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Cued Speech and Language Acquisition: With Specifics Related to Grammatical Gender[1]

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It is well known that lipreading or speechreading is a difficult and hazardous task for all deaf people, and all the more so for the small deaf child who has to acquire language from his parents' lips. Words with similar lip images, so-called "invisible" phonemes, and distortions induced by coarticulation are factors which make speechreading on its own unreliable, unfit to allow clear perception of spoken language.

Cued Speech (CS), designed by Cornett in 1967, was adapted to French under the name of Langage Parlé Completé pour les Sourds (LPC). The system is easy to learn and after adequate training can be practiced at a normal speech rate or at least according to a normal speech rhythm, even if the speaker slows the tempo.

Although CS was primarily created as a tool for speech reading, it has become clear that under some conditions it can also act as powerful tool for the language development of the small deaf child. Currently available data show that school children familiar with CS are capable of utilizing it efficiently for spoken language reception and understanding. Studies both in English (Nicholls and Ling, 1982) and French (Périer, Charlier, Hage and Alegría, 1988) have shown that sentences presented with CS are better understood than similar sentences presented without cues.

Effects of CS Practice at School and at Home on the Contribution of CS to the Reception of Spoken Language

The methodology of the experiment reported in the first part of this paper is essentially the same as that described in the paper **Evaluation of the Effects of Prolonged Cued Speech Practice upon the Reception of Spoken Language**, which is reprinted here also, beginning on page 47. Readers who desire a more detailed explanation of the experimental procedure should refer to that article. In the experiment reported here, the number of subject was increased to 55 and a more detailed analysis of various correlations was carried out.

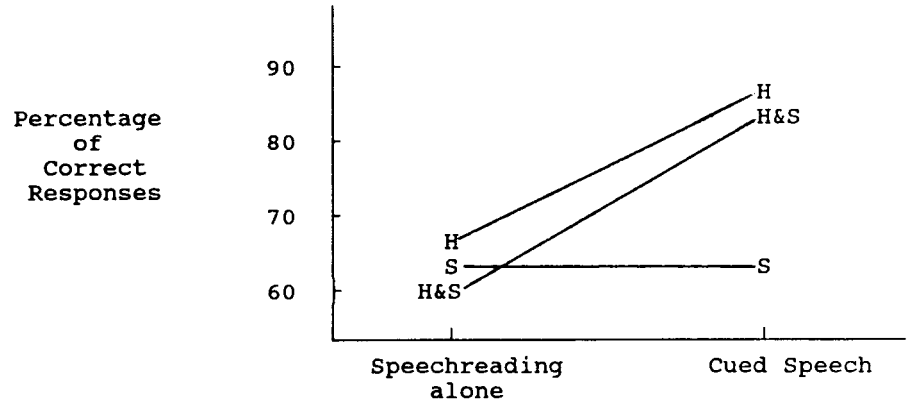

Figure 1 Percentage of Correct Responses for Three Groups Under Two Conditions of Presentation

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The 55 subjects ranged in age from 5 years, 11 months, to l6 years, 1 month. They had been exposed to Cued Speech for periods ranging from 10 months to 8 years, 2 months. Forty-five of them were profoundly deaf (more than 90 dB PTA 63 threshold). The group included 29 girls and 26 boys. They were divided into three groups, according to the place (or places) of exposure to CS:

1) H group = at home (n=7)
2) S group = at school (n=41)
3) H+S group = at home and at school (n=7)

In Figure 1 are shown the percentages of correct responses for the three groups under two conditions of presentation, speechreading alone (SR) and Cued Speech (CS). Figure 1 indicates first that the base level of speech reading is equivalent for the three groups. Secondly, a significant rise of the performance with Cued Speech can be seen in the three groups. Thirdly, the groups where CS is utilized at home have significantly better results than has the group which has the benefit of Cued Speech only at school.

Table 1 Correlation Between Individual Variables and Performance.

	SR	Improvement (CS-SR)
Age	-	-
Degree of hearing loss	.2827[xxx1]	.3206[xx2]
Duration of CS exposure in months		.2705[xx3]
Age at first CS exposure	-	–.2057[x4]
SR = Speech reading alone	[x]: $p < .10$	[xx]: $p < .05$
CS = cued Speech	[xxx]: $p < .0$l	no correlations
(In order to avoid any confusion, the absence of correlations is not mentioned in the table.)		

In addition, several other variables relative to age, degree of hearing impairment, duration of CS exposure, and age of first exposure to CS have also been taken into account. This was done because, in addition to obtaining data on spoken language understanding, the experiment was also aimed at investigating how those variables might influence the efficacy of CS. Table 1 shows the correlation (Spearman ranks) between individual variables and performances (n=53).

Four correlations in Table 1 are of interest: (1) There is a negative correlation with the degree of hearing loss in the speechreading condition. The more profound the hearing loss, the lower the performance in speechreading. (2) There is a correlation between the degree of hearing loss and the improvement through CS. This is to be expected on account of the previous correlation, since the possibility of improvement is greatest when the performance is low. (3) A positive correlation exists between the duration of CS exposure and improvement through CS. (4) There is an association--although not very strong statistically ($p < .05$), between the age at first exposure and improvement through CS. It would seem, therefore, that the possibility of improving one's speechreading performance with CS is linked with an early start.

Effects of Cued Speech on Learning of Certain Morphological and Syntactic Features of Language: Specifically, Grammatical Gender

Current observations of profoundly deaf children with whom CS is used consistently from a very early age, show that it is capable of developing their spoken language understanding at levels closely approximating that of normally hearing children of the same age. No empirical data as yet exists, however, capable of establishing whether CS effectively possesses the qualities required to provide an adequate linguistic input--that is, an input which could be a substitute for hearing in language development, not only in its communication function, but also in its cognitive function specifically in respect to the building up of internal representations of a phonological type.

The present work of our team is aimed at collecting such data. It is planned to examine a series of specific problems recognized as being difficult to resolve for deaf children educated by traditional aural-oral methods. Indeed, some aspects of linguistic development are particularly difficult for deaf children because of the opacity of speechreading in their regard.

In French, there is a rich morphology, expressed by affixes which are difficult to perceive by lipreading. Moreover, most of the function words, like articles, prepositions, logical connectors, etc., are often unstressed syllables (*un, du, que, mais,* etc.). All these linguistic elements tend to escape notice in a speech reading-supported message because of their inconspicuous character. It is well established that deaf children have greater difficulties with these items than with semantically invariant words such as substantive nouns and verb radicals. The hypothesis underlying the present research is that CS, inasmuch as it reveals the totality of the oral message, should have measurable effects upon morphological and syntactic development.

At present, most of the literature about the mastery of morpho-phonological rules is in English and is essentially concerned with problems encountered in that language--such as, the progressive present tense, the comparative mode, the superlative and so on. Studies bearing on knowledge of morphological rules by orally educated deaf students, such as Cooper's in 1967, conclude that 19-year-old deaf subjects fail to reach the level of nine-year-old hearing children. A more recent study bearing on some fine aspects of the Italian language (Taeschner, Devescovi and Volterra, 1988) shows a delay in tasks involving clitic pronouns and frankly deviant results in the use of articles.

Grammatical gender, in French, is an example of a basic syntactic aspect carried by the morphology of word endings. Several studies have demonstrated the relationship between word endings and grammatical gender (Seguin, 1969; Tucker, Lambert and Rigault, 1977; Desrochers, Paivio and Derochers, 1989).

Concerning gender acquisition by normally hearing children, Darmiloff-Smith (1979) has shown the predominance of word endings, demonstrating that by the age of three, children are aware of the difference between typically feminine word endings, such as: -ine, -aille, -ette--and masculine ones--like -oir, -eau, -on.

Typically feminine word endings in French:
la paille (the straw)
la farine (the flour)
la chaussette (the sock)

Typically masculine word endings in French:
le couloir (the corridor)
le manteau (the coat)
le mouton (the sheep)

In the case of deaf children, mastery of gender is particularly interesting. This competence appears to rest upon completely arbitrary rules and is, therefore, a major difficulty for learners of French as a second language, whereas native French speakers have no difficulty in mastering it very early. Grammatical gender mastery is in that respect a typical example of morpho-syntactic rules which hearing children acquire "unconsciously," through being immersed in their mother language from infancy. Grammatical gender for the French language has not been studied in deaf children and that it is generally taken for granted that this is a feature to which deaf children have limited access through traditional oral methods.

Method

The experiment which is now to be described is based upon a task of gender decision by profoundly deaf children with intensive CS practice. The hypothesis underlying this study, is that CS, by revealing the final critical gender information, could play a specific role in the mastery of gender by profoundly deaf children.

The items were 60 nouns. Among these 60 nouns, 30 were selected from the children's current vocabulary (for example: *tartine* [slice of bread]; *manteau* [coat]; *cigarette*; *poire* [pearl]; *verre* [glass]). The other 30 items were rarer words not belonging to the children's lexicon (ex: *mezzanine*, *troussequin*, etc.).

Among these 60 unfamiliar and familiar nouns, 20 were feminine-marked (*cigarette, girouette mezzanine, tartine*), 20 were masculine-marked (*manteau, lapin, troussequin and pomeau*). An additional 20 nouns were "unmarked", inasmuch as their endings were neither characteristically feminine nor masculine. Ten of these items were feminine (ex: *la poire*) and the other ten were masculine (ex: *le verre*).

Every item was represented by a picture on a card. The tester presented the picture while naming it in CS. The picture was named without the article, and the child had to answer by saying the article of the corresponding gender.

There were nine subjects in this preliminary experiment. All were prelingually, profoundly deaf (more than 90 dB mean loss). They had had intensive CS practice either at school, or both at school and at home. Six of them had had CS at home before the age of two. The other three had had CS at school for the last eight years.

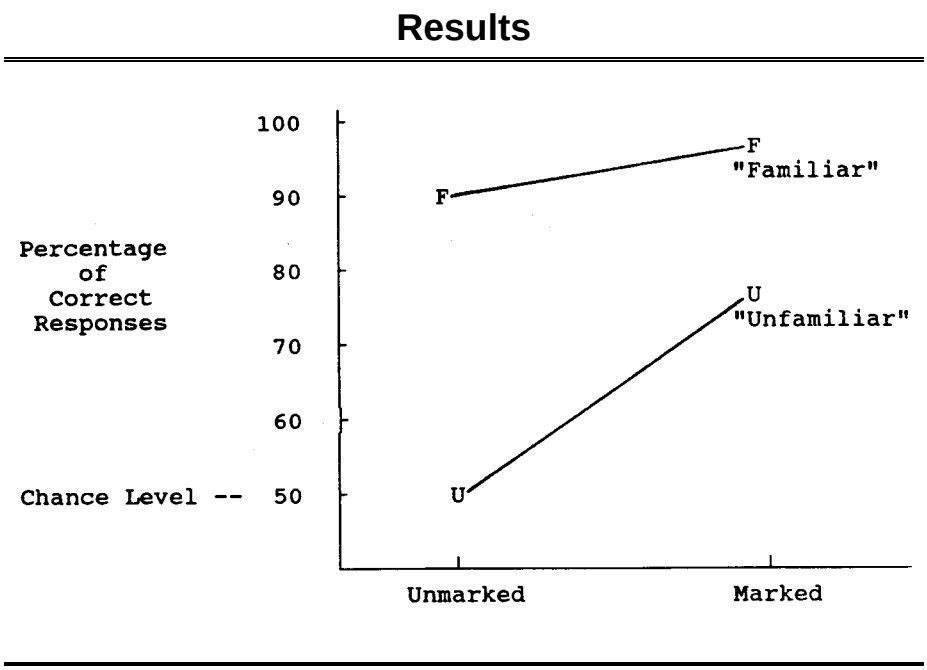

Figure 2 Mean Percentage of Correct Responses in Speechreading Task for Gender Marked and Unmarked, Familiar and Unfamiliar Words

Figure 2 shows the mean correct response percentage for each category of items: masculine-marked, feminine-marked and unmarked, for both familiar and unfamiliar words.

The results show, first, that for the familiar items, the percentage of correct responses is close to 100%, with no significant difference between marked and unmarked words. This indicates that the subjects master grammatical gender and correctly utilize the corresponding article. This result by itself does not allow us to know whether the child determines the word's gender with the help of phonological cues or whether he knows it "by heart." To establish the possible phonological origin of these responses, the results concerning the unfamiliar items have to be considered.

For the unfamiliar words, there is complete failure in the case of unmarked items. Indeed, 50% of correct responses exactly corresponds to chance. As predicted, in the absence of a phonological gender indicator, the child cannot decide whether a noun is feminine or masculine. If such indicators are introduced, as in the unfamiliar but marked items, the child becomes capable of giving a correct answer. His use of pertinent phonological indicators is demonstrated by the substantial increase in performance from the unmarked to the marked condition.

The difference in performance between "familiar" and "unfamiliar" conditions shows that "by heart" knowledge of the item's gender is partly responsible for the results. This difference is statistically significant in the unmarked condition, where the child cannot by helped by a gender-typical phonology (Wilcoxon, $p < .025$, unilateral).

Conversely, the difference between marked and unmarked items for unfamiliar words cannot be interpreted in the same fashion. This significant difference demonstrates an authentic generative competence based on phonological cues.

These preliminary results have not yet been tested against adequate controls, which might allow us to establish the impact of CS upon them. Given the usual low levels of achievement of deaf children in this domain, however, it is not unreasonable to hypothesize that CS played an important part in allowing grammatical gender mastery by the subjects.

These encouraging results prompt us to pursue further investigations into other domains which deaf children generally fail to master, for instance all that is related to the short function words, such as articles (*une, un, du, des*, etc.), prepositions (*en, chez, au,* etc.) and the various morpho-phonological features of verbs, which, in French, are full of irregularities (*je bois, de boirai, j'ai bu, je buvais*). Several experiments along these lines have been prepared and are now in progress.

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