Code mixing in mother-child interaction in deaf families

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In this paper we discuss the mixed language input of four deaf mothers and the mixed output of their three deaf and three hearing children. Taking a strict definition of code-mixing (as defined by Muysken, 2000) we find that the deaf mothers mainly use a form of code-mixing, or mixed code-blending, called congruent lexicalization, which results in a mixed form between NGT (Sign Language of the Netherlands) and Dutch in a structure which is compatible with both NGT and Dutch. The deaf children (up to 3 years), who are only just beginning to become bilingual, hardly produce any code-mixed utterances. The hearing children, however, are clearly bilingual in NGT and Dutch , and use code-blending of the mixed type in more or less the same form as their mother does.

Key words: code-mixing, code-blending, sign language acquisition, bilingual acquisition, NGT, interaction

1 Introduction*

In language acquisition studies of hearing children with bilingual input it has been found that if the parent(s) mix their languages, children are influenced by this mixed input. Besides acquiring the two (or more) offered languages they also, often from the very beginning, mix these languages (see for instance Quay 1995; Lanza 2001; De Houwer 1990; Bialystok 2001). In deaf families and in families with both hearing and deaf members both the sign language and the spoken language can be used. Moreover more than one sign language or spoken language can be offered (see Pruss-Ramagosa 2001). There can also of course be language mixing between these languages. The children in these deaf families are therefore exposed to a variable input, and, as research with hearing children has indicated, input determines the amount and type of code mixing that children produce (Nicoladis & Secco 2000).

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In this paper we will look at the language input in deaf families with deaf and hearing children and the language mixing that occurs, both in the input and in the language output of the children. This will be studied in the context of families in which both Nederlandse Gebarentaal (Sign Language of the Netherlands, abbrev. NGT) and Dutch are used.
In language contact situations it has been claimed that a third system can emerge as a language variant (Romaine 1995). She describes this third system as follows:

> In situations of intense language contact it is possible for a third language system to emerge which shows properties not found in either of the input language. Thus, through the merger or convergence of two systems, a new one can be created. (Romaine 1995:4)

Lucas & Valli (1992) consider the idea of a third system in the context of contact between a sign language and a spoken language, namely American Sign Language (ASL) and English. They studied native signers in different situations of language contact. They concluded on the basis of their findings that a third system was present that they call 'contact signing'.

> We suggest, then, that contact signing is a third system resulting from the contact between ASL and English and consisting of features from both languages. We clearly don't want to call it a variety of English or a variety of ASL. We have been able to isolate and list features of English and ASL that consistently show up in the data, indicating the existence of a predictable and consistent system." (Lucas & Valli 1992:104)

They found this contact signing not only in conversations between a deaf native signer and a hearing participant but also between deaf native signers. They also describe code switching between ASL and contact signing. It appears to be a system that is in regular use and in constant interaction with ASL.
Throughout their whole book, however, they have problems in defining what should be called code switching or code-mixing and what should be called the new system 'contact signing' (1992:108). They take a decision as to what can count as a new structure. This can be mixture of syntactic and morphological structures from ASL and English but also combinations of ASL signs and English mouthed or spoken words. The criteria for this decision are unclear.
Emmorey, Borinstein and Thompson (2005) have studied the language production of hearing ASL-English bilinguals, adults who are the children of deaf parents (CODA's). They designed different types of interaction situations. In retelling a cartoon film where it was expected that speech and sign or gesture would be produced, the participants were explicitly told that it was possible to use both languages with a bilingual partner; in a monolingual situation, where a non-signer was the conversation partner, this was not encouraged. In a third situation the participants were asked to use Sim-Com (a form of sign supported speech) to their bilingual addressee. In the bilingual situation the authors report that nine of the ten participants used mainly English: 95% of ASL signs co-occurred with English words and 23% of the English words with an ASL sign. Emmorey et al. distinguish between code-switching and what they call "code-blending". Code-switching between sign and

spoken language is, in their definition, to 'stop talking and switch to signing ASL' (2005:665). This was a relatively low percentage, around 6% in the bilingual situation. Code-blending they define as "ASL signs produced simultaneously with English words" (2005: 666). The notion of blend is useful in that it contains the image of two closely knit elements and we will use this term here where relevant to refer to the simultaneous mixing of signs and words.

For determining code-mixing in spoken languages Muysken (2000) has set out linguistic criteria alongside socio-linguistic factors. Muysken (2000:3) argues that in intra-sentential code-mixing there are in fact three processes to be distinguished:

- **insertion** of material from one language into a structure of the other
- **alternation** between structures from languages
- **congruent lexicalization** of material from different lexical inventories into a shared grammatical structure.

In Example (1) an English word (marked in bold) is inserted into a Dutch sentence that would have a different structure in English; this is therefore lexical insertion. Example (2) shows alternation, first English then Dutch. Example (3) shows congruent lexicalization; the structure of the sentence is identical in both English and Dutch.

Example 1	Ik	wil	dat	je	mij	een	**kiss**	geeft
	I	want	that	you	me	a	kiss	give

'I want you to give me a kiss'

Example 2	I	want	dat	je	mij	zoent
	I	want	that	you	me	kiss

'I want you to give me a kiss'

Example 3	Geef	mij	een	kiss

'Give me a kiss"

The last type, congruent lexicalization, is most often present in mixing between dialects and between languages, which are close to each other in structure. This type is seen by Muysken as an indication of good command of both languages since code mixing occurs at those points where the grammatical structures are compatible. Using this division into three types of code-mixing it becomes clearer what the extent of mixing is. Alternation is mixing at a structural level; lexical insertion is mixing at a more restricted lexical level. Congruent lexicalization is an avoidance of structural mixing through the choice of a parallel structure in both languages. It has been difficult in sign languages to determine the nature of code-mixing since signs and

words can be produced simultaneously. Muysken's system will be used in this paper to explore the different types of mixed utterances. Code-blending as the simultaneous mixing of words and signs often with the same meaning falls under congruent lexicalization but this has to be explored to see how frequently this occurs..

In every sign language investigated to date mouthings occur to a greater or lesser degree (Boyes-Braem & Sutton-Spence 2001). Lucas & Valli (1992:78) define mouthing to be a central feature of contact signing when it occurs continuously across the whole utterance. They also include as part of contact signing spoken words with phonation when they occur with or without a sign. It remains unclear in their analysis, however, when the presence and form of a spoken element in a signed utterance determines that the utterance belongs to the third system, to ASL or to a category of code-mixing.

Mouthings can be seen as part of the sign language or as part of a mixed system, according to the perspective of the researcher. Words that are produced **with** phonation can also be viewed in the same way (Ebbinghaus & Hessmann 1996). There is no clear consensus in the literature.

If words with or without phonation are considered as belonging to the spoken language, then clearly code-mixing occurs in deaf signers. It is also therefore possible that the three types of mixing mentioned above (Muysken 2000) occur. In **insertion** the lexical item or constituent from the one language takes the place of a comparable item in the other language but it is inserted into the structure of the other language. To identify this type, therefore, the sign or word must add content to the utterance *and* the structure of the sign language or spoken language must be clearly identifiable. Although research on the structure of sign languages has progressed considerably in the last twenty years, it can still be the case that it is not clear whether the spoken language and sign language are distinct in their structure in a specific area. As far as sign order is concerned, it is also known that sign languages are freer than many spoken languages. We can therefore predict that it will be difficult to identify many structures as clearly belonging to the spoken language or to the signed language. One clear area of difference is the possibility to omit both subjects and objects in a signed language, whereas in many spoken languages this is not possible.

The lack of difference is a restriction too in determining cases of **alternation**, since here structures must alternate**.** In the case of there being no apparent structural difference, then **congruent lexicalization** is the mixing process. The terms **insertion** and **alternation** suggest sequential mixing. With combinations of signs and words the combination of elements is often simultaneous. However this need not necessarily detract from the possibility of determining one type or the other. This will be discussed further in section 4.

2. Bilingual input in deaf families

Mallory, Zingle & Schein (1993) investigated from a socio-linguistic perspective the language use in several deaf families and found considerable variation and considerable mixing.[2]

2 Mallory et al. (1993) do not define in linguistic terms what they count as 'mixing'.

In most studies of deaf children's language acquisition little attention has been paid to the linguistic structure of the input and the mixing of languages.
Pettito, Katerelos, Levy, Gauna, Tétreault & Ferraro (2001) are interested in the language mixing in the input to hearing children of deaf parents. The children are learning Langue des Signes Québécoise (LSQ) and French. They choose to make a distinction between LSQ utterances and mixed utterances on the basis of the use of phonation. If a sign in an utterance is produced with phonation or a phonation is produced alone, then they code the utterance as mixed. Mouthed words are not discussed explicitly; implicitly an utterance that contains mouthings, whether continuous or not, belongs to LSQ. This is of course quite different from Lucas & Valli's (1992) definition.
Sutton-Spence and Day (2001) find in BSL that there are more mouthings in child-directed registers than in adult-directed registers.
Petitto et al. (2001) report that the mixed utterances in the input amounted to 91% and 66% from the deaf primary adult caregivers for one child aged around three years. This is a large amount although the deaf primary caregivers are described as being native signers of LSQ and non-speakers of French. At the same age the child produced 33% and 20% mixed utterances with these caregivers. It must be remembered, however, that this was input directed to hearing children and the definition of 'mixed' included any utterance in which phonation together with signs was used.
Pettito et al. do not use Muysken's idea that a lexical item or constituent must add to the meaning of the utterance for it to be considered mixed. They do report that a high percentage (89%) of simultaneously produced signs and words were semantically congruent. This would seem to imply that a large number of their mixed utterances would not count as code-mixing if Muysken's definition is followed strictly.
Van den Bogaerde (2000) studied the input to three deaf and three hearing children in deaf families in the Netherlands up to the age of three years[3]. Despite work on the function of spoken words in Sign Language of the Netherlands (NGT) by Schermer (1990) it is still a problem to distinguish between NGT and sign supported Dutch (SSD). SSD is a system made up of simultaneously produced signs and spoken/mouthed words that follows the grammar of Dutch. In its purest form it is re-lexification of Dutch but in the many variants between NGT and SSD it can be the case that mixing takes place. Since at the outset of Van den Bogaerde's research it was unclear how signed utterances containing mouthed or spoken words should be categorized, a strict definition was applied in the first instance. Only utterances with no mouthed or spoken words were included in the category NGT. Utterances including a combination of signs and words were placed in a category Simultaneous Communication. These are now called Code-blended using Emmorey et al.'s (2005) terms. Phonation was not a criterion for inclusion here; the words could be mouthed, whispered or spoken with voice.

Table 1 Percentages of code-blended utterances in the input of the deaf mothers

[3] Code-blending in the same children including the age six years has been studied in Baker & Van den Bogaerde (in press)

and the output of the deaf and hearing children up to 3 years of age (Van den Bogaerde 2000:260)

Deaf mother of deaf children	**code-blended utt. (%)**	**Deaf mothers of hearing children**	**code-blended utt. (%)**
mother of Carla	77	mother of Jonas	63
mother of Laura	62	mother of Alex	67
mother of Mark	54	mother of Sander	73

Deaf children	**code-blended utt. (%)**	**Hearing children**	**code-blended utt. (%)**
Carla	17	Jonas	39
Laura	7	Alex	18
Mark	3	Sander	47

As can be seen in Table 1, the percentages of code-blending used by the deaf mothers are considerable with both the hearing and deaf children. Petitto et al. (2001) also found high percentages in the deaf caregivers of LSQ and French mixed utterances, even though in their definition the use of phonation was essential to identify a code-blend. The children on the other hand produce relatively small percentages of utterances in this category; two of the deaf children have extremely few in number too (n = 16 and = 6). Again these results are not strictly comparable to Petitto et al.'s results because of their different definition of what can be considered code-blending. If we consider the amount of phonation in the mothers and children in this study, on the basis of an analysis at the level of words, it becomes clear that there are large differences (Van den Bogaerde 2000: 79,96-98). The deaf mothers of the hearing children had on average nearly 100% phonation in the words they produced. The deaf mothers of deaf children are more variable however. The deaf mother of one deaf child produced 94% of her utterances with phonation in contrast to the deaf mother of the other two deaf children who only used 15% phonation on average. If the definition of Petitto et al. (2001) of mixing is followed, therefore, mixing looks quite different in different individual adults interacting with their children. There is not a clear pattern with hearing children compared to deaf children as one might expect. The children also show a very variable pattern. The deaf children produce between 63-88% of their words with phonation and the hearing children between 39% and 99%. One hearing child shows considerable interlocutor sensitivity by omitting phonation with his deaf mother compared to the other two hearing children.
As already mentioned, Van den Bogaerde (2000) used a working definition of code-blended utterances, then called SC , in which utterances with phonation and mouthed words were pooled. She further analyzed these code-blended utterances in terms of their semantic content, that is on the basis of the proposition. Code-blended utterances

were divided into four different combinations. This was done on the basis of the semantics of the utterance as is common in work on code-mixing in spoken languages where the notion of semantic congruence is often used. In this study the proposition is a crucial concept for determining what we want to call the base language. This term originates in the area of creole languages in which a creole is seen as for example English-based when the bulk of the vocabulary is drawn from this language (see Tracy 2000:17-21 for a discussion of the problems of using different definitions in the context of language acquisition studies). Here we use the idea of a semantic base - for example, where the proposition is expressed fully in words with only semantically congruent signs, the code-blended utterance is classified as Dutch Base Language or Dutch BL. Only the proposition is used for this classification; morpho-syntactic criteria are not used since we are dealing in the children with emerging competence. The use of morphological elements to determine the Matrix Language in the terms of Myers-Scotton (1993) could lead to an incorrect classification, since these elements are in the process of being acquired. In the adult deaf mothers there is also incomplete competence in spoken Dutch. All three mothers could be seen as being in a category between an L1 and L2 learner of Dutch (see Berent 2004), although the mother of Jonas, Laura and Mark has quite a high competence in Dutch. Furthermore the mothers are in interaction with their children and could be using a child-directed register that may involve the omission of certain structural elements. Verb morphology in a sign language, for example, is produced less frequently in child-directed input than in adult-adult interaction (Van den Bogaerde 2000; Baker, Van den Bogaerde, & Woll, this volume).
The four types are briefly discussed below.

(1) Code-blended, Dutch base language[4]

A Dutch BL code-blended utterance is an utterance in which the proposition is expressed entirely in the words and where the signs do not contribute additional meaning to the utterance (see for comparison Example 1), in other words each sign occurring is semantically congruent with one word. The utterance is usually structured more or less according to Dutch morpho-syntactic rules but this is not a crucial criterion as discussed above.

(2) Code-blended, NGT Base Language[5]

An NGT BL code-blended utterance is an utterance in which the proposition is expressed entirely in the signs and where the words do not contribute additional meaning to the utterance (see for comparison Example 2), in other words each word occurring is semantically congruent with a sign. The utterance is usually structured more or less according to NGT morpho-syntactic rules but this is not a crucial criterion as discussed above.

(3) Code-blended, Full[6]

[4] In Van den Bogaerde (2000) this category was called fully spoken, complementary signed or cf.
[5] In Van den Bogaerde (2000) this category was called fully signed, complementary spoken or fc.
[6] In Van den Bogaerde (2000) this was called Full or ff

In these utterances the full proposition is expressed in both modalities The utterances do not have to be complete structurally, in either NGT or Dutch.

(4) Code-blended, Mixed[7]
A mixed code-blended utterance is an utterance where both the signs and words are necessary to make up the full proposition. There are two possibilities here with the simultaneously uttered elements, i.e. the sign and the word can belong to the same word class, but are semantically different or they can belong to different word classes.

In this study we aim to study in more depth the language production in the Code-blended Mixed category in the deaf mothers and their deaf and hearing children. These utterances clearly contain code-mixing according to Muysken's definition since the proposition is spread over the two modalities. They also amount to a considerable proportion of the input from the deaf mothers (see results Table 2). The hearing children also produce these utterances but the deaf children only to a slight degree. Despite these differences we are interested in the linguistic structures in which this code mixing occurs and in the kind of mixing the combinations of signs and words in this Code-Blended Mixed category (see above) represent. We can also see whether they can be termed a 'third system' as defined by Romaine (1995).

3 Method

3.1 Subjects
In this study we look at the language input and output of four deaf mothers and three deaf children called Carla, Laura and Mark, and three hearing children Jonas, Alex and Sander. These children and their mothers were followed from an early age (all before 1;0) up to age 9;0 in a longitudinal study on input and interaction in deaf families. Van den Bogaerde (2000) studied the children up to the age of 3 years. Below we will give more information on each of the children, and the families they belong to.
Carla (deaf)
Carla was diagnosed deaf at the age of 0;9 and at 1;1 showed no reaction to sound. Carla's mother usually wears a hearing aid, with the help of which she can pick up some sounds; her degree of hearing loss is not known. It is also unknown whether her hearing impairment was present from birth, although she suffered from no illness known to cause deafness in her youth. She is born deaf of hearing parents, with no known deaf relatives, and has used Sign Supported Dutch (SSD) and NGT since the age of 3;0 when she came into contact with other deaf children at the school for the deaf. The mother worked at home, and at the time of the study was not very active in the deaf community since in the town where they live there is no club for the deaf. Carla's father is deaf (cause unknown) of hearing parents and he works outside the home. Carla has one deaf brother (hearing loss unknown), who is nearly two years older than Carla.

[7] In Van den Bogaerde (2000) this was called supplementary signed and spoken or ss.

Laura (deaf)
Laura was probably born deaf, and at 0;11 was diagnosed to be profoundly deaf (≥ 80 dB hearing loss in best ear). Over the years however it appeared that she showed only little reaction to the standard hearing tests, so her loss of hearing may be greater.
Laura's mother has a hearing loss of ≥70 dB in the best ear, and usually wears a hearing aid, which enables her to pick up some sounds, for instance a passing motorcycle. However, she cannot hear spoken language. She was born deaf, and she has hearing parents and one deaf sister. Before the children were born she worked as a psychological assistant at an institute for the Deaf. She considers herself to be a member of the deaf community and has many contacts with other deaf people.
Laura's hearing father has deaf parents and is a native signer (CODA). He is an active member of the deaf community, and he has been working with deaf and hearing parents of deaf children, but he also develops sign language courses and is an interpreter.
Laura has one deaf twin brother, Mark and a hearing brother Jonas who is 14 months older than the twins.
Mark (deaf)
Mark was born profoundly deaf (≥ 90 dB hearing loss in best ear). He also joined the study at age 0;11. Mark is the twin brother of Laura and younger brother of Jonas.

The three deaf children Carla, Laura and Mark started going to kindergarten an institute for the Deaf when they were approximately 2;6. At the time the teachers in this school were using Sign Supported Dutch (SSD) with the children (see Knoors 1992; 1994). The children were in a class of 5 to 7 children once or twice a week.

Jonas (hearing)
Jonas is the hearing older brother of Mark and Laura (see Laura for family details).
Sander (hearing)
Sander is the hearing child of two deaf parents. He has two hearing brothers (twins), who are six years older. Sander's mother is born deaf of deaf parents and does not wear a hearing aid. Her hearing loss is unknown. She worked part-time as an assistant at a bookbinder's at the time of the filming. She considers herself an active member of the deaf community.
The father of Sander is deaf of deaf parents, with deaf brothers and sisters. He is an active member of the Dutch deaf community, and works as a representative of the deaf community.
Alex (hearing)
He has a deaf mother and a severely hearing impaired father (exact hearing loss unknown of both). He has one hearing sister, who is eight years older and one hearing brother six years his senior. His mother became deaf after meningitis at the age of 2;6; she has a hearing aid, which she wears inconsistently. There are no other deaf members in her family. She worked at home during the early stages of the study, and later worked in an administrative function. The father always wears a hearing aid and works outside the home.

The three hearing children attended pre-school from the age of approximately two and a half.

3.2 Data collection

The children were filmed at home monthly by a hearing researcher, who was well acquainted with the families. Since filming started when the children were not yet one year old, the researcher quickly became familiar to them. We feel confident that the language produced by the mothers and children was representative for their usual communication. This was confirmed by the mothers who viewed some of the sessions later. Nevertheless an influence on the interaction from the presence of the hearing researcher cannot be excluded.

Most filming sessions lasted about 20 to 30 minutes. The mothers and children played together in a spontaneous fashion that is with toys and books of their own choice. The first author transcribed 10 minutes of these sessions with the help of a native deaf signer. Interrater reliability with a second transcriber was over 88% signs and words for the mothers and over 79% for the children (see Van den Bogaerde 2000:52-55 for details).

For this study we selected the sessions when the children were aged 1;0, 1;6, 2;0, 2;6 and 3;0. The data were pooled across these sessions since the numbers of utterances involved are not large.

4 Analysis

All utterances that belonged to the category Code-blended Mixed (or 'ss' in the earlier study of these subjects,Van den Bogaerde 2000:99ff) were further analyzed since these could be strictly considered to contain code-mixing following Muysken (2000). The pointing gesture INDEX was analyzed as part of the grammatical structure in the utterances. When the INDEX occurs with another sign it is quite plausible that it is not a non-linguistic gesture but, for example, a pronoun. When the INDEX occurs without another sign but together with a word, then its status is more questionable. These were included since they often specified the meaning of the spoken item (see Examples 7 and 8) or functioned as a separate argument of the verb (see Example 9). Phonation was not considered a criterion for determining code-mixing as we discussed above[8]. The utterances were analyzed according to the types of code mixing suggested by Muysken as discussed above: lexical insertion, alternation and congruent lexicalization. Some examples are given here below.

Lexical insertion

Lexical material from one language is inserted into the structure of the other.

8 An analysis of the Code-blended Mixed utterances showed that the amount of phonation in the individual mothers and children was comparable to their phonation in all SC utterances. This category was therefore no different in this respect.

Example 4[9]	Mother of Sander, age 2;7: utt. 121	
signed	$INDEX_{to\text{-}book}$	HOUSE
spoken		schuurtje
English		shed
translation	'that's a shed'	

In Example 4 the structure is NGT and the Dutch word *schuurtje* 'shed' is inserted into that structure.

Alternation
No examples of this were identified in the data, neither in the mothers' utterances nor the children's. Example 5 is hypothetical. The signed form HOUSE is marked as a NGT topic followed by a Dutch main clause.

Example 5	*invented*		
	_____t		
signed	HOUSE		
spoken		heeft een	dak
English		has a	roof
translation	'as for the house, it has a roof'		

Congruent lexicalization
Lexical material from both languages has to be mixed in a structure that is shared between the two languages. In Example 6 both the signed part and the spoken part follow the same word order and are possible structures in both NGT and Dutch.

Example 6	Mother of Sander, age 2;6: utt. 110			
signed	PUSH			1-CL-FALL
spoken	zo	gaat de	boom	naar beneed
English	so	goes the	tree	to down
translation	'the tree is pushed over' or '[he] pushes the tree over'			

The utterances were further analyzed in terms of their linguistic structure to explore whether certain types of construction consistently re-occurred.

5 Results and discussion

The total number of utterances in the category Code-blended Mixed varied in absolute figures and percentages of the code-blended utterances as can be seen in Table 2 in both the mothers and children.

9 Convention for examples: the first line 'signed' describes the manual signs made and these are written in small capitals. If a line appears over the sign glosses, this indicates that a non-manual signal is simultaneously produced, like a head-nod or a head-shake. A dotted line indicates the extent to which a sign and word are produced simultaneously. The next line, 'spoken' depicts all Dutch (parts of) words, with or without phonation. The line called 'English' gives an English translation for the words in line 'spoken'. The line 'translation' gives a free translation of the meaning of the utterance.

Table 2 Frequency of Code-blended Mixed (formerly 'ss') utterances expressed in raw figures and as a percentage of all Code-blended utterances

Deaf mother of deaf children	**Mixed code-blended utt.**		**Deaf mothers of hearing children**	**Mixed code-blended utt.**	
	n	**(%)**		**n**	**(%)**
mother of Carla	57	(13)	mother of Jonas	117	(21)
mother of Laura	30	(10)	mother of Alex	132	(23)
mother of Mark	26	(9)	mother of Sander	155	(31)
Total code-blended utterances	113			404	

Deaf children	**Mixed code-blended utt.**		**Hearing children**	**Mixed code-blended utt.**	
	n	**(%)**		**n**	**(%)**
Carla	10	(22)	Jonas	41	(33)
Laura	3		Alex	21	(25)
Mark	0		Sander	49	(38)
Total code-blended utterances	13			111	

As we might expect, the deaf mothers have more Code-blended Mixed utterances with their hearing children than with the deaf children. The hearing children have also clearly more of such utterances than the deaf children and proportionally even more than their mothers. Carla is the only deaf child with more than just a few. Her mother also has the highest percentage amongst the deaf mothers with deaf children but it is not higher by a large amount.

The analysis of type of code mixing is presented in Table 3. No examples of alternation were found and so this category is omitted. The cases of lexical insertion are specified according to the matrix language (Myers-Scotton 1993). The percentages are taken from the total number of Code-blended Mixed utterances (see Table 2).

Table 3 Types of code mixing expressed as a percentage of utterances in the category Code-blended Mixed (matrix language given for lexical insertion)
LI means Lexical Insertion
CL means Congruent Lexicalization

Deaf mother of deaf children	**LI**		**CL**	**Deaf mothers of hearing children**	**LI**		**CL**
	NGT	**NL**			**NGT**	**NL**	
M of Carla	37%	0%	63%	M of Jonas	14%	0%	86%
M of Laura	13%	0%	87%	M of Alex	11%	0%	89%

M of Mark	19%	0%	81%	M of Sander	7%	0%	93%

Deaf children	**LI**		**CL**	**Hearing children**	**LI**		**CL**
	NGT	**NL**			**NGT**	**NL**	
Carla	0%	0%	100%	Jonas	0%	0%	100%
Laura	0%	0%	100%	Alex	0%	0%	100%
Mark	0%	0%	100%	Sander	4%	0%	96%

From Table 3 it is clear that the deaf mothers show predominantly congruent lexicalization with both the hearing children and with the deaf children. With the deaf children the mothers show, however, slightly more lexical insertion of Dutch into NGT structures. Insertion of NGT into a Dutch structure was not found. The deaf children have very little code mixing but only congruent lexicalization and the same is true for the hearing children. These results suggest strongly that the mothers have a restriction on this type of code-blending or mixing. It is however possible that in these still short utterances as input to the children in this age range the structures of NGT and Dutch are not different enough to show lexical insertion clearly.

Having analyzed the linguistic structure of the Code-blended Mixed utterances we found that the combinations of signs and words fell into the following six categories.

1. A deictic sign (glossed as INDEX) is combined with a word and specifies more precisely the referent. The INDEX does not have the function of an independent argument in the sentence.

   Example 7 Mother of Sander, age 1;0: utt. 3
   signed $INDEX_{lap}$---
   spoken kom hier
   English come here
   translation 'come here'

   In Example 7 the sign $INDEX_{lap}$ specifies the word 'here' but does not add totally new information to the proposition, i.e. it is semantically congruent with the word *hier*.

   Example 8 Mother of Jonas, age 2;0: utt.89.
   signed $INDEX_{book}$ PLAY $INDEX_{book}$
   spoken en Jonas speelt met de pop
   English and Jonas plays with the doll
   translation 'and here Jonas plays with this doll'

   In Example 8 the indices pointing to pictures in a book specify which Jonas is referred to and which doll.
   Utterances in this category were almost entirely congruent lexicalization. Both Examples 7 and 8 are examples of congruent lexicalization.

2. A deictic sign (INDEX) functions as an argument in the whole proposition.

Example 9	Mother of Alex, age 1;0: utt. 18
signed	$INDEX_{book}$
spoken	kijk
English	look
translation	'look at the book' or 'look here'

The sign $INDEX_{book}$ is the locative or object argument of the spoken verb *kijken*. Utterances in this category could have been either lexical insertion or congruent lexicalization, but the latter was predominant. Example 9 is an example of congruent lexicalization.

3. The lexical sign(s) and the lexical word(s) in one utterance are semantically incongruent, that is they differ in their meaning, *and* the word specifies the sign. The word and sign must be of the same word class.

Example 10	Mother of Sander, age 2;7: utt. 121	
signed	$INDEX_{to\text{-}book}$	HOUSE
spoken		schuurtje
English		shed
translation	'that's a shed'	

Example 11	Mother of Carla, age 2;0: utt. 29	
		nod
signed	GOOD	----
spoken	jij	leuk
English	you	fun
translation	'you really find that fun'	

The sign HOUSE (see Example 10) is usually accompanied by the spoken word *huis* 'house'. Here the word 'shed' specifies the meaning of HOUSE, that is the type of house. This type of specification through the spoken word occurs frequently in adult NGT (Schermer 1990). It is unclear in this example whether a separate lexical sign exists for 'shed'. There are separate signs for 'good' and *leuk* 'fun' but in Example 11 the sign GOOD is combined with the word *leuk*.

Example 12	Mother of Sander, age 2;6: utt. 110				
signed	PUSH				1-CL-FALL
spoken	zo	gaat	de	boom	naar beneed
English	so	goes	the	tree	to down
translation	'the tree is pushed over' or '[he] pushes the tree over'				

In Example 12 (repetition of Example 6) the relations are more complex. The verb sequence PUSH FALL specifies the meaning of the spoken verb *naar beneden gaan* 'to go down'.[10]
Utterances in this category could be either lexical insertion or congruent lexicalization according to the specificity of the structure in which the lexical combinations occur. Example 12 is an example of congruent lexicalization since the structures can occur in both NGT and Dutch. Examples 10 and 11 are examples of lexical insertion; the matrix language is NGT. The verb can be omitted in NGT but not in Dutch.

4. The lexical sign(s) and the lexical word(s) in one utterance are semantically incongruent that is they differ in their meaning *and* the word adds a quite different semantic aspect. The word can be in the same argument or realize different arguments.

Example 13	Sander, age 3;0: utt. 7	
signed	DOLL	TAKE
spoken	paars	
English	purple	
translation	'[I'll] take the purple doll'	

Example 14	Mother of Alex, age 2;0: utt. 111
signed	TELEPHONE
spoken	spelen
English	play
translation	'[you] are playing with the telephone'

In Example 13 the signed noun DOLL is specified further with the adjective 'purple'. Together they are the object of the verb TAKE. In Example 14 TELEPHONE is the object of the verb 'play'. The two arguments are realized in the two different modalities, and together they form the proposition.
It is difficult to determine here whether the structure is common since usually the combinations are simultaneous. Examples 13 and 14 are categorized as lexical insertion of Dutch in the matrix NGT since in both utterances the subject argument is dropped. This is grammatical in NGT but usually not allowed in Dutch, except in certain cases.

5. The two modalities express a different pragmatic function in one and the same utterance (Example 15).

Example 15	Mother of Sander, age 3;0: utt. 28	
signed	MUST	TICKET-PUNCH
spoken	moet	wat
English	must	what

10 This verb is not a correct lexical choice in this sentence. The verb should have been *vallen* 'fall'.

translation ‘what does he have to do? punch the ticket’

Here the mother asks a question in words, while at the same time giving the answer in signs. This is not congruent lexicalization since the structure is NGT-like and not Dutch. It is rather lexical insertion creating a structure in which a rhetorical question structure is used as a type of topic marking. All of the utterances falling in this category were of this type and were categorized as lexical insertion.

6. A number of utterances fell into a category Remainder. There were words or signs that were supplementary in these utterances but they were on the level of a discourse marker (Example 16), Minor (Example 17) or Dutch grammatical function word(s) (Example 18). The latter have no equivalent in NGT. These types are all non-referential.

Example 16	Mother of Alex, age 2;0: utt. 30
signed	PU[11]
spoken	oh kapot
English	oh broken
translation	‘oh dear, [it’s] broken’

Example 17	Mother of Carla, age 1;6: utt. 97
signed	CLEVER GOOD
spoken	ja
English	yes
translation	‘yes, [you’re] clever’

Example 18	Mother of Carla, age 2;6: utt. 47
	nod
signed	$INDEX_{Carla}$ NEW
spoken	heb jij nieuw
English	have you new
translation	‘yes, you have new [ones]’

The utterances in this category are not so clearly supplementary compared to the other categories since the information added is not strictly necessary for the proposition. If omitted, the proposition does not change fundamentally.

In Table 4 we present the distribution of these Code-Blended Mixed utterances across the categories described above.

11 PU stands for palm-up, which is generally considered to be a gesture-like discourse marker, or can be considered a general question sign (meaning what, where etc.)

Table 4 Distribution of different categories in the Code-blended Mixed input and output of the deaf mothers and the deaf and hearing children respectively, pooled over time (in raw figures and percentages)

Categories:	**Mothers of deaf children**		**Mothers of hearing children**	
	n	**%**	**n**	**%**
1. INDEX as specifier	7	(6)	123	(30)
2. INDEX as argument	26	(23)	85	(21)
3. Semantically incongruent: lexical specification	6	(5)	20	(5)
4. Semantically incongruent: new content	30	(27)	27	(7)
5. Different functions	2	(2)	4	(1)
6. Remainder	42	(37)	145	(36)
Total of utterances	113		404	

Categories:	**Deaf children**	**Hearing children**	
	n	**n**	**%**
1. INDEX as specifier	0	7	(6)
2. INDEX as argument	2	48	(43)
3. Semantically incongruent: lexical specification	0	6	(5)
4. Semantically incongruent: new content	1	17	(15)
5. Different functions	0	2	(2)
6. Remainder	10	31	(28)
Total of utterances	13	111	

As discussed above, the remainder category (6) showed the least addition of information since this was provided by elements such as Minors like ‘yes’, ‘oh’, nodding the head etc. The deaf children have almost only this category. This indicates that there **are** combinations of both languages but not frequently. They are also predominantly non-referential.

Across the deaf mothers and the hearing children the remainder category is relatively large too; the percentages are also comparable to each other. These three groups, however, show different patterns of usage in some of the other categories.

The deaf mothers use far more indices as a specifier (category 1) with the hearing children than with the deaf children. In contrast the proportion of use of indices to provide an argument (category 2) is comparably large in the mothers with both groups of children. The hearing children also make a proportionally large use of this category, even more so than their mothers. In category 1 the argument is lexically specified in Dutch, such as ‘doll’ in Example 8, and the index specifies which referent is meant, in this case which doll. This is comparable to the way pointing gestures are used by hearing mothers with their hearing children. This would lead us to the

conclusion that in fact these examples should not be seen as a form of language combination or code-mixing at all. It is actually impossible to determine this as we discussed earlier in section 4 (see also Volterra & Erting 1990). Utterances in the category Code-Blended NGT Base Language clearly are examples of language combination. Most cases are cases of congruent lexicalization. There are very few instances in category Code-Blended, Dutch Base Language and no difference between the mothers with their hearing of deaf children.

The deaf mothers of the deaf children provide proportionally more information by combining lexical content (Code-Blended Mixed) than the deaf mothers of the hearing children. This means that they are heavily relying on the deaf children being able to understand the words used in order to fully understand the whole proposition. In Example 14 the child must be able to understand 'play' in order to know what to do with the telephone. The utterances might be expected with hearing children who have full access to both NGT and Dutch, just as Petitto et al. (2001:487) found instances of this category with the hearing children of deaf parents they studied. This category is quite unexpected with deaf children, however, and it is even more unexpected that the category is larger with the deaf children. The hearing children produce this category proportionally more than their deaf mothers (15% and 7% respectively). Again most cases were of congruent lexicalization in both the mothers and children.

There are relatively few instances of combinations of functions and these are produced predominantly by the mothers. These are all examples of asking a question in one modality and providing the answer in the other **simultaneously** (see Example 15). We suggest that this is a form of topicalization using a rhetorical question construction. It is known from the literature from several sign languages that topics can be established using rhetorical questions (for example in BSL, Sutton-Spence & Woll 1999:61). This is also true for NGT. The topic in the form of a question is first followed by the rest of the clause or 'the answer'. In these examples this structure seems to be split across the two languages and is articulated simultaneously. In Example 19 even the order of question and answer is not strictly adhered to.

Example 19	Mother of Carla, age 3;0: utt. 5	
signed	ANIMAL	PU
spoken	wat is	dat? grgrgr
English	what is	that? grgrgr
translation	'as far as that is concerned, it's an animal'	

Following this interpretation, all these cases are examples of lexical insertion in the matrix of NGT.

6 Conclusion

In our analysis of those utterances in which strict code-mixing (Code-blending Mixed) could be determined it appeared that the deaf children produced very few such utterances and these were at a most basic level. Up to the age of three years their development in Dutch remains at the one-word stage (Van den Bogaerde 2000). They

are just beginning to become bilingual (Van den Bogaerde & Baker 2002). Since this is the case, they cannot be expected to show the ability to code-mix between Dutch and NGT. As discussed above, code-mixing ability is linked to a certain level of fluency in both languages (Appel & Muysken 1987). The deaf mothers use different types of structures in which mixing took place and these were used in different proportions with the deaf and hearing children. This can be explained as a 'hearing' strategy in the case of the greater use of specifying indices with the hearing children alongside the spoken word. However it is unclear why so much use is made of Dutch with the deaf children. The Dutch would seem not to be very accessible to the children, since again they are at very beginning of becoming bilingual at age three. The input is clearly having an affect on the hearing children in that they also produce the different types of mixed utterances.

The type of code-mixing process that primarily occurred is congruent lexicalization with just some lexical insertion. In lexical insertion the matrix language was always NGT. The structures in the utterances are not highly complex, neither in the mothers nor in the children, therefore there are few opportunities for structural differences to be apparent. The finding that congruent lexicalization is dominant could therefore be a result of that fact. There is no evidence that these mixed utterances have a structure that forms a third system, as defined by Romaine (1995).

Muysken (2000:9) identifies congruent lexicalization socio-linguistically as being:

> associated with second generation migrant groups, dialect/standard and post-creole continua and with bilingual speakers of closely related languages with roughly equal prestige and no tradition of overt language separation.

This description does not fit the situation with NGT and Dutch except possibly that in the deaf community there is no long tradition of separation of NGT and Dutch/SSD. Although the emergence of sign languages have been compared to creole languages, it is not clear in our view that the predominance of congruent lexicalization in these data should be ascribed to a post-creole situation.

We have shown that code-blending of the lexical insertion type occurs to a considerable extent in the input to the hearing children but also to a fair amount in the input to the deaf children. The deaf children show little strict code mixing but this is probably related to their limited competence in Dutch since they are just beginning to become bilingual. The hearing children follow the code mixing in their input. We need to investigate the code-mixing in greater detail in adults and in older children, amongst other things to see if the type of mixing changes with time in either the input or the children's production.

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