy of S2 one month after the sessions is slightly lower than the percentages he had in the previous assessments (83% and 82%). He correctly performed at 63% in non-actional verbs with the auxiliary '_essere_' and '_venire_', not enough to be considered above the chance level. In items with actional verbs and '_essere_' auxiliary S2 performed no more at ceiling, but the accuracy with actional verbs is still high (92%). When the by-phrase was expressed the mean of accuracy was 85% and 75% when the by-phrase was absent, as reported in table 26.

Table 25 shows the % of accuracy of S2 in passives comprehension one month after the linguistic sessions and compared them with previous results and the CG.

	Before	**After**	**1 month later**	**CG**
Actional ESSERE	100%	100%	92%	100%
Actional VENIRE	92%	100%	92%	100%
Non-actional ESSERE	75%	63%	63%	100%
Non-actional VENIRE	63%	63%	63%	100%
Mean of accuracy	**83%**	**82%**	**78%**	**100%**

Table 26: % of accuracy in comprehension of passive clauses with and without by-phrase.

	Before	**After**	**1 month later**	**CG**
By-phrase expressed	95%	90%	85%	100%
By-phrase not expressed	75%	80%	75%	100%

Interestingly, the errors were equally divided into 50% change of agent and 50% reversed role. The non-actional verbs '*sentire*' and '*annusare*' were still difficult for S2, although a mild decrease of mistakes in sentences containing the latter verb was detected, from 33% to 25%.

Table 27: % and type of errors of S2 and % of verbs that registered a lot of mistakes.

	Before	After	1 month later
Agent Error	100%	83%	50%
Reversed role error	0%	17%	50%
Other character error	0%	0%	0%
Error with verb '*sentire*'	50%	67%	50%
Error with verb '*annusare*'	33%	33%	25%

The production of passive clauses. Table 28 shows that a slow improvement in the production of passive clauses occurred from the first assessment before the treatment and the last one: S2 reached 42% of accuracy, he always built clauses with '*venire*' auxiliary and in 100% of cases he used the by-phrase in compulsory contexts. Among the correct passive clauses produced, 50% were generated with actional verbs, 10% with non-actional verbs, and 40% were correct structure that contained a non-target verb.

Table 28 displays the results from the production of passive clauses by S2 before, right after, and a month later the linguistic sessions.

	Before	After	1 month later
Mean of accuracy	**0%**	**21%**	**42%**
Actional	0%	40%	50%
Non-actional	0%	40%	10%
Use of non-target verbs	0%	20%	40%

Again, the analysis of the errors gave interesting information. SVO sentences were adopted 42% of times, SVO clauses that involved the verb '*ricevere*' 'to receive' were 42% and 71% contained the by-phrase (see tables 29 and 30). Errors in the conjugation of verbs were not found anymore, and in the category of 'others' (14%) answers a causative construction was individuated.

Table 29. % of the strategies used in the passive production test by S2 the three times he was tested.

	Before	After	1 month later
SVO	52%	50%	42%
SVO with verb 'ricevere'	5%	33%	42%
Conjugated verb with infinitive	21%	5%	0%
Others	21%	11%	14%
Mean of use of active clauses	**79%**	**95%**	**58%**

Table 30: % of use of by-phrase in active clauses.

	Before	After	1 month later
By-phrase	17%	40%	71%

S2 in 83% of cases tended to change the verb used in the stimulus when it was non-actional, and all these times he replaced them with actional verbs. Replacements of actional verbs drastically decreased in respect to the performance in previous assessments; no errors in conjugating the verbs and no ungrammatical sentences were individuated, and in this the performance of S2 was very similar to the test done right after the treatment sessions.

Table 31. % of substitutions and mistakes made by S2 before, right after and one month after the linguistic rehabilitation.

	Before	After	1 month later
Substitution of actional verbs	50%	75%	8%
Substitution of non-actional verbs	100%	83%	83%
Replacement of non-actional verbs with an actional one	83%	100%	100%
Error in conjugation	9%	0%	0%
Change of the subject	17%	8%	4%
Ungrammatical sentences	17%	4%	0%

The passive clauses produced by S2 in this final assessment are attached in Appendix E.

5.3.3.2 The performance on relative clauses

The comprehension of relative clauses. The percentage of general accuracy of S2 in the comprehension of relatives increasingly improved from the first to the last time he was tested, starting from 38% and arriving to 55%. Even though it is evident from table 32 that object relative clauses are still poorly comprehended, it is also true that a trend of growth characterized these structures.

Table 32 reports the % of general accuracy of S2.

	Before	**After**	**1 month later**
AMB	92%	83%	92%
SR	83%	100%	100%
OR	8%	17%	33%
ORp	0%	0%	17%
Mean of accuracy	**38%**	**43%**	**55%**

Graph 3 compares the % of accuracy of S2 before, right after and one month from the treatment on each sentence condition, and it counterposes his performance with the control group. The data outline the asymmetry between SRCs and ORCs in comprehension. Although S2 cannot be considered above chance level beyond the same three conditions he was in the previous tests (AMB_PL_PL; SR_SG_PL; SR_PL_SG), we cannot ignore the fact that he correctly understood some items that targeted object relative clauses: in 50% of cases of ORCs in match number conditions S2 pointed to the right referent.

Graph 3. % of accuracy of S2 before, right after and one month from the treatment and of CG on each sentence condition (100% = 6 correct answers; 83% = 5 correct answers; 67% = 4 correct answers; 50% = 3 correct answers; 33% = 2 correct answers; 17% = 1 correct answer).
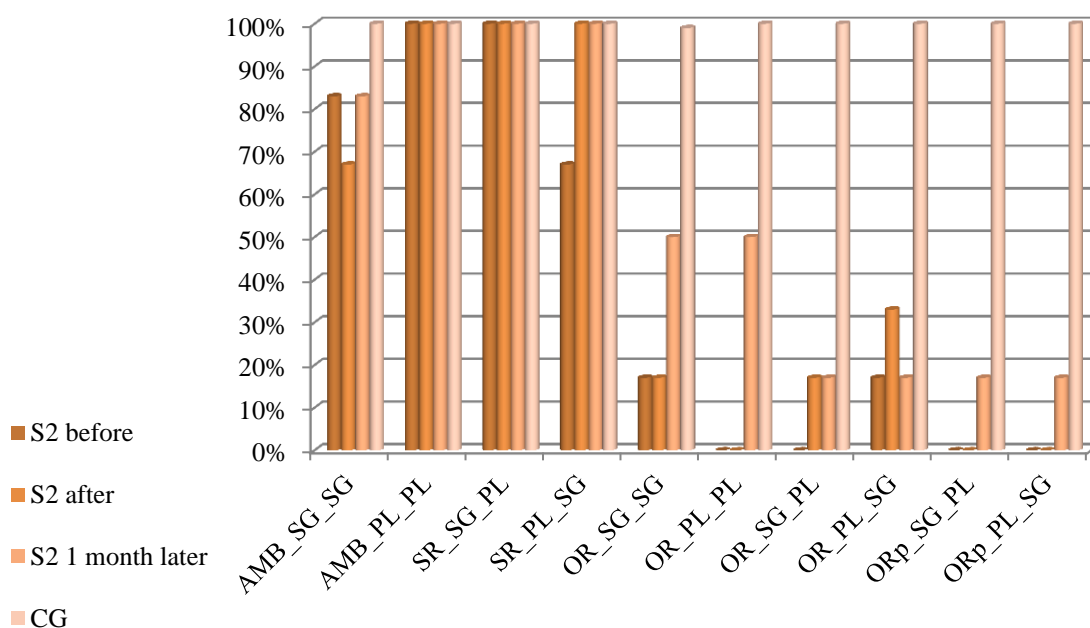
In pointing to the wrong referent, S2 chose the agent character 74%, while the reversible and other errors that decreased in the second assessment augmented in the third (0% vs 15% and 6% vs 11% respectively).

Table 33. % of types of errors S2 did the first, the second and the third time he was assessed on the comprehension of relative clauses.

	Before	After	1 month later
Agent	42%	94%	74%
Reversible	39%	0%	15%
Other	16%	6%	11%
Mean of errors	**62%**	**57%**	**45%**

The production of relative clauses. One month after the end of the linguistic treatment S2 still had 88% of accuracy in the production of relative clauses, with ORCs more accurate than SRCs (92% vs 83%). Albeit one could think that this is a sign of decrease in respect to 96% of the test administered right after the sessions, the errors S2 made goes against this conjecture. Actually the subject produced two ORCs when SRCs were targeted, and one SRC instead of the target ORC. Moreover, among the target ORCs 25% object relative clauses with a post-verbal subject were found.

Table 34 illustrates the % of target relative clauses produced by S2 the three times he was tested.

	Before	After	1 month later
SR	17%	92%	83%
OR	17%	100%	92%
Mean of accuracy	**17%**	**96%**	**88%**

The relative clauses produced by S2 are attached in Appendix E.

5.3.4 Discussion of results

By analysing the data from the two assessments after the end of the linguistic rehabilitation period, a complex frame emerged.

The skills of S2 in the comprehension of passive clauses seem not to have been influenced by the linguistic treatment period. The accuracy before and right after the treatment was 83% and 82% respectively, and a month later was 78%. The comprehension of passive clauses with non-actional verb remains below chance level, and none of the other conditions was at ceiling, contrary to what is expected by an individual of his age. S2 still experiences a particular difficulty in interpreting the non-actional verbs '*sentire*' 'to hear' and '*annusare*' 'to smell', and the errors were equally divided between the agent and the reversed role (50% and 50%). But S2 clearly improved in the production of these structures: if before being treated he did not produced passive clauses at all, the last time he was assessed he reached 42% of correctly built constructions, but, again, the majority involved actional verbs and only 8% contained non-actional. In recurring mainly to active SVO clauses instead of the wished passive clauses, S2 had the same preference showed by 3 to 6 year old children of Volpato, Verin & Cardinaletti (2014), but also CG tended to produce active clauses replacing the non-actional '*sentire*' 'to hear' with an actional, and this put in evidence that non-actional verbs are more difficult not only for S2 but also for normal hearing adults.

The 100% presence of the by-phrase in compulsory situations indicates that it is not an obstacle in the production of passive (*contra* Fox & Grodzinsky 1998), and consequently the deficit has to be searched elsewhere: it might be due to the form of test, since it is hard to represent in a fixed picture a non-actional verb, or to a particular arduousness that S2 faces in interpreting non-actional verbs. We propose that the two possibilities may co-occur and exercise mutual influence. Another possible factor that could have influenced the performance of S2, both in production and in comprehension, is the fact that passive clauses are not frequently present in the spoken language, with which S2 might get in contact through lip

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reading, and that the written language, in which the passive often recurs, can be really hard for deaf people to interpret.

As far as the improvement detected in the production of passive clauses is concerned, we suggest that it can be considered a reflection of the work we did with S2 on the thematic theory and not a syntactic generalization of the sessions devoted to the movement: first of all, S2 did comprehend 83% of passive clauses even before the linguistic therapy, and this indicates that he can interpret passive structures, even though not at ceiling like normal hearing adults of CG. Secondly, 100% of the passive constructions generated by S2 one month after the linguistic sessions was built with '*venire*' auxiliary, and this unambiguously means that he treated them as eventive passives. Thirdly, he always showed difficulties in dealing with non-actional verbs, both in comprehension and in production tests: this can account for the lower accuracy in comprehension, and at the same time it is confirmed in the production, where enhancements were apparent with actional but not with non-actional verbs. Therefore we claim that S2 showed a syntactic competence similar to the hearing impaired adolescents of Bertone et al. (2011), and that thanks to the linguistic treatment an improvement was detected in his production of passive constructions.

By comparing the means of accuracy in comprehension of relative clauses, a slight but continuous growing trend clearly arises: before the treatment S2 correctly answered to the provided stimuli in 38% of the cases, right after the treatment 43% and one month later 55%. Albeit his performance is still poor if compared to chronological peers and he remained below chance level in 7 out of 10 sentence types, attention has to be payed to the fact that in the final assessment 33% of object relative with centre-embedded subject (8 out of 24) and 17% of ORCs with post-verbal subject (2 out of 12) were correctly comprehended, while the first time we tested him only 8% of ORCs with centre-embedded subject (2 out of 24) and none ORCs with post-verbal subject were comprehended. Therefore the asymmetry between subject and object relative clauses appears less sharp. Nonetheless, the great difficulty S2 experiences in interpreting ORCs puts in evidence the results of an atypical language development process, since Italian typically developing children usually completely master these constructions by age 10-11 (Utzeri 2007; Arosio, Adani & Guasti 2009; Volpato 2012; Contemori & Belletti 2013 a.o.).

S2 performed above chance level in ambiguous relative clauses with plural match of the DPs, and in subject relatives with DPs in number mismatch conditions. On the one hand, these findings confirm the subject/object asymmetry, where SRCs are easier to process than ORCs

(see §3.2, §3.3); on the other hand it comes out that neither match nor mismatch of number features of the DPs in the relative clauses seemed to facilitate or hamper the comprehension process.

The positive outcomes of the session focused on the thematic theory clearly emerge when we look at the errors of S2. While before the linguistic sessions he made a lot of mistakes pointing to the agent, the reversible and the other character, 74% of errors were only of agent type the second time he was tested after the treatment. This suggests that, albeit he chose the wrong target item, he correctly understood who was doing the action in the provided items.

The results from the elicitation tasks conducted right after and one month after the end of the linguistic treatment arose an unusual asymmetry between comprehension and production, where the latter registered higher percentages of improvement than the former. S2 mean of accuracy was 96% the first time he was tested after the sessions and 88% the second, and these percentages are extremely high if compared to 17% of the subject when we met him for the first time. He did not reach 100% of accuracy because in some cases he produced SRCs when the target were ORCs, and ORCs when SRCs were targeted. But in both assessments he actually produced only relative clauses, and the asymmetry between subject and object relatives was unusually in favor of the latter. The asymmetry between production and comprehension, where the former scored higher means of accuracy, is unexpected if we look at the findings of studies reported in 3.2 and 3.3, but it enters a long-lasting debate on what does occur first in language acquisition, comprehension or production. And if the researches on relative clauses in 3.2 and 3.3 claimed in favour of comprehension even in atypical language acquisition (Contemori & Garraffa 2010 for SLI children), Håkansson & Hansson (2000) found a different pattern in which production of RCs precedes the comprehension, and the same order of development emerged in Hendriks & Koster (2010), who investigated the acquisition of object pronouns and SVO order. Hendriks & Koster gave four possible explanation for the asymmetries between production and comprehension: they can stem (i) from some properties of the task used, (ii) from insufficient processing resources or immature cognitive abilities, they can result from (iii) a particular deficit in the pragmatic knowledge or it can be due to (iv) some specific properties of the grammar of the language in case. As far as S2 is concerned, an asymmetry between comprehension and production, where results from the latter are higher than in the former, was found both in passive and in relative clauses. We think that the shape of the test can have played a role in determining this asymmetry: in the comprehension task the subject is expected to correctly answer to a great number of items with a complex underlying structure and many of them resemble each other.

He has to do a great effort because he has to read the sentence, look at the pictures representing two or more opposite scenarios, keeping in mind the clause of the item in question, and then he has to decide which is the correct answer. And this process has to be repeated for each of the 60 items of the task on the relative clauses and 40 of the test on the passive. On the other side he may find the production task less demanding because he is not given an already done sentence to interpret, but he has to build it by himself and he can control each step of the structure generation.

To summarize, this attempt of linguistic rehabilitation had a positive impact on the language competence of S2, in particular in relative clauses, the main object of the treatment, but enhancements have been found in passive clauses too as a consequence, we suppose, of the explicit teaching of the thematic theory. Furthermore, the positive influence of the linguistic sessions emerges also from the fact that the percentages of errors, ungrammatical sentences, and strategies not usually adopted by normal hearing individuals conspicuously decreased in S2's performance.

Conclusions

The aim of the present study was to conduct a linguistic intervention on an adult deaf LIS signer in order to verify (i) whether it could be effective on this kind of participant, (ii) whether generalization effects from relative to passive clauses take place, (iii) and to assess whether the potential improvements are still visible one month after the rehabilitative sessions.

Since the individual involved in the study was deaf, in chapter 1 the question of the typical and atypical language development was discussed, in order to highlight the problems hearing impaired people have in acquiring the language, especially when they are not given a proper linguistic input. Actually an environment rich in linguistic material is the key for the language to develop normally. Indeed, if deaf children grow surrounded by sign language input they will experience no language delay since the linguistic material of a sign language activate the same cerebral areas of oral languages (Iverson & Thelen 1999; Petitto et al. 2000; Petitto et al. 2004; Mayberry et al. 2011). But the deaf population is not homogeneous because of the many and different variables that can intervene in the language acquisition process (Grosselle 2008; Bertone & Volpato 2012), and these factors may influence the language competence reached by deaf people. The results of scarce and/or not proper contact with language are visible from some peculiarities that deaf productions have and that were reported in many studies (Caselli et al. 1994; Ajello et al. 2002; Chesi 2006, a.o.). Since it is well known that hearing impaired individuals usually have difficulty with Italian subordinate clauses, in particular with passive and relative clauses, we decided to investigate the competence of two adult deaf LIS signers in these constructions. But before testing, passive and relative structures, in chapter 2 and 3 respectively, were described in detail.

In passive sentences, according to the Smuggling Hypothesis proposed by Collins (2005), the DP internal argument of the VP can overtake another DP, the external argument, only it rises to the IP together with the VP. This kind of movement is called A-movement. In the tree structure of passive clauses the agent of the action, namely the external argument, is introduced by the preposition by/from that is set in the VoiceP. Messenger, Branigan & McLean (2001) and Bencini & Valian (2008) demonstrated that 3 and 4 years old English-speaking children have a syntactic representation for verbal passive clauses, and results from Italian agree with these data both in comprehension (Manetti 2013; Volpato, Verin &

Cardinaletti 2015) and in production (Volpato, Verin & Cardinaletti 2014, 2015). Volpato et al. (2013, 2015) investigated the comprehension of passive clauses in typically developing children, and she found that passive constructions with non-actional verbs are comprehended later than those with actional, and this may depend also on the difficulty in representing them properly. Moreover, results from Manetti (2012) and Belletti & Guasti (2015) revealed that children's difficulty with passives cannot lie in the presence of the by-phrase because they understood both long and short passive clauses. As far as the production of the passive is concerned, some components of it seem to be available from the early age of 3 (Volpato, Verin & Cardinaletti 2014), and until they do not completely handle them they prefer to generate SVO clauses, which sometimes contain an object pronoun too. SVO sentences with clitic pronouns are more frequently used in the colloquial language than the passives, and consequently this strategy is adequate to the context, while simple SVO clauses without clitics are not. Nevertheless, SVO clauses are produced by adults too, even though only when the non-actional verb '*sentire*' was proposed, but this indicates that if a structure is not elicited in the task it does not necessarily means that the participants cannot produce it.

The information we have about the acquisition of passive clauses by hearing impaired individuals is not so much, but all the data collected revealed that the passive constructions are usually seriously impaired in this population, and the fact that deaf adolescents and adults show the same competence of very young normally developing children witnesses this difficulty (Volpato, Verin & Cardinaletti 2014, 2015). When they are supposed to produce passive clauses, they instead adopt the SVO strategy, and this makes them similar to the hearing populations, suggesting that they both follow a common language acquisition pattern.

Cross-linguistic studies, as well as studies on Italian, repeatedly found an asymmetry between subject and object relative clauses, and it can be explained in terms of the Relativized Minimality principle (Rizzi 1990, 2004): the latter have a more complex syntactic structure than the former because the DP head of the relative clause is moved to the beginning of the sentence, and in raising to the CP node it crosses the lexical subject, which intervenes in the relation between the relative head and the gap in its original position. This procedure, which generates a non-canonical word order, implies a major effort for the working memory in respect to SRCs. Moreover, according to the Minimal Chain principle (De Vincenzi 1991) the movement of the relative head is shorter in the SRCs than in ORCs, and the latter are consequently more complex to compute (and even more complex when the subject is in post-verbal position). But a part from all these observations, a stricter version of the Relativized

Minimality principle seems to be active in early childhood: the featural specification of the NP relative head and of the lexical subject have to be disjoint, otherwise the relation between the trace and the moved DP cannot take place, because the weaker computational system of the child is not ready to distinguish the features of the first NP from those of the second, and this fact creates lexical restriction (Friedmann, Belletti & Rizzi 2009). Volpato (2012) and Bentea, Durrelman & Rizzi (2016) demonstrated that features associated to the NP can provoke or reduce the lexical restriction effect, and, consequently, decrease or increase the accuracy of typically developing children. All this considerations are valid for deaf individuals too, who better perform in SRCs than ORCs, but the number featural mismatch that helps normal hearing children has not the same positive effect for the hearing impaired (Volpato 2012), and this fact can be read as a consequence of their morpohsyntactic fragility.

There is a paucity of data regarding the syntactic competence that deaf adults have in Italian language, therefore in this work we could not compare our results to a great number of hearing impaired individuals. Two adults deaf LIS signer participated to this research: they were tested on the comprehension and production of passive and relative clauses and their performance was compared to a control group of normal hearing Italian-speaking adults. Our expectation was that both the deaf subjects would have scored poorly, but actually only one of them did. S1 performed at ceiling in the comprehension of passive clauses and got high percentages of accuracy in comprehension and production of relative clauses, resembling the control group; he did not performed like the CG in the production of passive sentences, but his low scores can be a consequence of the task's format and of the fact that passive structures are not so common in Italian. On the other hand the data analysis showed that S2's syntactic abilities were seriously impaired, therefore the linguistic treatment was planned only for him.

The linguistic intervention was divided into seven sessions, and the purpose was to rehabilitate the relative clauses and to verify whether enhancements occurred in passive clauses too for a generalization effect. Moreover, even in teaching the relative clause structure explicitly, we did not directly touch ORCs with post-verbal subject in order to ascertain whether S2 could do it on his own, after having been taught of this possibility in simple sentences. S2 was tested twice after the linguistic sessions: once right after the end of the treatment and the second time one month later. The data collected the first time gave a positive feedback of the treatment period: despite the mean of accuracy in the comprehension of passive clauses stayed unvaried, mild improvements were detected in the production task. The second time we tested S2 on the passive, the percentage of accuracy in comprehension

slightly decreased, while the correct production of passive clauses increased. Difficulties emerged especially with non-actional verbs, like Volpato et al. (2013) and Cardinaletti & Volpato (2015) found, but the correct answers to items containing the by-phrase and the production of sentences including it demonstrated that the source of the deficit in the passive is not in the presence of the by-phrase (*contra* Fox & Grodzinsky 1998).

Considerable improvements occurred mainly in relative clauses production, while they were slighter in comprehension, which was still far from being comparable to the CG. In both the assessments clearly emerged the well-known asymmetry between subject and object relative clauses, where the former were better comprehended than the latter. The same asymmetry apparently took place in production too, but if we analyse the non-target answers, we see that in 100% of the cases S2 generated relative clauses: in some occasions he produced ORCs instead of SRCs and vice versa. The first time S2 was tested after the linguistic sessions he even produced some ORCs with post-verbal subject, and this fact demonstrates the validity of a treatment focused on the rehabilitation of the syntactic movement (Thompson & Shapiro 1994; Ebbels & van der Lely 2001; Levi & Friedmann 2009; D'Ortenzio 2014).

An asymmetry between comprehension and production, where the first was less accurate than the latter, emerged in both the assessments after the linguistic intervention. This kind of asymmetry was never found, as far as we know, in deaf individuals, but others studies witnessed to this phenomenon (Håkansson & Hansson 2000; Hendriks & Koster 2010). Following Hendriks & Koster (2010) we claim that it can be explained with the complexity of the comprehension tasks, which requires to stay concentrated for a long time on a great number of difficult and similar one to the other items.

Going back to our goals, after this investigation we can affirm that: (i) a linguistic treatment can have positive effects also on adult deaf subjects whose mother tongue is a signed language; (ii) after the intervention improvements took place and they were maintained one month later; (iii) the findings show that enhancements took place both in relative and passive clauses, even though we believe that the improvements in the latter structures occurred as a consequence of the work we did together with S2 on the thematic theory. It is noteworthy also the fact that after the rehabilitative sessions S2 made fewer mistakes in the conjugation of the verbs and produced fewer ungrammatical sentences in respect to his performance before the treatment.

These findings indicate that the language input in the first steps of the acquisition process is fundamental for the language knowledge and skills to properly develop, and at the same time

they show that it is possible to recover, at least partially, syntactic abilities even in adulthood. It would be interesting to investigate whether such a treatment can have positive effects on other structures involving A-bar movement, such as *wh-* interrogative clauses, and whether it can be effective in other linguistic domains, too.

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Appendix A

Answers that S1 and S2 gave in the test of production of passive clauses.

S1

1. Marco è stato spinto da Sara.
2. Marco apre la bocca.
3. Marco è per terra e tranquillo.
4. La mamma riceve un calcio da Sara.
5. Sara è stata colpita.
6. Sara dice qualcosa a Marco.
7. Marco riceverà un bacio.
8. Il papà in ghioccio è stato abbracciato da Sara.
9. La mamma non cade.
10. Sara scappa.
11. Sara è felice.
12. Sara è stata scoperta.
13. Marco cerca di difendersi.
14. Marco grida.
15. Il papà dice segretamente a Marco.
16. Sara mangia.
17. Sara sorride.
18. Marco non vuole farsi vedere dal papà.
19. /
20. Il pesce è in mano di Marco.
21. Sara è stata calciata.
22. Il papà prova a dire una cosa a Marco.
23. La mamma si stufa.
24. Sara porta il pesce.

S2

1- Nella prima foto Sara sembra non spinge Marco.
2- Sara da mangiare a Marco che sembra non aver fame.
3- Marco è tranquillo. L'altra appare Marco pensieroso.
4- Mamma sembra al corrente di ricevere felice un calcio nel suo c***!
5- Sara è contenta di ricevere una botta da suo padre ma sa che si tratta di un bastone giocattolo.
6- Sara dice qualcosa al suo fratello Marco tramite il megafono.
7- Marco sorride nel riceve il bacio da Sara.
8- Papà sta allungando la sua braccia per non farsi cadere.
9- Mamma regge alla spinta di Marco.
10- Sara sembra fermarsi.
11- Marco sorridente abbraccia Sara.
12- Sara sta guardando incolume.

13- Marco sembra divertente nel ricevere un colpo di testa da Sara.

14- Marco dice qualcosa a suo padre con il megafono.

15- Papà dice qualcosa a Marco con il megafono.

16- Sara sta abboccando qualcosa di amaro.

17- Sara sorride nel riceve un bacio da Marco.

18- Papà guarda/controlla se Marco è calvo o no.

19- Papà sembra non aver problemi a ricevere un abbraccio da Sara.

20- Sara chiude il suo naso con le dita della sua mano: sentiva puzza di pesce che tiene Marco.

21- A Sara fa più male il calcio della madre perché le scarpe sono appuntite!

22- Papà sta dicendo qualcosa a suo figlio.

23- Sara sa che mamma non può cadere.

24- Sara sembra tranquilla nel sentire puzza di pesce.

Appendix B

Answers that S1 and S2 gave in the test of production of relative clauses.

S1

Answers given when subject relative clauses were expected:
1- Mi piace di più il bambino che pentina la mamma.
2- Mi piacciono di più i bimbi che inseguono le api.
3- Mi piace di più il bimbo che insegue il gatto.
4- Mi piace di più il bambino che guarda la zebra.
5- Mi piacciono di più i bimbi che guardano i cavalli.
6- Mi piacciono di più i bambini che salutano i papà.
7- Mi piacciono di più i bimbi che tirano le mucche.
8- Mi piace di più il bimbo che bacia la bimba.
9- Mi piace di più il bambino che rincorre il cane.
10- Mi piacciono di più i bimbi che lavano il cane.
11- Mi piace di più il bambino che è guardato.
12- Mi piacciono di più i bambini che accarezzano il gatto.

Answers given when object relative clauses were expected:
1- Mi piacciono di più i bambini che sono baciati dai loro nonni.
2- Mi piace di più il bambino che è coccolato da orso.
3- Mi piace di più il bimbo che è pentinato da suo papà.
4- Mi piace di più la bambina che è baciata da sua mamma.
5- Mi piace di più il bambino che è stato visitato.
6- Mi piacciono di più i bambini che sono premiati da loro maestra.
7- Mi piace di più il bambino che è inseguito da cane.
8- Mi piacciono di più i bambini che sono salutati da i vigili.
9- Mi piacciono di più i bambini che tirano i leoni.
10- Mi piace di più il bambino che è lavato.
11- Mi piace di più il bambino che è baciato.
12- Mi piacciono di più i bambini che sono inseguiti.

S2

Answers given when subject relative clauses were expected:
1- Mi piace il bambino che pettina un cane.
2- Un bambino cattura le farfalle.
3- Mi piace un bambino che rincorre il gatto.
4- Mi piace un bambino guardare una zebra.
5- Mi piace due bambini vedere i due cavalli.
6- Mi piacciono i bambini salutare un papà.
7- Mi piacciono i bambini tirare le vacche.
8- Mi piace il bambino baciare la bambina.

9- Mi piace un bambino inseguire un cane.
10- Mi piacciono i bambini lavare un cane.
11- Mi piace un bambino vedere un elefante.
12- Mi piacciono i bambini accarezzare un gatto.

Answers given when object relative clauses were expected:
1- Nonni danno un bacio ai nipoti.
2- Mi piace un orso accarezzare un bambino.
3- Mi piace un barbiere pettinare una bambina.
4- Mi piace la mamma dare un bacio al bambino.
5- Mi piace il bambino salutare il dottore.
6- Mi piace vedere i bambini ricevere le premiazioni dall'insegnante.
7- Mi piace il bambino inseguito da un cane.
8- Mi piacciono i vigili salutare i bambini.
9- Mi piacciono i bambini tirare i leoni.
10- Mi piace il papà lavare il bambino.
11- Mi piace il bambino che riceve il bacio dal padre.
12- Mi piacciono i bambini inseguiti da un cane.

Appendix C

Material used during the linguistic intervention.

First linguistic session

<u>SVO sentences formed by S2</u>

- Un amico mostra una regola al gatto
- La segretaria aiuta un carabiniere
- La bambina bacia un gatto
- Un bambino dorme in macchina
- Una giornalista fotografa il piatto
- Un attore cade sul pavimento
- Un professore insegna musica
- Un barista dimentica /di regalare/ una bottiglia
- Un impiegato pulisce la macchina da scrivere

<u>Sentences given to S2: the subject had to judge if they were correct or wrong; S2 was asked to correct the mistakes he found.</u>
The words were crossed when their presence in the sentence was erroneous; the words in capitals are those that S2 added in order to obtain well-formed sentences; the brackets indicate that something in the clause is missing. The sentences were not modified when considered correct by S2.

- Mi piace bere ~~con~~ acqua ghiacciata.
- La sera esco CON gli amici.
- Lucia ama mangiare ~~ai~~ dolci.
- Ilaria studia lettere antiche all'università di Bologna.
- La mia amica telefona ~~della~~ ALLA nonna.
- I bambini dicono alla mamma (COSA?).
- Marco chiede un consiglio a Gianni.
- Il giornalista scrive ~~per~~ le notizie.
- Maria ha litigato con Paolo.
- Il fotografo rincorre. (…?...)

Second linguistic session

Sentences produced by S2: only the conjugated verbs were given, and the subject was required to fill the gaps (the words written by S2 are here reported in italic font). The first four sentences gave the cue of the number of arguments required by the verbs, while the second part of the exercise did not.

- *__Il turista_____* viaggia
- *_Due persone___* lavano *_la macchina/il topo/le bambine___*
- *_Le nonne__* regalano *_i dolci__* *_ai nipoti__*
- *_Il postino__* porta *_una lettera__*

- *Gli studenti* mangiano *i panini.*
- *L'amico* sporca *il tappeto/l'amica.*
- *Il bambino* dorme (in bus).
- *I carabinieri* abbracciano *i cani/i ladri.*

Third linguistic session

SVO sentences (from the second session) turned into subject relative clauses by S2.

- Mi piace il turista che viaggia.
- Mi piacciono due persone che lavano le bambine.
- Mi piacciono le nonne che regalano i dolci ai nipoti.
- Mi piace il postino che porta una lettera.
- Mi piacciono gli studenti che mangiano i panini.
- Mi piace l'amico che sporca l'amica.
- Mi piace il bambino che dorme.
- Mi piacciono i carabinieri che abbracciano i ladri.

S2 was given a list of verbs: he had to write SVO sentences and then to transform them into SRCs.

Verbs from the test on relative clauses: LAVARE (to wash), INSEGUIRE (to chase), FERMARE (to stop), SPINGERE (to push), TIRARE (to pull), SALUTARE (to greet), GUARDARE (to look), SPORCARE (to dirty).

New verbs: ROMPERE (to break), ACCOMPAGNARE (to accompany), INCONTRARE (to meet), ASCIUGARE (to dry), SPAVENTARE (to scare), INVITARE (to invite), APPLAUDIRE (to clap), CHIAMARE (to call).

- (SVO) Luisa lava la tovaglia. → Mi piace Luisa che lava la tovaglia. (Appositive relative)
- (SVO) Il figlio rompe una tazza. → Mi piace il figlio che rompe una tazza.
- (SVO) La fidanzata insegue il nonno. → Mi piace la fidanzata che insegue il nonno.
- (SVO) La gatta accompagna i suoi tre gattini. → Mi piace la gatta che accompagna i suoi tre gattini.
- (SVO) I cani fermano un ladro. → Mi piacciono i cani che fermano un ladro.
- (SVO) I preti incontrano le suore. → Mi piacciono i preti che incontrano le suore.
- (SVO) I nipoti guardano i cartoni alla TV. → Mi piacciono i nipoti che guardano i cartoni alla TV.
- (SVO) Le sorelle chiamano la loro mamma. → Mi piacciono le sorelle che chiamano la loro mamma.
- (SVO) Il nemico spinge il prigioniero in galera. → Mi piace il nemico che spinge il prigioniero in galera.
- (SVO) Maria asciuga il volto di Gesù. → Mi piace Maria che asciuga il volto di Gesù. (Appositive relative)
- (SVO) Il parroco tira le corde delle campane. → Mi piace il parroco che tira le corde delle campane.
- (SVO) Il flash di una foto spaventa il gatto. → Mi piace Il flash di una foto che spaventa il gatto.
- (SVO) Il Chievo saluta la capolista. → Mi piace il Chievo che saluta la capolista. (Appositive relative)
- (SVO) La Juventus invita gli ex rifugiati al suo stadio. → Mi piace la Juventus che invita gli ex rifugiati al suo stadio. (Appositive relative)
- (SVO) Il pubblico applaude il clown. → Mi piace il pubblico che applaude il clown.
- (SVO) Il maiale sporca il pavimento. → Mi piace il maiale che sporca il pavimento.

Forth linguistic session

SVO sentences from the second session were turned, when possible, into ORCs.

- Il turista viaggia → impossibile
- Mi piacciono le bambine che le due persone lavano.
- Mi piacciono i dolci che le nonne regalano ai nipoti.
- Mi piace una lettera che il postino porta.
- Mi piacciono i panini che gli studenti mangiano.
- Mi piace l'amica che l'amico sporca.
- Il bambino dorme → impossibile
- Mi piacciono i ladri che i carabinieri abbracciano.

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S2 was given the same list of verbs of the third session. He had to write SVO sentences and then to transform them into ORCs.

- (SVO) Il soldato lava le scarpe. → Mi piace le scarpe che il soldato lava.
- (SVO) Il tifoso rompe la bandiera. → Mi piace la bandiera che il tifoso rompe.
- (SVO) I pulcini inseguono il gatto. → Mi piace il gatto che inseguono i pulcini.
- (SVO) Le suore accompagnano gli scolari. → Mi piacciono gli scolari che le suore accompagnano.
- (SVO) Il vigile ferma la moto. → Mi piace la moto che il vigile ferma.
- (SVO) La volpe incontra il lupo. → Mi piace il lupo che la volpe incontra.
- (SVO) Le formiche guardano la TV. → Mi piace la TV che le formiche guardano.
- (SVO) L'anziana chiama i pompieri. → Mi piacciono i pompieri che l'anziana chiama.
- (SVO) La mamma spinge il figlio. → Mi piace il figlio che la mamma spinge.
- (SVO) Il nonno asciuga il nipote. → Mi piace il nipote che il nonno asciuga.
- (SVO) Il calciatore tira la corda. → Mi piace la corda che il calciatore tira.
- (SVO) L'angelo spaventa il diavolo. → Mi piace il diavolo che spaventa l'angelo.
- (SVO) Il dottore saluta i pazienti. → Mi piacciono i pazienti che il dottore saluta.
- (SVO) Il sindaco invita il capo cantiere. → Mi piace il capo cantiere che il sindaco invita.
- (SVO) I fedeli applaudono il vescovo. → Mi piace il vescovo che i fedeli applaudiscono.
- (SVO) Il cane sporca la macchina. → Mi piace la macchina che il cane sporca.

Fifth linguistic sessions

Text used to review the SVO order, the verbal argument structure and the thematic theory.

L' Inverno e la Primavera (Esopo) - versione adattata
The Winter and the Spring (Aesop) – adapted version

Un giorno il *signor Inverno* si trovò faccia a faccia con la giovane *signorina Primavera*. L'anziana stagione, con aria sapiente disse: "Mia cara amica, tu non sai essere decisa. Quando giunge il tuo periodo annuale, le persone e gli animali ne approfittano per precipitarsi fuori dalle loro case o dalle loro tane e si riversano nei prati che tu hai fatto fiorire. Essi strappano gli arbusti, calpestano senza pietà l'erba e assorbono quel sole splendente che diventa più caldo col tuo arrivo. I tuoi frutti vengono raccolti e divorati e infine, tutto il baccano che fanno non ti permette neppure di riposare in pace. Invece io incuto timore con le nebbie, il freddo e il gelo. La gente si chiude in casa e per paura del brutto tempo e così mi lascia riposare tranquillo".
La bella Primavera, colpita da quelle parole, rispose: "Il mio arrivo è desiderato da tutti e le persone mi amano. Tu non puoi nemmeno immaginare cosa significa essere apprezzati. È una sensazione bellissima che tu non hai mai provato, perché con il freddo che porti al tuo arrivo

anche i cuori più caldi si gelano". L'inverno non disse più niente e si fermò a riflettere. Forse essere ammirati ed amati dagli altri poteva anche essere una bella sensazione.

Sixth linguistic sessions

Turn each of the SVO sentences into subject and object relative clauses.

1- Il signor Inverno trovò la signorina Primavera.
   (SR) Mi piace il signor Inverno che trovò la signorina Primavera.
   (OR) Mi piace la signorina Primavera che il signor Inverno trovò.

2- Le persone e gli animali strappano gli arbusti.
   (SR) Mi piacciono le persone e gli animali che strappano gli arbusti.
   (OR) Mi piacciono gli arbusti che le persone e gli animali strappano.

3- Le persone e gli animali calpestano l'erba.
   (SR) Mi piacciono le persone e gli animali che calpestano l'erba.
   (OR) Mi piace l'erba che le persone e gli animali calpestano.

4- Le persone amano la primavera.
   (SR) Mi piacciono le persone che amano la primavera.
   (OR) Mi piace la primavera che le persone amano.

5- L'inverno porta il freddo.
   (SR) Mi piace l'inverno che porta il freddo.
   (OR) Mi piace il freddo che porta l'inverno.

Turn the relative clauses into simple SVO sentences.

Relative clauses	SVO clauses

S_Sing_Sing   La polizia che insegue le macchine. → La polizia insegue le macchine.
S_Sing_Sing   Il turista che ferma un vigile. → Un vigile ferma il turista.
S_Sing_Plur   La segretaria che chiama i clienti. → La segretaria chiama i clienti.
S_Sing_Plur   Il ragazzo che spaventa gli animali. → Il ragazzo spaventa gli animali
S_Plur_Sing   I nipoti che guardano il film. → I nipoti guardano il film.
S_ Plur_Sing   I clienti che salutano il panettiere. → I clienti salutano il panettiere.
S_Plur_Plur   Le mamme che accompagnano i figli. → Le mamme accompagnano i figli.
S_Plur_Plur   Le zie che invitano i nonni. → Le zie invitano i nonni.
O_Sing_Sing   La camicia che Anna lava. → Anna lava la camicia.
O_Sing_Sing   La tazza che la cugina rompe. → La cugina rompe la tazza.
O_Sing_Plur   La studentessa che i professori incontrano. → I professori incontrano la studentessa.

O_Sing_Plur   Il carro che tirano le mucche. → Le mucche tirano il carro.
O_Plur_Sing   Le nipoti che la nonna asciuga. → La nonna asciuga le nipoti.
O_Plur_Sing   Gli stivali che il contadino sporca. → Il contadino sporca gli stivali.
O_Plur_Plur   I carrelli che le ragazze spingono. → Le ragazze spingono i carrelli.
O_Plur_Plur   Gli attori che gli spettatori applaudono. → Gli spettatori applaudono gli attori.

Seventh linguistic sessions

Text used to review the SVO order, the verbal argument structure and the thematic theory.

Il lupo e il pastore (Esopo)- versione adattata
The wolf and the shepherd (Aesop)- adapted version

Un lupo seguiva un gregge di pecore, ma senza attaccarle. All'inizio il pastore guardava il lupo come un nemico e lo controllava. Ma il lupo continuava a seguire le pecore, e non provava a rubarle, così il pastore si convinse che il lupo era suo amico. Un giorno il pastore fu chiamato in città e decise di lasciare le pecore in custodia al lupo che sembrava buono. Ma il lupo approfittò dell'occasione: si lanciò sul gregge e uccise le pecore. Poi il pastore ritornò, vide le pecore che il lupo aveva ucciso e pensò: - Sono uno sciocco! Non dovevo lasciare al lupo le pecore che amavo tanto!

Allo stesso modo, le persone perdono le cose che danno agli uomini malvagi.

Appendix D

Answers that S2 gave in the test of production of passive and relative clauses the first time he was assessed after the linguistic treatment.

Passive clauses

1. Marco viene spinto da Sara.
2. Marco riceve il cibo da Sara.
3. Marco che Sara lo guarda.
4. Alla mamma riceve calci da Sara.
5. Sara sta ricevendo un colpo alla testa da suo papà.
6. Sara sta urlando a Marco.
7. Marco sta ricevendo un bacio da Sara.
8. Sara vorrebbe abbracciare suo papà.
9. La mamma sta ricevendo una spinta.
10. Sara sta correndo.
11. Sara è amata da Marco.
12. Sara viene osservata da Marco.
13. Marco teme di ricevere un colpo da Sara.
14. Marco urla a suo padre.
15. Papà urla a Marco.
16. Sara sta imboccando qualcosa.
17. Sara sta ricevendo un bacio da Marco.
18. Marco è seduto su un pavimento.
19. Il papà è abbracciato da Sara.
20. Marco tiene un pesce.
21. Sara sta ricevendo un calcio da sua madre.
22. Papà dice qualcosa a Marco.
23. Mamma è inseguita da Sara.
24. Sara fa annusare un pesce a Marco.

Relative clauses

1. Mi piace il bambino che pettina i capelli della (sua) mamma.
2. Mi piacciono i bambini che i cani baciano.
3. Mi piacciono i bambini che inseguono le farfalle.
4. Mi piace il bambino che rincorre il gatto.
5. Mi piace il bambino che l'orso accarezza.
6. Mi piacciono i bambini che il barbiere pettina.
7. Mi piace il bambino che bacia la mamma.
8. Mi piace il bambino che guarda la zebra.
9. Mi piace il bambino che saluta il dottore.

10. Mi piacciono i bambini che guardano i cavalli.
11. Mi piacciono i bambini che la maestra premia.
12. Mi piace il bambino che il cane insegue.
13. Mi piacciono i bambini che salutano un amico.
14. Mi piacciono i bambini che tirano le mucche.
15. Mi piacciono i bambini che i vigili salutano.
16. Mi piace il bambino che bacia la bambina.
17. Mi piacciono i bambini che tirano i leoni.
18. Mi piace il bambino che il padre lava.
19. Mi piace il bambino che rincorre il cane.
20. Mi piace il bambino che il padre bacia.
21. Mi piacciono i bambini che lavano la tigre.
22. Mi piace il bambino che l'elefante guarda.
23. Mi piacciono i bambini che accarezzano il gatto.
24. Mi piacciono i bambini che il cane insegue.

Appendix E

Answers that S2 gave in the test of production of passive and relative clauses the second time he was assessed after the linguistic treatment.

Passive clauses

1. Sara spinge Marco
2. Marco assaggia qualcosa da Sara
3. Marco viene guardato da Sara
4. Mamma riceve i calci da Sara
5. Sara riceve il colpo da papà
6. Sara dice qualcosa a Marco
7. Marco sta ricevendo un bacio da Sara
8. Papà sta ricevendo un abbraccio da Sara
9. Mamma viene spinta da Marco
10. Sara viene inseguita dalla madre
11. Sara viene abbracciata da Marco
12. Sara viene guardata da Marco
13. Marco viene colpito da Sara
14. Marco fa sentire qualcosa a papà
15. Papà dice qualcosa a Marco
16. Sara riceve qualcosa in bocca da Marco
17. Sara riceve un bacio da Marco
18. Marco viene guardato dal papà
19. Papà viene abbracciato da Sara
20. Marco tiene un pesce a Sara
21. Sara viene calciata dalla madre
22. Papà dice qualcosa a Marco
23. Mamma viene inseguita da Sara
24. Sara fa annusare qualcosa a Marco

Relative clauses

1. Mi piace il bambino che pettina il cane
2. Mi piacciono i bambini che baciano i nonni
3. Mi piacciono i bambini che inseguono le farfalle
4. Mi piace un bambino che rincorre un gatto
5. Mi piace un bambino che accarezza un orso
6. Mi piacciono i bambini che il papà pettina
7. Mi piace il bambino che la mamma bacia
8. Mi piace il bambino che la zebra guarda
9. Mi piace il bambino che il dottore visita

10. Mi piacciono i bambini che guardano le scimmie
11. Mi piacciono i bambini che la maestra premia
12. MI piace il bambino che il cane insegue
13. Mi piacciono i bambini che salutano il papà
14. Mi piacciono i bambini che tirano le mucche
15. Mi piacciono i bambini che vigili salutano
16. Mi piace il bambino che bacia il cane
17. Mi piacciono i bambini che tirano i leoni
18. Mi piace il bambino che il papà lava
19. Mi piace il bambino che insegue il cane
20. Mi piace il bambino che il papà bacia
21. Mi piacciono i bambini che lavano il cane
22. Mi piace il bambino che l'elefante guarda
23. Mi piacciono i bambini che accarezzano il gatto
24. Mi piacciono i bambini che inseguono il cane

Abstract

In this study it will be investigated if it is possible to enhance the comprehension and production of relative clauses in an adult deaf LIS (Italian Sign Language) signer through a period of linguistic treatment.

Some studies showed that linguistic rehabilitation gave positive results with aphasic adults (Thompson & Shapiro 1994), with hearing-impaired children fitted with cochlear implant (D'Ortenzio 2014), and with SLI adolescents (Levy & Friedmann 2009) and children (Ebbels & van der Lely 2001).

The aims of this study are to verify if this kind of treatment can be effective also for an Italian deaf adult signer of LIS, if the potential positive effects are maintained for some time after the syntactic treatment, and if improvements occur also in passive clauses.

The data analysis revealed an asymmetry between production and comprehension of relative clauses after the linguistic treatment session, where a considerable improvement had been detected mainly in production. These results suggest that syntactic structures can be rehabilitated, at least partially, even in adult subjects, but the unusual asymmetry between comprehension and production (having the latter improved more than the former) still has to be clarified. The performance on passives comprehension did not changed before and after treating relative clauses, while findings from production will be discussed.

To date this is the first attempt to rehabilitate relative clauses lead on a deaf adult subject.

Резюме

В этой работе исследуется возможность улучшения понимания и оброзования речи придаточных предложений всрослым глухим человеком, носителем ЛИС (Итальянский Язык Жестов) посредством лингвистической терапии.

Ряд исследований показал, что лингвистическая реабилитация дала позитивные результаты у вролых людей с афазией (Томпсон и Шапиро 1994), у ребенка с нарушением слуха, носителем кохлеарного имплантата (Д'Ортенцио 2014), у подростка (Леву и Фредманн 2009) и ребенка (Эббелс и ван дер Лелу 2001) со специфическим расстройством речи.

Цель данной работы – проверить является ли действенной данная модель терапии для взрослого глухого итальянца, носителя ЛИС; сохраняются ли потенциальные позитивные действия через некоторое время после окончании синтаксической терапии, происходят ли улучшения и в предложениях со страдательным залогом.

Анализ данных показал асимметрию между способностью оброзования и понимания придаточных предложений после лингвистических сессий, результатом которых стало значительное улучшение в понимании придаточных предложений, но особенно – в их оброзовании. Эти данные показывают, что можно восстановить, по крайней мере частично, синтаксические структуры даже в всрослых субъектов, но необычная асимметрия в результатов в ползу оброзования речи пока не понятна. Сумма баллов теста, оценивающего понимание предложений со страдательным залогом, не изменилась до и после реабилитации придаточных предложений, а обсудятся результаты, касающиеся способности образования этих предложений.

На сегодняшний день эта работа является первой попыткой восстановить способность образования придаточных предложений в взрослыми глухими людьми.