Input and interaction in deaf families
van den Bogaerde, E.M.

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In this thesis we have explored the input and output of six deaf mothers and their three deaf and three hearing children in interaction when the children were between ages 1;0 and 3;0. We have looked at quantitative and qualitative aspects and how these developed over time. We also compared the input and output of the deaf mothers with the deaf children to that of the deaf mothers with the hearing children. From the results of this study it has become clear that Simultaneous Communication is an important but varying concept. This issue of its status will be addressed immediately in 10.1, since it affects the rest of the discussion. In section 10.2 we look at the relationship between input and output in terms of quantity and quality. In section 10.3 we focus on the differences between the deaf and hearing children also in terms of input and output. In section 10.4 we consider the implications of this research for deaf families but also for hearing parents with a deaf child. Finally we make a number of suggestions for future research.

10.1 The status of Simultaneous Communication (SC)

In deciding how to describe the complex nature of the input and output in deaf families a methodological decision was taken (see section 5.3) to separate out utterances in which a combination of speech and signs occurred. This decision was taken with the awareness that it might not be correct to create a priori a third system (SC), as suggested by Romaine (1995) but it was considered necessary in order to arrive at a more detailed description of the form of the input and output. In this section we will discuss the status of the SC utterances on the basis of the evidence found in this study and reflect on the issue of the third system. From the description of the input and output of the deaf mothers and the deaf and hearing children, we see differences emerge in the multilingual nature of both input and output. We found mainly SLN and SC in the input to the deaf children, whereas the deaf children themselves mainly produced SLN. The input to the hearing children contained SC, Dutch and SLN, and the children produced all three language modes, although Alex started later with SLN. Although in both groups of children SC was the main form of the input, a consideration of the structure of the SC utterances showed however considerable differences. In the input to the deaf children the structure of SC very closely resembled SLN syntax. For instance, the verbs in SC were most often put in SLN verb position (initial with subject drop, or final), and the inflection of the verbs in SC was similar to SLN verb inflection. Copulas and auxiliaries were frequently missing in the spoken part. The spoken input to the deaf children was very simple, and consisted mainly of nouns, adjectives and verbs, with only few instances of function words.
Verbs in SC were most often offered in signs, whereas those spoken verbs that did occur were mainly produced together with signed verbs. These spoken verbs also often occurred in an uninflected form, or in a stem form. This parallels the findings of Ebbinghaus and Hessmann (1990; 1996) for GSL. They claim that such forms are an integral part of the sign language and are not loanwords from the spoken language.

There were instances of SC utterances in the input to the deaf children in which the proposition was made up both by a spoken part and a signed part (category ss in Chapter 6). These utterances form some evidence for a third system as described by Romaine (1995), because syntactic features of both SLN and NL were present in the same utterance, such as for instance Dutch word order, but together with SLN verb inflection. However, these ss utterances make up only 10% (median) of the SC input to the deaf children; for 90% of the SC input there is no reason to think that this might be a separate system. Apart from these supplementary SC utterances we conclude, on the basis of the evidence found in Chapters 6 and 9, that what we have separated out here as SC utterances in the input to the deaf children are in fact SLN utterances. We must also conclude that the mouthing of spoken parts is important in SLN.

The deaf children produce mainly SLN utterances, no Dutch and hardly any SC utterances. We also know that the children miss a great deal of the spoken input in the context of SC. Only Carla produces a very few ss utterances. There is no evidence that they are producing a third system. Again we conclude that the SC utterances that the deaf children produce are SLN.

The picture with the hearing children is more complicated however. The SC input to the hearing children was in some aspects similar to that of the deaf children. This could be seen in particular in those utterances in which no verb was present; they had a SLN-like structure. SC utterances with only a spoken verb were Dutch-like (see section 9.4.1). However, in SC utterances with both a signed and a spoken verb and especially in those utterances where the semantic content was distributed over the two channels (ss), we found that both SLN and Dutch syntactic features were present. Often words were left out in the spoken parts apparently under the influence of SLN, for example a great deal of subject drop occurred and auxiliaries and copulas were omitted. The inflection of spoken verbs was also sometimes incorrect. In these SC utterances we see structural evidence for a 'third system'. Sometimes SLN structure was followed, with a relexification in the spoken parts, sometimes not. The sign and spoken channels were used in combination to express the whole proposition (ss in Chapter 6) in as much as 29% (median) of the utterances. These utterances showed syntactic features characteristic of both languages (Chapter 9).

In the output the hearing children also use such ss combinations. In those SC utterances where both a signed and a spoken verb occurs, an influence of SLN is apparent in that the verb is often in final position (section 9.4.2). The hearing children are acquiring syntactic SLN structures from the SLN and signed SC input.
of their mothers. They produce these more complex structures mainly in SC contexts; their SLN output is simple (MLU ≤ 1.5, section 9.1.2). This suggests that they consider the SC input as a third system, namely signs and words are to be produced together, probably under the influence of the input they are receiving. The children's SC output does, however, seem more Dutch-like than their mothers' input, although it is not Dutch in structure. The children's SC is therefore to be seen as a third system, but a slightly different one from that of their mothers. The SC that we found in the input and the output with the hearing children is not strictly signed Dutch. In a strict signed Dutch system the structure of Dutch would be followed with no omission of subjects or copulas etc. Word order would also follow Dutch syntactic rules. Such signed systems have been devised for teaching purposes in many countries, that is to teach the structure of the spoken language (see sections 2.2.1 and 2.2.3). It is not clear, however, that in the Netherlands such a strict signed Dutch system exists. What we see here is a considerable influence of SLN in terms of structure. In previous research it has already been observed that hearing Dutch teachers produce a mixed system that reflects an influence of SLN (Keppels and Jansma 1994). The utterances produced by the deaf mothers to their hearing children seem to constitute evidence for a third system but this system does not warrant the name signed Dutch in the way this term is usually used.

Initially it appeared that the input to the deaf and hearing children was similar in that SC was prominent for both groups, but now we see that the SC utterances have to be differentiated. The hearing children could receive an input identical to the deaf children and learn SLN in this way, but in fact the deaf and hearing children receive different input. The adaptation of the mothers to the hearing status of the children is reflected amongst other things in the structure of SC. Because the children can see most of their mother's signing the mothers apparently adjust their use of spoken Dutch (for instance by leaving out words) in the SC input. Why is this the case? The deaf mothers are used to communicating with hearing people and having to optimize communication by using as much spoken language as possible. It is probable that this context is so strong for the deaf mothers that they automatically change to this mode with their hearing children. It is also a fact that up to this moment in time many deaf people are still advised by professionals to speak with their hearing children. It is argued that, if they do not, the children's spoken language acquisition might be delayed. These two factors may explain the language choice of the deaf mothers.

In the following discussion of the input and output of the deaf children we will no longer consider the SC input and output as distinct from SLN. In the discussion of the hearing children we will continue to make this distinction. This has some important consequences for the discussion.
10.2 Input and output

10.2.1 Quantitative influences of input on output

In all theories on language acquisition it is accepted that children must come in contact with a language in order to be able to acquire it (Chapter 1). That input must be accessible (uptake) otherwise no processing of the language by the children is possible (intake) (section 1.3.1). The input should also contain the full scale of functions and forms, or the children will not be able to acquire those functions and forms that are part of the language. We also know that in a bilingual situation the amount of language input in each language is necessarily less than in a monolingual situation and that considerable variation occurs in different bilingual situations. It is an important issue to establish the minimum amount of language input required for acquisition to take place.

In our study we found that the deaf mothers offer their deaf and hearing children multilingual input. The amount of all input to the children is comparable to that found for hearing children of hearing parents, but the amounts in different modes differ. (Chapter 5). For the deaf children the input consists of Sign Language of the Netherlands (SLN) with a considerable amount of spoken components and a very little Dutch (NL); for the hearing children this consists of SLN, Dutch and predominantly Simultaneous Communication (SC) (see section 10.1).

The deaf children receive and can access (80%) of the signed input (see Chapter 6) and they also acquire SLN. The amount of signed language offered is clearly enough for acquisition. There was very little Dutch in their input compared to SLN and this is reflected in the output of the deaf children in which they also use very little Dutch. They had increasing visual access to this spoken input over time but Carla still misses around 40%. Less than optimal visual access may be an explanation for this lack of acquisition, at least in part. The mothers’ input in Dutch and in the spoken components of SLN was more complex than the children’s spoken output, which stayed at the level of single words up to the age of three. This suggests, not surprisingly, that the children’s lack of hearing is also an important factor in their lack of acquisition. We cannot therefore conclude that the amount of Dutch offered and visually accessed was too little per se for acquisition to take place - in a hearing child it may be enough. The visual information from spoken words offers at most 30% of the information required to identify and re-produce the sound (Dodd and Campbell 1987) so that intake is problematic for fully learning the spoken language. In the context of deafness in the child we see that acquisition does not take place to a great extent before the age of three, although a small beginning has been made. There is no evidence from this study that increasing the amount offered would be the answer to speeding up the rate of acquisition of the spoken language in the context of deafness.

In conclusion there is evidence to suggest that the little input in Dutch together with the less than optimal visual access may play a part in the lack of acquisition in
Dutch by the deaf children but the fact that visual information alone is not enough to learn spoken language is certainly an important factor.

The hearing children receive mainly SC and some SLN and have good visual access to the signed input (80%). They also produce SLN and SC, sometimes using more SLN utterances than their mothers. The input is clearly enough for acquisition of signing to take place, but the rate of acquisition is on the whole slower than that of the deaf children. This suggests that amount might influence rate of acquisition here. They receive little Dutch from their deaf mothers but use it a great deal. Clearly the other sources of Dutch (other family members, extended family etc.) are enough for acquisition to take place at a similar rate to monolingual Dutch children.

10.2.2 Qualitative influences of input on output
The influence of the quality of the input on the output can be observed in various areas. First of all we saw a change in interaction patterns with the three deaf children and one hearing child, Sander (Chapter 6). A consistent use of attention strategies by the mother seemed to promote the development of attention-giving behavior in the children. We found that the mothers of Laura (D), Mark (D) and Sander (S) gradually shift to predominantly signing and/or speaking when the child is looking at the mother. Carla's mother showed this behavior less consistently. The mothers of Jonas (H) and Alex (H) did not show consistent behavior and used more 'hearing-like' strategies, like beginning to sign/speak while the child is not paying visual attention.

Around the age of 2;6 the children have learned to look up spontaneously at their mother more often to check whether or not linguistic information is being offered. Carla (D) is slower in her development of spontaneous looks than Laura (D), Mark (D), and Sander (H) and this was found to be connected to the less consistent use of attention strategies by her mother. Of the hearing children only Sander showed an increase in visual attention-giving behavior, which can partly be attributed to his mother's use of attentional strategies. Even though his language input was similar to that of the other two hearing children, the development of his attentional behavior is different from Jonas' and Alex'. We will come back to this aspect in section 10.2.3. Jonas and Alex showed inconsistent development in attentional behavior appropriate for sign language interaction; at times their behavior shows evidence that they know they have to look up for signed input, but at other times they do not. It can be the case that their development in appropriate visual attention-giving behavior for signed language is delayed and not only geared to behavior appropriate for spoken language interaction, as it now seems to be. Further research at a later age should shed light on this aspect for Jonas and Alex.

A second area where we can see the input reflected in the output is in sign and word combinations. All children were offered sign combinations increasingly over time, and the children all produce these increasingly (Chapter 7). Sign
Discussion and conclusions

Word combinations were offered far more to the hearing children than to the deaf children, and to the latter mainly as spoken components of SLN, not as Dutch. The MLU of the spoken input increases with most children, although with the deaf children it remains below 2.0. The deaf children do not combine words (yet) and we see no development up to the age of three years. With the hearing children we see an increasing spoken MLU in the input; the children also show an increase in word combinations and in MLU, although this may well be related to input received from other adults than their mother.

On the whole the children also reflected their mother's level of preference for nouns. The mothers differed from each other in their noun ratios, but their individual preference were mostly reflected in the output of the children. However, we doubt that these individual differences in noun bias will have a long-lasting effect on acquisition. Research on spoken language has shown some evidence for different noun ratios in different languages, depending on the typology of the language (e.g. rich versus poor agreement languages, section 1.3.2). On the basis of typology we would have expected a low noun-ratio in SLN, but the evidence was not convincing since there was so much individual variation. The interaction situation with the children (playing with toys, books) might have induced a higher noun use by the mothers (labeling). We need to look at other interaction situations in order to further compare the input for this aspect to other languages.

On a functional level we found that the mothers offer the children input with declarative, interrogative and imperative functions in proportions similar to the input of Dutch hearing mothers (Chapter 8). The deaf children also produce all of these functions in SLN and the hearing children in all language modes. We saw that the input showed a decrease in the use of labeling utterances over time, which was reflected in the output of the children. With Carla (D) and Alex (H) we found that both they and their mothers showed less of a decrease in labeling utterances than the other mothers and children. This is probably related to the fact that these two children needed more time to develop good visual attention-giving behavior, which induced the mothers to use labeling utterances more with them. This type of interaction in turn influenced the use of labeling utterances by the children themselves.

Interrogatives were offered in the input as mentioned above, slightly more often to the hearing children. The children start to produce interrogative utterances after age 2;0, the deaf children in SLN, the hearing children in all three language
Input and output 247

modes; the hearing children also produced slightly more than the deaf children. The interrogatives were not always in a grammatically correct form in the SLN, NL and SC input. Non-manual markers were sometimes omitted in SLN and signed SC input, more so with the hearing children than with the deaf children. In the children wh-q signs are first seen between 1;6 and 2;0, but the appropriate non-manual sentence markers for interrogatives are not yet produced. It is not clear whether the lack of correct input here is crucial. In Dutch and spoken SC there were many incorrect interrogatives, more with the deaf children than with the hearing children but with both to a substantial degree (56% versus 30%). Often the verb was not inverted, and no interrogative intonation could be heard. The hearing children did not however seem to be behind in their acquisition of interrogatives compared to monolingual hearing children.

In contrast to wh-q and q, the negation sentence marker neg is offered correctly as sole negator to the deaf children, who also seem to acquire it effortlessly at an early age (after 1;6). The input to the hearing children differed considerably in this respect, where the negation markers were always used together with a negation word. The hearing children reflected this in their output in that they also never used neg as sole negator.

A clear difference in functional use was found for affective utterances: these were offered in a signed mode to the deaf children, and in a spoken mode to the hearing children. This difference was reflected in the output of the children, although the actual number of affective utterances was very low in their output.

We looked at the verbal systems in the three language modes and at the (non)realization of arguments. In the input to the deaf children the various inflections of signed verbs appeared often enough for the children to start acquiring them in SLN. The hearing children also were offered inflected forms, primarily in SC. All children start to inflect signed verbs between age 2;0 and 2;6. The deaf children do not produce spoken verbs, although these were present to some extent in their input. The hearing children start to inflect spoken verbs correctly between 1;6 and 2;0, and to use past participles around age 2;6, which is similar to the timing of acquisition of monolingual hearing children, but they have other sources of Dutch input than their mothers.

The deaf children are offered SLN, and in their SLN production they show that are beginning to acquire the grammatical rules of the verbal system in SLN. The hearing children also show the beginning of SLN syntax in their SC production, and also of NL syntax in Dutch and SC. However, the spoken SC in their output showed more characteristics of Dutch syntax than appeared in the input. As described in section 10.1 both the input to and the output of the hearing children sometimes showed a mixture of the verbal systems of SLN and Dutch in the SC contexts.
Discussion and conclusions

10.2.3 Output is different from input

There are a few instances where the output does not reflect the mothers' input. The input in Dutch to the deaf children is generally not reflected in their output, but as already discussed, this can be related to the lack of visual information (section 10.2.2). The hearing children also produce more Dutch than their mothers do; for example they have more utterances with a spoken verb than the mothers. As already discussed, the hearing children have access to spoken Dutch from native speakers, for example from the hearing members of their families. These other sources of input are clearly important and result in a development of the spoken language which is similar to monolingual children. The hearing children are not clearly influenced by the Dutch input from their mothers in terms of structure. For example they place verbs more often in final position in their SC utterances (up to 31%) than occurs in the SC input (21%) (section 9.4.2). It must be remembered that this final position is typical in monolingual hearing children of hearing parents at that age. They use this final position to the same extent in their Dutch utterances (28%), which confirms the interpretation that this is a result of their developmental stage in Dutch rather than of the influence of signed verb position from the SC and SLN input.

The signed vocabularies in the input were similar in the input to the deaf and hearing children, but two of the hearing children, Jonas and Alex, show a slower rate of acquisition than the other four children. Sander (H) developed in a way comparable to the deaf children, despite the fact that his signed input was not different from that of the other two hearing children. In our view this is connected to his early awareness that his mother is deaf. The fact that he suppresses his voice from an early age on, and his development of his visual attention-giving behavior support this interpretation. He is oriented towards behavior appropriate for sign language interaction. Even at this early age he has a focus on signed language; a language attitude has been established. It is not clear how this has come about.

10.2.4 Input is one of several factors

In Chapter 1 we discussed the position of language input and interaction in various theories. In most of such theories it is accepted that exposure to a language is a prerequisite for a child to be able to acquire that language (section 1.1). However, exposure to a language, as we have seen here, is not a sufficient condition. With the deaf children accessibility of the language is shown to be important: SLN is very accessible, Dutch is barely accessible (see also section 1.3.1) resulting in a very limited acquisition of Dutch.

With the hearing children a spoken input that is partly different from standard Dutch is shown to have little influence on their acquisition of Dutch. Their acquisition of the spoken language is similar to that of monolingual hearing children. The input that they receive in standard Dutch in their extended families seems to provide the basis for their acquisition, not their mother's input.

The form of the input does appear to be related to what is acquired. What is offered in small amounts or later, also is acquired more slowly or later, for example the
non-manual markers (see also for ASL, Snitzer-Reilly and Bellugi 1996) or verb inflection. From the descriptions we have of SLN to date it does not appear to be the case that these are infrequent aspects in adult-adult language and that therefore slow acquisition can be related to infrequency in the language in general. This study shows that these aspects are particularly infrequent in the adult-child language and so the pacing of acquisition seems really to be directed by the input. It is not clear why such aspects are restricted in the input although there may well be a relationship with the development of attention-giving behavior on the part of the children.

In general input is shown to be important and a necessary factor in explaining acquisition. It cannot continue to be neglected as it has in much of the acquisition literature.

10.3 The influence of hearing status

As already discussed in the previous sections of this chapter, input to and output of the deaf and hearing children is often different. This section will summarize these differences with the focus on the influence of hearing status and look for explanations for these differences.

In the choice of language the input and the output differs between the two groups of children very clearly. Deaf children receive and produce SLN with some use of spoken components but very little Dutch. They focus on SLN. They show evidence that they are aware that they should pay visual attention in order to get the linguistic information. They are beginning to show (Carla less than Laura and Mark) that they are aware that for sign language communication visual access is imperative, and they should thus also take care that their mother in turn can see their output.

The hearing children focus on the spoken language but show a variation in this that is not related to hearing. Jonas uses Dutch, which is a reflection of the fact that he is hearing himself, and he focuses on the spoken mode, but he also uses SC which reflects an adaptation to the fact that his mother is deaf. Alex produces mainly Dutch, which is a reflection of his own hearing status. He receives SC input, although with only few sign combinations, but he is generally slower in his development. He seems to become aware that his mother is deaf somewhat later than the other children. Sander, on the other hand, receives linguistic input similar to that of Jonas' and Alex', but his mother's interactional style is different from that of their mothers, and we saw that his output is different from the language production of Jonas and Alex. He communicates more often in SLN or SC than they do, although he also uses some Dutch. However, the structure of his SC is similar to that of Jonas and Alex as discussed above (10.2.3), he just seems to be more oriented towards signing, so his choice in language is more defined by his mother's hearing status than his own. This is supported by the fact that Sander
increasingly checks whether or not his mother is giving visual attention before signing or speaking. This is not so clear with Jonas and Alex.

A clear difference in the input to the two groups of children is the structure of what was initially called SC as discussed in 10.1. The deaf children receive SLN whereas the hearing children are also offered a mixed form of input. Another difference lies in the frequency of certain forms that are offered to them. We found such differences in several different areas. In SC input we see more signed verbs with the deaf children. The signed input to both groups of children contained a diversity of forms of verb inflection, which all the children began to produce, but the hearing children to a lesser extent than the deaf children (see Table 10.1). This supports again the fact that the hearing children are more focused on the spoken language. More spoken verbs are used with the hearing children; the spoken verbs are more often in finite form with the hearing children and they are also offered more auxiliaries and copulas. In negative signed utterances the non-manual marker neg is used only with the deaf children as a sole negator. These differences in the input for frequency of forms is reflected in the output of the deaf and hearing children as discussed in 10.2. In general we see more complexity in the sign language with the deaf children and more in the spoken language with the hearing children.

Another aspect is the correct grammatical realization of the forms described above, both in the input and the output. For interrogatives for instance, we found that the use of incorrect signed forms decreased in the input to the deaf children, but not with the hearing children. The reverse is true for the spoken interrogatives which are more often incorrect with the deaf children.

As already discussed (10.2.4) these quantitative and qualitative differences in the input have an influence on the output of the children. If certain forms are encountered less often, then they will be acquired more slowly. In Table 10.1 an overview is presented of the acquisition of SLN and signed SC for both the deaf children and hearing children on the one hand and of Dutch and the spoken part of SC for the hearing children on the other.

The development of Dutch can only be described for the hearing children. As we see from Table 10.1 representational words first appear around age 1;0, followed by word-combinations at age 1;6 in Jonas and Sander. Alex is a little slower at age 2;0. There are some individual differences, but on the whole the children first produce interrogative utterances around age 2;0, auxiliaries and copulas also appear around this age, as well as finite verbs and morphological markings on nouns and adjectives. At age 2;6 past participles are produced. This is all within normal ranges for monolingual children acquiring Dutch.

From the other column in Table 10.1 it is possible to compare the two groups of children in their SLN and signed SC acquisition in more detail and identify the points of comparison or contrast.
Table 10.1 Overview of acquisition for SLN and signed SC, and NL and spoken SC of the deaf and hearing children.

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<thead>
<tr>
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<th>SLN and signed SC</th>
<th>Hearing children</th>
<th>Dutch and spoken SC</th>
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<tr>
<td></td>
<td>Deaf children</td>
<td>Hearing children</td>
<td>Hearing children</td>
</tr>
<tr>
<td>1;0</td>
<td>• representational signs all</td>
<td>• representational signs all</td>
<td>• representational words all</td>
</tr>
<tr>
<td>1;6</td>
<td>• sign combinations Laura, Mark</td>
<td>• questions Jonas</td>
<td>• less voice by Sander</td>
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<td></td>
<td>• questions Mark</td>
<td>• wh-q sign Jonas</td>
<td>• word combinations Jonas</td>
</tr>
<tr>
<td></td>
<td>• wh-q sign Mark</td>
<td>• verbs Jonas</td>
<td>• questions Jonas</td>
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<tr>
<td></td>
<td>• verbs all</td>
<td></td>
<td>• finite verbs Jonas</td>
</tr>
<tr>
<td>2;0</td>
<td>• sign combinations Carla</td>
<td>• visual attention Sander</td>
<td>• inflected adjectives Sander</td>
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<tr>
<td></td>
<td>• questions Laura</td>
<td>• sign combinations Jonas, Sander</td>
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<td></td>
<td>• wh-q sign Laura</td>
<td>• questions Alex, Sander</td>
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<td></td>
<td>• verb inflected for location and classifier use Laura</td>
<td>• imperatives Jonas, Sander</td>
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<td></td>
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<td>• wh-q sign Sander</td>
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<td>• wh-q marker Jonas</td>
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<td>• y/n-q marker Sander</td>
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<td>• verbs inflection for location Jonas, Sander</td>
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<td>2;6</td>
<td>• visual attention Laura, Mark</td>
<td>• imperatives Alex</td>
<td>• imperatives Jonas, Alex</td>
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<td>• questions Carla</td>
<td>• verbs Alex</td>
<td>• auxiliaries Alex, Sander</td>
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<td></td>
<td>• imperatives Laura, Carla</td>
<td>• verbs inflected for subject/object Jonas</td>
<td>• copulas Jonas</td>
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<td>• wh-q sign Carla</td>
<td>• verbs inflected for subject/object Jonas</td>
<td>• past participles Jonas, Sander</td>
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<td>• negative verb Mark</td>
<td>• verbs inflected for subject/object Jonas</td>
<td>• inflected adjectives Jonas, Alex</td>
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<td>3;0</td>
<td>• visual attention Carla</td>
<td>• sign combinations Alex</td>
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<td></td>
<td>• verb inflected for manner/aspect Carla, Laura</td>
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<td></td>
<td>• verb inflected for location, subject/object Mark</td>
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<td>• auxiliary OP Mark</td>
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All children produce their first representational signs around their first birthday. Sign combinations are first seen in Laura and Mark (D) at 1;6 and at later ages with the other children. The first signed interrogatives occur at age 1;6 with Mark (D) and Jonas (H) along with wh-q signs - the other children follow at later ages, but Alex produces only one (imitation of a) wh-q sign at age 1;0. We see no clear difference between the deaf and hearing children here. Interrogative sentence markers are only produced by Jonas and Sander (H) around age 2;0. Mark (D) and Jonas (H) show the quickest rate of development in using interrogatives (still...
incorrectly formed), Carla (D) and Alex (H) the slowest. After age 2;0 the first verb-inflections occur with all children except Alex (H), but the deaf children produce more diverse inflections around age 3;0 than Jonas and Sander. The differences in the language acquisition of the deaf children and the hearing children can partly be attributed to hearing status, most clearly in the fact that the deaf children produce little Dutch. Partly the differences can be explained by the input, for example the hearing children are given an different input with regard to the use of neg. Individual variation in language acquisition must also be considered, for example Alex is generally slower than the other children and Sander is more oriented to signing.

10.4 Implications for parents

In Chapter 1 we have discussed the need to establish the quantity and quality of the input and to describe the interaction in which language acquisition takes place. In section 10.2 we have concluded that input can have an influence but that it is not the only factor that decides which language is acquired by a child and how it is acquired. Our study has shown the areas of influence of input and interaction and these have been related to theories of acquisition. However the results also have some implications for parents since they are the primary source of input. The results from the deaf children are relevant for both deaf and hearing parents of deaf children; the results from the hearing children for deaf parents with hearing children.

Deaf parents with deaf children use SLN in bringing up their children. Based on everyday interaction, the children will be able to acquire SLN. By providing signed information within the visual field of the child about the world around him/her, the mothers teach the children appropriate visual attention-giving behavior. The accessibility of the linguistic input is of major importance for the children during the early years of their language acquisition development. This comes naturally to deaf parents of deaf children. What is important is that hearing parents of deaf children are made aware of the absolute necessity to give the child access to the language that is being used. Specific training in how to guide the child to appropriate visual attention-giving behavior should be part of the earliest guidance programs for hearing parents of deaf children. This should be integrated into their sign language lessons. In most family guidance programs in the Netherlands attention training is already integrated from the earliest moment on. Building a vocabulary in signs is important during the early years, along with training the child's visual behavior. Establishing a smooth interaction pattern is one of the prerequisites for the deaf child to be able to learn any language through the visual channel.

Once the child shows appropriate attention-giving behavior, the parents can begin to offer more complex SLN or SC. When the visual attention of the children is appropriate for sign language interaction, deaf parents begin to offer their children
sign language which is morpho-syntactically more complex. Deaf parents provide their children with a rich vocabulary from the beginning. They gradually build up the syntactic structures in the input; the input is relatively simple in the beginning. Hearing parents of deaf children do therefore have some respite in learning the language. Hearing parents of deaf children face the enormous challenge of learning a sign language at the same time as their child is supposed to acquire it. However, we have found that the sign language addressed to the child during the early years of language acquisition does not have to be very complicated or structurally perfect. Since hearing parents of deaf children are usually second language learners in SLN, attention should be paid in their SLN instruction as to how they can make their SLN or SC more complex, that is what forms they should offer to their children. For instance, attention should be paid to non-manual grammatical markers on different levels, the inflectional verb system and the (non-) realization of arguments, as well as the use of classifiers and indexes and the use of space. By using SLN with mouthed words deaf children become aware that lip-movements can carry symbolic meaning. This forms the basis for acquisition of the spoken (and written) language. On the basis of this form of spoken input, however, we cannot expect that deaf children will have made a real start in acquiring the spoken language by the age of three years. They will need more time than hearing children to acquire the spoken language, and they will need explicit instruction. The most logical way to give form to this instruction is by making use of sign language, their first language. We have found that the hearing children can acquire SLN from the SC input they receive. This implies that the languages offered can be SLN, or Simultaneous Communication (see section 10.1). It follows, that if hearing parents, just learning to use SLN, use SLN and SC with their deaf children, these deaf children will also start to acquire SLN. The spoken or mouthed input will make the deaf children aware that lip-movements can carry symbolic meaning in the same way that the deaf children of deaf parents discover this.

Deaf parents with hearing children seem to have no communication problems with their child, whether they use a sign language, spoken language or a mixture of the two. As long as there are other hearing members in their (extended) family, the children acquire the spoken language in the same way as hearing children of hearing parents. We do not know how the acquisition of the spoken language would develop if there was less exposure to the spoken language. Within deaf mother–hearing child interaction we found that both the mothers and the children adapt to their own hearing status, but also to the hearing status of the partner in conversation. By the time the children are about 2;6 a communication mode has been established that enables both the deaf parent and the hearing child to participate equally in the interaction. For some this means more signing, for others this may mean more spoken language. The hearing children in our study are acquiring SLN, although two of them seem to have a slower development than the deaf children. And they are also acquiring Dutch. The influence of their mothers'
Discussion and conclusions

different use of Dutch apparently hardly plays a role here, except that the SC production of the children shows characteristics of a third system (see section 10.1). This third system apparently has little influence on their acquisition of the other languages, and shows that the children are aware that different languages exist. The communication of hearing children with their deaf parent(s) may be determined individually, by the choice of language of the parents, and the communicational needs of the child.
The most important finding of our research is, in our opinion, the fact that the interaction and communication between deaf mothers and their hearing and deaf children appears to pose no problems for the language acquisition development of the children. The deaf children are acquiring SLN, and the hearing children SLN, Dutch and a third system.

10.5 Further research

This thesis was handicapped to some extent by the fact that SLN has not yet been fully described although in-roads have and are being made (see Chapter 2; also Crasborn et al. 1999). Sign language acquisition research depends on a description of the adult form as the target for the acquisition process. Without it the development of the output cannot be fully examined in terms of its differences and similarities in relation to the language that is used by adult native signers. The description of SLN is incomplete in terms of the structure but some areas have hardly been touched at all such as the lexicon and pragmatics. This study limited itself to those areas where some description was available but there is enormous scope for further work.

In this exploratory research we have examined many aspects of the interaction between six deaf mothers and their deaf and hearing children up to age 3;0. We have covered many areas, but still a great deal of the data has not been examined even up to age three years. The phonological development, for example, was not touched on. Our full database also consists of filmed sessions of the mother-child dyads up to the age of 8;0 (see Chapter 4). This study traces the beginnings of acquisition but the same children can be followed into their development of more complex language. We would like to know how the development of spoken language continues for the deaf children for example. The development of their language orientation after age three is also a fascinating aspect. Does Sander continue to have a more SLN orientation than the other two hearing children or do they "catch up"?

Our data are gathered from a restricted sample, that is six mother-child dyads in 10 minutes of interaction at six-monthly intervals. All conclusions therefore have to be interpreted with some care. A study with a much larger group of children in longer interaction samples needs to be done in order to substantiate our findings.

This study provides a guideline to establishing the first suggestions for mile-stones in the acquisition of SLN. What is still needed is a profile for sign language
acquisition, comparable to GRAMAT for spoken Dutch (Bol and Kuiken 1988) or the LARSP for English (Crystal, Fletcher and Garman 1976). This kind of profiling is based on spontaneous language samples but it is also possible to use tests with children older than three years of age. These are currently being developed (Jansma, Knoors and Baker 1997). The larger studies in spontaneous use and the assessment studies together will help us to discover milestones in the language acquisition process of deaf children, both for signed and for spoken language. Such instruments will help parents, teachers and professionals to improve the linguistic opportunities of deaf children. It is imperative that deaf and hearing children, both of deaf and of hearing families, can be objectively assessed for their level of language acquisition (signed and/or spoken) when they start to attend school, so that appropriate decisions can be made for their language education.

This study has produced many pages of results but is just a small beginning. Hopefully it will stimulate further research as suggested above. The results are interesting for the field of acquisition research but there is also the practical goal of optimizing the opportunities for deaf children so that they can become a full participant in society with the same chances for success as hearing children of hearing parents.