Quantitative and Qualitative Evaluation of Linguistic Input Support to a Prelingually Deaf Child With Cued Speech: A Case Study

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This paper studies the linguistic input attended by a deaf child exposed to cued speech (CS) in the final part of her prelinguistic period (18–24 months). Subjects are the child, her mother, and her therapist. Analyses have provided data about the quantity of input directed to the child (oral input, more than 1,000 words per half-an-hour session; cued ratio, more than 60% of oral input; and attended ratio, more than 55% of oral input), its linguistic quality (lexical variety, grammatical complexity, etc.), and other properties of interaction (child attention and use of spontaneous gestures). Results show that both adults provided a rich linguistic input to the child and that the child attended most of the input that the adults cued. These results might explain the positive linguistic development of children exposed early to CS.

Historically, a causal relation was erroneously assumed between deafness and poor cognitive development. As Vernon (1968, 2005) showed, the connection does exist, but it is generally caused by social, educational, or clinical facts and not by deafness itself. However, today, as a century ago, many deaf children show two important deficits in their development: slow and incomplete acquisition of oral language (for review, see Lepot-Froment & Clerebaut, 1996; Santana & Torres, 2003) and, thereafter, a poor reading level (for reviews, see Alegría, 2004; Conrad, 1979; Holt, 1994; Torres & Santana, 2005). Such deficits make them dependent learners. On the other hand, hearing students generally achieve a good command of oral and written language and thus become autonomous learners. Therefore, in coming decades an important effort must be made to help deaf children acquire oral language. As Conrad (1979) stated, “The education of children born deaf is essentially a war against cognitive poverty” (p. xi). A crucial step in this war is to make speech perceptible to the deaf child.

Speech Perception: The Main Problem

Traditionally, speech perception has been associated almost exclusively with audition. Only a few exceptions to this association have been recognized (Summerfield, 1987): a signal/noise ratio unfavorable to the signal, auditory deficiency, laryngectomy, and a conflict between auditive and visual information. This assumption persists until the mid-1970s, sustained by the argument that people who are born blind develop language normally, excluding small alterations in the order of production of certain phonemes (Campbell & Wright, 1988; Dodd & Campbell, 1987).

McGurk and MacDonald (1976) showed that this assumption was wrong, as sight does contribute to speech perception. An interesting aspect of the McGurk effect is not the spontaneous nature of lipreading...
but, more importantly, its demanding or imperative nature. In the classic experiment of McGurk and MacDonald, the effects of lipreading occurred without the participants being able to neutralize it. Data of McGurk and MacDonald have important implications for deaf people. Deaf individuals have to elaborate phonological representations not only from their residual audition but also from visual information perceived through lipreading.

However, several studies have shown that lipreading by itself is insufficient for speech perception. Nicholls and Ling (1982) studied word and syllable discrimination in English. They compared visual input (only lipreading) with auditory + lipreading input. Subjects achieved 25% success with visual input and 42% with auditory + lipreading input. In a task consisting of the identification of French words, Charlier and Paulissen (1986, cited in Charlier, 1994), deaf subjects obtained 66% accuracy (lipreading only) and 73% accuracy (auditory + lipreading). Charlier, Hage, Alegría, and Périer (1990) obtained similar results in a task consisting of sentence recognition. Villalba, Fernández, and Ross (1996) studied the identification of high-frequency words in Spanish. Their subjects, 30 children with prelingual profound deafness, between 8 and 15 years, obtained 61% accuracy (lipreading only) and 69% accuracy (auditory + lipreading). All their subjects used binaural hearing aids in the auditory + lipreading experimental condition.

The Contribution of Cued Speech to Speech Perception and Language Development

A system that could make speech visible to the deaf has been dreamt of for centuries. In recent decades, several systems have been developed, the most popular being cued speech (CS), invented 40 years ago by Cornett (1967). Cued speech is a simple sound-based system comprising a limited series of hand complements and the lip patterns of normal speech. These two components, hand complements and lip patterns, work together to provide a non-ambiguous visual representation of oral language (see Figure 1, Spanish version of CS known as “La Palabra Complementada,” Torres & Ruiz, 1996). The main difference between CS and other systems, such as finger spelling, is the hand complement. A hand complement consists of three parameters, which are perceived simultaneously:

1. **Hand location**, in relation to the face. There are three positions to show the five Spanish vowels: side position for vowel /a/, chin position for vowels /e,o/, and throat position for vowels /i,u/. The number of positions in each language depends on the complexity of its phonological system. In English there are four positions and in French there are five.

2. **Hand shape**. There are eight shapes in all, which are used to disambiguate consonants.

3. **Hand movement**. There are three in all. The first one is a forward or forward–backward movement, a gentle movement that goes with a consonant–vowel (CV) syllable, for example, /ma/ in [malo] is a forward movement, whereas /ma/ in [mala] is a forward–backward movement; the second is a flick movement, a brief and energetic movement that goes with any consonant outside the CV sequence, for example, /m/ in /am/; and finally, a rotatory movement to visually show the intonation.

The cue or hand complement is therefore the simultaneous combination of position, hand shape, and movement, which, having no linguistic meaning on its own, is used to disambiguate lipreading, thus making speech visible in its totality.

Several researchers have shown that perception level with CS is higher than perception with lipreading alone. In English, Nicholls and Ling (1982) found perception levels of 30% and 25% for English syllables and English words, respectively, through lipreading alone. In contrast, perception levels were 80% and 95% through CS. Santana (1999) studied the efficiency of CS in the perception of Spanish. He studied 68 profoundly deaf Spanish children, classified into four different groups according to the main system of communication they had been exposed to: CS, oral, sign language, and manually coded Spanish. They had to identify high-frequency words. In the auditory + lipreading experimental condition, the results obtained by the different groups on the word identification task were CS 82.8%, oral 70%, sign language...
66%, and manually coded Spanish 28%. When the CS group did the same task with the help of CS, the success rate achieved was 92%.

What is more, by using CS deaf people can obtain the same linguistic and paralinguistic information visually that a hearing individual obtains auditorily (for review, see LaSasso, Crain, & Leybaert, 2003). In CS, manual complements and oral language collaborate in order to transmit phonemic information. This fact may explain why children exposed to CS develop better phonological representations of speech, better lexical and syntactical oral information, and so on and the child starts receiving input as soon as he/she is exposed to CS (Charlier, 1994; Charlier & Leybaert, 2000; Hage, 1994; Leybaert & Lechat, 2001; Santana, Torres, & García, 2003).

Figure 1  Spanish version of cued speech (from Torres & Ruiz, 1996).

The Importance of Input in the Prelinguistic Period

Some studies have shown that there are differences between deaf children depending on how old they are when they are first exposed to CS. Alegria, Charlier, and Mattys (1999) compared a group of children exposed to CS before the age of 2 years (early group) with a group exposed to CS after the age of 3 years (late group). Groups were compared in a lexicality task (word vs. pseudoword) in two modalities: lipreading and CS. Despite the age difference (early group: 10.9 years; late group: 15.9 years), the early group obtained better rates in word and pseudoword perception, both in lipreading and in CS presentation. In a recent paper, Alegria and Lechat (2005) studied
the McGurk effect in children exposed to CS. In this experiment, lips and cues were sometimes congruent and sometimes incongruent, like in the experiment of McGurk and MacDonald with lipreading and auditory information. Subjects improved performance when the lips and cues were congruent, but the improvements were greater with the subjects who were exposed to CS before 2 years of age. The authors conclude that the results show the importance of early exposure to CS for the development of phonological processing.

It is important to note that for the child to receive input, the adults must overcome certain obstacles. First, parents must have a good command of CS. Second, adults will have to cue at the same time as they use their hands for other activities, such as object manipulation or gesturing. Hence, it is possible that cueing could reduce gesturing (Mohay, 1990) or vice versa. Finally, as for any visual communication system (Harris & Mohay, 1997; Loots, Devisé, & Jacquet, 2005), it is fundamental that the child maintains visual contact with the adults. Given the positive data about children exposed to CS, we may hypothesize that adults do manage to overcome such obstacles: parents quickly become expert cuers, both therapists and parents do provide rich input, and the child attends a large part of cued production. It is the main aim of this research to confirm such hypotheses. To do so, we will provide data about the following three aspects of linguistic interactions: (a) the quantity of input attended by the child, (b) the quality of such input, and (c) other aspects of the interaction between child and adults: visual attention and spontaneous gestures.

Method

Participants

Participants were a deaf child, her mother, and her speech therapist. The subject (identified by the pseudonym Blanca in the corpus) was a Spanish girl who was neurosensorial bilateral prelingually profoundly deaf, according to Bureau International d’Audiophonologie Audiometric Classification of Hearing Impairments (see details at www.biap.org/biapanglais.htm). Mean loss in the better ear was equal to 100 dB at 500, 1,000, 2,000, and 4,000 Hz. There was no associated impairment. There were no antecedents of deafness in her family, which may explain the delay in detecting the impairment until the girl was 12 months old. She had a hearing brother 18 months older than herself. She used binaural hearing aids from 12 to 17 months. When she was 17 months old, she was fitted with a cochlear implant (CI). According to the report of the CI center, the auditory function of the girl improved in the months after the fitting of the CI. At the beginning of this research, just after CI programing, the aided threshold was approximately 50 dB. At the end of this research, 7 months after programing, the aided threshold was approximately 35 dB. At that point the girl was 25 months old. When the girl was 14 months and 15 days, she started our language rehabilitation program, Oral Cued Model (MOC; see www.uma.es/moc). The first session included in the corpus was videotaped the same day she was 18 months old. By then, her mother was already using CS to communicate with her and, of course, her speech therapist always used CS at work.

The mother was the main interlocutor for the girl at home. She always communicated with her daughter with the support of CS. The father had also learnt CS and he used it to communicate with his daughter. However, due to his profession, the father was often away from home several days a week. When the parents spoke between themselves in the girl’s presence, they used CS. In order to learn CS, the parents had followed a computer-assisted instruction system at home (see www.uma.es/moc), and they had the support of a specialist during their training.

The speech therapist was a professional with 10 years’ experience in CS rehabilitation of deaf people. She had five 1-hr sessions with Blanca per week.

Materials

Transcriptions used for this research were encoded according to Codes for the Human Analysis of Transcripts (CHAT) scheme (MacWhinney, 2000), with some project-specific codes necessary for this communicative context. The full coding scheme and other general criteria are described in Moreno-Torres and Torres (2005). The 30 sessions analyzed here can be
Recordings were made with a Digital Video Camera Recorder SONY DCR TRV950E 3CCD Megapixel. Each videotape in the corpus corresponds to a 30-min weekly session. Sessions took place alternatively at home (with the mother) and in the laboratory (with the therapist). These 30 files (18–25 months) are part of a larger corpus (156 in total, 18–54 months). The selection analyzed here corresponds to the final part of the prelinguistic period, and it finishes when the girl produced her first words.

Procedure

In the laboratory sessions, the girl interacted with a therapist. Occasionally, a researcher was present as well. Laboratory sessions included standard rehabilitation activities of the MOC program. In the home sessions the girl always interacted with her mother. Occasionally, another member of the family was also present. Neither a therapist nor a researcher was present in the home sessions. The mother was given these basic instructions: the session should include 30 min without interruption; she could videotape any moment in which the girl would be actively participating, that is, playing, having dinner, reading, and so on.

Coding

The 30 files were transcribed and reviewed always before the next video recording took place. Each file was reviewed by two judges. Coding effort concentrated specially on aspects related with input quantity and quality.

1. A special code was inserted to identify uncued utterances. If an utterance is cued partly, then uncued words are marked with parentheses. Cued utterances are not marked.

2. To determine input quality, Mean Length Utterance (MLU) was examined. MLU has been traditionally used to reflect syntactic complexity of children's language (Brown, 1973) and child-directed adult language (Snow, 1995). In this research it was used to compare the syntactic complexity of oral input versus cued input. Note that if speakers leave part of the utterances uncued, oral MLU should be lower than MLU for cued production. In order to obtain reliable MLU values, we followed strict utterance division criteria. Every full sentence was coded as an independent utterance. Linguistic expressions that do not have a syntactic function in a sentence (i.e., pragmatic markers, interjections, salutations, and any word produced alone) were also coded as independent utterances. Another aspect that affects MLU is repetition of words. Some repetitions are a linguistic strategy or a syntactic construction (Moreno-Cabrera, 1991). For instance, if a speaker says a fat fat woman, repetition is a means to emphasize fatness, and it is equivalent to a very fat woman. In these cases, all words are coded as independent words. Other repetitions reflect a failure in the speaker to produce a fluid message. We generally call these repetitions dysfluencies. In the preproject sessions we found several dysfluencies in the mother's production. Dysfluencies were probably a means to have more time to cue, as oral production was quicker than manual cueing. Dysfluencies are identified with CHAT [//] or [/\], which means that they are not counted by MLU calculations.

3. Child attention was encoded at utterance level. An utterance was coded as unattended if the child ignored the adult or the child was involved in an activity that made it impossible for her to see the hands or lips of the adult in question. Judgment of attention level is the most complex part of coding effort.

4. Natural gestures are associated to a speaker's utterance. For example, if the mother says good-bye, as she waves her hand producing the gesture GOODBYE, we would add the gesture GOODBYE to the utterance good-bye. Gestures that do not co-occur with speech are associated to an utterance with no words. We followed the criteria of Butcher and Goldin-Meadow (2000) to identify gestures. These authors classify gestures as iconic, deictic, conventional, and ritual. We include all gesture types in our calculations.

In order to analyze the linguistic properties of attended input and lost input, we examined the 100 most frequently produced words of each adult. Each word was classified according to its main linguistic...
function: pragmatic, grammatical, or lexical. We omitted words that admitted double classification such as vale (pragmatic O.K. or lexical to cost). We classified as pragmatic units, words used to guide linguistic interaction or to express emotions. Pragmatic units included interjection (ah, oh...), discourse markers (a ver, let’s see), and attention getters (the girl’s name, the imperative form mira look, etc.), which are common in interaction with deaf children (Gallaway & Woll, 1994). Deictic words such as aquí (here) and allí (there) were also included in the pragmatic group as they were very often used with POINT gestures and play a central role in guiding the child to the appropriate objects. Grammatical words included pronouns, articles, determiners, prepositions, conjunctions, and auxiliary and copulative verbs. Interjudge reliability of each of these criteria was above 95%.

Results

Quantity of the Input

For input analysis we considered five main variables: oral input, cued input, cued ratio, attended input, and attended ratio. Oral input refers to word tokens produced orally by adults, cued input represents the number of oral tokens that were cued, cued ratio represents the proportion of oral tokens that were cued, attended input refers to the number of oral tokens that were cued by the adults and attended by the deaf child, attended ratio represents the proportion of oral words that were cued by the adult and attended by the child. The number of word tokens refers to the total number of words produced. The number of word types refers to the number of different words produced.

Mean oral input was above 1,300 word tokens per session for the therapist and above 1,000 for the mother; both adults cued more than 60% of their oral input, and the girl attended more than 55% of oral tokens (i.e., more than 86% of total cued tokens) produced by the adults (see Table 1). Differences between therapist and mother were significant for oral input ($U = 52, p = .011$, Mann–Whitney $U$-test) and attended ratio ($U = 49, p = .008$) but not for cued ratio ($U = 70, p = .078$); that is, the therapist and mother cued the same proportion of words.

Throughout these 15 sessions with each adult there was an important progression in the attended input both for the therapist and the mother. Linear regression analysis (see Figure 2) showed that this progression was significant both for the therapist and

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**Table 1** Input quantity of therapist ($n = 15$) and mother ($n = 15$)

<table>
<thead>
<tr>
<th>Speaker</th>
<th>Word production</th>
<th>Cued ratio</th>
<th>Attended ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$M$</td>
<td>$SD$</td>
<td>$P$</td>
</tr>
<tr>
<td>Therapist</td>
<td>1,370.8</td>
<td>280.1</td>
<td>0.62</td>
</tr>
<tr>
<td>Mother</td>
<td>1,086.9</td>
<td>241.0</td>
<td>0.64</td>
</tr>
</tbody>
</table>

*Note. Oral production represents the mean number of word tokens produced orally by adults per session, Cued ratio represents the percentage of oral tokens that were cued, and Attended ratio represents the percentage of oral tokens that were cued by the adults and attended by the deaf child.*

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**Figure 2** Attended input.
the mother. The influence of input for the therapist resulted in the unstandardized regression coefficient 
\[ b_{\text{session}} = 46 \ (p < .001), \] 
whereas for the mother it was 
\[ b_{\text{session}} = 27 \ (p < .001). \] 
Constants were 
\[ b_0 = 464 \] 
for the therapist and 
\[ b_0 = 382 \] 
for the mother.

For the therapist’s data we obtained 
\[ R^2 = .61, \] 
and for the mother’s data we obtained 
\[ R^2 = .66. \] 
Because progression is significant in both adults, it might indicate a change in the communicative attitude of the girl. The more her attentional capacity increases, the more the adults communicate.

Analysis of attended ratio showed a progression in the therapist, 
\[ b_{\text{session}} = .52 \ (p < .047), \] 
but not in the mother, 
\[ b_{\text{session}} = .39 \ (p < .145). \] 
For the therapist’s data we obtained 
\[ R^2 = .27, \] 
and for the mother 
\[ R^2 = .16. \] 
These results suggest that, as time passes, the mother does not seem to adapt her strategies to augment the attention of the child.

Quality of the Input

MLU was obtained both for oral input and for cued input (see Table 2). We did not expect to obtain MLU values that were always lower for oral input than for cued input. This difference was significant both for the therapist, 
\[ t(14) = -2.287, \ p = .038, \] 
and for the mother, 
\[ t(14) = -3.617, \ p = .003. \] 
It might be caused by two linguistic properties of cued input. On the one hand, speakers often tended to leave pragmatic expressions uncued. As these expressions are generally one-word utterances, oral MLU tends to decrease. On the other hand, speakers tended to cue every word in each utterance. This fact tends to increase cued MLU. Our qualitative analysis below will provide more details about these linguistic features. However, what seemed more striking to us was that we found no significant differences between the mother and the therapist either for oral MLU \( (U = 84, \ p = .250) \) or for cued MLU \( (U = 88, \ p = .310). \) These results show that there is considerable similarity between the mother and the therapist in terms of the syntactic complexity of their productions.

Lexical Analysis

The total number of word tokens produced by the therapist in her 15 sessions was the largest for the two adults \( (20,562, \ M = 1,371 \) per session for the therapist, SD = 280.09, vs. 16,304, \ M = 1,087 \) per session for the mother, SD = 240.97). However, the therapist’s number of word types was the smallest \( (1,281 \) vs. 1,511). Another important result was the percentage of attended tokens and types with respect to oral tokens and types. Though the percentage of attended tokens ranges between 55% and 60%, the percentage of attended types rose to 83% for both adults.

Analysis of the 100 most frequent words showed that the pragmatic group represents at least 32% of the therapist’s global production and 34% of the mother’s global production. The rest are lexical or grammatical words. As Table 2 shows, words classified as pragmatic were not cued as often as grammatical or lexical ones. Noncuing pragmatic and deictic expressions can be related to the nature of these expressions, often produced to express emotions and used with natural gestures. This was the case with deictic aquí (here) and attention-getter mira (look), which were frequently produced with a pointing gesture. The

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**Table 2** Global input quality of therapist and mother

<table>
<thead>
<tr>
<th>Speaker</th>
<th>Oral</th>
<th>Cued</th>
<th>Pragmatic</th>
<th>Lexical</th>
<th>Grammatical</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td>P</td>
</tr>
<tr>
<td>Therapist</td>
<td>1.6</td>
<td>0.16</td>
<td>2.31</td>
<td>0.20</td>
<td>0.41</td>
</tr>
<tr>
<td>Mother</td>
<td>1.49</td>
<td>0.18</td>
<td>2.12</td>
<td>0.18</td>
<td>0.35</td>
</tr>
</tbody>
</table>

*Note.* Oral MLU shows the mean MLU and SD of adults’ oral production; Cued MLU shows the mean MLU and SD of adults’ cued production; Pragmatic, Lexical, and Grammatical columns show the percentage of words in each group that were cued.
low percentage of cueing pragmatic expressions summed to their high frequency may also explain the low MLU values obtained for uncued production.

Child Attention

Child attention is the percentage of input that the child attends out of cued production. We found significant differences between therapist and mother \( (U = .000, p < .001) \). This difference might be caused by their different roles. The mother was placed in a more functional context in which it is more difficult to constantly gain her daughter’s attention. Linear regression could not confirm any significant progression in the 15 sessions either in the therapist or in the mother.

Close examination of the strategies of the adults to interact with the girl showed that both adults took into account visual attention. This was particularly evident when they stopped cueing whenever they suspected that the child was not paying attention. Such interruptions were usually followed by an attention getter (Gallaway & Woll, 1994), such as blowing, gesturing, or touching the girl. Another common strategy used by the adults was to repeat utterances that the child had not attended. More research is necessary to determine the importance of these strategies.

Natural Gestures

Mean number of gestures per 100 words was 7.1 for the therapist \( (SD = 1.1) \) and 6.6 for the mother \( (SD = 2.2) \). Difference between adults is not statistically significant \( (U = 86, p = .272) \). The fact that the proportion of gestures over words is similar in both adults suggests once more that the mother’s command and use of CS is similar to that of the therapist. Moreover, these data indicate that adults integrate both communicative systems (CS and gestures), despite the fact that both of them are manual.

Two factors that contributed to the ability to produce both gesture and CS were left-hand cueing and utterance repetition. Left-hand cueing was used occasionally both by the therapist \( (M = 2.86 \text{ per session}, SD = 2.13) \) and the mother \( (M = 2.53 \text{ per session}, SD = 2.47) \), whereas the right hand was used to manipulate objects or to gesture. Utterance repetition is also a common phenomenon. Normally, one of the instances is not cued and the other is cued. More research is necessary to determine the interaction between CS and spontaneous gestures.

Discussion

The main objective of this study was to examine the linguistic input attended by a child exposed to CS. We hypothesized that in order to attend a rich linguistic input, it would be necessary to overcome three potential obstacles. First of all, the mother would have to achieve a good command of CS. Second, both adults would have to cue a large proportion of their input. Finally, the child should pay attention to the adults.

The parent’s command of CS is an obvious prerequisite. But, even if parents do achieve a good command of CS, they face another problem during this period. The effects of using CS are not apparent until several months have gone by. Hence, if parents do not begin to see results quickly, they might become discouraged and stop using CS. These problems should not affect the therapists, who are already experts in the field, and when they first meet a deaf child, they know that results only begin to materialize after the first few months. Furthermore, as the therapist interacts with the child for only 5 hr a week, it is absolutely essential that parents actively participate in this process.

Our data show that the mother’s command of CS is equivalent to the therapist’s. Both adults cue the same proportion of oral words. Both show the same MLU for oral and cued input. Both use a similar proportion of lexical, grammatical, and pragmatic expressions, each group being cued to the same proportion. Finally, they use the same ratio of gestures per 100 oral words, and they seem to use the same strategies to provide a rich linguistic input. The main difference between the adults refers to the number of words produced per session, which is significantly higher for the therapist. It is important to note at this point that the mother had been using CS only for 2 months prior to the start of the project, whereas the therapist had 10 years’ experience. In this context, our results confirm that CS is not a barrier as a mother with little experience may learn CS very quickly. As far as we know, there are no previous empirical data related to this.
The second hypothesis was that the adults would provide a high proportion of input that would be linguistically rich. One potential problem here was that the adults would cue too few words or utterances or that the input would be linguistically poor. For instance, input would be poor if adults did not cue every word in each cued sentence or if they did not cue grammatical words. The proportion of cued tokens is 65% for the therapist and 62% for the mother. The quality of the input is confirmed lexically and grammatically. Adults cue 83% of the oral word types, which suggests that the input is lexically rich. As for grammatical input, we found that adults cue more grammatical tokens (63% for the therapist and 69% for the mother) than pragmatic expressions (41% for the therapist and 35% for the mother). This difference between grammatical and pragmatic words and the fact that the MLU of CS input was significantly higher than the MLU of oral production for both adults suggest that the input is grammatically rich. Altogether, these results confirm our hypothesis that the adults who use CS provide a significant level of input that is linguistically rich.

The third hypothesis was that the child would attend an important proportion of the cued tokens. Several authors (Harris & Mohay, 1997; Loots, Devisé, & Jacquet, 2005; Swisher, 1992) have drawn attention to the necessity of visual attention in the successful use of language and communication by deaf children and their communicative partners. In order to gain the deaf child’s attention, adults use several attention getters. Adults in this study often used attention getters and the strategy of utterance repetition, which explains the high proportion of attended input. This result confirms our hypothesis that the child would attend the adults’ input.

To conclude, these results show that the child is attending a rich linguistic input and might explain the positive linguistic development of children exposed early to CS (Alegria & Lechat, 2005; Alegria et al., 1999; Charlier, 1994; Charlier & Leybaert, 2000; Hage, 1994; Leybaert & Lechat, 2001; Santana et al., 2003). We expect to be able to evaluate the linguistic development of Blanca shortly so as to confirm if there is a relation between the input she has attended and her linguistic development.

Our research has answered certain questions, but it has left other questions related to the indirect effects of CS unanswered. These indirect effects might be important if we compare subjects such as Blanca with deaf children who are not exposed to CS, like most deaf children nowadays. Furthermore, such comparisons would provide more exact information about the effectiveness of CS.

One potential indirect effect of CS is related to the amount of gesture used by the parents. Our data show that the adults repeat utterances quite frequently: the first cued, the second uncued, but accompanied with gestures. This common strategy shows that the adults use all available means to communicate. However, examination of the videos shows that oral language remains the main communication system, while spontaneous gestures are secondary; this idea is confirmed by the absence of gesture combinations (the mean is less than 1 per session), which are typical of home signs (Goldin-Meadow, 2003). Though Goldin-Meadow (2003) considers that adults do not participate in the apparition of home signs, Cunha Pereira and Lemos (1990) observed that some parents do collaborate with their deaf children to define gestures. The question is the following: if the mother did not use CS, would she have a stronger tendency to use gestures, leaving oral language in a secondary position? If this were the case, mothers who do not use CS, as is the case of most (non-signing) mothers, might be indirectly stimulating the generation of home signs. A distinct but related indirect effect is related to child attention. Given that attention levels are very high, the question is the following: is it possible that such high attention levels are related to the lip-reading ability observed in children exposed early to CS (Alegria & Lechat, 2005)? Our objective now is to answer these two fascinating questions and many others that will arise as the corpus is being coded.

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