

Conclusions

The main aim of this work was to investigate the comprehension and production of restrictive right-branching relative clauses by populations with hearing impairment and populations with normal hearing.

The research carried out during my PhD was the first study investigating the syntactic competence of complex sentences in Italian-speaking children with cochlear implants, whose performance was compared with a group of younger hearing children matched on general morphosyntactic abilities (TCGB). In addition, a group of adolescent LIS signers was compared to a group of younger children matched on morphosyntactic abilities and a group of adolescents matched on chronological age. As for the hearing populations, a group of young children was compared to a group of adolescents and a group of adults.

Following much experimental cross-linguistic research on the acquisition of relative clauses in populations with typical and atypical language acquisition, new tools were developed in order to assess comprehension and production of these structures in Italian.

The comprehension task tested different relative clause types: ambiguous sentences, subject relatives, object relatives with preverbal subjects, and object relatives with postverbal subjects. Number features of relative heads and embedded DPs were also manipulated as to obtain 10 different conditions. This task tested many more conditions than previous research, thus succeeding in obtaining a more accurate analysis of the performance of both participants with normal hearing and participants with hearing impairment.

The production task tested subject and object relative clauses in which the relative head and the embedded DP were either in the singular or in the plural, and both referents were animate.

The ability of children with hearing impairment to comprehend relative clauses was found to be significantly lower than that of normal hearing children. Despite the significant difference in performance between the two populations, within-group analyses showed that children with hearing impairment pattern with hearing children as far as the gradient of difficulty of relative clauses is concerned. In both populations, an asymmetry between subject and object relatives was found, replicating previous results on the comprehension of these structures by other typical and atypical populations. Subject relatives were more accurate than object relatives, and object relatives with preverbal subjects were more accurate than object relatives with postverbal subjects. The higher accuracy on subject relatives is explained by the short relationship between the relative head and the site from which it has been extracted. In object relatives with preverbal subjects, the performance of the two groups is qualitatively and quantitatively different, especially as far as the type of incorrect responses is concerned. The source of difficulty was attributed to different reasons. Hearing participants showed higher percentages of correct responses in those conditions in which the DPs were dissimilar in terms of number features (OR_SG_PL and OR_PL_SG) than when the two DPs displayed the same features (OR_SG_SG and OR_PL_PL), and performed significantly better than the group of participants with hearing impairment in the sentence type OR_SG_PL. Sentences containing the Num(ber) projection strongly facilitated hearing children in assigning the correct interpretation. The difficulties found in hearing children with object relatives displaying the same number on both DPs were explained by intervention effects (Friedmann, Belletti, Rizzi 2009). Sentences containing disjoint specification of number features help assigning correct sentence interpretation. In addition, when the embedded subject is plural, the presence of redundancy of information (AGREE + Spec-Head agreement + [+pl(ural)] markedness in the Spec-Head configuration) leads children to the correct selection of target referents.

Whereas marked number features were crucial for normal hearing children, they often failed to be computed by children with hearing impairment. Both attraction phenomena in the sense of Kayne (1989) and failed computation of the plural verbal morpheme explain the performance and the difficulties experienced by participants with hearing impairment.

In the course of (typical) language development, namely at adolescence, the number of correct responses in object relative comprehension increases, although some errors still occur. The structures that are difficult for children are also problematic (to a less extent) for adolescents.

The difficulty that all groups experienced with ORp is explained by the fragile subject-verb agreement occurring with postverbal sub-

jects, which is only based on the AGREE relation, and is not strengthened by Spec-Head agreement (Guasti, Rizzi, 2002; Franck et al. 2006).

The production task was developed following the model proposed by Friedmann and Szterman (2006), in order to force children to produce either a subject or an object relative clause. Interesting results were found by analysing the data from this task.

The asymmetry between subject and object relatives found in the comprehension task was also found in the production task, replicating previous studies on the production of relative clauses by populations with typical and atypical language development.

However, despite the difficulties experienced in the comprehension task with object relatives, both children with normal hearing and children with hearing impairment did produce object relatives. Conversely, neither adolescents nor adults with normal hearing produced any object relative clause.

When object relatives were not produced, all participants adopted different strategies turning the target sentence into a subject relative. The most frequent strategy consisted in the production of passive relatives. Children produced a quite high percentage of passive relatives, but there is a difference between hearing children and children with hearing impairment. Hearing children produced a high percentage of object relatives, as opposed to passive relatives, while children with cochlear implants produced a high number of passive relatives, as opposed to object relatives. Children with cochlear implants adopted the passive strategy which was largely used by older Italian-speaking individuals, namely adolescents and adults (Utzeri 2006; 2007; Carpenedo 2009; Belletti, Contemori 2010). This phenomenon is linked to age. Since children with hearing impairment are older than hearing children, some of them, namely those with a more mature linguistic system and who had reached high levels of linguistic competence, showed a performance comparable to age peers.

The reason for which passive relatives are acquired later than object relatives is related to the fact that they involve subject extraction and the presence of two chains: They are derived through *smuggling* (Collins 2005) and subsequent extraction to perform relativization (Belletti 2009). Object relatives are instead derived through a long movement of the VP-internal object DP to the left-peripheral position. The higher number of object relatives produced by younger children is explained in terms of a preference for the lowest number of steps necessary in the derivation, as opposed to passive relatives, which require more local steps and are therefore produced at a later linguistic developmental stage. The delayed production of passive relatives is also explained by adopting the minimalist theory of Agreement (Chomsky 1995). Following Guasti and Rizzi (2002), I assume that Agreement is more robust when it occurs both under AGREE and in the Spec-Head configuration. The delayed access to

smuggling depends on the fragility of agreement based on AGREE only (Franck et al. 2006).

The most interesting aspect emerging from the analysis of both comprehension and production skills is that, in child grammar, robustness of agreement favours better performance in both tasks.

Comparing production and comprehension of relative clauses, the former seems to precede the latter. Indeed, children produce structures that they sometimes fail to comprehend. This is somewhat surprising, although previous studies showed that the production of relative clauses occurs at an earlier age as opposed to comprehension (Tavakolian 1981; Goodluck, Tavakolian 1982; Crain, McKee, Emiliani 1990). We hypothesize that when producing a sentence, all features are available to the child, and the whole structure is built up step by step. In comprehension, however, children sometimes tend to hypothesize simplified structures. Comprehension may be driven by particular strategies, as for instance interpreting the first DP, i.e. the relative head, as the subject. When encountering the DP in the embedded subject position, reanalysis of the sentence is necessary. This is not always possible for young children (De Vincenzi 1991).

In addition to investigating syntactic competence, the experiment also included different repetition tasks, measuring participants' memory skills. The inclusion of these tasks was necessary in order to verify whether the difficulties experienced in the comprehension task may be attributed to limited memory resources.

That the source of difficulty in the group of typically developing children is different from that in the group of children with cochlear implants is further emphasized by the results obtained from a correlation analysis between memory and comprehension. While for the group of younger participants with normal hearing, working memory appeared to be associated to the computation of all relative clause conditions, for the group of participants with hearing impairment, memory was responsible to a less extent of the computation of these complex syntactic structures. Some memory skills were lower in children with cochlear implants than in children with normal hearing, and, overall, relative clause comprehension correlated with some memory measures in children with cochlear implants. Even though low memory skills may also imply low language skills, the difficulty that children with cochlear implants encounter with (object) relative clauses is to be attributed to a morpho-syntactic deficit (computation of number) associated to hearing impairment.

In conclusion, I hope that the findings of such a detailed research on the syntactic competence and memory skills of children with cochlear implants may not only advance our knowledge but also be useful in defining new rehabilitation strategies.