Code-mixing in young bilingual children

Elena Nicoladis
McGill University, Montreal
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Language is a virus [...].

-William S. Burroughs

Abstract

This thesis examined several possible explanations for young bilingual children's code-mixing: the unitary language system (ULS) hypothesis, parental rates of code-mixing, parental discourse strategies in response to children's code-mixing, and children's language dominance. These explanations were examined in six French-English bilingual children, observed between the ages of 18 and 30 months. They were observed separately in interaction with each of their parents. The results showed that the ULS hypothesis cannot explain children's language use. Similarly, parental input could not explain children's code-mixing. In contrast, children's dominance was shown to be the best explanation of their code-mixing. It was suggested that bilingual children are particularly likely to code-mix when they do not know a translation equivalent. These results suggest that bilingual children's code-mixing is largely due to peformance factors rather than underlying competence.

Résumé

Cette thèse examina plusieurs explications possibles pour le mélange de langues chez les jeunes enfants bilingues: l'hypothèse du système de langue unitaire (ULS), des taux de mélange de langues chez les parents, des stratégies de discours chez les parents en réponse au mélange de langues de leurs enfants, et la dominance linguistique des enfants. Ces explications furent examinées avec six enfants bilingues (français-anglais), observés entre les âges de 18 et 30 mois. Ils furent observés séparément avec leurs deux parents. Les résultats montrèrent que l'hypothèse ULS n'expliqua pas l'usage linguistique des enfants. En outre, le choix de langue chez les parents n'expliqua pas le mélange de langues chez les enfants. Par contre, la dominance linguistique des enfants fut la meilleure explication de leur mélange de langues. Ces résultats suggèrent que le mélange de langues chez les enfants bilingues est en grande mesure dû aux facteurs de performance plutôt qu'à la compétence sous-jacente.

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CHAPTER 1

Introduction

Research on bilingual children has often stressed differences between bilingual development, or the acquisition of two languages simultaneously, and monolingual development. It has been claimed that bilingual development differs quantitatively and qualitatively from monolinguals. In general, syntactic development in bilingual children has been thought to be slower than in monolingual children (Doyle, Champagne, & Segalowitz, 1978). Furthermore, research has shown that bilingual children have smaller vocabularies than monolinguals in any one language (Doyle, Champagne, & Segalowitz, 1978; Nicoladis, 1992). Qualitative differences between bilingual and monolingual development have also been posited. In particular, it has been thought that bilingual children pass through an extra stage in language development-- in this extra stage, they learn to differentiate their two languages (Ben-Zeev, 1977). In addition, bilingual children code-mix, or use their two languages in a single unit of discourse (Meisel, 1989), while monolingual children do not code-mix.

There is no doubt that there are differences between monolingual and bilingual development. Researchers do not, however, agree as to whether these differences can best be attributed to competence (in particular, how a bilingual's two languages are represented) or performance. Early studies of bilingual development often attributed qualitative differences between bilingual and monolingual development to bilingual children's underlying competence. For example, Leopold (1949) claimed that his bilingual daughter used whichever language she wanted, presumably with no regard for whether or not her interlocutor understood her. Her language use was attributed to her lack of differentiation of her two languages at a representational level.

In contrast, recent research has pointed out that many aspects of language development are the same for bilingual and monolingual children. Paradis and Genesee (to appear), for example, argue that bilingual children's syntactic development is qualitatively similar to that of monolingual children. When differences between monolingual and bilingual children are found, they can often be attributed to universal cognitive constraints on language development. For example, while it is true that bilingual children's vocabulary in one language is smaller than that of monolingual children, when their vocabulary in *both* languages is counted, then there are no differences between bilingual and monolingual children (Nicoladis, 1992; Pearson, Fernández, & Oller, 1993). Presumably, putative differences in vocabulary size in each language considered separately reflect memory constraints.

The focus of this thesis is on code-mixing, a phenomenon unique to bilinguals. One underlying theme in this thesis is whether young bilingual children's code-mixing can be attributed to competence or performance. In this chapter, I discuss what code-mixing is, how often it occurs in bilingual children, and what might explain it.

Code-mixing

Code-mixing is the use of elements from two languages in a single unit of discourse; it is common in bilinguals, both adults and children (deHouwer, 1990; Heller, 1990; Leopold, 1949; Tabouret-Keller, 1963). Explanations for code-mixing view bilingual adults very differently from bilingual children, or children who grow up with exposure to two languages from birth. Code-mixing in bilingual adults has been associated with proficiency in both languages (Poplack, 1988). In contrast, one of the most frequent explanations of code-mixing in children is that they confuse the two input languages and represent them as a single linguistic system (see Genesee, 1989, for a review). While other explanations of children's code-mixing exist, most assume that children code-mix for reasons beyond their control (Ronjat, 1913). Thus, in adults code-mixing is viewed as a sign of proficiency while in children it is viewed as a sign of deficiency.

Adult code-mixing, in contrast to young children's code-mixing, has usually been shown to be purposeful and for this reason has been called code-switching (see Meisel, 1989). The term code-switching refers to a pragmatic ability, both the ability to use languages according to the appropriate sociolinguistic context (Meisel, 1989) and the ability to change languages for rhetorical purposes (see Scotton, 1987). Code-switching is a complex behavior and has been associated particularly with adult bilinguals who are proficient in both languages (Poplack, 1988). In many bilingual communities, adult code-switching can serve as a statement about power relations and group identity (Heller, 1990; Poplack, 1988; Scotton, 1979, 1987;

Scotton & Ury, 1977). For example, in a study in Kenya, Scotton and Ury (1977) reported that most of their Luyia subjects interpreted a language switch from Swahili to English as a social distancing technique. Switching to English was seen as a statement of higher status or power. Code-switching can also serve as a marker of group identity. In the Puerto Rican community in East Harlem, New York, a great deal of intra-sentential code-switching is used to identify speakers as having both Hispanic and American roots (Poplack, 1988).

Indications of deliberate use of their two languages in socially appropriate ways have certainly been identified in bilingual children by the time they are about three years old. At this age, many bilingual children have been known to use their two languages with remarkable facility and sensitivity. Fantini (1974) reported that after the age of three his Spanish-English bilingual son, Mario, would use the stronger language of his interlocutor. Slobin (1978) noted that his daughter, Heida, who had been exposed to a number of languages in addition to her native English, asked for translations of words, starting about the age of three. Reports such as these (and many more; see Bergman, 1976; deHouwer, 1990; Leopold, 1949; Ronjat, 1913; Swain & Wesche, 1975) leave little doubt that by the age of three years, bilingual children not only know (at least implicitly) that they have two languages but also can use them in socially appropriate ways.

For children younger than three years, explanations of code-mixing have been varied, ranging from representational to performance explanations. Before turning to a brief review of some of the more common accounts of children's code-mixing, I first discuss what constitutes code-mixing and how often it occurs in young bilingual children.

Across studies of bilingual children, there is a lack of consistency in the definition of the term "code-mixing". In general, mixing is thought to be "any utterance or conversation containing features of both languages [...], irrespective of the reasons which cause this to happen" (Köppe & Meisel, 1992, p.3). An utterance can be defined as "a word or group of words with a single intonation contour" (Lanza, 1992, p.638). This definition of code-mixing is meant to capture all possible instances of intra-utterance (within a single utterance) mixing, including phonological, syntactic, and lexical mixing, and inter-utterance mixing (mixing between utterances). This definition of code-mixing does not distinguish between code-switching and code-mixing; the former refers to the intentional use of two languages that is associated with high levels of proficiency in bilingual adults (Poplack, 1988).

Code-mixing should be distinguished from permanent borrowing that often occurs in communities with frequent language contact. In Quebec, French and, to a lesser extent, English have borrowed words from each other. Expressions such as "*le fun*", "*c'est cute*", "*le smoked-meat*" and "*check ça*" are all perfectly acceptable in Quebec French. Words borrowed from French are rare in English, but not non-existent; for example, the French word "dépanneur" for a corner store is in common usage, and many anglophones across Canada use "serviette" to refer to a paper napkin. Native Quebec anglophones have been known to sprinkle their English with the discourse marker "there", perhaps analogous to the ubiquitous Quebec French "*là*". These permanently borrowed words are now part of French and English dialects used in Quebec and should not be confused with code-mixing.

Code-mixing in bilingual children

Reports on rates of bilingual children's code-mixing are extremely variable across studies. Rates of intra-utterance mixing in particular, especially lexical mixing, vary considerably. In contrast, low rates of phonological and syntactic mixing are generally reported. Rates of inter-utterance mixing can be quite high compared to rates of intra-utterance mixing. I now turn to a more detailed review of these characterizations.

At least three levels of linguistic analysis can be relevant in describing intra-utterance mixing: phonological, syntactic and lexical. Phonological and syntactic mixing are difficult to identify in young children and thus have not been frequently studied. Single lexical elements are the most common unit of analysis used when examining children's intra-utterance mixing.

Code-mixing at the phonological level, namely phonological blends of two synonymous words from either language, have been reported for some bilingual children (Leopold, 1939; Ronjat, 1913; Vihman, 1981). For example, Vihman's son, Raivo, used the word [nu:et], a blend of the English word "new" and the Estonian word "*uued*", meaning 'new, plural'. Only Vihman (1981) has reported anything about the rate of phonological mixing -- in the case of her son it was quite low. Leopold (1939) and Ronjat (1913) did not cite the prevalence of phonological blends. The lack of precise reports on phonological mixing in young bilingual children may be due to the difficulty in identifying instances of this kind of code-mixing. The difficulty arises because young children's pronunciation of any language is far from adult-like (Smith, 1978). In order to identify phonological blends, it is necessary to distinguish a bilingual child's pronunciation from a monolingual's pronunciation, to verify that the bilingual's is not within the phonological variation seen in monolinguals.

Syntactic mixing, or the use of a syntactic structure for one language with the words of another, is also thought to occur infrequently in young bilingual children (Swain & Wesche, 1975). Syntactic mixing is particularly hard to identify in young children because it must be distinguished both from normal adult usage and from monolingual children's usage (Genesee, 1989). Failure to take these factors into account can result in counting as code-mixed an utterance that is not an instance of code-mixing within a given community. For example, Swain and Wesche (1975) count as syntactic mixing the expression "you want to open the lights" because this is a word-for-word translation from the French expression. However, use of "open" rather than "turn on" is used by some English speakers in Quebec (Genesee, 1989). Another example of syntactic mixing identified by Swain and Wesche is noun apposition -- for example, "They open, the windows?". Again, this structure is used by some Quebec anglophones, influenced perhaps by the French structure.

In contrast, lexical mixing in bilingual children occurs relatively frequently and is easier to identify (Goodz, 1989; Lanza, 1992; Leopold, 1949; Redlinger & Park, 1980; Volterra & Taeschner, 1978). Lexical mixing can occur within a single utterance (intra-utterance mixing) or between utterances (inter-utterance mixing). Intra-utterance lexical mixing is the use of at least one word from each of a bilingual's languages in a single utterance. One example of this comes from one of the children in this study who said "*où* car?" ('where car?'), a French and an English word in the same utterance. Studies of young bilingual children's code-mixing have most often concentrated on intra-utterance lexical mixing.

Table 1.1 summarizes the rates of intra-utterance mixing reported in various studies of bilingual children in the age range of this study. The percentages reported here were sometimes averaged for ease of comparison. For example, Arnberg (1981) reported rates of code-mixing in speech addressed to fathers and to mothers; these rates are combined in Table 1.1. It is evident from this summary that overall rates of intra-utterance mixing are extremely variable, ranging from 0% to 45%.

Table 1.1
Rates of intra-utterance mixing and MLU reported in a number of studies, listed according to the child's age.

Study	Child's name	Age (mo.)	Rate†† of code-mixing	MLU
Arnberg (1981)	Camilla	17-?	13	na**
Köppe & Meisel (1992)	Annika	18	19	na
Köppe & Meisel (1992)	Annika	19	21.9	na
Köppe & Meisel (1992)	Annika	20	10.9	na
Vihman (1985)	Raivo	20	34	na
Köppe & Meisel (1992)	Annika	21	18.9	na
Vihman (1985)	Raivo	21	21*	na
Arnberg (1981)	Daniel	21-?	12.5	na
Köppe & Meisel (1992)	Annika	22	14.4	na
Köppe & Meisel (1992)	Ivar	22	15.4	na
Vihman (1985)	Raivo	22	22*	na
Goodz (1994)	N<13	19-24	0.4-0.6	na
Goodz (1994)	N<13	19-24	0.4-0.6	na
Köppe & Meisel (1992)	Annika	23	10.4	na
Köppe & Meisel (1992)	Ivar	23	20.8	na
Vihman (1985)	Raivo	23	16*	na
Vihman (1985)	Raivo	24	7*	na
Genesee et al. (in press)	Ban	24	1	1.60
Genesee et al. (in press)	Gen	24	5.4	1.96
Genesee et al. (in press)	Oli	24	.8	1.87
Genesee et al. (in press)	Tan	24	.8	1.75
Genesee et al. (in press)	Wil	24	1.3	1.31
Lanza (1990)	Siri	24	38.5	na
Köppe & Meisel (1992)	Annika	24	1.3	na
Köppe & Meisel (1992)	Ivar	24	27.0	na
Redlinger & Park (1980)	Marcus	24	30	1.39
Redlinger & Park (1980)	Danny	24	20.8	1.92
Arnberg (1981)	Kajsa	24-?	7	na
Redlinger & Park (1980)	Marcus	25	19.5	1.47
Redlinger & Park (1980)	Danny	25	12	2.46
Lanza (1990)	Siri	25	45	na
Vihman (1985)	Raivo	25	4*	na
Köppe & Meisel (1992)	Annika	25	0.3	na
Köppe & Meisel (1992)	Ivar	25	19.6	1.53†
Arnberg (1981)	Linnéa	25-?	9	na
Lanza (1990)	Siri	26	37.5	na

(Table 1.1 continued)

Table 1.1, continued

Köppe & Meisel (1992)	Annika	26	0	na
Köppe & Meisel (1992)	Ivar	26	27.4	1.69†
Redlinger & Park (1980)	Marcus	26	27.5	1.50
Redlinger & Park (1980)	Danny	26	7.4	3.00
Lanza (1990)	Siri	27	19.5	na
Köppe & Meisel (1992)	Annika	27	1.2	na
Köppe & Meisel (1992)	Ivar	27	29.3	1.83†
Goodz (1994)	N<13	25-30	1.5-5	na
Goodz (1994)	N<13	25-30	1.3-2.4	na
Lanza (1990)	Siri	28	18	na
Köppe & Meisel (1992)	Annika	28	0	na
Köppe & Meisel (1992)	Ivar	28	33	2.04†
Redlinger & Park (1980)	Marcus	28	26.8	1.90
Redlinger & Park (1980)	Danny	28	5.5	2.92
Redlinger & Park (1980)	Henrik	28	11.9	2.89
Lanza (1990)	Siri	29	12.5	na
Köppe & Meisel (1992)	Annika	29	1	na
Köppe & Meisel (1992)	Ivar	29	5	2.85†
Redlinger & Park (1980)	Marcus	29	21.2	2.21
Redlinger & Park (1980)	Danny	29	14.6	3.35
Lanza (1990)	Siri	30	9	na
Köppe & Meisel (1992)	Annika	30	0.3	na
Köppe & Meisel (1992)	Ivar	30	4.1	3.31†
Singer (1980)	N=1	30	14	na
Redlinger & Park (1980)	Henrik	30	8.2	2.98

†from Meisel and Müller (1991)
††rate means percentage of code-mixed utterances out of total utterances, unless indicated otherwise
*out of multimorphemic utterances
** na = not available

Some of the variation in rates of code-mixing between studies may be due to a lack of agreement in defining lexical mixing. Most studies fail to state clearly what constitutes mixing, that is, whether only intra-utterance mixing is being counted and, if so, what kind of intra-utterance mixing. For example, Padilla and Liebman (1975) count as code-mixing any utterance that contains phonological representations from two languages and report low levels of code-mixing (although they do not report actual percentages). This definition could include phonological blends. Vihman (1985) and Goodz (1994) report only lexical mixing. Redlinger and Park (1980) say that "language mixing refers to the combining of elements from two languages in a single utterance." (pp.339-340) and then say that "elements" can include phrases. They do not specify if "elements" can refer to phonological or syntactic units as well. Swain and Wesche (1985) include syntactic mixing.

Another possible explanation of the large variation in rates of mixing is the lack of a uniform basis of comparison. If the rates of code-mixing are reported as a function of all of children's utterances (including, for example, the unintelligible ones), this would result in a much lower rate than if rates of code-mixing are reported as a function of children's multimorphemic utterances (as does Vihman, 1985). Most researchers do not state how they calculated the rate of code-mixing.

In order to understand children's code-mixing, it is minimally necessary that researchers agree to certain definitional standards. To this end, it is recommended that researchers report different kinds of code-mixing separately (e.g., phonological mixing should be reported separately from lexical mixing). Within each category of code-mixing, researchers should report the token number of utterances counted as mixed (over a stated amount of time) and the percentage of all the utterances (excluding unintelligible ones). In addition, intra-utterance lexical mixing should also be reported as a function of the number of multimorphemic utterances, since a minimum of two words is necessary for this kind of mixing.

One primary concern in the study of children's code-mixing has been the question of what sort of lexical items (e.g., nouns, verbs, adverbs) are mixed. In order to answer this question, researchers have distinguished between the matrix language of code-mixed utterances, or the language that provides the syntactic framework, and the code-mixed item (see Petersen, 1988). Using this framework, it is commonly reported that nouns account for most lexical mixing in children (Lanza, 1992; Redlinger & Park, 1980; Vihman, 1985). This means that the child inserts a single noun from another language into an utterance in the matrix language. While the matrix language of a mixed utterance of three words or more is fairly easy to identify, it can be difficult to identify the matrix language of a two-word utterance. In the utterance "*où* car" ('where car'), one could argue that the speaker inserted the English noun "car" in a French utterance or that he inserted a French question word "*où*" in an English utterance. The difficulty in identifying the matrix language of two-word utterances has led to different descriptions of what is being mixed. For example, for one French-English bilingual boy, Dolitsky (1981) described words other than nouns as being primarily responsible for his lexical mixing (e.g., *un autre, encore, là,* no, and me, p.101). And yet the examples of lexical mixing she gives almost always involve a noun (e.g., "no *bateau*" ('no boat'), "*là* cow" ('there cow')). For this reason, in some studies with young bilingual children, no attempt is made to identify the matrix language (e.g., Genesee, Nicoladis, & Paradis, in press; Goodz, 1994).

Inter-utterance mixing, or code-mixing between utterances, is the use of an inappropriate language in a particular linguistic context. For example, addressing an utterance entirely in Japanese to a monolingual French person is an example of inter-utterance mixing. This kind of code-mixing is particularly important in studies of young bilingual children in the one-word stage because they will not yet be capable of lexical intra-utterance mixing which by definition requires at least two words in an utterance (see Genesee, Nicoladis, & Paradis, in press). Besides inter-utterance mixing, the only other indication of code-mixing possible at this stage could be phonological mixing since all other exemplars of mixing require the use of two or more words. Rates of inter-utterance mixing are not commonly reported. In two-year old children, the rates of inter-utterance mixing can be as high as 70% of the children's total utterances (Genesee, Nicoladis, & Paradis, in press). Singer (1980) reported that the rate of inter-utterance mixing for one 30-month old bilingual child was 40% . DeHouwer (1990) reported that Kate's rate of inter-utterance mixing was very low, ranging from 4.7% to 6.3%; these rates were calculated for Kate's language between the ages of 2;7 (years;months) and 3;4.

Most researchers have been concerned with explaining children's lexical intra-utterance mixing, so the review of the literature that follows focuses on lexical mixing. Because the present study is concerned with exploring possible explanations of both intra-utterance and inter-utterance mixing, both kinds of mixing will be included in the analyses. They will be treated separately when appropriate.

Explanations of children's code-mixing

The most common explanations of young children's code-mixing are briefly reviewed here-- the unitary language system hypothesis, parental input, and language dominance. The issues underlying each of these explanations are complex. More thorough reviews of each explanation follow in later chapters.

Unitary language system hypothesis

The most popular explanation of children's code-mixing has been conceptualized in terms of underlying linguistic representation-- how many languages do these children know? Some researchers have argued that bilingual children initially have a single linguistic system that becomes differentiated over the first three years of life (e.g., Volterra & Taeschner, 1978). This has been referred to as the unitary language system (ULS) hypothesis (Genesee, 1989). According to the ULS hypothesis, bilingual children code-mix because their vocabulary items are not differentiated according to language. Proponents of this view have seen code-mixing, and in particular intra-utterance mixing, as evidence of the children's ULS (see Genesee, 1989). Thus, there is a certain circularity in reasoning-- bilingual children code-mix because they initially have a single linguistic system. Yet, the evidence for the single linguistic system is the fact that bilingual children code-mix.

The ULS hypothesis has been criticized frequently but only rarely challenged on empirical grounds. Criticism of this hypothesis has generally been based on how infrequently children code-mix.

Some researchers have found that rates of code-mixing in bilingual children are quite low-- usually less than 5% of their total utterances (e.g., Goodz, 1989). It follows, according to these researchers, that a serious test of the ULS hypothesis must utilize evidence other than code-mixing to escape the circularity of reasoning (Genesee, Nicoladis, & Paradis, in press). That is, the ULS hypothesis should be tested on the grounds of what bilingual children do with the greater part of their language use, namely the language that is not code-mixed. Such suggestions have led to the examination of bilingual children's context sensitivity, that is, whether or not children most often use the language that is required by a social context. Most studies that have set out to examine children's context sensitivity have found evidence for it and claim that bilingual children almost always use an interlocutor's stronger language (e.g., Fantini, 1974). On the basis of bilingual children's pragmatic context sensitivity, many researchers have argued that they differentiate their two languages from very early on, perhaps prior to their first linguistic productions (e.g., Bergman, 1976). This view has been referred to as the dual system hypothesis (Genesee, 1989).

Studies in which a dual system hypothesis has been proposed have often lacked empirical rigor. For example, the rates of children's code-mixing are not always determined systematically. More importantly, these studies have not always examined children of an appropriate age to challenge the ULS hypothesis. Proponents of the ULS hypothesis have proposed that differentiation occurs sometime between the ages of two and three years. Yet, studies of children's context sensitivity often concern children who are two and a half years or older (e.g., deHouwer, 1992). In order to test the explanatory power of the ULS hypothesis, a systematic examination of young bilingual children's context sensitivity is necessary.

Parental input

If the ULS hypothesis does not explain children's code-mixing, then other explanations must be considered. Some recent alternative explanations have shied away from explanations in terms of underlying representation and instead have turned to the relationship between children's code-mixing and parental input. Two ways in which parents might influence children's code-mixing have been suggested: by code-mixing themselves and by shaping children's language usage.

One explanation of children's code-mixing is that it is related to parental rates of code-mixing. Parents in bilingual families, even those who claim they use only one language, have been found to code-mix when interacting with their children (Goodz, 1989) . Thus, it is possible that children code-mix because their parents code-mix (Genesee, 1989). In contrast, it is possible that parents model their code-mixing on that of their children. Goodz (1989) has argued that children's code-mixing influences their parents' code-mixing. If this is indeed the case, then the question of the origins of children's code-mixing remains unanswered.

An alternative explanation suggests that parents can play a role in children's code-mixing without necessarily code-mixing themselves. By using particular discourse strategies in response to children's code-mixing, parents might shape children's language choice. Lanza (1992), for example, has proposed that parents' responses to children's code-mixing could encourage or discourage further code-mixing. If parents respond to children's code-mixing like monolinguals (e.g., showing non-comprehension of a code-mixed utterance), then children are forced to seek a way of communicating other than code-mixing. If, on the other hand, parents respond to children's code-mixing like bilinguals (e.g., showing comprehension of a code-mixed utterance), then children continue to code-mix.

Language dominance

Most bilingual children are dominant, or more proficient, in one of their languages. Dominance has only rarely been considered as a possible explanation of children's code-mixing (Leopold, 1949). Because of their dominance, children may know many words in only one language. Accordingly, children may code-mix because they do not know a word in a particular language (Lindholm & Padilla, 1978). This explanation has occasionally been asserted but has rarely been examined rigorously. One reason for this may be that dominance has rarely been systematically measured.

Goals of this thesis

This thesis sets out primarily to examine several explanations of bilingual children's code-mixing. Specifically, the questions posed in this thesis are:

-Does the ULS hypothesis explain bilingual children's language use?

-Is children's code-mixing related to parental rates of code-mixing?

-Can parental discourse strategies in response to children's code-mixing affect whether or not they continue to code-mix?

-What is the relationship between dominance and code-mixing?

A separate chapter in this thesis treats each of these questions. In Chapter 5, the ULS hypothesis is tested, using children's non-code-mixed utterances. Because no claims about bilingual children's non-code-mixed utterances have been made by a proponent of the ULS hypothesis, it is necessary to test two versions of the hypothesis. Assumptions about these two versions and how they were tested are detailed in Chapter 5. Next, several other explanations of children's code-mixing will be examined: the role of parental code-mixing in Chapter 6, the role of parental discourse strategies in Chapter 7, and the role of language dominance in Chapter 8.

This thesis seeks to correct some of the methodological shortcomings of previous studies. In particular, addressee and children's age are systematically taken into account. Many studies of bilingual children's code-mixing have failed to take addressee into account (Genesee, 1989). In bilingual families, a parent can constitute a linguistic context since children are often requested to use only one language with a parent. Thus, studying children's language use with both parents (who speak different languages) is one way of examining children's context-sensitive language use (see Fantini, 1974). Another limitation on many previous studies is that age has not always been systematically accounted for. Some studies have included children who were not an appropriate age to explore the issue of interest. Lindholm and Padilla (1978), for example, claimed to find support for a dual system hypothesis in a study of bilingual children between the ages of 2;10 and 6;2. However, proponents of the ULS hypothesis claim that bilingual children differentiate their two languages sometime between the ages of two and three years of age. Thus, an adequate test of the ULS hypothesis should concentrate on children's language use before the age of two and a half years. By examining a wide range of possible explanations in a single, carefully executed study, it will be possible to put forth with greater certainty likely explanations for bilingual children's code-mixing.

Before turning to explanations of bilingual children's code-mixing, it is important to characterize the children who took part in this study and to describe the data collection procedures used in this study. Thus, in Chapter 2, the methodology for collecting, transcribing and coding the data is described. In Chapter 3, some markers of the bilingual children's language development will be detailed and compared to published reports of monolingual development. In Chapter 4, I discuss how to systematically determine bilingual children's dominant language at this age. As will be seen, dominance is an important factor in explaining why children might code-mix and why they might appear to lack context sensitivity. Chapters 5 to 8 examine the role of specific factors in young children's code-mixing.

CHAPTER 2
Methodology

The children and their families

Six bilingual families were included in this research. All were recruited from advertisements in French and English newspapers. All children were learning French and English simultaneously in their homes. When the study began, all children were considered to be in the one-word stage on the basis of parents' reports. The children were first-born and did not have any siblings at the time of the study. At the beginning of the study, all six families were residing in Montreal, Quebec.

Each child in this study is identified by a three-letter code that bears some relationship to his or her name. There were five boys (MAT, NIC, OLI, STT, YAN) and one girl (ELI). This distribution was accidental. All of the children except YAN were learning French from their fathers and English from their mothers. YAN's mother is francophone and his father is anglophone.

The average age of the children at the beginning of the study was about 18 months (see Table 2.1). Note that YAN was included in this sample, even though he was much older than the rest of the children. There were two reasons for including him: first, he was born 6 weeks prematurely and this may have slowed his language development (see Siegel, 1982). Secondly, YAN's parents reported that he was in the one-word stage when the study began.

Over the course of the year, three families moved to suburbs of Montreal and filming sessions were continued with these three families. ELI's family moved to France about halfway through the year; one additional session was filmed with that family in France and then they were dropped from the study. At the age when ELI left, most of the children were starting to put two words together in an utterance. For this reason, OLI was included in the study on the basis of the parental report that he had just started to put two words together.

Table 2.1.
Age of children (years; months. days) at the beginning, middle and end of the study.

Child	Beginning	Middle	End
ELI	1;5.12	1;10.21	--
MAT	1;4.5	1;9.25	2;4.6
NIC	1;5.23	2;0.4	2;7.10
OLI	--	1;10.5	2;5.0
STT	1;4.27	1;10.26	2;4.29
YAN	1;11.15	2;6.4	3;1.3
Avg. age (mos.)	18	24	30

The families varied somewhat with regards to educational background and employment. All the parents had a minimum of a high school or community college degree. One father had a post-graduate degree. Three mothers had a university degree; one mother also had a post-graduate degree. Three fathers worked full-time outside of the home; one father worked on call; one father was a student at the start of this study; and one stayed at home full-time with his child. Three mothers worked full-time outside the home; one mother worked part-time outside the home; one mother was a student throughout the course of this study; and one was unemployed at the start of the study and then started a full-time job about four months into the study. Two children were enrolled full-time in daycare: YAN in a bilingual daycare and OLI in a French daycare.

All the parents had at least some fluency in their spouse's language. Two families reported using the one parent-one language rule (ELI and OLI) when addressing their children while two of the families reported mixing the languages freely (MAT and STT). In YAN's family, the mother reported that she used only French in addressing her son while the father reported that he used both languages freely. In NIC's family, the mother reported that she used only English to address her son while the father reported that he frequently switched to English when his son could not understand French. As for the language they used when addressing each other, four families reported to use both languages freely (MAT, OLI, STT, YAN) and the two other families claimed to use primarily English with favorite French words or expressions inserted (ELI and NIC).

Recording procedure

Four of the families were visited fifteen times over the course of the year by a bilingual observer. Two families were visited less often-- ELI six times and OLI eight . For each visit, the parents were simply instructed to do what they normally did in a free play situation; in some cases, the free play time proceeded naturally into meal time. There were three different types of sessions: in one session, the child was observed playing with both parents, in the second the child played with his/her mother alone, and in the third, the child played with his/her father alone. All sessions lasted between 45 and 60 minutes.

Table 2.2 shows the filming schedule. The filming sessions are referred to by a code representing the month number (see Table 2.2) and the parent present. For example, session 2F would have taken place during the second month from the start of the filming sessions with the family and would have been with the father alone with the child. Each child was filmed with both parents at six-month intervals and with each parent alone at two-month intervals (about every seven to nine weeks). The sessions with each parent alone were scheduled as close together as possible, usually within a week. There were approximately three to four weeks between each session with both parents and the next session with a parent alone. Naturally, this schedule was subject to the family's availability.

Table 2.2
Idealized filming schedule showing the approximate age of child, the month from the start, and the kind of session.

Age (mos.)	18	19	21	23	24	25	27	29	30
Month	1	2	4	6	7	8	10	12	13
Session	B	F,M	F,M	F,M	B	F,M	F,M	F,M	B

B=both parents present, F=father only, M=mother only

Transcription

Both the children's and the parents' speech was transcribed. Transcripts of the first twenty minutes after the first five minutes of each session were done in accordance with the CHAT transcription system (McWhinney & Snow, 1990). The first five minutes were ignored in order to allow the families to become accustomed to the presence of the recording equipment and observer (see Demetras, Post & Snow, 1986). The bilingual observer who had attended the session transcribed the sessions based on both the video and audiotaped records.

Transcription of the speech was done on the basis of the utterance, defined as "a word or a group of words with a single intonation contour" (Lanza, 1992, p. 638). Young children's speech does not always fit easily to this definition; in fact, children may not use utterances as a unit of speech early in development. In spite of the possible definitional complexities, it was possible to use utterances to transcribe the children's speech. Children's repetitions of the same word in a single utterance were transcribed but in the analysis were counted as a single word unless the repetition served some discourse purpose. For example, in French, it is common for adults to repeat a word three times for emphasis. Thus, where an anglophone might say that something is "very far", a francophone might say that it is "*loin loin loin*" ('far far far'). All repeated words that served this emphasis function were counted.

Utterances by adults were transcribed orthographically unless some part of the utterance deviated noticeably from usual pronunciation. In this case, that part of the utterance was transcribed phonetically. All the children's utterances were recorded in broad phonetic transcription; in addition, utterances that were clearly comprehensible as words of a language were also transcribed in the usual orthography of that language.

In the transcripts, the words used by the speaker were divided into the number of productive morphemes available to that speaker. For adults, it was assumed that most morphemes they used were productive morphemes, so for example, "doggy" was counted as two morphemes when spoken by an adult, even when there was no evidence in the recorded sessions of productive use of the diminutive "-y" suffix. In counting the adults' morphemes, it was also assumed that some obscure morphemes might not be productive. So, for example, "away" was counted as a single morpheme because it was thought that the majority of adults would use that word as a single morpheme. A slightly more conservative method was used when counting the morphemes of the children-- children's morphemes were counted only if they showed evidence of productivity within the sessions recorded in the same month. Thus, if a child used the word "doggy" and showed no evidence of knowing the word "dog", then "doggy" was counted as a single morpheme. This conservative method of analysis might underestimate the number of productive morphemes a child has in either language.

All of the transcripts were checked for accuracy by a native speaker of Quebec French who is also fluent in English. Inter-rater agreement of the transcription averaged 93.74% (range: 71.32% to 99.94%). Any discrepancies were resolved by discussion.

Coding

Every utterance was coded for addressee and for the language of the utterance. In the case of the parents, it was usually fairly clear who the addressee of an utterance was. In the case of the children, particularly at the beginning of the study, utterances were sometimes not addressed to anyone in particular (see Vygotsky, 1934/1962, for an explanation). In these instances, the addressee was coded as the speaker (i.e., the child was addressing himself or herself). When an utterance was addressed externally, although with no clear referent, the addressee was coded as the parents present (e.g., only the mother if the mother were the only parent present). While this coding scheme called for judgment on the part of the coder, there was a high rate of agreement between judgments of the two coders.

Five different codes were used for the language of an utterance: French, English, mixed, both, and unknown. An utterance was coded as French or English if and only if all the words within the utterance belonged to a single adult language. A "mixed" utterance contained morphemes from both French and English (see Lanza, 1992); for example "doggy dodo" would be coded as a mixed utterance. Note that the use of "mixed" in this context requires that an utterance be at least two morphemes long. Because of the difficulty in identifying them, phonological blends (see Vihman, 1985) and code-mixing at the syntactic level will not be considered for this report.

Some words were counted as belonging to both French and English; an utterance that was composed solely of these words was coded as a "both" utterance. This category includes many interjections (oh, ah, uhoh, etc.), some onomatopoeic words (bang, boing, rrr, etc.), and proper nouns (Maman, Daddy, Barney, etc.). Not all interjections were considered to be part of both languages: for

for instance, "*hein*" is clearly French and "huh" is clearly English, on phonological grounds. Some onomatopoeic words also clearly belonged to one language or the other, such as "quack quack" in English or "*coin coin*" in French. Proper nouns were included on the both list following Saunders (1986). A complete list of the words counted as belonging to both languages can be found in Appendix 1. When a word of both languages appeared in an utterance that was otherwise completely in one language, it was assumed that that word became a lexical item of that language; so, for example, if a child said, "oh look!", the utterance was counted as English. A number of the children's utterances were not clearly French or English, such as idiosyncratic onomatopoeia or babbling; the language of these utterances was coded as "unknown".

The actions of the participants were coded when they clarified the discourse and/or took the place of a conversational turn.

The coding of the transcripts was checked for accuracy by the same French speaker who checked the transcription. The inter-rater agreement of the coding averaged 96.11% (range: 83.44% to 100%).

CHAPTER 3

Markers of Language Development

In this chapter, certain aspects of the children's language development are described. There are at least two important reasons for describing markers of language development. First, these markers will serve as the basis for some of the analyses that follow. For example, given the wide range of individual differences in rates of child language development (Brown, 1973), it is possible that children do not differentiate their languages at a particular age, but rather at a particular developmental stage (Redlinger & Park, 1980).

A second reason to describe bilingual children's markers of language development is to compare these with monolingual children's norms. It has been claimed that bilingual children develop language more slowly than monolingual children (Doyle, Champagne, & Segalowitz, 1978) and that there are no differences (Goodz, 1994). Thus, in this chapter, where possible, the bilingual children's development is compared to reports of monolingual children in other studies. Such a comparison also provides a general picture of these children's development relative to other children.

Several markers of the children's language development are described in this chapter, to the extent possible within the limits of language production data. The markers considered here do not usually distinguish the children's usage of French and English. In this chapter, the age of the children's first word is first reported. Next, the volubility and intelligibility of these children are examined. Next, the vocabulary of these children is looked at. Finally, two morphosyntactic indicators, Mean Length Utterance (MLU) and multimorphemic utterances (MMU) are examined. When possible, comparisons with monolingual development are made.

First words

At the end of the first session, the parents were asked at what age their children had said their first word. Table 3.1 shows the ages that the fathers and mothers reported. Taking the mothers' reports only, since OLI's and YAN's fathers did not report the age of their sons' first words, the average age of first words was 11.6 months.

Table 3.1
Parental report of the age (in months) of the children's first word.

	Father	Mother
ELI	12-13	13
MAT	7	6
NIC	10	10
OLI	-	11
STT	6	6
YAN	-	12

While retrospective reports are not completely accurate (see Zechmeister & Nyberg, 1982), it is nevertheless interesting that this age corresponds with retrospective parental reports in other studies. For example, Doyle, Champagne and Segalowitz (1978) asked the parents of three- and four-year old bilingual and monolingual children to report the age of their children's first word. The parents of the bilingual children reported an average age of 11.2 months and the parents of the monolingual children reported an average age of 12 months for the three-year olds and 11.6 months for the four-year olds. Similarly, a survey of 448 familes showed that English monolingual children said their first word at an average age of 11.3 months, with a standard deviation of 2.3 (Capute, Palmer, Shapiro, Wachtel, Schmidt, & Ross, 1986). This suggests that the age of bilingual children's first word is the same as that of monolingual children.

Volubility

Volubility refers to the number of utterances used by a child in a particular time period. A number of analyses that follow, both in this chapter and in subsequent chapters, are based on the number of utterances in a particular session. The children's total number of utterances (including unintelligible utterances) in each 20-minute session is reported in Table 3.2. As can be seen in this table, on average, the children's number of utterances showed a rough increase over time. At 18 months, the average number of utterances the children used with both parents present was 81.8 and at 30 months, 138.6. This increase was not, however, strictly linear and there was a great deal of individual variation.

A close examination of Table 3.2 reveals that some children spoke more with one parent or the other. For example, NIC and STT were consistently more talkative with their mothers than with their fathers. OLI, on the other hand, tended to talk more with his father than with his mother. For other children, volubility did not vary according to parent. For example, while YAN's rate of volubility over the year was variable, he didn't seem to talk more to one parent in particular. There is no consistent pattern of increase or decrease in children's talkativeness when both parents are present. STT is noticeably less talkative than the other children until the end of the year (sessions 12 and 13B).

Table 3.2
Children's token number of utterances per session.

Session	ELI	MAT	NIC	OLI	STT	YAN	Average
1B	46	162	62	-	26	113	81.8
2F	82	87	19	-	30	141	71.8
2M	63	103	19	-	41	120	69.2
4F	-	220	45	-	79	115	114.8
4M	-	70	158	-	91	143	115.5
6F	38	175	50	-	32	123	83.6
6M	103	101	131	-	57	180	114.4
7B	245	119	107	177	6	187	140.2
8F	-	194	66	100	43	103	101.2
8M	-	175	133	108	103	187	141.2
10F	-	217	120	180	32	289	167.6
10M	-	260	222	150	101	291	204.8
12F	-	67	137	247	60	226	147.4
12M	-	257	195	132	127	169	176.0
13B	-	144	87	144	63	255	138.6

Intelligibility

In later analyses in this study, children's unintelligible utterances are not included. Unintelligible utterances are utterances that could be transcribed phonetically but could not be assigned to a language. These utterances were coded as "unknown" in Chapter 2. Untranscribable utterances (i.e., utterances that could not be transcribed phonetically) were not counted because they were very rare. It is possible that children's unintelligible utterances were attempts to use a language that simply could not be identified by the coders. Thus, if the rate of unintelligible utterances were quite high, the results of later analyses might be doubted. For this reason, the rates of unintelligible utterances are reported here. These rates are also compared to rates of unintelligible utterances in monolingual children, to verify that bilingual children are not substantially different in intelligibility from monolingual children.

Quite a large proportion of the bilingual children's utterances were unintelligible at the beginning of the study. Figure 3.1 shows the children's percentage of unintelligible utterances out of all the utterances addressed to both parents in every session. At 18 months, the average rate of unintelligible utterances was 41.38%, ranging from 27.50% to 81.82% in the first session. Over the course of the year, the rate declined considerably. The high average rate of unintelligible utterances is largely due to STT. However, by 24 months, the average rate had dropped to 17.50% (range: 0.50 - 66.67%) even including STT. By the age of 30 months, the average rate of unintelligibility was 7.59%, ranging from 0% to 28.89%. Except where noted otherwise, unintelligible utterances were dropped from subsequent analyses.

Studies of language development do not commonly report the rates of intelligible (or unintelligible) utterances (e.g., Bates, Bretherton, & Snyder, 1988; Bloom, 1978; Brown, 1973; Lightbown, 1977). This omission might lead one to believe that children are always comprehensible to the transcribers. There are, however, clues in some papers that this is not the case. For example, Brown (1973) notes that the three children in his study were chosen out of thirty because their pronunciation was notably clear (p.51). Some researchers indicate that unintelligible utterances are not included in their analyses (e.g., Seitz & Stewart, 1975) but they do not mention the percentage of the children's utterances that were unintelligible. Even when they mention the existence of unintelligible utterances, researchers generally do not distinguish between unintelligible utterances (ones that could be phonetically transcribed) and untranscribable utterances (ones that could not be transcribed at all because the speaker is whispering or is too far away from the recording equipment to be heard).

Figure 3.1
Percentage of the children's unintelligible utterances.

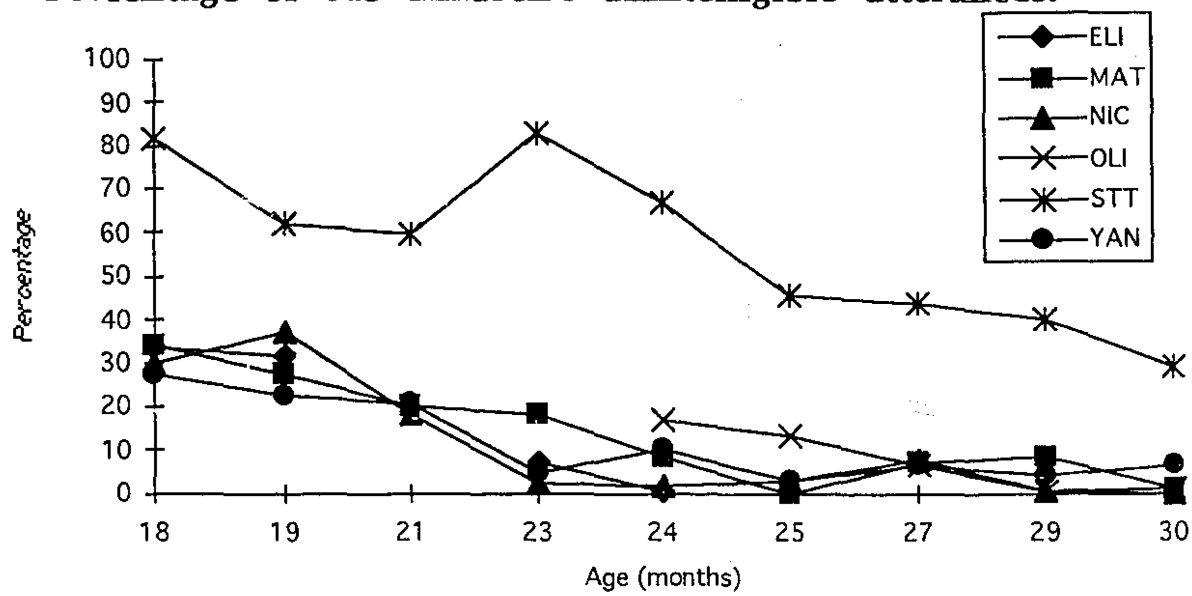


Table 3.3 summarizes data from the few studies that report intelligibility rates. The children in these studies were exclusively English-speaking. As can be seen in this table, there is a good deal of variability among monolingual children during this age period. Higher rates of unintelligibility have usually been found at the younger ages (e.g., 36.5% at 18 months [Greenfield & Smith, 1976] and 21.1% at 19 months [Retherford, 1981]). However, lower rates

have not necessarily been found at the older ages (e.g., at 18 months, one child was at 7.0% [Miller, 1982]). The lowest rate of unintelligible utterances is 4.0%, reported for a 21-month old child (Miller, 1982). In contrast, the two oldest children (29 months old) for whom unintelligibility rates could be found in this age range averaged 8.0% unintelligible utterances (Miller, 1982).

Table 3.3
Percentage of children's unintelligible utterances in other studies.

	Age (mos.)	N	Avg. % unintelligible
Greenfield & Smith (1976)	18	1	36.5
Miller (1982)	18	1	7.0
Greenfield & Smith (1976)	19	2	11.3
Miller (1982)	19	1	6.0
Retherford et al. (1981)	19	1	21.1
Greenfield & Smith (1976)	20	2	6.3
Miller (1982)	20	1	8.0
Retherford et al. (1981)	20	2	9.0
Greenfield & Smith (1976)	21	2	11.3
Miller (1982)	21	1	4.0
Retherford et al. (1981)	21	2	15.0
Greenfield & Smith (1976)	22	2	9.7
Miller (1982)	22	1	7.0
Greenfield & Smith (1976)	23	1	8.6
Miller (1982)	23	1	6.0
Greenfield & Smith (1976)	24	1	10.2
Miller (1982)	24	1	11.0
Retherford et al. (1981)	24	1	16.8
Greenfield & Smith (1976)	25	1	10.7
Miller (1982)	25	2	9.5
Miller (1982)	26	2	15.0
Miller (1982)	27	2	11.5
Miller (1982)	28	2	9.0
Miller (1982)	29	2	8.0

The rates of unintelligible utterances reported for monolingual children in Table 3.3 are comparable to the rates for the children in the present study, except for STT. By comparing Figure 3.1 with Table 3.3, it can be seen that STT's rate of unintelligible utterances is high, not only in comparison with the other children in the present study but also in comparison with monolingual children in other studies. In spite of the variability in monolingual children, no child attains the levels of unintelligibility of STT at this age.

In general, then, the rate of unintelligible utterances was not very high for bilingual children and thus the effect of omitting these utterances from subsequent analyses is probably minimal. Also, the intelligibility of bilingual children can be said to be similar to that of monolingual children. Possible reasons for STT's notable difference are discussed in the general discussion of this chapter.

Vocabulary

Vocabulary measures are often used as a developmental marker for young children. There are two common ways of counting productive vocabulary in children: type-token ratio and number of words produced.

Type/token ratio is the proportion of word types (number of different words) to word tokens (number of words) used by a child. Several researchers have questioned the validity of this measure because type/token ratio does not necessarily increase over the course of language development. A high type/token ratio (i.e., close to 1.00) has been associated with greater development because this would indicate that the speaker did not repeat any words. In fact, the repetition of some types of words, in particular syntactic markers such as definite and indefinite articles, is the mark of a fluent and developed speaker (Bates, Bretherington, & Snyder, 1988; Rondal, 1983). Similarly, the type/token ratio does not take base rates into account. For example, one child, STT, had a type/token ratio of 1.00 at the age of 18 months. However, he only said 5 different words. Ideally, one would like to distinguish between a type/token ratio of 1.00 based on 5 words and a similar ratio based on a much higher rate. The type/token ratio (calculated on their French and English utterances together) for the children in this study in each session can be found in Appendix 2.

Another way of measuring productive vocabulary is to count the number of word types used by children, either through parental report or in a recording session. Children differ in volubility, so merely counting the word types used by children in a particular amount of time is not necessarily representative of their productive vocabulary. No parental reports of vocabulary were collected for this study, so counting the number of word types used in each session is the only way of estimating vocabulary from production data. The number of word types, or different words, used by the children in each session is reported.

Researchers have sometimes used children's first 50 words as a marker of language development. This cut-off point is associated with the time children learn new information about words. For example, Walley (1993) has suggested that children need to know about 50 words in order to learn that words can be categorized into phonological neighborhoods on the basis of similarity. Categorization into phonological neighborhoods then allows children to rapidly acquire many more words (see also Pinker, 1984; Stoel-Gammon & Cooper, 1984).

Table 3.4 shows the number of word types in French and English combined that were used at each age for which there were two twenty-minute sessions (i.e., sessions 2, 4, 6, 8, 10, and 12). The types were calculated across the sessions with the mother alone and the father alone in a particular month (e.g., sessions 2F and 2M). Thus, the table shows the number of word types in a 40-minute period. As can be seen in Table 3.4, the children generally increased the number of word types they used over sessions. At 19 months, they are using an average of 35.6 different word types in two 20-minute sessions and at 29 months, they are using an average of 132.6 different words.

Table 3.4
The number of word types produced by the children at each age.

Age (mos.)	Session	ELI	MAT	NIC	OLI	STT	YAN	Avg.
19	2	36	36	28	-	11	67	35.6
21	4	-	66	77	-	16	75	58.6
23	6	85	49	83	-	13	52	56.4
25	8	-	110	90	110	23	97	86.0
27	10	-	126	104	220	29	164	128.6
29	12	-	118	125	250	38	132	132.6

Note that STT's use of word types is much lower than the other five children at all ages. This may be due to the fact that so many of his utterances were unintelligible (see Figure 3.1) and thus cannot appear in the vocabulary count. As a group, these children passed the fifty word stage in production between 19 and 21 months. STT never produced more than fifty words over the course of this year.

Turning now to a comparison of these children with monolingual children in other studies, direct comparison is difficult because of different methods of assessing vocabulary. In studies concerned primarily with children's vocabulary, researchers generally use parental diaries to complement recording sessions. In doing so, these researchers obtain a more comprehensive estimate of children's vocabulary than was obtained here.

Keeping in mind that children's productive vocabulary is probably underestimated in this study, bilingual children's vocabulary compares favorably with monolingual children's vocabulary. For example, Hoek, Ingram, and Gibson (1986) found that this child had a productive vocabulary of about 20 words at the age of 19 months. As can be seen in Table 3.4, the children were using an average of 35.6 words at 19 months. Similarly, Smith (1929) reported that the average number of words used by 11 two-year old children during an hour was 78 and the average number of words used by 18 two-and-a-half-year old children was 118. Compared with the 78 words **per hour** used by monolingual children in Smith's study, at the age of two years, the bilingual children were using an average of 56.4 different words **in two twenty-minute sessions** (67.3 without STT). And compared with the 118 words per hour used by the monolingual children, at 29 months the bilingual children are using an average of 132.6 in the two twenty-minute sessions, including STT.

Benedict (1979) estimated that 8 English-speaking children attained a productive vocabulary of about 50 words at about 18.5 months on average, ranging from 15 months to 22 months. Capute et al. (1986) reported that 448 monolingual children attained a 50-word vocabulary at 20.9 months, with a standard deviation of 3.2. The children in this study reached the 50-word threshold at a similar age. Table 3.4 suggests that the children produced 50 words or more between the ages of 18 months (YAN) and 21 months, with the exception of STT. Generally speaking, the bilingual children's rate of acquisition of productive vocabulary and age to reach a 50-word productive vocabulary do not differ strikingly from those of monolingual children.

Mean Length of Utterance

In this section the Mean Length of Utterance (MLU) and Upper Bound of these children is first reported for both languages combined, for each session. MLU is the average number of morphemes per utterance and Upper Bound is the number of morphemes in the longest utterance (Brown, 1973). To compare these children's MLU with monolingual children's MLU, their MLU in each language is used (e.g., bilingual children's French MLU is compared with monolingual children's French MLU). Because French uses more inflections than English, it is possible that an MLU that combines French and English might give bilinguals a higher MLU than English monolinguals and a lower MLU than French monolinguals simply on the basis of the difference in languages. To avoid this possibility, the bilingual children's MLU is compared to that of monolingual children's in French and English separately.

The combined MLU was calculated as in Brown (1973) except that all of the children's utterances in French, English and "mixed" were included in the calculation, not just 100 utterances, as suggested by Brown. French MLU was calculated on the children's French utterances and English MLU on the English utterances. It was sometimes necessary to use less than 100 utterances since, as can be seen in Table 3.2, the children did not consistently use 100 utterances or more in a single 20-minute session until about the age of two years (session 7B). Bates, Bretherton & Snyder (1988) have reported that MLU can be used successfully with as few as 20 utterances.

As can be seen in Table 3.5, at the first session, the children's combined MLU was about 1.00. Over the course of the year, the children's MLU generally increased, though not in a linear fashion; instead it varied somewhat from session to session. This pattern is seen in monolingual children as well (Brown, 1973). There were large individual differences in the development of MLU. The combined MLU for OLI, for example, increased very rapidly over the six months that he was observed. In contrast, the combined MLU of STT rarely went much above 1.00 over the course of the year. At the end of the year, at about the age of 30 months, the range of the children's MLU is 1.00 to 3.09.

As can be seen from Table 3.5, all of the children started out in Brown's (1973) stage I, including OLI. Three of the children stayed in stage I over the course of the year (MAT, NIC, and STT). STT's language development was markedly slow. Two children passed into stage II in the last session (ELI at 24 months and YAN at about three years). OLI , in contrast to the other children, passed rapidly through Brown's stages; he progressed from stage I to stage III in the six months he was followed.

Table 3.5
Children's Combined Mean Length of Utterance (MLU) and Upper Bound (UB).

Age	ELI		NIC		OLI		MAT		YAN		STT	
(mos.)	MLU	UB	MLU	UB	MLU	UB	MLU	UB	MLU	UB	MLU	UB
18	1.33	2	1.00	2	--	--	1.13	3	1.00	1	1.00	1
19	1.37	5	1.07	2	--	--	1.14	3	1.43	3	1.20	2
21	--	--	1.09	3	--	--	1.49	4	1.61	3	1.27	2
23	1.30	3	1.38	3	--	--	1.28	6	1.51	4	1.11	2
24	1.83	7	1.31	3	1.65	4	1.56	3	1.47	4	1.00	1
25	--	--	1.29	5	2.10	9	1.38	4	1.39	3	1.11	3
27	--	--	1.41	5	2.87	8	1.61	4	1.51	4	1.02	2
29	--	--	1.70	8	3.14	8	1.34	4	1.47	5	1.19	2
30	--	--	1.63	4	3.35	8	1.48	3	2.16	6	1.00	1

To compare these children's MLU with monolingual children's MLU, their French MLU is first compared with that of French monolinguals and then their English MLU with that of English monolinguals. Only the average MLU and the range of MLU in each language will be presented here. Individual children's MLU in French and English can be found in Appendix 3.

Table 3.6 shows the average MLU and the range for all of the children's French-only utterances. The average MLU for these children is sometimes lower than that of francophone monolinguals of the same age as reported by others (Lightbown, 1977; Rondal, 1980). However, the high end of the range of MLU of the bilingual children is quite comparable.

Table 3.6
French MLU: Average and Range.

Age (mos.)	N	Average MLU	MLU Range
18	5	1.12	1.00-1.50
19	5	1.09	1.00-1.44
21	4	1.56	1.00-2.04
23	4†	1.37	1.00-1.82
24	5†	1.47	1.00-1.78
25	5	1.45	1.00-2.31
27	5	1.65	1.00-2.86
29	5	1.71	1.00-3.21
30	5	1.92	1.00-3.58

†STT did not use any French utterances at this time

The same pattern emerges for the children's English MLU, as summarized in Table 3.7. Again, the average MLU of the bilingual children is sometimes below the MLU of their monolingual peers (e.g., Brown, 1973). However, the high end of the range of the bilingual children's MLU is comparable to that of anglophone monolinguals (Cunningham, Reuler, Blackwell, & Deck, 1981; McLaughlin, White, McDevitt & Raskin, 1983; Miller, 1982; Miller & Chapman, 1981; Retherford, Schwartz & Chapman, 1981; Seitz & Stewart, 1975; Smith, 1929).

The general pattern of findings for MLU suggests that bilingual children's MLU can be as high as that of monolingual children's MLU. However, some children had a particularly low MLU in one language. For example, NIC never exceeded a French MLU of 1.00 over the course of this year while his English MLU ranged from 1.04 to 1.79. This suggests that he was developing morphosyntactically in English but not in French. Possible reasons for this will be discussed in the next chapter on language dominance.

Table 3.7
English MLU: Average and Range.

Age (mos.)	N	Average MLU	MLU Range
18	5	1.09	1.00-1.25
19	5	1.30	1.11-1.46
21	4	1.30	1.10-1.59
23	5	1.37	1.04-1.63
24	6	1.40	1.00-1.82
25	5	1.37	1.00-1.84
27	5	1.42	1.00-1.76
29	5	1.55	1.13-2.09
30	5	1.68	1.00-2.67

Multimorphemic utterances

As we will see in the next chapter, it is important to have a measure of bilingual children's morphosyntactic development in order to determine their dominant language. DeHouwer (1990) suggests that MLU is not a very good cross-linguistic measure because some languages are more inflected than others (see also Goodz, 1989). Another morphosyntactic indicator that is appropriate for children of this age is the number of multimorphemic utterances the children use in each language. A multimorphemic utterance is an utterance that consists of more than one productive morpheme (Greenfield & Smith, 1976). As children develop morphosyntactically, the number of multimorphemic utterances they use increases (see Brown, 1973).

Table 3.8 shows the number and percentage of multimorphemic utterances (out of the total number of French, English and "mixed" utterances) for each child. Calculated this way, multimorphemic utterances give similar information to MLU; when calculated as an index of dominance in the next chapter, the information is different. As can be seen in Table 3.8, both the average number and the average percentage of multimorphemic utterances increased with age. For individual children, however, there is a great deal of variation from session to session. As with MLU, STT uses noticeably fewer multimorphemic utterances and OLI uses noticeably more than the other children.

In comparison to the two monolingual children studied by Greenfield and Smith (1976), the bilingual children start off with about the same number and percentage of multimorphemic utterances at the age of 18 months (i.e., none for the monolingual children). However, Greenfield and Smith's monolingual children used a greater percentage of multimorphemic utterances than the bilingual children as the year progressed. This should not necessarily be taken as evidence that monolingual children are more developed morphosyntactically than bilingual children; their MLU scores belie this conclusion. Thus, while these children's rates of morphosyntactic utterances were lower than that of two monolingual children, there is sufficient evidence from MLU to suggest that they do not differ in rate of morphosyntactic development from monolingual norms.

Table 3.8
Token number and percentage of multimorphemic utterances.

Age (mos.)	ELI	MAT	NIC	OLI	STT	YAN	Avg.
18	5 35.71%	10 25.64%	2 11.76%	-	1 33.33%	0 0	2.6 21.29%
19	14 48.28%	8 11.11%	1 30.00%	-	1 12.50%	36 32.73%	12.4 26.92%
21	-	45 38.14%	7 7.22%	-	3	87 56.49%	35.8 31.35%
23	25 40.98%	19 21.84%	34 25.19%	-	1	82 42.49%	32.4 31.10%
24	97 52.72%	25 49.02%	19 21.59%	63 53.39%	0 0	24 28.92%	38.0 34.27%
25	-	60 69.77%	32 26.89%	87 62.59%	3 23.08%	72 37.31%	50.8 51.47%
27	-	161 52.10%	61 22.93%	197 76.95%	1 2.00%	231 57.32%	130.2 42.26%
29	-	74 33.33%	108 37.89%	236 78.41%	9 25.00%	131 45.64%	111.6 44.05%
30	-	39 35.14%	21 28.00%	107 78.68%	0 0	124 56.36%	58.2 39.64%

Summary and discussion

The data presented in this chapter indicate that these children are generally quite average in their language development. The parents reported that their children say their first words at the same age as do the parents of monolingual children. Their rates of unintelligible utterances, vocabulary, and MLU fall within the range reported for monolingual children in other studies. Three of the children (MAT, NIC, and STT) never go beyond Brown's (1973) stage I, as measured by their MLU. ELI and YAN attain stage II in the last filming session and OLI is in stage III at the end of the year. As for vocabulary, most of the children are clearly using more than 50 different words after the age of 19 months, approximately the same age reported for monolingual children.

The one notable exception to these generalizations is STT. He had high rates of unintelligible utterances; his vocabulary did not go over 50 words by the age of two years; and he did not use many multimorphemic utterances over the course of the year. STT's speech developed slowly even beyond the study. At his current age of almost four years he often has difficulty making himself understood. STT's pattern of development is characteristic of children with expressive language delay (see Paul, 1991; Whitehurst, Fischel, Lonigan, Valdez-Menchaca, Arnold, & Smith, 1991). His hearing was tested and deemed normal when he was 3;6. Expressive language delay is, by definition, found in children with no cognitive or intellectual deficits (Whitehurst, et al., 1991). For this reason, such a delay could be considered a variation on normal language development. When possible, STT was included in the following analyses in spite of his expressive language delay. Because the token number of intelligible utterances used by STT was often so small, it was often not possible to analyze his data until after the age of 24 months.

This study was not designed to examine differences in language development between monolingual and bilingual children; thus, no strong claims can be made about this. Nevertheless, the data are consistent with the claim that language develops at the same rate for bilingual and monolingual children (see also Goodz, 1989). There is some indication that development in both children's languages might not proceed at an equal rate. For example, with regard to MLU, bilingual children's morphosyntactic development resembles that of monolingual children's in each language, although sometimes one language is more developed then the other. This mismatch in the development of the two languages is examined in the next chapter.

CHAPTER 4

Language Dominance

Children's code-mixing has been associated with language dominance in a number of ways. The dominant language might explain with whom children code-mix and/or in what direction code-mixing occurs. For example, Genesee, Nicoladis and Paradis (in press) found that children used more inter-utterance code-mixing when attempting to use their non-dominant language. Others have suggested that the dominant language could often provide the syntactic frame, or matrix language, for children's code-mixing, particularly in intra-utterance mixing (Köppe & Meisel, 1992; Petersen, 1988). Thus, a mixed element would likely be in the non-dominant language while the rest of the utterance would be in the dominant language. In this thesis, dominance will be examined as a possible explanation for code-mixing in Chapter 8. In addition, as will be seen in the next chapter, dominance might also play a role in the unitary language system (ULS) hypothesis. Because of its importance in explanations of children's code-mixing, language dominance should be determined objectively. To this end, this chapter first discusses what dominance is and where it comes from. Then, methods of determining the dominant language of bilingual children are considered. Lastly, each child in the present study is classified as dominant in a particular language, using markers of language development in both languages.

Almost all studies of young bilingual children have found that they seem to know one language better than the other at a given point in development (e.g., Leopold, 1949; Pavlovitch, 1920). The language in which a child is more proficient has been called his or her dominant language. Romaine (1989) has pointed out that "balanced" bilingualism, that is equal proficiency in both languages, is often wrongly seen as an ideal by researchers and educators. Bilinguals' experiences with their two languages always occur in at least slightly different social contexts and thus their proficiency in each language will differ according to the context in which it is measured. This point is clearly evident when the input languages are separated by location. Saunders (1986), for example, noticed that his sons, who attended school in English and who spoke German to him at home, had difficulty conveying concepts about their schooling in German. It is not unusual for bilinguals to have domain-specific knowledge in each language (see also deHouwer, 1990).

Even when the input languages are present in the same environment, as in bilingual families, parents do not always present exactly the same information to their children. Also, one parent often spends a great deal more time interacting with a child than the other because there is often a primary caregiver in each family. This means that a bilingual child will often be exposed to one language more than the other language. Grosjean (1982) has suggested from anecdotal evidence that amount of exposure is one of the most important factors in determining the dominant language of a bilingual. Other possible factors include domain-specific exposure to concepts, affection for someone who speaks a particular language, or preference for a language (Dodson, 1981; Döpke, 1992).

At first blush, the concept of a dominant language may appear simple. However, a number of problems arise in the assessment of dominance. For example, many researchers have remarked that bilinguals do not necessarily have a single dominant language--dominance can vary according to the mode assessed (i.e., on-line language production, comprehension, reading, or writing), the interlocutor, the domain of knowledge being tapped, and the social context (Lambert, 1955; Leopold, 1949; Macnamara, 1969). Macnamara (1969) argued that anybody with any proficiency in two languages could be considered a bilingual, even if the proficiency were only in writing. According to this argument, a scholar who spoke only English but could also read ancient Greek would be bilingual even though his or her proficiency in spoken Greek might be null. Proficiency in a language can also change depending on the domain of knowledge being tapped. For example, deHouwer (1992) reported that Kate knew words for colors only in one language; thus, it would be possible to say that Kate had a domain-specific dominance with regard to color terms. In addition, the dominant language of a child can sometimes change quite quickly-- Leopold (1949) reported that Hildegard's dominance switched from German to English in a matter of six weeks upon her return to the United States after a visit to Germany.

While there is an extensive literature on how to determine the dominant language of bilingual adults and older children (see Baetens Beardsmore, 1982 for a review), there is very little work on how to determine the dominant language of preliterate children. Most studies simply do not report how the dominant language of the children they studied was determined (e.g., Arnberg, 1981; Leopold, 1949; Meisel & Müller, 1992; Petersen, 1988; Singer, 1988). A few recent studies have attempted to measure dominance objectively. DeHouwer (1990) equated dominance with fluency and determined Kate's dominant language by counting the number of pauses that she made in each language. She thought that Kate would show more signs of hesitation in her non-dominant language. DeHouwer reported that she was unable to determine a dominant language and thus concluded that Kate was balanced in her fluency of both languages. This seems to be an idiosyncratic way of determining dominance; dominance is most often considered a measure of proficiency and not of spoken fluency. Döpke (1992) assessed the dominance of children by measuring which language they used more often when addressing their mothers and fathers. While relative use of a language is a possible measure of dominance for children of this age, it would be preferable to avoid such a measure in the present study because frequency of language use with specific interlocutors is the dependent variable used to test the ULS hypothesis Chapter 5. Finally, Lanza (1992) suggested that the dominant language of a child could be the language in which he or she shows a higher level of morphosyntactic complexity. Lanza did not specify, however, how she determined morphosyntactic complexity.

Genesee, Nicoladis and Paradis (in press) have conducted the most thorough empirical analysis of dominance to date. They examined the relationship between their subjective classifications of five children's dominance and six structural measures of language use (namely, MLU, Upper Bound, word types, word tokens, utterances, and MMU). They found confirming evidence for their subjective classifications using all six measures and suggested using percentage of multimorphemic utterances and word types as indicators of dominance.

Some of the analyses later in this study require a linear measure of dominance. Thus, the first aim of this chapter is to propose a linear measure of dominance based on both multimorphemic utterances and word types in both languages, as suggested by Genesee, Nicoladis, and Paradis (in press). This will be called the dominance index. The second aim is to test whether the dominance index can accurately classify children's dominance. To test this possibility, the children's dominance is first classified subjectively. Then, a discriminant analysis on the dominance index is performed to statistically classify the children's dominance. Lastly, the dominance classifications yielded by the discriminant analysis are compared to the subjective classifications. This comparison has two aims: 1) to test the validity of the dominance index as an indicator of dominance and 2) to identify each child's dominant language.

Before proceeding, there are a couple of points to be made about the use of the term "dominance. First, there may be an affective component to children's language choice. For this reason, Dodson (1981) has argued that the term "language dominance" would more usefully be replaced by the term "language preference". He defines language preference as the following:

> "A language becomes a preferred language if (a) the child is able to cope with more aspects of his world in this language

> and with fewer aspects in the other language and (b) the child feels more "at home" on a greater number of occasions in one language rather than in the other for those aspects in which he makes use of both languages." (p.17).

This definition points to both a quantitative analysis of bilingual children's language use as well as to some affective connection to a language. Dodson provides no guidelines for determining language preference, especially the affective component. And, indeed, it is not clear how this could be done in the case of young children in the one- or two-word stage. For this reason, I will continue to use "language dominance" as opposed to "preference". When examining children's code-mixing in Chapter 8, I examine whether children use particular words as if they had a preference for language choice. This examination is done on the basis of preference for a particular word and not on the basis of preference for a language. The method for determining preference for a particular word is discussed in Chapter 8.

It is also important to recognize that the use of the term "dominance" assumes that the bilingual child has two distinct languages, one of which is stronger. This assumption is not, however, universally supported. For example, as noted earlier, Volterra and Taeschner (1978), argue that children under the age of two and a half are most likely using a single linguistic system made up of items of both languages. If this were indeed the case, then the "dominant language" as I have described it is simply the adult language in which the child happens to know more vocabulary items. The more words a child knows in a particular language, the more likely it is that he or she will produce multimorphemic utterances in that language. Thus, the measures of dominance chosen by Genesee, Nicoladis and Paradis (in press), relative use of word types and multimorphemic utterances, could equally well reflect, not differential proficiency in two languages, but unequal distribution of two adult languages in the child's single language system. The ULS does not necessarily have to consist of an equal number of vocabulary items from both input languages. An empirical test of the ULS hypothesis will be made in Chapter 5.

Method

<u>Subjective classifications of dominance</u>

Six dominance indices were used in the subjective classification of children's dominance: percentage of utterances, percentage of word types, percentage of word tokens, percentage of multimorphemic utterances, MLU, and Upper Bound. All were calculated for French and English (as in Genesee, Nicoladis, & Paradis, in press). All indices were calculated over each session (e.g., session 2 included both the session with the mother alone and the session with the father alone). The indices based on percentages (i.e., utterances, word types, word tokens, and multimorphemic utterances) were calculated as a function of the total number of that measure in both French and English. So, for example, if a child used 10 multimorphemic utterances in French and English, 5 in each language, then he or she would have 50% French MMU and 50% English MMU. MLU and Upper Bound were calculated as in Chapter 3. Each child's score on these dominance indices in each language can be found in Appendix 3.

Using all six of these indices, children were classified subjectively as dominant in French, dominant in English, or balanced in both languages.

Discriminant analysis of dominance

A total of 40 sessions were used in the analysis. Analysis of STT's dominance began with session 8 because of his low level of intelligible speech before this time.

The discriminant analysis was performed on the dominance index in French and English. The dominance index was calculated as the mean of the percentage of multimorphemic utterances and percentage of word types in French and English. For example, if 50% of a child's multimorphemic utterances and 60% of his or her word types were in French, then the score on the dominance index in French would be 55%. When children did not use any multimorphemic utterances in one or both languages, then their percentage of word types alone was used in calculating the dominance score for that language. For this reason, the children's dominance scores in French and English do not necessarily add to 100%. For the French dominance index, the higher the score, the more French dominant a child is. Similarly, for the English dominance index, the higher the score the more English dominant a child is. The children's dominance scores for each session calculated in this way are summarized in Table 4.1.

Table 4.1
Children's combination indices in French (Fr.) and English (Eng.).

Ses.	ELI		NIC		OLI		MAT		YAN		STT	
	Fr.	Eng.	Fr.	Eng.	Fr.	Eng.	Fr.	Eng.	Fr.	Eng.	Fr.	Eng.
1B	25.00	75.00	15.00	85.00	-	-	35.77	64.23	40.00	30.00	33.33	66.67
2	9.52	90.48	16.67	83.34	-	-	3.33	96.67	50.00	50.00	40.00	60.00
4	-	-	4.72	95.29	-	-	35.56	64.44	48.09	51.92	4.55	95.46
6	13.72	86.28	0.96	99.04	-	-	60.29	39.71	55.25	44.75	0.00	100
7B	5.75	94.25	1.47	98.53	67.76	32.24	50.98	49.02	57.80	42.20	0.00	100
8	-	-	4.88	95.12	60.79	39.21	39.22	60.79	58.75	41.25	48.08	51.93
10	-	-	5.34	94.66	87.38	12.62	34.82	65.18	54.01	45.99	22.22	77.78
12	-	-	1.71	98.29	85.50	14.50	33.11	66.90	33.12	68.88	58.33	41.67
13B	-	-	6.12	93.88	82.52	17.48	41.56	58.44	66.87	33.13	62.50	18.75

In order to ensure that the discriminant analysis classified the children according to dominance rather than anything else, some children were assigned a dominance group before the analysis. Thus, before the analysis, children were assigned a dominance group for sixteen sessions. These sessions were chosen on the grounds that all three dominance indices showed a 70%:30% or greater ratio in the same language. On this basis, ELI was grouped as English dominant for all 4 observation sessions, NIC was grouped as English dominant for every session after session 4 (inclusive), and OLI was grouped as French dominant for all 5 observation sessions. The children's dominance was not grouped for the remaining 24 sessions.

The discriminant analysis was designed to discriminate between two groups: a French dominant group and an English dominant group. Because of this design, the analysis forced a categorization of each child into a dominance group of either French or English.

Results

Subjective classifications of dominance

Table 4.2 shows the subjective dominance classifications for the children. As can be seen, three children (ELI, NIC, and OLI) appeared to show a consistent dominant language over the course of the year they were observed. ELI and NIC were considered English dominant while OLI was considered French dominant. The other three children appeared to vary in dominance over the course of the year. YAN appeared to be the most consistently balanced in his French and English proficiency.

Table 4.2
Children's language dominance at every session according to subjective classification.

Session	ELI	NIC	OLI	MAT	YAN	STT
1B	English	English	-	English	balanced	?
2	English	English	-	English	balanced	?
4	-	English	-	English	balanced	?
6	English	English	-	French	balanced	?
7B	English	English	French	English	French	?
8	-	English	French	English	French	balanced
10	-	English	French	English	balanced	English
12	-	English	French	English	English	French
13B	-	English	French	English	French	French

? = use of intelligible language so low that it is difficult to make a judgment

Discriminant analysis of dominance

The primary goal of the discriminant analysis was to test the validity of the combination index as a measure of children's dominance. To this end, I first examine if the combination index was useful in identifying a dominant language in the children. I then compare the discriminant analysis classifications with the subjective classifications.

The discriminant analysis used stepwise variable selection to determine the more useful dominance index for distinguishing the two groups. At the first step, the results showed that the French dominance index was the most useful variable in distinguishing the two groups, $F(1)=102.05$, $p<.01$. In the subsequent step in the analysis, the English dominance index ($F[2]=242.17$, $p<.001$) was chosen.

The discriminant analysis confirmed that all 16 sessions that were assigned a dominance group beforehand were correctly classified. It also assigned a dominance group to each child at each session. Table 4.3 shows the children's dominance group as assigned by the discriminant analysis.

Table 4.3
Children's language dominance at every session according to discriminant analysis.

Session	ELI	NIC	OLI	MAT	YAN	STT
1B	English	English	-	English	French	-
2	English	English	-	English	French	-
4	-	English	-	French	French	-
6	English	English	-	French	French	-
7B	English	English	French	French	French	-
8	-	English	French	French	French	French
10	-	English	French	English	French	English
12	-	English	French	French	English	French
13B	-	English	French	French	French	French

In comparing Tables 4.2 and 4.3, it can be seen that there are few differences between the subjective classifications and the classifications according to the discriminant analysis. ELI, NIC, and OLI were given the same dominance group for all sessions by both classifications. The other three children were found to alternate in dominance according to both classifications, although the specific dominance classification in each session did not always coincide. For YAN and STT, the only differences were between the subjective classification as "balanced" and classification as French dominant by the discriminant analysis. This is due to the fact that the discriminant analysis had to force classification as French or English dominant while the subjective classification did not.

The only other differences between the classifications were found with MAT. In the subjective classification he was considered

English dominant for sessions 4, 7B, 8, 12, and 13B. For these five sessions, the discriminant analysis classified MAT as French dominant. Thus, generally speaking, the dominance classifications according to the discriminant analysis corresponded closely to the subjective dominance classifications. It should be kept in mind, however, that MAT's dominance is doubtful.

Summary

In sum, the discriminant analysis showed that the dominance index, the mean of percentage of multimorphemic utterances and word types, was useful in distinguishing the two dominance groups. These results confirm Genesee, Nicoladis and Paradis's (in press) recommendation to use MMU and word types as indices of dominance for young bilingual children. It should be pointed out that use of these indices to measure dominance may be limited to young children. After about 30 months of age, bilingual children might be using so many multimorphemic utterances in each language that it might no longer be profitable to use this as a measure of dominance (see Note 1).

A discriminant analysis is designed to force group classification. However, there are at least two reasons why a discrete classification of dominance is not always desirable. First, some children are more strongly dominant than others and a discrete classification does not reflect the degree in dominance. For example, YAN was classified by the discriminant analysis as French dominant in most sessions even though his English proficiency was almost equal to his French proficiency (see Appendix 3). YAN was less French dominant than

OLI whose French proficiency was much greater than his English proficiency. A second reason to desire a continuous dominance variable rather than a discrete one is for statistical purposes. In some of the analyses that follow (such as correlations), the dominance indices (in Table 4.1) will be used since a continuous variable is required.

A description of degree of the children's dominance is possible using the dominance indices. ELI and NIC were strongly dominant in English over the course of this study, while OLI was dominant in French. MAT's dominance changed from session to session and there was some doubt as to how to classify his dominance at each session. YAN was fairly balanced overall in his French and English proficiency, with a slight leaning toward greater French proficiency. STT was slightly dominant in French in session 8 and afterward.

CHAPTER 5

The ULS Hypothesis

In this chapter, I first review the literature regarding the debate over whether bilingual children initially have a unitary language system (ULS) or a dual language system. Then, I describe the analyses undertaken in the present study that test the ULS hypothesis.

ULS hypothesis

Many researchers have argued that bilingual children initially pass through a stage of linguistic fusion (see Meisel, 1989, for a discussion of this issue) and are unable to differentiate their two languages. Variations of this view are collectively called the undifferentiated language system (ULS) hypothesis (Genesee, 1989). One of the commonalties of all versions of the ULS hypothesis is the idea that bilingual children pass through a period during which their two languages are not differentiated. Another commonality is that all versions of the ULS hypothesis have used children's code-mixing data to support the hypothesis. The different versions of the ULS hypothesis differ in how many stages of development the children pass through and how old they are when they pass through these stages. These commonalities and differences are discussed in the following review.

Leopold (1949) provided one of the earliest explicit descriptions of the ULS hypothesis. He published a detailed description of the acquisition of English and German by his daughter, Hildegard, from birth until the age of two years. Citing Hildegard's code-mixing as evidence, Leopold claimed that during her first two years, she made no attempt to distinguish her two languages. He concluded that Hildegard "built a hybrid system out of both [languages]." (p.179). Or, in a longer description:

> "In looking back over the effect of bilingualism on Hildegard's early language, we find that it was striking in her vocabulary, because she chose words from both languages as carriers for her communications, and combined them into utterances with no regard of their linguistic provenience. She was the sole arbiter of her choice, which favored now one language, now the other, with shifts of emphasis due to changes of linguistic environment, but never entirely determined by it." (p.186)

This conclusion has often been interpreted to mean that Hildegard passed through a stage of confusion when she failed to distinguish her two languages.

The most explicitly developed ULS hypothesis is that of Volterra and Taeschner (1978). They proposed that there are three stages in language differentiation and that complete differentiation occurs by the age of three years. This hypothesis was based on an examination of the development of two German-Italian bilingual sisters, Lisa and Giulia, and of Leopold's daughter, Hildegard. In the first stage of development, the undifferentiated stage, bilingual children do not know they are being exposed to two languages and use words from both of their languages indiscriminately. At this stage, the children may know a few cross-linguistic synonyms, but they use these words in distinct contexts so that while the words might be synonyms for adults, they are not truly synonyms for the children. For this reason, the language that the children choose is dependent almost solely on what they want to say and not whom they are addressing. In the second stage, at about the age of 2;6, they have two distinct lexicons but use a single syntactic framework for their words. In the third stage, at approximately three years of age, it is clear that the children have two distinct linguistic systems. The languages are associated with particular addressees and are syntactically distinct.

Vihman (1985) traced her son, Raivo's, acquisition of Estonian and English from the age of 13 months to almost two years of age. She found that Raivo first went through a stage of a undifferentiated lexicon and then slowly differentiated his two languages. By the age of two years, the differentiation process was complete. However, Raivo did not pass through Volterra and Taeschner's stage two in which he used one syntactic system with lexical items from another language (see also Meisel, 1989, for a similar finding).

In a study of four bilingual children in Germany, Redlinger and Park (1980) suggested that differentiation occurs gradually, somewhere between the ages of two and a half and three years. The children they examined ranged in age from about 2;0 to 2;8 at the start of the study and were observed for 5 to $8^1/_2$ months. All the fathers of the children were German speaking and the mothers spoke a language other than German. The rates of code-mixing by these children decreased with age and also seemed to decrease with the children's increasing MLU. This decrease in code-mixing was interpreted as evidence for the children's differentiation of their two languages. According to the authors, the children's language differentiation seemed to be associated with advances in morphosyntactic complexity.

Similarly, Swain and Wesche (1975; Swain, 1976) found evidence for gradual language differentiation between the ages of 3;0 and 3;9. They observed Mike, a French-English bilingual boy, in interaction with two "monolingual" researchers, one who spoke only French and one who spoke only English. The boy was asked to act as the communication link between the two researchers who pretended they could not speak the other language. The researchers noted that while there was very little lexical mixing overall, the rate of mixed utterances declined over the period of study. In addition, Mike's ability to translate improved over the period of study. These two results were interpreted by the researchers as evidence for Mike's differentiation.

In sum, a number of researchers have interpreted children's decreasing rates of code-mixing between the ages of two and three years as evidence for increasing language differentiation. The children in these studies completed their differentiation at ages ranging from two years (Vihman, 1985) to over three years (Swain & Wesche, 1975). Redlinger and Park (1980) attempted to explain this variation in age by ascribing differentiation to morphosyntactic stages (as indicated by MLU) rather than age. This suggestion is interesting; however, no theoretical justification as to why there might be a relationship between MLU and code-mixing was provided and the finding has not been replicated in any other study. In fact, looking at the data from many studies of bilingual children, there is no clear decrease of code-mixing with age (see Table 1.1). A correlation on all the data available in an appropriate format (i.e., one age, one rate of code-mixing) in Table 1.1 shows that there is a non-significant negative correlation with age, $r(52)= -.221$, $p>.05$. Where the data are available in an appropriate format, there is a non-significant negative correlation of code-mixing with MLU, $r(22)= -.343$, $p>.05$. The negative correlation was predicted by Redlinger and Park (1980), though the lack of significance was not. This suggests that the variability in rates of code-mixing across studies must be accounted for in some way other than age or MLU.

Dual system hypothesis

The ULS hypothesis has not received universal acceptance among researchers. Two principal reasons are cited by researchers as evidence that bilingual children initially have two languages. First, they claim that the rates of intra-utterance mixing in bilingual children are low and thus should not be taken alone as evidence for language representation. Second, many researchers have argued that it is essential to look at what children do with the majority of their utterances, the ones that are not code-mixed, to characterize language representation. Looking at children's non-code-mixed utterances, these researchers note there is evidence for bilingual children's ability to use their two languages in a contextually sensitive way. Specifically, children try to use their interlocutor's language.

The present discussion concerns language differentiation at the pragmatic level as opposed to language differentiation at the underlying syntactic level. Meisel (1989) has rightly pointed out that these two levels should be distinguished. Syntactic differentiation is an issue of children's competence and thus pertains directly to representation. Meisel has provided extensive evidence that the existence of Volterra and Taeschner's (1978) stage II is not supported by bilingual children's use of language. He has shown that children can differentiate their languages syntactically from about the age of two years (Köppe & Meisel, 1992; Meisel, 1992; Meisel, 1989). In contrast, language differentiation at the pragmatic level is an issue of performance-- can children learn to differentiate language by conversational context (interlocutor, in particular), and if so, when? Context sensitivity, or pragmatic differentiation, speaks indirectly to how children's languages are represented. If bilingual children differentiate their languages according to interlocutor, this would be consistent with but not conclusive of differentiated representation of the two languages. In this section, I first review the rates of children's intra-utterance mixing reported by researchers positing a dual system for young bilingual children, and then examine the evidence for the children's context sensitivity.

Researchers who posit a dual system for young bilingual children have usually found that code-mixing does not constitute a large proportion of their utterances. Bergman (1976), for example, reported that her Spanish-English bilingual daughter, Mary, showed no signs of code-mixing until the age of 2;3 when she used one mixed utterance. Bergman later discovered that this particular mixed structure was used by children and adults alike at Mary's play group and thus was not an example of spontaneous code-mixing. In general, Mary responded in the language in which she was addressed from the time she was just over a year old. Padilla and Liebman (1975) studied three Spanish-English bilingual children in California, starting from the age of 1;5 for one child and from the age of about 2;0 for the two other children. The children were observed over the course of 3 to 6 months. The researchers did not report the actual rates of mixing but stated that they were low. Lindholm and Padilla (1978) gathered spontaneous speech from five Spanish-English bilingual children, ranging in age from 2;10 to 6;2. They found that code-mixing accounted for only 2% of all of the children's utterances. The mixes seemed to occur only when the children did not know a word in the language they were trying to speak. Goodz (1989) found that in 13 French-English bilingual children, aged 25 to 30 months, the highest rate of code-mixing was 5% of one child's total utterances, and the usual rate of code-mixing was much lower. The authors of these studies concluded that there is no evidence for a ULS hypothesis.

When rates of code-mixing are much higher than 5% (see Table 1.1), it is often because the instances of code-mixing are reported as a function of the child's multimorphemic utterances (Vihman, 1985) or because intra-utterance mixing and inter-utterance mixing (code-mixing between utterances) are counted together (Lanza, 1992; see Note 2).

In addition to low rates of code-mixing, several researchers have reported other evidence for children's context sensitivity. Ronjat (1913) and Pavlovitch (1920) cite evidence for their sons' early differentiation of their two languages. Ronjat described his son Louis's acquisition of French and German and Pavlovitch described his son Douchan's acquisition of French and Serbian. Both authors found that their sons could distinguish their languages according to interlocutor from an early age. Ronjat cites the age of 16 months for Louis's first signs of clear separation of the languages (this is also the age at which Louis first began to produce words that were clearly French or German). Pavlovitch cites the age of 20 months for Douchan's clear separation of French and Serbian, though it should be noted that Douchan's exposure to French began at the age of 14 months.

Both of these case studies were conducted by the fathers of the children and do not provide information concerning the children's language use with their mothers alone. In examining context sensitivity in bilingual families, it is important to consider children's language use with both parents. A dual system hypothesis would posit that a child uses more of the father's language with the father than with the mother *and* more of the mother's language with the mother than with the father. In this formulation, the parents are assumed to be the basis for a linguistic context for their children because children are often requested to address only one language to a parent.

Researchers have not always taken linguistic context into account when studying children's code-mixing. For example, in Vihman's (1985) study, the family home was defined as the Estonian context and thus all English utterances Raivo used in the home were considered as code-mixes, including utterances addressed to himself. And yet, presumably bilinguals can address themselves in either language without violating any pragmatic norms. A few recent studies of bilingual children have corrected this problem. DeHouwer (1990) found that Kate, a Dutch-English bilingual girl, aged 2;7 to 3;4, consistently addressed much more Dutch than English to speakers of Dutch and much more English than Dutch to speakers of English. Köppe and Meisel (1992) found that the two French-German children they studied made very few mistakes in language choice when addressing two monolingual research assistants, from the age of about two years to over four years. Genesee, Nicoladis, and Paradis (in press) showed that five two-year olds addressed more of their fathers' language to their fathers than to their mothers and more of their mothers' language to their mothers than to their fathers. Quay (1992) reported that a young Spanish-English bilingual girl used more Spanish than English in a Spanish context and more English than Spanish in an English context before the age of 1;10.

In sum, the rates of intra-utterance mixing are usually very low in young bilingual children, when counted as a function of the total number of utterances. This and evidence from the few studies in which linguistic context has been systematically controlled suggest that pragmatic differentiation emerges between the ages of 1;10 and 2;0.

The present study

The present study examines six bilingual children's context sensitivity between the ages of 18 months and 30 months. By examining language usage in such young children developmentally, it is possible to discover when bilingual children *initially* show signs of context sensitivity. Also, by examining context sensitivity in so many children (relative to other studies), some insight into individual differences can be gained. The analyses in this chapter test two versions of the ULS hypothesis. In the following discussion, predictions from both versions of the ULS hypothesis as well as from the dual system hypothesis are described.

The first version of the ULS hypothesis makes no assumption about language dominance and thus assumes that 50% of children's utterances to both parents will be in French and 50% in English based on chance. For example, if a child used 10 French utterances, approximately 5 would be addressed to each parent (and the same with his or her English). I shall refer to this version as the 50/50 version. In contrast, if bilingual children were sensitive to the language of their addressee (and thus had a dual language system), then one would expect them to use more of their father's language with the father and more of the mother's language with the mother. This prediction is shown in Table 5.1 where a plus sign (+) represents more than expected by the ULS hypothesis and a minus sign (-) represents less than expected by the ULS hypothesis. So, for example, a dual system hypothesis would predict that if a child used 10 French utterances, more would be used in addressing the francophone parent than in addressing the anglophone parent. Similarly, if he or she used 15 English utterances at the same time period, more would be used in addressing the anglophone parent than in addressing the francophone parent.

The second version of the ULS hypothesis to be tested here systematically takes into account the children's dominant language. Genesee, Nicoladis, and Paradis (in press) found that the bilingual children in their study used more of their dominant language to address both their French-speaking parents and their English-speaking parents. Even so, the children in their study generally used their two languages in the pattern predicted by a dual system hypothesis (as in Table 5.1), namely more French with their francophone parents than with their anglophone parents and more English with their anglophone parents than with their francophone parents. Their finding suggests that dominance may influence bilingual children's language usage.

Table 5.1
Pattern of children's language use expected by the dual system hypothesis.

	Father's language	Mother's language
to Father	+	-
to Mother	-	+

The second version of the ULS hypothesis shall be called the dominance version of the ULS hypothesis. In this version, children are expected to use their languages in proportion to their dominant language, regardless of addressee. So, for example, a child's vocabulary might be composed of 80% from one language and only 20% from the other language. For this child, this version of the ULS hypothesis would predict that 80% of the child's utterances would be in the first language and 20% in the second, regardless of context. The second analysis tests this version of the ULS hypothesis. In contrast to the predictions of the ULS hypothesis, a dual system hypothesis would again predict that children use more of their addressee's language than would be predicted by their dominant language. This prediction would again result in the pattern seen in Table 5.1.

In this chapter, the two versions of the ULS hypothesis are first tested. When the results of these analyses do not support the ULS hypothesis, I discuss whether the results provide support for a dual system hypothesis. Finally, in order to explain individual differences in pragmatic differentiation, the results of these analyses are also compared to individual differences in age, MLU and vocabulary.

Method

The unit of analysis in testing the ULS hypothesis is the number of utterances the child used in French and in English to each parent in each session (e.g., session 4F and 4M). Graphs depicting each child's relative use of French and English to each parent in each session can be found in Appendix 4.

It was necessary to control for the number of utterances addressed to each parent because some children spoke more to one parent than to the other (see Figure 3.2). The fact that the children did not address an equal number of utterances to both parents can affect the results. For example, in session 7 with YAN and both parents, the child addressed 22 French utterances to his anglophone father and only 14 French utterances to his francophone mother. Thus, as can be seen in Appendix 4e, at session 7B, about 60% of his French utterances were to his father and 40% of his French utterances were to his mother. These rates could be interpreted to mean that YAN was not very sensitive to the language spoken by each of his parents. However, these figures do not take into account the fact that YAN only addressed a total of 25 French or English utterances to his mother while he addressed 56 French or English utterances to his father. Thus, only about 40% of YAN's utterances to his father were in French while almost 70% of his utterances to his mother were in French. These new figures suggest that YAN could actually differentiate his languages according to addressee. Thus, because the base rates could change the interpretation, it is important to control for the number of utterances addressed to each parent.

To test the two versions of the ULS hypothesis, two separate sets of chi-square analyses were performed, both of which took the children's relative volubility to each parent into account. This was done by using the total number of utterances addressed to each parent as the base rate as the expected value.

In the 50/50 version, it would be expected that approximately half of the children's utterances to each parent would be in each language. The observed values for this set of chi-square analyses were the number of utterances in the father's language and in the mother's language addressed to the father and the number of utterances in the mother's language and in the father's language addressed to the mother for each session. The expected value was calculated by taking half of the total number of French and English utterances a child directed to each parent. The observed and expected values for this analysis can be found in Appendix 5.

In the dominance version, it would be expected that the children would use their languages according to their relative dominance in each language, regardless of addressee. The observed values for this set of chi-square analyses were the same as in the previous set of analyses. The expected values were calculated by multiplying the total number of French and English utterances a child directed to each parent by the dominance index (combination index) in Table 4.1. To obtain the expected value for the number of French utterances, the total number of utterances to each parent was multiplied by the children's French combination index. Similarly, to obtain the expected value for the number of English utterances, the total number of utterances to each parent was multiplied by the English combination index. The observed and expected values for this analysis can be found in Appendix 5.

Both sets of analyses were designed so that the ULS hypothesis is the null hypothesis. The expected values were calculated on the assumption that if the ULS hypothesis (either version) is true, then children use their languages in the same way with both parents. If this is correct, then the chi-square value will not be significant. In presenting the results, an equal sign (=) will be used to indicate no significant difference between the observed and expected number of utterances (and thus support for the ULS hypothesis). If, however, the children use their languages differently than expected by the ULS hypothesis, then the chi-square value will be significant. It is not possible to test the dual system hypothesis directly in this analysis; it is only possible to find indirect evidence in support of the dual system hypothesis. The dual system hypothesis does not simply predict that bilingual children will use their languages differently than expected by a ULS hypothesis but that they will use their languages in a particular pattern. This pattern was shown in Table

5.1. Thus, if a dual system hypothesis is correct, we would expect to see significant chi-square values and the pattern of results given in Table 5.1 for each session.

The results of sessions with the parents alone are presented separately from the sessions with both parents present. Genesee, Nicoladis, and Paradis (in press) found that children appeared to use their languages in a less context sensitive way with both parents present than with each parent alone. For STT, only the results of sessions after 7B are presented.

Results

The 50/50 version of the ULS hypothesis

The results of the chi-square analysis of the 50/50 version of the ULS hypothesis are presented in Tables 5.2 and 5.3. Recall that if this version is correct, then the chi-square values should not be significant; this will be represented by four equal signs in each box in Tables 5.2 and 5.3). The dual system hypothesis, in contrast, would predict that the chi-square values will be significant and the results will resemble those in Table 5.1.

The data presented in Table 5.2 suggest that the 50/50 version of the ULS hypothesis is untenable. Most of the chi-square values are significant meaning that bilingual children use their languages significantly differently than would be expected given the ULS hypothesis. There are only 3 sessions out of the 26 analyzed in which the ULS hypothesis is an adequate explanation for the children's use of language: NIC-2, STT-10, and STT-12. However, in session NIC-2, NIC only addressed a total of five French or English utterances to both his mother and his father; thus the token number of utterances might have been too small to yield a reliable chi-square.

Table 5.2
Results of chi-square analysis of the 50/50 version of the ULS hypothesis-- parents alone condition.

Ses.		ELI F.L.	ELI M.L.	ELI χ^2	NIC F.L.	NIC M.L.	NIC χ^2	OLI F.L.	OLI M.L.	OLI χ^2	MAT F.L.	MAT M.L.	MAT χ^2	YAN F.L.	YAN M.L.	YAN χ^2	STT F.L.	STT M.L.	STT χ^2
2	Fat.	-	+	11**	=	=	2.0				-	+	61**	+	-	7.3**			
	Mot.	-	+		=	=					-	+		+	-				
4	Fat.				+	-	82**				-	+	46**	+	-	36**			
	Mot.				-	+					-	+		-	+				
6	Fat.	-	+	38**	-	+	131**				-	+	28**	+	-	15**			
	Mot.	-	+		-	+					-	+		-	+				
8	Fat.				-	+	88**	+	-	67**	-	+	29**	+	-	9.7**	-	+	4.6*
	Mot.				-	+		-	+		-	+		-	+		-	+	
10	Fat.				-	+	218**	+	-	155**	-	+	53**	+	-	15**	=	=	3.7
	Mot.				-	+		+	-		-	+		-	+		=	=	
12	Fat.				-	+	258**	+	-	207**	-	+	113**	+	-	67**	=	=	2.5
	Mot.				-	+		+	-		-	+		-	+		=	=	

Fat.=addressed to Father, Mot.=addressed to Mother, F.L.=Father's Language, M.L.= Mother's Language, *p<.05, **p<.01

Table 5.3
Results of chi-square analysis of the 50/50 version of the ULS hypothesis-- parents together condition.

		ELI F.L.	ELI M.L.	ELI χ^2	NIC F.L.	NIC M.L.	NIC χ^2	OLI F.L.	OLI M.L.	OLI χ^2	MAT F.L.	MAT M.L.	MAT χ^2	YAN F.L.	YAN M.L.	YAN χ^2	STT F.L.	STT M.L.	STT χ^2
1B	Fat.	-	+	6.8**	=	=	2.8				-	+	10**	+	-	7**			
	Mot.	-	+		=	=					-	+		+	-				
7B	Fat.	-	+	148**	-	+	85**	+	-	47**	-	+	9.9**	=	=	2.9			
	Mot.	-	+		-	+		-	+		-	+		=	=				
13B	Fat.				-	+	45**	+	-	75**	-	+	9.9**	+	-	9**	+	-	5.8*
	Mot.				-	+		+	-		-	+		-	+		-	+	

Fat.=addressed to Father, Mot.=addressed to Mother, F.L.=Father's Language, M.L.= Mother's Language, *p<.05, **p<.01

Rejection of the ULS hypothesis does not necessarily provide support for a dual system hypothesis. In fact, the children seldom used language as predicted by a dual system hypothesis. In only 7 of the 26 sessions they used their languages as predicted by a dual system hypothesis. YAN used his languages fairly sensitively according to the addressee starting in session 4 all the way through session 12. The only other sessions yielding the pattern of language use expected by a dual system hypothesis are OLI-8 and NIC-4. However, even though NIC appears to produce more utterances with his father in his father's language than expected in session 4, the difference between the observed number of utterances and the expected is only 0.5.

In a majority of the sessions (16 of the 26 sessions), the children's use of language differed from the predictions of both the 50/50 version of the ULS hypothesis and the dual system hypothesis. In these sessions, most of the children were using more of their dominant language with both their parents. For example, ELI and NIC were very dominant in their mothers' language and used much more of that to both parents than would be expected by the assumptions of this version of the ULS hypothesis. Conversely, OLI was dominant in his father's language and he used much more of that language with both parents in sessions 10 to 12. Only YAN, who was fairly balanced in proficiency, showed fairly consistent signs of using his languages in a context sensitive way.

A similar pattern of results is seen in the sessions with both parents present; see Table 5.3. Here, in 2 of the 14 sessions (NIC-1B and YAN-7B) the children's language use did not differ from that expected by the 50/50 version of the ULS hypothesis. In 3 of the 14 sessions (OLI-7B, YAN-13B and STT-13B) the pattern of the children's language use corresponds to that expected by a dual system hypothesis. Again, in most sessions (9 out of 14), the children used more of their dominant language with both parents. In the sessions with the parents together, the dual system hypothesis explains proportionately fewer sessions than in the session with the parents alone. It is possible that having the parents together creates a different context from the one with the parents alone. This possibility will be discussed again in chapter 6. Nevertheless, these chi-square analyses indicate quite clearly that the 50/50 version of the ULS hypothesis does not explain the children's language use.

The dominance version of the ULS hypothesis

The results from the analysis of the 50/50 version of the ULS hypothesis suggest that while that version can be rejected, there may not be enough evidence to reject completely the ULS hypothesis. In most sessions, children used their dominant language even when the context did not call for use of that language. In this section, the dominance version of the ULS hypothesis is tested. Recall that this version predicts that the children would direct the same proportion of each language to both parents. The proportion is based on the children's relative proficiency in each language.

This version predicts no significant differences between the children's use of French and English to the parents (i.e., non-significant chi-square values; again represented by equal signs in the tables). In contrast, the dual system hypothesis would predict that the children would use more of the father's language to the father than expected given their dominance and more of the mother's language to the mother than expected (again, as seen in Table 5.1). The results of this analysis can be seen in Table 5.4 (for sessions with the parents alone) and Table 5.5 (for the sessions with the parents together).

The data presented in Table 5.4 reveal that the dominance version explains no more of the children's use of language than the 50/50 version. Again, in only 3 out of the 26 sessions can the children's dominant language be used to predict how they will use their languages with their parents. All three of these sessions are with NIC (sessions 2, 6, and 12).

In contrast, the dual system hypothesis explains children's language usage in 15 of the 26 sessions. Some of the children seemed particularly adept at using their languages in a context-sensitive way. ELI, OLI and YAN consistently addressed more of their fathers' language to their fathers and more of their mothers' language to their mothers' than would be predicted by their dominant language. NIC showed the pattern expected by a dual system hypothesis after the age of two years, except for session 12. STT showed the pattern expected by a dual system hypothesis starting with session 12.

Table 5.4

Results of chi-square analysis of the dominance version of the ULS hypothesis-- parents alone condition.

		ELI			NIC			OLI			MAT			YAN			STT		
		F.L.	M.L.	χ^2	F.L.	M.L.	χ^2	F.L.	M.L.	χ^2	F.L.	M.L.	χ^2	F.L.	M.L.	χ^2	F.L.	M.L.	χ^2
2	Fat.	+	-	8**	=	=	2.6				+	-	5.6*	+	-	23**			
	Mot.	-	+		=	=					-	+		+	-				
4	Fat.				+	-	69**				-	+	17**	+	-	43**			
	Mot.				+	-					-	+		-	+				
6	Fat.	+	-	5.3*	=	=	1.2				-	+	62**	+	-	34**			
	Mot.	-	+		=	=					-	+		-	+				
8	Fat.				+	-	53**	+	-	100**	-	+	19**	+	-	45**	-	+	4.1*
	Mot.				-	+		-	+		-	+		-	+		-	+	
10	Fat.				+	-	10**	+	-	203**	-	+	29**	+	-	58**	+	-	8**
	Mot.				-	+		-	+		-	+		-	+		+	-	
12	Fat.				=	=	1.3	+	-	147**	+	-	57**	+	-	23**	+	-	10**
	Mot.				=	=		-	+		-	+		-	+		-	+	

Fat.=addressed to Father, Mot.=addressed to Mother, F.L.=Father's Language, M.L.= Mother's Language, *p<.05, **p<.01

Table 5.5

Results of chi-square analysis of the dominance version of the ULS hypothesis-- parents together condition.

		ELI			NIC			OLI			MAT			YAN			STT		
		F.L.	M.L.	χ^2	F.L.	M.L.	χ^2	F.L.	M.L.	χ^2	F.L.	M.L.	χ^2	F.L.	M.L.	χ^2	F.L.	M.L.	χ^2
1B	Fat.	=	=	1.9	+	-	6.1*				-	+	7.5**	+	-	4.8*			
	Mot.	=	=		+	-					-	+		+	-				
7B	Fat.	=	=	0.8	+	-	4.3*	+	-	70**	-	+	14**	-	+	12**			
	Mot.	=	=		+	-		-	+		-	+		-	+				
13B	Fat.				+	-	6.5*	+	-	91**	=	=	3.3	+	-	19**	+	-	5.6*
	Mot.				+	-		-	+		=	=		-	+		-	+	

Fat.=addressed to Father, Mot.=addressed to Mother, F.L.=Father's Language, M.L.= Mother's Language, *p<.05, **p<.01

In 8 of the 26 sessions, the children's language usage could be explained neither by the predictions from the ULS hypothesis nor the dual system hypothesis. Most of these sessions were with MAT. While MAT did show the pattern of language use expected by a dual system hypothesis in sessions 2 and 12, his general tendency was to use more English (his mother's language) than expected by his dominance with both parents. The remaining sessions unexplained by either hypothesis are NIC-4, YAN-2, STT-8, and STT-10.

Table 5.5 shows the results of the chi-square analyses of the dominance version of the ULS hypothesis for the sessions with both parents present. In these sessions, the ULS hypothesis can explain 3 of the 14 sessions (ELI-1B, ELI-7B, and MAT-13B). The children's language use corresponds to the pattern expected by a dual system hypothesis in only 4 of the 14 sessions (OLI-7B, OLI-13B, YAN-13B, and STT-13B). In the remaining 7 sessions, the children use much more of one language to address both parents than would be expected given their dominant language. NIC consistently used more French (his father's language) to both parents; MAT generally used more English (his mother's language) to both parents; and YAN used more English (his father's language) in session 1B and more French in session 7B. The results of these chi-square analyses indicate clearly that the dominance version of the ULS hypothesis does not explain children's language use.

Developmental factors related to context sensitivity

The results presented above suggest that there may be a great deal of individual difference in context sensitivity. For example, ELI, OLI and YAN showed context sensitivity consistently and early on while MAT did not show context sensitivity consistently. NIC and STT showed signs of context sensitivity after the age of two years. It is possible that these differences could be attributed to developmental differences. It might be expected that context sensitivity will become evident in bilingual children with increasing age or developmental stage (e.g., MLU or vocabulary). In this section, a brief examination of the relationship between age, MLU, and vocabulary and context sensitivity is carried out. Only the results of the analysis of the dominance version of the ULS hypothesis are used in this discussion because the analysis of the 50/50 version of the ULS hypothesis simply showed that children were using more of their dominant language with both parents.

In terms of age, there was no clear evidence for increasing differentiation as the children got older as might be expected with an initial ULS (see Volterra & Taeschner, 1978). Looking at the development of individual children, if there had been gradual differentiation as they got older, then their language use over the course of this study could have initially been explained by the ULS hypothesis and then explained by the dual system hypothesis. However, most of the children never used their languages as expected according to the ULS hypothesis and some of the children in this study showed evidence of context sensitivity as young as 19 months of age.

Looking at age and context sensitivity across all the children, when the children were older they were more likely to show context sensitivity than when they were younger. At the age of 29 months, four out of the five children in this study were using their languages according to context while at 19 months, only two out of the five children showed evidence of context sensitivity (see Table 5.4). Similarly, when both parents are present, three of five children showed evidence of context sensitivity at age of 30 months while none of the children showed such sensitivity at 18 months (see Table 5.5). However, some children showed context sensitivity as young as 19 months (ELI and YAN) while other children did not show such sensitivity until two years (NIC and STT). MAT did not show consistent signs of context sensitivity even when he was 30 months old. Thus, there is not overwhelming evidence for the suggestion that children's context sensitivity increases with age. It is not clear that pragmatic differentiation develops at a particular age or with age.

While age is not a clear marker of differentiation, context sensitivity might increase as language proficiency increases. Redlinger and Park (1980) suggested that context sensitivity increased as MLU increased. They based this suggestion on their finding that code-mixing decreased as MLU increased in four bilingual children between the ages of two and three years. They did not offer any theoretical justification for why MLU might be related to context sensitivity. Other researchers have found evidence of a different relationship between code-mixing and MLU. Goodz (1989) found some evidence to suggest that the rates of code-mixing increased as MLU increased. Gawlitzek-Maiwald and Tracy (1994) found that code-mixing followed a U-shaped pattern in one German-English bilingual child; her code-mixing increased until about the age of 2;5 and MLU of 3.5, then decreased. Still, Redlinger and Park's (1980) claim that context sensitivity increases as MLU increases has not been directly challenged.

In this study, it is not possible to statistically correlate context sensitivity with MLU because the former is not a continuous variable. Nevertheless, it is possible to examine qualitatively children's context sensitivity and MLU. Table 5.6 shows the children's combined MLU (from Table 3.4) with those sessions in which they used their two languages as expected by a dual system hypothesis in bold italics. As can be seen from this table, there is no clear relationship between context sensitivity and MLU; namely, there is no threshold MLU above which children show evidence of context sensitivity. For example, MAT's MLU varies widely over the course of this year and the sessions in which he showed context sensitivity seem arbitrary *vis à vis* his MLU. STT shows signs of context sensitivity with an MLU as low as 1.00 (session 13B); he never put two content words together in a single utterance during the year he was studied and yet his language use appears context sensitive at the end of the year. While this method of "eyeballing" the data cannot be used to conclusively disprove a relationship between context sensitivity and MLU, some striking counter-evidence is seen here. It seems highly unlikely that context sensitivity requires a particular morphosyntactic stage of development, as measured by MLU.

Another possible explanation of individual differences in context sensitivity is that children need a certain vocabulary base before they can separate their languages according to context. That is, it is possible that children need to know a certain number of words (regardless of language) in order to learn that those words should be used differentially according to context. Snow (1988) claimed that bilingual children know about 50-100 words before they differentiate the phonological system of their two languages. Although she did not cite any evidence to support this claim, it is an interesting one. In Chapter 3, it was noted that a number of researchers have suggested that a vocabulary of about 50 words is necessary before children learn rules that apply over the words.

Table 5.6
Children's Combined MLU; Sessions with evidence of dual system in bold italics.

Session	ELI	NIC	OLI	MAT	YAN	STT
1B	1.33	1.00	--	1.13	1.00	
2	***1.37***	1.07	--	***1.14***	1.43	
4	--	1.09	--	1.49	***1.61***	
6	***1.30***	1.38	--	1.28	***1.51***	
7B	1.83	1.31	***1.65***	1.56	1.47	
8	--	1.29	***2.10***	1.38	***1.39***	1.11
10	--	***1.41***	***2.87***	1.61	***1.51***	1.02
12	--	***1.70***	***3.14***	***1.34***	***1.47***	***1.19***
13B	--	1.63	***3.35***	1.48	***2.16***	***1.00***

Again, it is not possible to perform a statistical correlation between overall vocabulary and context sensitivity because the latter is a discrete variable. Table 5.7 shows the overall number of word types the children used in each session, again with the sessions in which the children differentiated their languages (according to the analysis of the dominance version) in bold italics. In this table, it can be seen that, in general, a productive vocabulary of about 35 words was required before the children started using their languages differentially. The one seeming exception is STT who produced only

20 different word types in session 13B. However, he produced over 35 words in the previous session (sessions 12), suggesting that his total productive vocabulary exceeded 35 words and his apparent 20-word productive vocabulary in session 13B was an artifact of the short session.

Table 5.7
The number of word types produced by the children at each session; Sessions with evidence of dual system in bold italics.

Session	ELI	NIC	OLI	MAT	YAN	STT
1B	21	26	-	23	23	
2	***36***	28	-	***36***	67	
4	-	77	-	66	***75***	
6	***85***	83	-	49	***52***	
7B	85	43	***83***	49	52	
8	-	***90***	***110***	110	***97***	23
10	-	***104***	***220***	126	***164***	29
12	-	125	***250***	***118***	***132***	***38***
13B	-	57	***148***	80	***105***	***20***

This is true of the other children as well. Because the transcriptions were based on only 20 to 40 minutes of their speech, their productive vocabularies were undoubtedly higher than what appears in Table 5.7. Also note that a 35-word productive vocabulary did not guarantee pragmatic differentiation (see NIC, MAT and YAN). It is possible that a certain productive vocabulary size is a necessary but not sufficient prerequisite to context-sensitive language use.

Discussion

Generally speaking, it is clear from these analyses that both versions of the ULS hypothesis can be rejected. In the analysis of the 50/50 version, the children were not necessarily using their languages in the pattern expected by a dual system hypothesis. Most often the children used more of their dominant language with both parents. The results of the analysis of the dominance version showed that all of the children showed evidence of context sensitivity at some point over the year they were observed, although some children were more consistently context sensitive than others. In most of the sessions, the children used language as would be predicted from a dual system hypothesis. They generally used more of their non-dominant language when their non-dominant language was required than was expected given their dominance. So even though their proficiency in one language may be lower than the other, the children still try to use that weaker language when it is required. These results support the findings and interpretation of Genesee, Nicoladis and Paradis (in press).

In the sessions with both parents present, the dual system hypothesis could not explain the children's language use any better than did the ULS hypothesis (either version). This suggests that interacting with both parents challenges the children's context sensitivity. There are a couple of possibilities as to why the both-parent sessions might have been particularly challenging to children's context sensitivity. It is possible that when children interact with both parents, they feel free to choose the language themselves rather than allow the parent to choose the language.

With both parents present, the children know that at least one parent will understand them regardless of their language choice. It is also possible that the parents are more likely to switch to one language or another when they are both present. If it is true that the parents are less consistent in language choice when they are both present, then the children's failure to separate the languages according to parent would be understandable. This issue will be examined in the next chapter.

There were individual differences in context sensitivity. ELI, OLI, and YAN showed pragmatic differentiation consistently and early. NIC and STT showed pragmatic differentiation fairly consistently after the age of two years. MAT, however, did not consistently show context sensitivity over the course of the year he was observed.

An examination of some possible developmental factors that might be related to the emergence of context sensitivity suggested that age and MLU may not be related. However, a minimum productive vocabulary of 35 words seemed to be necessary (but not sufficient) for the children to show context sensitivity. Thus, it is possible that bilingual children do not initially differentiate their languages according to interlocutor. A certain threshold in vocabulary may be necessary in order for children to learn to differentiate the vocabulary items according to language.

Because a particular vocabulary base does not guarantee that bilingual children will show context sensitivity, there remains the question of what is required for children to show such sensitivity. Ronjat (1913) argued that parents of bilingual children had to maintain a strict separation of the languages-- one parent speaking only one language-- in order for children to achieve early differentiation. Thus, it is possible that parental input plays a role in children's pragmatic differentiation. This topic will be explored in the next chapter.

An explanation based on children's vocabulary allows a reinterpretation of Leopold's (1949) and Vihman's (1985) proposal that bilingual children might pass through a period that resembles Volterra and Taeschner's (1978) stage one and then go directly to their stage three. During the first period, the children use words regardless of language, simply to get their meaning across. This might lead the children to code-mix frequently at this stage. If this is true, then code-mixing is not due to a failure to differentiate the languages, but instead to a small vocabulary.

CHAPTER 6

Parental Code-mixing

There are two reasons to look at parental code-mixing in bilingual families. First, as mentioned in Chapter 5, parents' language use may play a role in children's context sensitivity. If parents code-mix a lot, then their children may not differentiate their languages according to parent. Conversely, if parents rarely code-mix, then their children might show clear context sensitivity early one. A second reason to examine parental code-mixing is that rates of parental code-mixing may be related to rates of children's code-mixing, regardless of how much code-mixing parents do. In this chapter, both implications of parental code-mixing are discussed.

Before proceeding, it is important to note that children's context sensitivity may be related to their code-mixing and thus the effect of parental code-mixing on both could occur simultaneously. Children's lack of context sensitivity necessarily entails frequent code-mixing (i.e., inter-utterance mixing), both of which may be due to frequent parental code-mixing. However, when children show context sensitivity, their rates of code-mixing could be quite high or quite low. Thus, while context sensitivity and code-mixing may be related, they are not necessarily so. Since it was found in Chapter 5 that most of the children showed context sensitivity at some point, the two effects of parental code-mixing are treated separately in this chapter.

The first question to be examined in this chapter is how differences in input might explain the differences in context sensitivity seen in Chapter 5. Ronjat (1913) claimed that it was essential that parents use only one language in addressing their children (one person-one language) in order that they show early differentiation (see also Pavlovitch, 1920). His evidence for this claim was that he used only one language in addressing his son and his son showed early differentiation. Support for the importance of the one person-one language rule was also found in a study by Tabouret-Keller (1962). She observed a family that code-mixed frequently and claimed that the child did not show early differentiation. The claim that parents' strict adherence to a one person-one language rule is necessary for children's early differentiation has never been systematically examined. Thus, in this chapter, I examine whether parents of children who clearly differentiated their languages early on (like ELI, OLI, and YAN) were stricter in avoiding code-mixing than parents of children who did not clearly differentiate early on (like NIC, MAT, and STT). In trying to answer this question, as the first analysis in this chapter, an analysis of variance is performed to see if there are differences in code-mixing between families.

Another way in which parental code-mixing might be important is in relationship to children's code-mixing. In a review of studies of bilingual development, Genesee (1989) noted that few studies had carefully examined the language use of children's interlocutors. He pointed out hints in the literature that parents of bilingual children might sometimes code-mix and suggested that this could be a possible explanation for children's code-mixing and called for a systematic analysis of the correlation between parents' and children's code-mixing.

Only two studies have examined this issue directly. Tabouret-Keller (1962) examined one child's code-mixing in a context in which code-mixing occurred frequently. The child (observed between the ages of 1;8 and 2;11) code-mixed as frequently as the adults in her environment. One implication from this study is that code-mixing might be parent-initiated in that the child adopts the language characteristics of the parents.

In contrast, Goodz (1994) suggested that parental intra-utterance mixing may be influenced by child intra-utterance mixing. This suggestion is based on her study in which she found that in the four French-English bilingual families she studied in Montreal, there were positive correlations between the rates of intra-utterance code-mixing done by the parents and by the children (Goodz, 1989). Within the families, she found that the children's rates of code-mixing correlated with the mothers' rates of code-mixing in three out of the four families. In contrast, the fathers' rates of code-mixing correlated with the children's in only one out of the four families. Goodz (1989; 1994) interpreted her results to mean that in bilingual families there is a relationship between parental and child rates of intra-utterance mixing and that the code-mixing is often initiated by the children. Thus, both studies on this topic agree that there is an association between parental and child code-mixing, but they do not agree on the directionality of causality. One argued that parents initiate code-mixing and the other that children initiate.

Trying to identify whether children or parents initiate code-mixing may be fruitless, for both theoretical and methodological reasons. Research on language use in monolingual families suggests that structural aspects of language development (as opposed to meaning) develop in a bi-directional manner. This means that parents influence children to a certain extent and children influence parents (Bruner, 1981; Maccoby & Martin, 1983; Hoff-Ginsberg & Shatz, 1982; Newport, Gleitman, & Gleitman, 1977; Seitz & Stewart, 1975). Maccoby and Martin (1983) suggested that instead of looking at who initiates what in family interactions, it is more useful to ask how each family member contributes to interactions. Certainly children influence how parents speak, generally in terms of parental fine-tuning of speech (Cunningham, Reuler, Blackwell, & Deck, 1981; Furrow, Nelson, & Benedict, 1979; Hoff-Ginsberg, 1990; Snow, 1971). For example, parental MLU in child-directed speech has been found to correlate with but remain consistently higher than children's MLU (Rondal, 1985), suggesting that parents tailor their language according to what they think children will understand. It is equally certain that parents influence how children speak (Masur & Berko-Gleason, 1980; Ninio, 1992; Retherford, Schwartz, & Chapman, 1981). Ninio (1992), for example, showed that many of children's one-word utterances were imitations of their mothers' one-word utterances. Within this framework, it is possible to ask if there is a relationship between parental and child code-mixing but it is not interesting to ask who initiates code-mixing. It is more interesting to ask how parents respond to children's code-mixing and vice versa. This issue is considered in Chapter 7.

In addition to the theoretical reasons there is at least one methodological reason why it is difficult to know who initiates code-mixing. An outside researcher could examine who initiated code-mixing within a given session, but there is no way of knowing if the original initiative did not occur much earlier. For example, if a child uses a code-mixed utterance in a session before his or her parent, it is possible that the child is reminding the parent about a language game they played on an earlier occasion that the parent originally initiated.

The question posed in this chapter is thus: do parents and children in bilingual families influence each other's code-mixing? Correlations between parental and child code-mixing (both intra-utterance and inter-utterance) are examined both across families and within families. Even if there is no correlation between parental and child code-mixing across all families, it is possible that parents and children influence each other's rates of code-mixing within a family.

Before attempting to answer the questions posed here, the children's rates of code-mixing are reported. These rates will be relevant to the analyses in Chapters 7 and 8 as well, but are only reported here.

Method

Intra-utterance mixing was based on the number of utterances that contained lexical items from both French and English. These utterances were called "mixed" in Chapter 2. Children's intra-utterance mixing is presented in three ways: 1) as the token number of "mixed" utterances, 2) as the percentage of "mixed" utterances as a function of all utterances (excluding the unintelligible ones), and 3) as the percentage of "mixed" utterances as a function of all multimorphemic utterances.

Inter-utterance mixing, as defined in Chapter 1, is the use of an inappropriate language for a particular context. Because of this definition, it is necessary to report the children's rates of mixing by context, or addressee for the purposes of this study. The rates of inter-utterance mixing were determined by dividing the number of utterances that were instances of inter-utterance mixing (e.g., the number of French utterances addressed to an anglophone parent) by the total number of utterances in that session.

In testing for differences in the rates of code-mixing between families, the rates of intra-utterance and inter-utterance mixing were combined, or added together, for each session. This was done because the rates of intra-utterance mixing were so low.

All correlations between parental and child code-mixing were based on the rates of code-mixing (i.e., percentage of code-mixed utterances out of the total number of utterances) in a single session. The correlations were performed separately for intra-utterance and inter-utterance mixing in order to allow comparisons with other studies.

Results

Rates of code-mixing

Intra-utterance mixing

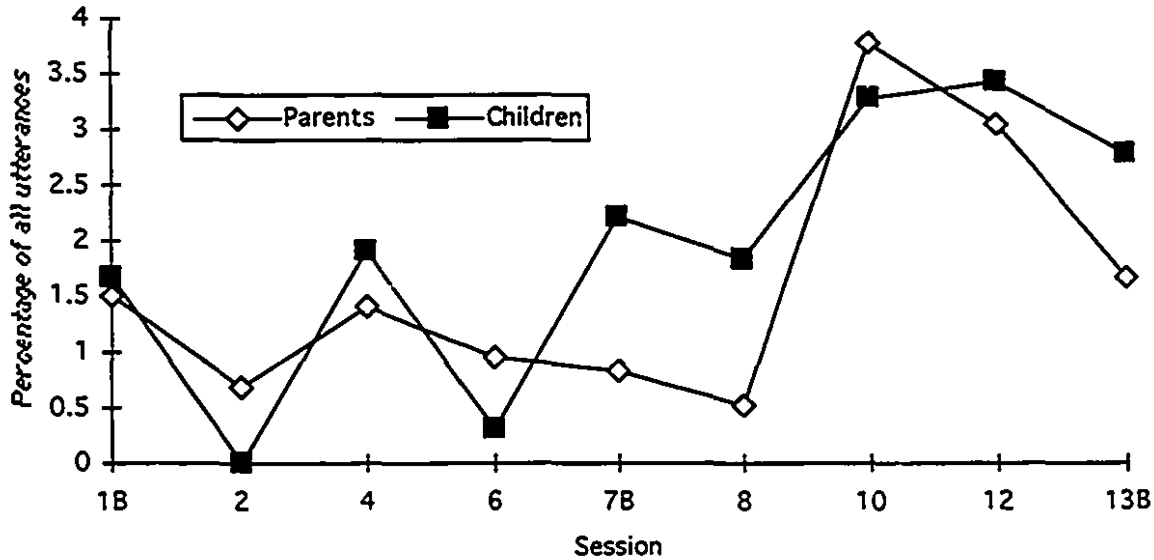
The token number and rates of intra-utterance mixing for each child in each session are presented in Table 6.1. As can be seen in this table, the rates of intra-utterance mixing were generally very low. Overall, the token number of "mixed" utterances ranged from 0 to 27. The rate of intra-utterance mixing as a function of all utterances ranged from 0 to 11.25%. The range of intra-utterance mixing as a function of the children's multimorphemic utterances is 0 to 29.27%. The children used very little intra-utterance mixing at the beginning of the study, as would be expected of children in the one-word stage. Even with such a small token number, individual differences in the use of intra-utterance mixing can be seen. For example, NIC did not use a single mixed utterance while MAT and YAN used mixed utterances relatively frequently. The rates of intra-utterance mixing for the children in this study can be compared to the rates found in other studies in Table 1.1.

Table 6.1
Token number of "mixed" utterances (token) and percentage of lexical intra-utterance mixing as a function of all utterances (% all) and of multimorphemic utterances (% MMU).

session		ELI	NIC	OLI	MAT	YAN	STT
1B	token	1	0		0	0	0
	% all	3.22	0	-	0	0	0
	% MMU	20.00	0	-	0	-	0
2F	token	0	0	-	0	0	0
	% all	0	0	-	0	0	0
	% MMU	0	0		0	0	0
2M	token	0	0	-	0	0	0
	% all	0	0	-	0	0	0
	% MMU	0	0		0	0	0
4F	token	-	0	-	1	2	0
	% all	-	0	-	0.60	2.94	0
	% MMU		0		2.86	5.26	0
4M	token	-	0	-	2	8	0
	% all	-	0	-	3.63	7.77	0
	% MMU		0		20.00	16.33	0
6F	token	2	0	-	1	1	0
	% all	6.67	0	-	0.75	0.86	0
	% MMU	28.57	0		6.25	5.88	0
6M	token	0	0	-	0	2	0
	% all	0	0	-	0	1.24	0
	% MMU	0	0		0	3.08	0
7B	token	6	0	2	10	2	0
	% all	2.65	0	1.40	10.75	1.30	0
	% MMU	6.18	0	3.17	40.00	8.33	-
8F	token	-	0	0	5	1	0
	% all	-	0	0	3.07	1.12	0
	% MMU		0	0	13.51	2.33	0
8M	token	-	0	1	4	5	0
	% all	-	0	1.02	2.80	3.27	0
	% MMU		0	2.50	17.39	19.23	0
10F	token	-	0	1	17	14	0
	% all	-	0	0.56	7.83	5.20	0
	% MMU		0	0.83	22.97	14.58	0
10M	token	-	0	11	16	6	0
	% all	-	0	8.21	6.15	2.27	0
	% MMU		0	14.29	18.39	5.22	0
12F	token	-	0	4	3	20	1
	% all	-	0	1.69	4.76	9.09	2.78
	% MMU		0	2.42	15.00	23.26	20.00
12M	token	-	0	3	7	12	0
	% all	-	0	2.40	3.08	7.64	0
	% MMU		0	4.23	14.00	29.27	0
13B	token	-	0	0	5	27	0
	% all	-	0	0	3.52	11.25	0
	% MMU		0	0	12.82	21.27	-

Figure 6.1 shows the average rate of intra-utterance code-mixing used by all the parents and all the children in each session. As can be seen in this figure, the parents' rates of intra-utterance mixing are very low (less than 5% of their total utterances), as are the children's. There appears to be little difference between the average amount of intra-utterance code-mixing done by the children and by the parents. Graphs of parental and child intra-utterance code-mixing for each family can be found in Appendix 6.

Figure 6.1
The average rate of intra-utterance mixing used by the parents and by the children at each session.



Inter-utterance mixing

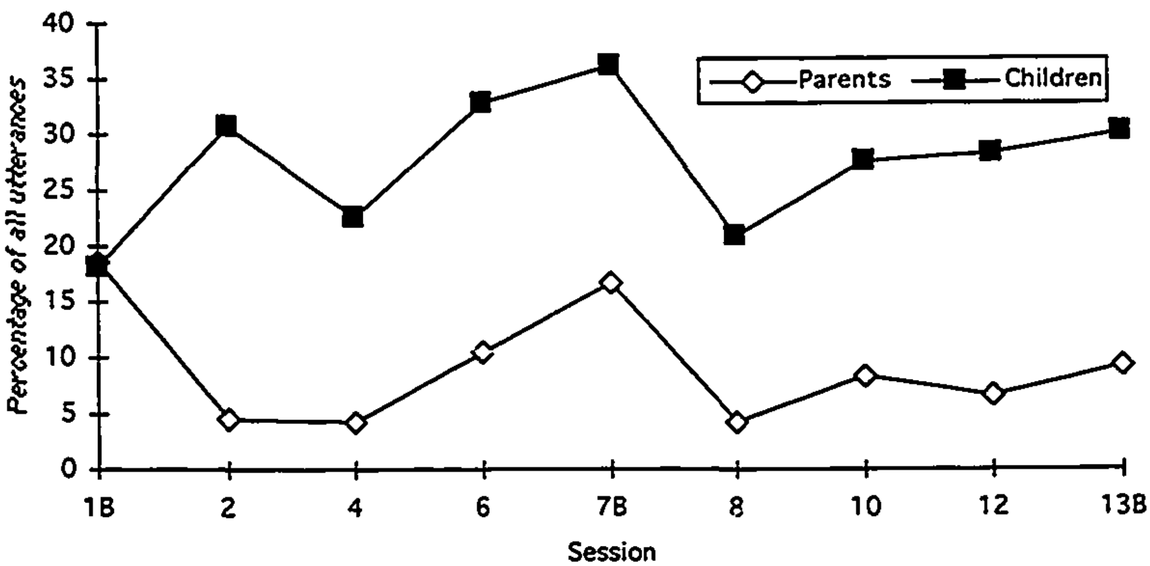
The rates of inter-utterance mixing for individual children and their parents in each session are graphed in Appendix 7. The rates of inter-utterance mixing were sometimes very high, compared to the rates of intra-utterance mixing. The children with a strong dominance in one language (ELI, NIC, and OLI), tended to use more inter-utterance mixing when interacting with the parent who spoke the child's non-dominant language. This did not necessarily hold true for the children who did not have a strong dominance in one language (i.e., MAT, YAN, STT).

For ELI and NIC, the strongly English-dominant children, the rates of inter-utterance mixing were much higher when they were addressing their francophone fathers than when addressing their anglophone mothers. ELI's average rate of inter-utterance mixing was 59.27% (range: 23.53%-81.67%) with her father compared to an average rate of 5.91% (range: 3.41%-10.00%) with her mother. Similarly, NIC's average rate of inter-utterance mixing was 55.22% (range: 11.54%-84.21%) with his father compared to an average rate of 3.31% (range: 0%-11.11%) with his mother. The reverse pattern is seen for OLI. He was French-dominant and used much more inter-utterance mixing with his anglophone mother than with his francophone father. The average rate of inter-utterance mixing addressed to his father was 3.79% (range: 0.60%-10.47%) while the average rate to his mother was 45.40% (range: 21.51% to 65.77%).

In contrast, MAT, who was slightly dominant in French, used much more inter-utterance mixing to his francophone father than to his anglophone mother. The average rate of inter-utterance mixing addressed to his father was 40.51% (range: 25.00%-56.25%) while the average rate to his mother was 12.12% (range: 4.35% to 28.42%). The most balanced of all the children, YAN, used slightly more inter-utterance mixing with his francophone mother than with his anglophone father. The average rate of inter-utterance mixing addressed to his father was 24.87% (range: 6.45%-36.05%) while the average rate to his mother was 34.03% (range: 25.93% to 47.46%). And STT, who was slightly dominant in French after session 7B demonstrated fairly equivalent rates of inter-utterance mixing with both parents in sessions 8, 10, 12 and 13B. For those four sessions, inter-utterance mixing made up an average of 22.57% of his utterances to his francophone father and an average 15.16% of his utterances to his anglophone mother.

Figure 6.2 shows the average rate of inter-utterance mixing used by all the parents and all the children in each session. As can be seen from this figure, the parents appeared to use less inter-utterance mixing than the children. Across all sessions, the parents used an average of 9.16% inter-utterance mixing while the children used an average of 33.70%.

Figure 6.2
The average rate of inter-utterance mixing used by the parents and by the children at each session.



Differences between families

To examine possible differences between families in rates of code-mixing, a one-way repeated-measures ANOVA was performed on the rates of code-mixing used by the parents. There were six levels in the ANOVA (i.e., the six families), with age as the repeated measure. Because the rates of intra-utterance mixing were so low, the rates of intra-utterance and inter-utterance mixing were combined for this analysis. Fisher's Protected Least Significant Difference was used to compare the difference between the individual families. The only significant differences were that OLI's parents code-mixed significantly less than MAT's parents (mean difference= 11.23, p=.02) and STT's parents (mean difference= 11.85, p=.02).

Relationship between parental and child code-mixing

Relationships across families

The overall correlation of the rates of intra-utterance mixing by the parents and by the children was not significant, $r(88)=.199$, $p>.05$. The correlation between the rates of inter-utterance mixing by all the parents and all the children was positive and significant, $r(88)=.298$, $p<.01$.

As can be seen in Figure 6.2, the average rate of inter-utterance mixing by the parents increased slightly when both parents were present as compared to when parents were alone with their children. This difference is statistically significant as shown by an unpaired t-test comparing the rates of inter-utterance mixing with the parents alone and with the parents together, $t(22)=2.241$,

$p<.05$. The average rate of inter-utterance mixing when the parents were alone was 4.38% (SD=5.96) while the average rate of inter-utterance mixing when the parents were together was 17.81% (SD=19.89). The children's rate of inter-utterance mixing did not show a similar increase when both parents were present, $t(88)=.675$, $p>.05$. The children's average rate of inter-utterance mixing with both parents present was 31.55% (SD=29.70) and their average rate with their parents alone was 27.68% (SD=23.82).

Relationships within families

Examining the relationship between parental and child code-mixing within families, Table 6.1 shows the correlation coefficients for the rates of parental and child intra-utterance mixing. In contrast to Goodz's (1989) finding, there was only one (YAN) positive and significant correlation between the mother's amount of code-mixing and the children's. Also, there were one father whose rates of code-mixing correlated with their children's: YAN's as well. For NIC, ELI, and STT, the children and the parents used so little intra-utterance mixing that it was impossible to perform a correlation.

Table 6.1
Correlation coefficients for intra-utterance mixing in children and parents.

	df	Father	Mother
ELI	2	.924	n.v.
NIC	7	n.v.	n.v.
OLI	3	.000	-.093
MAT	7	.209	.230
YAN	7	.857*	.858*
STT	7	-.555	n.v.

*p<.01
n.v.=not enough variance to perform this analysis

Table 6.2 shows the correlation coefficients for the rates of inter-utterance mixing by the children and their parents within families. Most of the correlations are not significant, with the exception of OLI and his father. While both OLI and his father used very little inter-utterance mixing with each other (see Appendix 7), their rates are highly correlated. Note, too, that ELI's and OLI's mothers' rates of inter-utterance code-mixing were negatively (though not significantly) correlated with their children's. This suggests that these mothers were insisting on using their native language, no matter what the child did.

Table 6.2
Correlation coefficients for inter-utterance mixing in children and parents.

	df	Father	Mother
ELI	2	.718	-.592
NIC	7	.092	-.026
OLI	3	.976**	-.606
MAT	7	.143	.315
YAN	7	-.085	.388
STT	7	.477	.525

**p<.01

Summary and discussion

As noted earlier, there is a necessary relationship between children's lack of context sensitivity and high rates of inter-utterance mixing. However, if children show context sensitivity, this does not necessarily say anything about their rates of code-mixing. For example, OLI and YAN both showed clear signs of context sensitivity and yet OLI used very little intra-utterance mixing with either parent and very little inter-utterance mixing with his father while

YAN's rates of intra-utterance and inter-utterance mixing were quite high with both parents.

In this chapter, only minimal support was found for the claim that parents who avoid code-mixing have children who show early context sensitivity. Recall that three children (ELI, OLI, and YAN) showed clear signs of early context sensitivity while the other children showed such sensitivity later (NIC and STT) or never consistently (MAT) (see Chapter 5). OLI's parents code-mixed significantly less than MAT's and STT's parents. This finding could be seen as support for the claim that using a consistent one parent-one language rule can lead to early pragmatic differentiation (Ronjat, 1913). No counter evidence for this claim was found. However, the question remains as to why YAN and ELI showed early context sensitivity when their parents' rates of code-mixing did not differ from that of OLI's, MAT's or STT's parents. It is clear that future research should be aimed at identifying other factors that might be more strongly related to children's context sensitivity.

Turning to the relationship between parental and child code-mixing, the results in this chapter suggest that there is no clear relationship. Across families, there was no correlation between parental and child code-mixing in terms of intra-utterance mixing. There was, however, a small positive correlation in terms of inter-utterance mixing. This correlation only explains approximately 9% of the variance in inter-utterance mixing, suggesting that, across families, parents and children have little influence on each other's rates of code-mixing.

Similar results were obtained upon examination of the relationship between parental and child code-mixing within families. The children's rates of intra-utterance mixing correlated with that of their parents in only 2 out of 12 combinations. The children's and parents' rates of inter-utterance mixing correlated in only 1 out of 12 combinations. These results suggest that children and parents have very little influence on each other's rates of code-mixing within families. Children's rates of code-mixing can clearly not be attributed to parents' rates of code-mixing (or vice versa) at this age.

While these findings appear contradictory to those of Goodz (1989) and Tabouret-Keller (1962), there are some differences between those studies and the present study that should be taken into account. In Goodz (1989), the children were observed until they were as old as five years. Thus, while there may be no correlation between child and parental code-mixing before the age of 30 months, there may be a correlation later on. In Tabouret-Keller (1962), both parents used both languages in relatively equal proportions to address the child. Thus, the input characteristics in that study differ somewhat from those in the present study.

A cautionary note is needed here. While no clear relationship was found between child and parental code-mixing in any session, there is still the possibility that parental code-mixing might influence children's code-mixing (or vice versa) in a more general way. Other studies have shown a time lag in the effect of parents' language on children's language. For example, Furrow, Nelson, and Benedict (1979) found that mothers' use of yes/no questions (questions that contain an auxiliary verb as the first word) influenced children's use of auxiliary verbs (among other advancements in language acquisition) nine months later. It is possible to do a partial correlation in a study such as Furrow , Nelson, and Benedict's because there is an end-state all children will eventually reach: in this case, all English-speaking children will eventually learn auxiliary verbs. With code-mixing there is no clear end-state so it would be impossible to test whether or not children had learned a particular pattern of code-mixing. Nevertheless, it should be pointed out that while the possibility exists that code-mixing at one time influences code-mixing at a later time, there is no clear way to test this possibility empirically.

CHAPTER 7

Parental Discourse Strategies in Response to Children's Code-mixing

While parents do not necessarily influence their children's code-mixing directly, it is still possible that they influence their code-mixing indirectly. In this chapter, I examine how parental discourse strategies might influence children's code-mixing.

Lanza (1992) noted that language context is dynamic and can be renegotiated by the participants (see also Scotton, 1979). She applied this idea to parent-child interactions in bilingual families and suggested that children might code-mix because their parents create linguistic environments in which code-mixing is acceptable. Thus, by responding to children's code-mixing with certain speech acts, parents can shape children's language use. For example, if parents respond to children's code-mixing as if they haven't understood (labeled the "minimal grasp strategy"; see also Ochs, 1988), children might detect the break-down in communication and repair it by changing languages (see also Taeschner, 1983).

Using this framework, Lanza described a continuum of parental strategies in responding to children's code-mixing; this is reproduced in Figure 7.1. At the bilingual end of this continuum are speech acts that signal that code-mixing is allowed. At the monolingual end are speech acts that signal that code-mixing is not permitted.

The continuum was created partially theoretically, drawing on sources from a wide range of fields, and partially empirically, drawing on her observations of a Norwegian-English bilingual child, Siri, and her parents in Norway. The two most monolingual strategies (minimal grasp and expressed guess) came from suggestions by Ochs (1988) and Taeschner (1983) that these strategies encouraged children to clarify themselves. Adult repetition, repeating a child's code-mixed utterance in the parent's language, would have been considered a monolingual strategy by Lanza except that the bilingual child in her study continued to code-mix following an adult repetition. The two bilingual strategies, the move-on strategy and adult code-switching, were devised largely from Lanza's observations. Lanza claimed that this continuum could account for the different rates of code-mixing with Siri's mother and father between the ages of 2;0 and 2;7. Siri's father created a more bilingual environment while her mother insisted on a more monolingual environment.

Figure 7.1
Parental strategies in response to child language mixes
(from Lanza, 1992, p.649; Figure 2).

Bilingual Context	5 Code-switching (csw)
	4 Move on strategy (mos)
	3 Adult repetition (rpc)
	2 Expressed guess (egs)
Monolingual Context	1 Minimal grasp (rcs)

Lanza's creation of this continuum was based on an innovative synthesis of research. However, because the continuum was also created using the data it was meant to explain, it is desirable to test the validity of the continuum using other bilingual families. In this chapter, I first verify that parents in this sample are indeed using the strategies described by Lanza. Then I examine whether the parental strategies influence children's code-mixing in two ways. First, I test whether children's overall rate of code-mixing correlates with parental use of discourse strategies. If Lanza's continuum is correct, then the more bilingual strategies parents use, the more code-mixing children will do and conversely, the more monolingual strategies parents use, the less code-mixing the children will use. A second test of the effectiveness of parental strategies is performed by examining children's responses to parental strategies in the next conversational turn. If Lanza's continuum is correct, children should respond to parental strategies at the bilingual end of the continuum by continuing to code-mix. Conversely, children should respond to parental strategies at the monolingual end of the continuum by ceasing to code-mix.

Method

Coding parental strategies

Parental strategies were categorized using Lanza's (1992) five categories (see Figure 7.1). Examples from each category, from the most bilingual to the most monolingual, of parental strategy are given here.

Code-switching (csw)

Code-switching was thought by Lanza to be the most bilingual of the parental strategies. In this category, the parent switched from his or her native language to the language the child had used. For example, in NIC-12F, the following exchange took place between NIC and his francophone father:

Father: (*puts a puzzle piece between NIC's toes*)
Child: too big.
Father: who's too big?

Lanza reasoned that if the parent code-switched, the child would understand that the other language was an appropriate means of communication.

Move-on strategy (mos)

With the move-on strategy, the parent continued the conversation with the child without drawing attention to the child's code-mixing. Lanza thought that this would be a fairly bilingual strategy on the part of the parents because it showed that they had understood the child and were allowing a language inappropriate to the context to persist. For example, this exchange took place between OLI and his anglophone mother in session 7B:

Child: *il est où ma pomme?*
<where is my apple?>
Mother: Mommy put it away in the kitchen.

In this example, OLI's mother clearly showed comprehension of OLI's utterance. This strategy might have signaled to him that it is acceptable to continue to code-mix since he will be understood. Lanza considered the move-on strategy to be a less bilingual strategy than code-switching because parents never use the other language.

Adult repetition (rpc)

In this category, the parent simply repeated what the child said, but in his or her language. The adult repetition strategy was thought by Lanza to fall about halfway between the extremes of bilingual and monolingual strategies. In this example from MAT-4F, MAT's francophone father was watching MAT do a puzzle:

Child: (*holds a puzzle piece in the air*) plane!
Father: *avion!*
<plane>

In this example, MAT's father showed his understanding of the word "plane". This strategy might indicate to children that they can be understood when they use the inappropriate language. If they are understood, they have no reason to switch languages.

Expressed guess (egs)

The expressed guess strategy falls on the monolingual side of the language environment continuum. In this category, a parent guessed at what the child was saying using only his or her native language. Thus, for example, this exchange took place between MAT and his anglophone mother in session 7B:

Child: *où* that?
<where that?>
Mother: who that?

In this example, MAT's mother guessed at what he was trying to say, using only her native English. This strategy might indicate to the child that the parent's grasp of the other language is weak and thus encourage the child to continue in the parent's stronger language.

Minimal grasp (rcs)

The minimal grasp strategy was considered by Lanza to be the most monolingual kind of strategy. In this category, the parent requested clarification of a child's utterance after the child code-mixed. A response was counted as a request for clarification even if the parent did not make it clear that he or she was questioning the language. For example, YAN's francophone mother is talking with YAN in session YAN-2M:

Child: (*points up in the air*) down!
Mother: *quoi?*
<what?>

The act of asking for clarification in the parent's native language might indicate to the child that it would be necessary to change the language of his or her utterance in order to be understood.

In addition to Lanza's five categories of parental strategies, one other category was added: "no verbal response". This category was applied when in response to a child's code-mixed utterance a parent used his or her next turn in the conversation to laugh (with no evidence of comprehension of the child's utterance), to play with a toy, to speak with someone else in the room, or merely to not respond verbally. It was included at the far end of the bilingual side of the continuum on the grounds that a lack of response to young children will encourage them to repeat their utterance in the same form until they get a response. Supporting this reasoning is research showing that children in the one-word stage repeat an utterance until they receive some kind of response (Greenfield & Smith, 1976). Also, the number of "no verbal responses" by all the parents correlated significantly and positively with the children's overall rate of code-mixing at each session in the present study, $r(89)=.521$, $p<.05$.

All of the transcripts were coded using these six categories of parental strategies in response to children's code-mixing. Because the token number of intra-utterance mixing was so small in both parents and children (see Appendix 6), parental strategies to children's intra-utterance and inter-utterance mixing were coded together.

Parental strategy score

In order to analyze how parental strategies related to children's overall rate of code-mixing, a Likert scale from 1 to 6 was imposed on the bilingual-monolingual continuum, with 1 representing the monolingual end of the continuum and 6 representing the bilingual ("no verbal response") end of the continuum (see Figure 7.1). A score representing the general trend (i.e., how bilingual or how monolingual on the continuum) of each parent's strategies was composed using the following formula:

$$\frac{(1[\#rcs])+(2[\#egs])+(3[\#rpc])+(4[\#mos])+(5[\#csw])+(6[\#nvr])}{\text{Total number of parental strategies}}$$

By dividing by the total number of parental strategies, this score takes into account differences in the token number of parental strategies. This was important to do because the children's rates of code-mixing were not equal with both parents (see Chapter 7 and

Appendix 7). Using this formula, an overall score for each parent for each session with his or her child was obtained. Parents' scores for each session are summarized in Appendix 8.

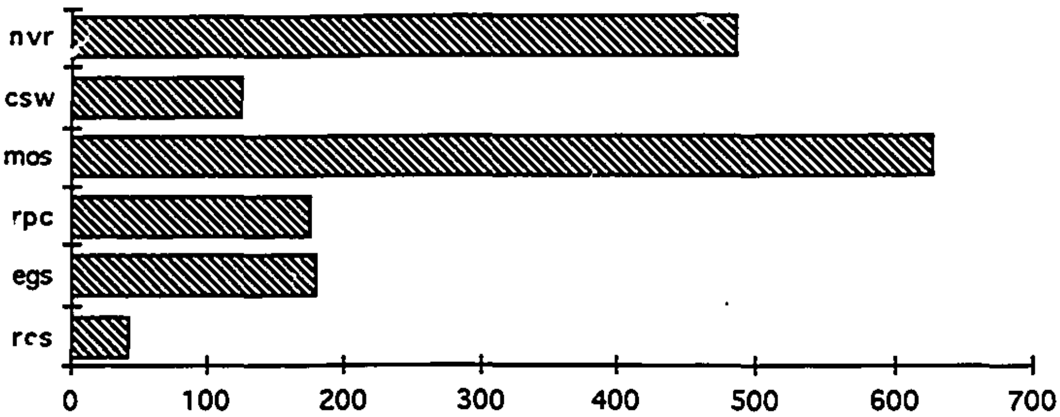
Coding children's response to parental strategies

To see if parental strategies affected children's code-mixing in their next conversational turn, the children's responses to every parental strategy were coded. There were three possible responses the children could make: code-mixing (i.e., intra-utterance or inter-utterance mixing), no code-mixing (i.e., same language as parent or an utterance in "both" languages), and no response.

Results

All parental strategies described by Lanza (1992) were used by the parents in this sample, but not all were used equally. Figure 7.2 shows the token frequency of parental strategies in response to their children's code-mixing from the entire corpus. As can be seen in this figure, the single most frequent strategy was the move-on strategy, with "no verbal response" being the second most frequent.

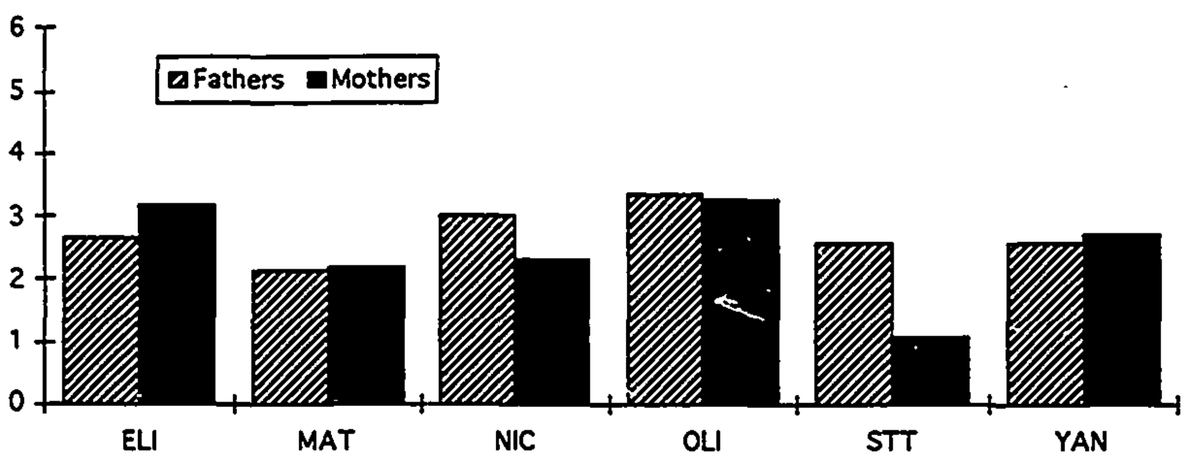
Figure 7.2
Token number of parental responses to children's code-mixing by category.



nvr=no verbal response; csw=code-switching; mos=move-on strategy; rpc=adult repetition; egs=expressed guess strategy; rcs=minimal grasp strategy

The average score for each parent aggregated across all sessions is shown in Figure 7.3. As can be seen in this figure, OLI's parents had the highest average scores on this language continuum, while STT's mother had the lowest score.

Figure 7.3
Average score on continuum by fathers and mothers in response to their children's code-mixing.



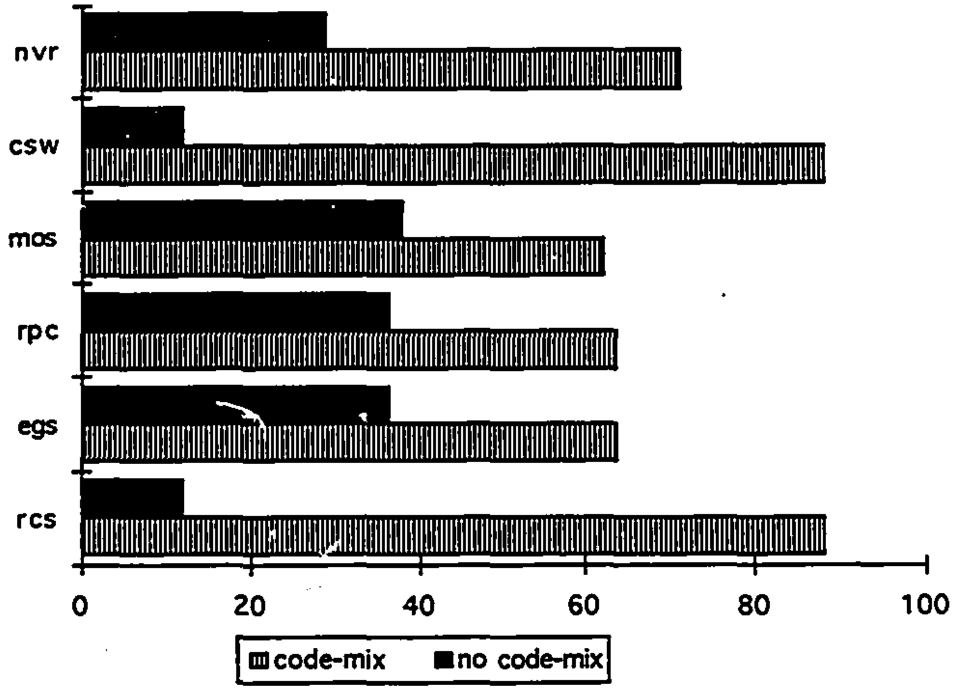
Effects of parental strategies

To see if the parental strategy score corresponded with the children's code-mixing, the children's overall rate of code-mixing (inter-utterance and intra-utterance mixing) was correlated with the parental strategy score for each session. This correlation was not significant, $r(88)=.180$, $p>.05$.

Examining the effects of parental strategies on the children's use of language in the next conversation turn, the single most frequent response to all parental strategies was no response on the child's part. Out of 1686 child responses, 892, or 52.91%, were categorized as no response. In fact, the single most common scenario was that the child code-mixed, then the parent did not respond, and then the child did not respond. The parental strategy that was the most effective in getting a response from the child was requesting clarification: the children responded to a parental request for clarification 64.10% of the time.

Eliminating the children's "no response" responses, Figure 7.4 shows the relative rates of code-mixing and no-code-mixing the children did in response to each parental strategy. In general, no matter what the parents' strategy was, the children continued to code-mix more often than they stopped code-mixing. Overall, of the children's verbal responses to the parental strategies, 68.39% were continued code-mixing. There were two parental strategies that were associated particularly strongly with continued code-mixing by the children: code-switching and requesting clarification.

Figure 7.4
Children's percentage of code-mixing and no-code-mixing in response to each parental strategy.



nvr=no verbal response; csw=code-switching; mos=move-on strategy; rpc=adult repetition; egs=expressed guess strategy; rcs=minimal grasp strategy

Interim summary and discussion

The results from these analyses do not strongly support Lanza's (1992) hypothesis. Parental strategy scores did not correlate with children's rates of code-mixing. Furthermore, on the level of conversational turn, none of the parental strategies was associated with children's ceasing to code-mix. Children responded to some parental strategies as predicted. For instance, as Lanza predicted, parental code-switching was associated with the child's continued code-mixing, and the expressed guess strategy was associated with lower rates of children's code-mixing. However, most of the parental strategies were not followed by the children's response predicted by

Lanza. For example, requests for clarification were thought by Lanza to be a particularly monolingual kind of strategy, whereas these children frequently continued to code-mix after a request of clarification.

Neither Lanza (1992) nor her sources for the continuum of parental strategies (Ochs, 1988; Taeschner, 1983) systematically examined the effects of parental strategies. When Lanza drew on observations of language use in a bilingual family, it was with observations of only one child. For these reasons, it is possible that the basic idea of a continuum of parental strategies is correct but that Lanza's proposed order is incorrect. In the next analysis, I re-order Lanza's continuum according to children's responses and test the validity of the resulting continuum on new families.

Re-ordering the continuum

In this section, I examine the possibility that Lanza's (1992) continuum contains useful descriptions of parental strategies in response to their children's code-mixing but that the ordering of parental strategies on her continuum was wrong. To do this, the parental strategies were re-ordered on the bilingual-monolingual continuum according to how much code-mixing the children did in response to each strategy (see Figure 7.4). So, for example, in the present sample, the children continued to code-mix after a parental minimal grasp strategy more often than after any other parental strategy. Thus, the minimal grasp strategy was placed at the bilingual end of the continuum. Children stopped code-mixing (i.e., their next turn was in their parent's language) most often after an adult repetition of their code-mixed utterance. Adult repetition was therefore placed at the monolingual end of the continuum. The resulting order of the new bilingual continuum can be seen in Figure 7.5.

Figure 7.5
Categories describing parental strategies in response to children's code-mixing.

Bilingual Context	6 Minimal grasp (rcs)
	5 Code-switching (csw)
	4 No verbal response (nvr)
	3 Move on strategy (mos)
	2 Expressed guess (egs)
Monolingual Context	1 Adult repetition (rpc)

This analysis was directed at answering two questions. First, do the new parental strategy scores correlate with children's code-mixing in the old families? This analysis would verify that the re-ordered continuum is useful. Second, and more important: can parental strategies as described by the new continuum explain children's code-mixing in new families? The latter analysis would establish the reliability of the new continuum.

Method

New children and their families

To see if this new coding scheme for the continuum were reliable, it was tested on a new sample of six bilingual children, BAN, GEN, JOE, LEI, TAN, and WIL. These children were all filmed when they were about two years old and had francophone fathers and anglophone mothers. They were filmed in three different sessions, one with the father alone, one with the mother alone and one with both parents. The complete methodology used for collecting and transcribing the data from four of these children (BAN, GEN, TAN, and WIL) is described in Genesee, Nicoladis, and Paradis (in press). The complete methodology for JOE and LEI can is described in Genesee, Boivin, and Nicoladis (in preparation). Most of the children were very or slightly dominant in English, their mother's language, with the exception of GEN, who was fairly balanced.

Coding parental strategies and children's responses

The same coding categories described for Lanza's original continuum were used for the new continuum. Six categories describing parental strategies were used: minimal grasp strategy (rcs), code-switching (csw), no verbal response (nvr), move-on strategy (mos), expressed guess strategy (egs), and adult repetition (rpc). In this analysis, only two kinds of children's responses to parental strategies were counted: code-mixing and no code-mixing. The "no response" category was dropped for this analysis.

Analysis

A Likert scale, ranging from 1 to 6, was imposed on the new bilingual continuum and a score representing parental strategies was determined for each session, as in the preceding analysis. The one difference was the order of the strategies. The formula for determining the score was the following:

$$\frac{(1[\#rpc])+(2[\#egs])+(3[\#mos])+(4[\#nvr])+(5[\#csw])+(6[\#rcs])}{\text{Total number of parental strategies}}$$

Parents' scores on the new continuum in each session can be found in Appendix 9 for both the old families and the new families.

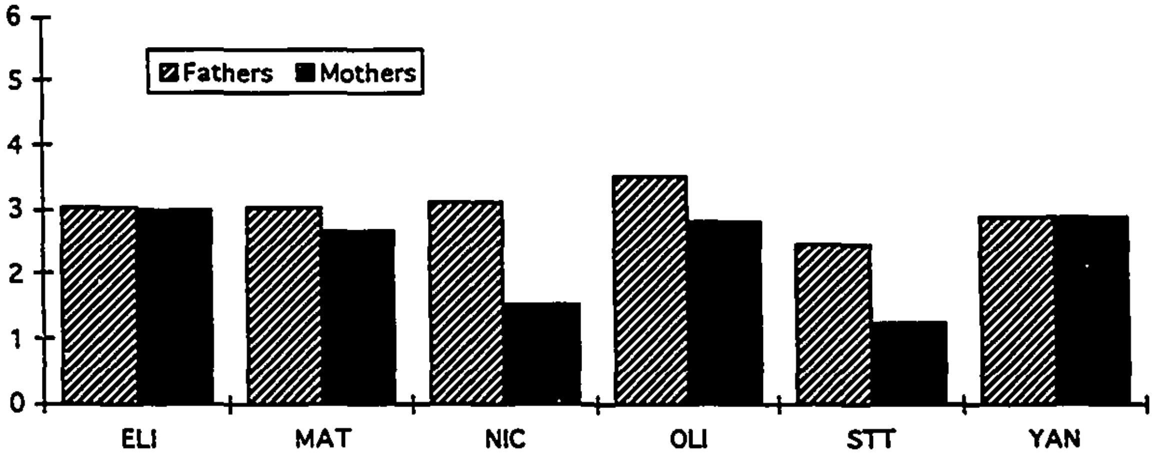
Results

Does the re-ordering work?

Figure 7.6 shows the average score for each of the parents in the original sample on the new continuum. This figure can be compared with Figure 7.3 to see the changes on the average scores after changing the order of the continuum. There were no obvious systematic changes. MAT's parents scored higher on the new continuum and ELI's and NIC's mother scored lower.

Correlation of each parent's score on the new continuum to children's code-mixing at each session is significant, $\underline{r}(88)=.414$, $p<.05$. This is not surprising since some of the children's code-mixing was used to form this new continuum.

Figure 7.6
Average score on new continuum with old families.



Testing the reliability of the new continuum

The average score on the continuum of parental strategies for the new families can be found in Figure 7.7. For these families, the score on the continuum correlated positively but not significantly with the children's overall rate of code-mixing at each session, $\underline{r}(23)=.300$, $p>.05$.

Figure 7.7
Average scores on new continuum with new families.

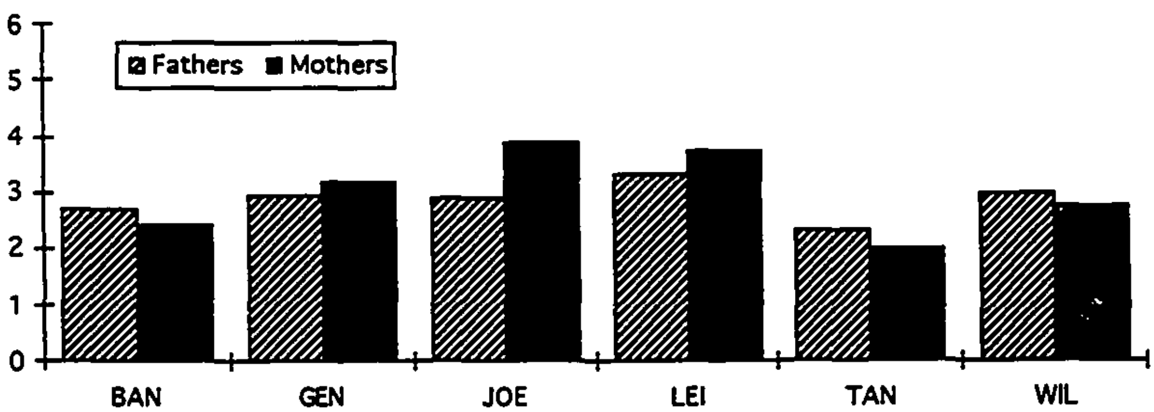
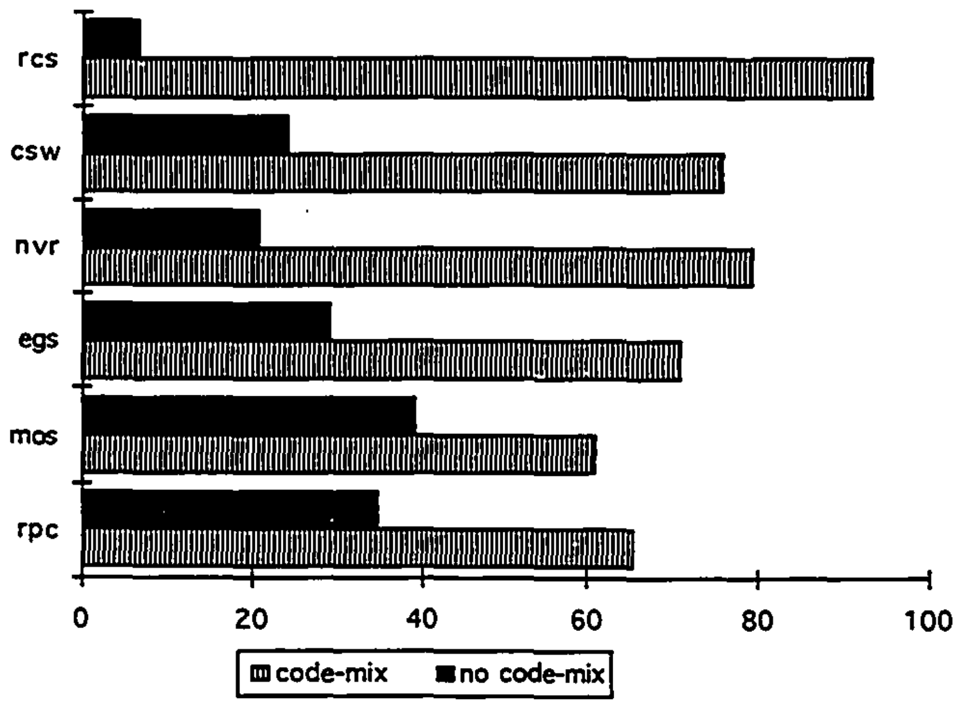


Figure 7.8 shows the percentage of code-mixed and not code-mixed responses to each of the parental strategies for the six new children. As can be seen, the strategies that the children responded to by code-mixing did not descend perfectly in order from the bilingual end of the continuum (top of Figure 7.8) to the monolingual end of the continuum. However, the three most bilingual strategies and the three most monolingual strategies were the same for both groups. Parental requests for clarification still resulted in the most code-mixing on the part of the children.

Figure 7.8
New children's percentage of code-mixing and no-code-mixing in response to each parental strategy.



nvr=no verbal response; csw=code-switching; mos=move-on strategy; rpc=adult repetition; egs=expressed guess strategy; rcs=minimal grasp strategy

Discussion

The results reported in this chapter suggest that parental strategies in response to children's code-mixing are not strongly related to their subsequent code-mixing. In the first analysis, using Lanza's (1992) proposed continuum of parental strategies, parental scores on this continuum did not correlate with children's overall rates of code-mixing. Also, in response to particular parental responses, the children did not continue to code-mix or stop code-mixing in the pattern expected by Lanza. In the second analysis, it was assumed that the idea of a continuum of parental strategies was basically correct and that Lanza's proposed ordering reflected the behavior of one family. On the basis of this assumption, the continuum was re-ordered to reflect how the children in the original sample responded to parental strategies. Parental scores on the new continuum correlated positively and significantly with children's rate of code-mixing in each session. The re-ordered continuum was then tested on a new sample of six bilingual children. With the new sample, there was no correlation between parental score on the bilingual continuum and the children's overall rate of code-mixing. However, the children's rates of code-mixing in the conversational turn following the parental turn occurred roughly in the order expected.

These results suggest that parents' discourse styles had a minimal effect on the code-mixing by their children in the next conversational turn. The children continued to code-mix more often than they stopped code-mixing following all parental strategies. Three parental strategies were particularly associated with children's code-mixing in the next conversational turn: minimal grasp strategy, code-switching, and no verbal response. Three parental strategies were particularly associated with children not code-mixing in the next turn: expressed guess strategy, move-on strategy, and repetition of child's utterance in the parent's language.

These results show some support for Lanza's (1992) hypothesis. For example she predicted that parental code-mixing would be a bilingual strategy and thus children would continue to code-mix. She also predicted that the expressed guess strategy would be a monolingual strategy.

There were, however, a few notable differences between these results and predictions from Lanza's continuum. Lanza had predicted that the move-on and adult repetition strategies would be fairly bilingual strategies. And yet, the children in this study stopped code-mixing after these strategies more often than after many other parental strategies. This may be because these children often interpreted these strategies as a signal that they had been understood and could continue on another topic. In support of that interpretation is an example of an interaction with YAN and his anglophone father in session 10F. They are looking at the story of the Three Little Pigs:

Child: *loup*.
<wolf>
Father: wolf ... yeah.
Child: (*points to a new picture*) what that?
Father: yeah ... that's pigs.

In this example, YAN seemed to interpret his father's English repetition of his French utterance as a sign of comprehension so that he could continue the conversation.

The most remarkable difference between these analyses and Lanza's predictions was the placement of the minimal grasp strategy on the continuum. Lanza predicted that it would be a fairly monolingual strategy and would signal to children that they had to change languages in order to be understood. However, children continued to code-mix more often after this strategy than after any other parental strategy. It is possible that the children in this study were aware that their parents could speak some of their spouse's language, so that when a parent requested clarification, the children interpreted this as a request for them to repeat what they had said rather than to modify it in some way. Support for this statement can be seen by looking at how YAN responded to his mother's request for clarification in the example given above from YAN-2M:

> Child: (*points up in the air*) down!
> Mother: *quoi?*
> <what?>
> Child: down down!

In this example, YAN seems to interpret his mother's request for clarification as a request for repetition. This was a frequent interpretation of parental requests for clarification across the children.

Children's responses of their parents' strategies in this study might have been different from that of the child in Lanza's (1992) study for at least two reasons. First, as mentioned above, the children in this study were usually aware that their parents were bilingual. Because of this awareness, the children might not have interpreted any parental strategy as a truly "monolingual" strategy. Second, the sociolinguistic setting in these two studies was very different. Lanza's study took place in Norway where English is clearly a minority language. It is quite likely then that Siri had met many monolinguals and thus knew that language choice could result in a break-down in conversation. In contrast, Montreal is a fairly bilingual sociolinguistic setting in which neither French nor English could strictly be said to be a minority language. The children in this study may never have encountered somebody who was truly monolingual (i.e., with no proficiency in French or English). Thus they might not have suspected that their code-mixing would not be understood.

CHAPTER 8

Issues of Proficiency in Children's Code-mixing

In this chapter, several possible explanations of children's code-mixing related to their proficiency, children's dominance, lack of translation equivalents, and preference for particular words, are examined. These explanations have occasionally been suggested in the literature on bilingual acquisition but have not been examined systematically.

There are several reasons to think that bilingual children's dominance might be related to their code-mixing. First, Genesee, Nicoladis, and Paradis (in press) found that the children in their study used more inter-utterance mixing when interacting with the parent who spoke their non-dominant language than when interacting with the parent who spoke their dominant language. Similarly, the children in the present study seemed to use more inter-utterance mixing with the parent who spoke their non-dominant language (see Appendix 7). Secondly, in Chapter 5, it was shown that children's pragmatic differentiation could be shown more clearly when their dominant language was taken into account. This finding suggests that language dominance may explain some of the children's language use with their parents.

One way in which dominance might explain children's code-mixing is a lack of translation equivalents. Because bilingual children's experience in their two languages is never exactly the same, it is possible that there are some concepts for which they do not know the word in one language or the other (deHouwer, 1990).

Some recent research has suggested that bilingual children may have a large gap between languages in terms of knowledge of translation equivalents. Pearson, Fernández, & Oller (1994) examined the developing vocabularies of 27 bilingual (Spanish-English) children aged 8 to 30 months. They found that children whose vocabulary was as low as 2-12 words and children whose vocabulary was as high as about 500 words had on average about 30% of their vocabulary in translation equivalents. The vocabulary measurements were taken from parental reports of children's production. With such a large gap between languages in terms of translation equivalents, it is possible that children's code-mixing can be ascribed to their lack of knowledge of particular words in one language (see also Lindholm & Padilla, 1978).

One last possibility to explain children's code-mixing is that they simply might have a preference for particular words (see Dodson, 1981). Some words might sound better to children in one language as compared to the other one. It is also possible that usage of a preferred word might be due to avoidance of particularly difficult sounds in the word's translation equivalent (see Smith, 1973 for a description of phonological avoidance in a young monolingual boy).

In this chapter, I examine the relationship between children's dominance and their rates of code-mixing. Then I explore how much of children's vocabulary is composed of translation equivalents using production data; this is a replication of Pearson, Fernández, & Oller's (1994) study, using production data alone. It should be noted that the present study was not specifically designed to examine this question. A stronger design would be that used by Pearson, et al. (1994) in which both the vocabulary as reported by the parents and the spontaneous productive vocabulary of the children were examined. Nevertheless, it is possible to examine to what extent these children's data are consistent with the idea that they code-mix because they do not know a word in the language they are trying to speak. Expecting that only about 30% of the children's vocabulary is devoted to translation equivalents, I examine whether children's code-mixed words (i.e., words used in a code-mixed context; for example, English words used in addressing the French parent) can be accounted for by their lack of translation equivalents. Lastly, I examine the children's use of code-mixed words for which they know a translation equivalent to see if there is evidence for preference as an explanation for their code-mixing.

Method

Children's dominance

To test the relationship between children's dominance and their rates of code-mixing, the language dominance scores from Chapter 4 (see Table 4.1) were correlated with rates of intra-utterance mixing, rates of inter-utterance mixing, and combined rates of code-mixing (intra-utterance and inter-utterance mixing) in each session. The children's code-mixing with their French-speaking parent was correlated with their dominance in French and their code-mixing with their English-speaking parent was correlated with their dominance in English. If dominance is related to code-mixing, the correlations should be negative. For example, as children become more dominant in French, they should code-mix less with their French-speaking parent.

In a related analysis, children's rates of code-mixing to both parents are tested. If dominance is related to code-mixing, then these correlations should again be negative; as code-mixing to the parent who speaks the children's dominant language decreases, code-mixing to the other parent increases.

Lack of translation equivalents

Two questions are asked about children's knowledge of translation equivalents. First, how much of their vocabulary is comprised of translation equivalents and, second, is their code-mixing consistent with a lack of translation equivalents?

To examine how much of children's vocabulary is comprised of translation equivalents, three measures are reported: the number of word types, the number of translation equivalents (or doublets), and the percentage of doublets as a function of word types. The number of word types was the total number of word types in French and English used by each child in each 20-minute session. Words that did not have a clear translation equivalent in both French and English and words making grammatical distinctions that are not relevant in the other language were excluded from the word-type count. For example, if a child used the words "petit" ('small', masculine) and "petite" ('small', feminine) in the same session, only one word type was counted because English does not consistently distinguish masculine and feminine forms of adjectives.

In order to count children's doublets, the first 30 minutes of the video tape of each session was checked to determine if the child used a translation equivalent in the other language of any word types. If a child knew a word in both languages (e.g., hat-*chapeau*), then he or she was counted as knowing two doublets, following the analysis in Pearson et al. (1994). The results are presented in terms of the proportion of translation equivalents that make up the children's overall productive vocabulary.

There is one important difference between Pearson et al.'s vocabulary counts and my own. Pearson et al. included words that would be counted as belonging to "both languages" in the present study; for instance, they give the example of a child knowing "Mama" in both languages. I have discounted words belonging to both languages (see Chapter 2), so it is possible that the overall average number of translation equivalents for these children will be slightly lower than the 30% found by Pearson et al.

To determine whether children's code-mixing is consistent with a lack of translation equivalents, I ask if children knew a translation equivalent for the words used in both intra-utterance and inter-utterance mixing. For this analysis, every code-mixed word type (i.e., word type used in a code-mixed context) was counted. The list of children's translation equivalents obtained in the first analysis was then examined to see if there was evidence that they knew translation equivalents for code-mixed words. The results compare the number of word types for which there was evidence of knowledge of translation equivalents for code-mixed words with the number for which there was no evidence of knowledge of translation equivalents. The breakdown according to session can be found in Appendix 10.

Children's preference

When children use code-mixed words for which they know the translation equivalent, they may simply prefer the sound of one word over another. If this were the case, one might expect children to use the preferred word more often than its translation equivalent. To test this possibility, I examine the number of code-mixed words for which children knew a translation equivalent that they use preferentially. Preferential usage was defined as the use of a code-mixed word more often than its translation equivalent in the same session. So, for example if one child knew both the English word "hat" and the French word "chapeau" but preferred the English word, we would expect that child to use "hat" more often than "chapeau" when addressing his or her French-speaking parent. The raw data for this analysis can be found in Appendix 11.

Results

Children's dominance

When interacting with their French-speaking parents, the children's rates of intra-utterance mixing did not correlate with their dominant language, $\underline{r}(43)=.173$, $\underline{p}>.05$. However, when interacting with their English-speaking parents, their rates of intra-utterance mixing correlated negatively and significantly with their dominant language, $\underline{r}(43)=-.366$, $\underline{p}<.05$. Thus, as English dominance increases, intra-utterance mixing to the English-speaking parent decreases.

The rates of intra-utterance mixing addressed to their fathers correlated positively and significantly with the rates of intra-utterance mixing addressed to their mothers at each session, $r(88)=.406$, $p<.05$. Thus, as the rates of intra-utterance mixing increased with one parent, they also increased with the other parent.

When interacting with their French-speaking parents, the children's rates of inter-utterance mixing correlated negatively and significantly with their dominance, $r(43)=-.607$, $p<.05$. Thus, as their French dominance increased, their inter-utterance mixing to their French-speaking parent decreased. When interacting with their English-speaking parents, the children's rates of inter-utterance mixing correlated negatively and significantly with their dominant language, $r(43)=-.809$, $p<.05$. As their English dominance increased, their inter-utterance mixing to their English-speaking parent decreased. The rates of inter-utterance mixing addressed to their fathers correlated negatively and significantly with the rates of inter-utterance mixing addressed to their mothers at each session, $r(88)=-.543$, $p<.05$. Thus, as their rate of inter-utterance mixing with one parent increased, the rate with the other parent decreased.

The combined (intra-utterance and inter-utterance mixing) rates of code-mixing the children did with their French-speaking parents correlated negatively and significantly with the children's French dominance, $r(43)=-.604$, $p<.05$. This suggests that code-mixing with the French-speaking parents decreased when the children were more French dominant. Similarly, the children's rates of code-mixing with their English-speaking parents correlated negatively and significantly with the children's English dominance,

$\underline{r}(43)=-.818$, $p<.05$. This again suggests that code-mixing with the English-speaking parents decreased when the children were more English dominant.

Lack of translation equivalents

Table 8.1 shows the number of word types (in French and in English), the number of doublets, and the percentage of doublets as a function of the total number of word types for each child at each session. Some of the children had an average of about 30% doublets in their vocabulary. No child had noticeably more than 30% of his or her vocabulary in translation equivalents. However, both of the strongly English-dominant children (ELI and NIC) had noticeably less than 30% of their vocabulary in translation equivalents. This is undoubtedly because their French vocabulary is so small. When averaged over the year he was observed, STT had only 11.39% of his vocabulary in translation equivalents. As can be seen in Table 8.1, this is probably due to his small vocabulary during the first part of the year. Toward the end of the year, STT's vocabulary expanded and he started to use translation equivalents at a similar rate to the other children. For the last four sessions, STT had an average of 25.64% of his vocabulary in translation equivalents.

Table 8.1

The percentage (%) of doublets (dblts.) as a function of the children's number of French and English word types (wds.).

	ELI			NIC			OLI			MAT			YAN			STT		
Ses.	wds.	dblts.	%	wds.	dblts.	%	wds.	dblts.	%	wds.	dblts.	%	wds.	dblts.	%	wds.	dblts.	%
1	11	0	0	10	2	20.00	-	-	-	8	2	25.00	8	2	25.00	2	0	0
2	13	2	15.38	6	0	0	-	-	-	23	4	17.39	44	16	36.36	5	0	0
4	-	-	-	49	6	12.24	-	-	-	35	10	28.57	51	18	35.29	8	0	0
6	39	12	30.77	44	2	4.55	-	-	-	39	14	35.90	48	22	45.83	5	0	0
7	74	4	5.41	30	2	6.67	58	26	44.83	25	8	32.00	34	12	35.29	1	0	0
8	-	-	-	69	12	17.39	75	28	37.33	71	18	25.35	65	14	21.54	5	2	40.00
10	-	-	-	76	8	10.53	164	58	35.37	79	16	20.25	114	20	17.54	17	2	11.76
12	-	-	-	101	12	11.88	173	26	15.03	86	20	23.26	75	10	13.33	18	4	22.22
13	-	-	-	41	4	9.76	113	38	33.63	49	15	30.61	79	20	25.32	7	2	28.57
Avg			12.89			10.34			33.24			26.48			29.50			11.39

Table 8.2 shows the number of code-mixed word types according to whether the child displayed knowledge of the translation equivalent (TE) or whether there was no evidence that the child knew the translation equivalent (no TE). In general, there were more code-mixed words for which the children did not know a translation equivalent than code-mixed words for which they did know the translation equivalent. The one exception is NIC's code-mixing to his mother: when addressing her, he used an equal number of French word types for which he knew a translation equivalent and for which he did not know a translation equivalent. NIC's French vocabulary was almost completely overlapped by his English (in terms of translation equivalents), so perhaps this is not a surprise.

Table 8.2
Number of code-mixed word types for which there was evidence that children knew translation equivalents (TE) or for which there was no evidence that they knew translation equivalents (no TE).

		ELI	NIC	OLI	MAT	YAN	STT
To father	TE	4	6	9	12	24	3
	no TE	53	85	12	66	101	16
To mother	TE	3	5	35	18	34	1
	no TE	5	5	110	40	72	10

Children's preference

Table 8.3 shows the number and percentage of word types that children used preferentially. Note that for the children who had a strong dominant language (ELI, NIC, OLI), very little code-mixing to the parent who spoke their dominant language (ELI's and NIC's mothers and OLI's father) could be accounted for by preference. MAT shows a marked preference for many of the English words he addressed to his francophone father.

Table 8.3
Number and percentage of word types used preferentially in code-mixing to each parent.

		ELI	NIC	OLI	MAT	YAN	STT
To father	#	3/4	2/5	2/9	9/12	9/25	1/3
	%	75.00	40.00	22.22	75.00	36.00	33.33
To mother	#	0/3	0/5	17/35	8/18	17/34	1/1
	%	0	0	48.57	44.44	50.00	100

Discussion

The results of this examination of some proficiency factors related to children's code-mixing revealed that these factors seem to play an important role. Children's dominance was shown to be related to their rates of inter-utterance mixing but not to their rates of intra-utterance mixing. Two pieces of evidence support the assertion that dominance was related to rates of inter-utterance mixing. First, as their dominance in the language of the parent they were addressing increased, their rates of inter-utterance mixing to that parent decreased. Also, as children's rates of code-mixing to the parent who spoke their dominant language increased, their rates of inter-utterance mixing to the other parent decreased. The results for intra-utterance mixing are less straightforward for two reasons. First, the rates of intra-utterance mixing when addressing the francophone parent did not decrease as dominance in French increased, as would be expected; instead, no significant correlation was found. Secondly, if dominance were related to rates of intra-utterance mixing, it would be expected that as the rates of intra-utterance mixing to one parent increased, the rates to the other would decrease. In fact, a positive correlation was found between the rates of intra-utterance mixing to both parents. These findings suggest that there is a developmental factor involved in intra-utterance mixing that might outweigh the importance of dominance; perhaps, intra-utterance mixing increases as MMUs increase (see Appendix 6). When the rates of inter-utterance and intra-utterance mixing are combined, dominance is a strong correlate of code-mixing.

There is some evidence that dominance points to a lack of vocabulary items in one language. First, the overlap in terms of translation equivalents was found to be no more than 30% of the children's total productive vocabulary. This suggests that there may be extensive gaps in their vocabulary in at least one of their languages. Secondly, the results were consistent with the proposal that children code-mix because they do not know a word in the language they are trying to speak. In the 37 hours of conversation analyzed, the children in this study only used 154 word types for which there was evidence that they knew a translation equivalent. In contrast, they used 575 word types for which there was no evidence that they knew a translation equivalent. This finding, while not conclusive, is compatible with the idea that children code-mix because they do not know a word in the language they are using (see Lindholm & Padilla, 1978). This finding is necessarily tentative because there was no requirement for the children to produce translation equivalents in the free play context of the study. Thus, there may have been many words for which children knew the translation equivalents but chose not to use them.

When children are not filling a lexical gap, they sometimes seem to have a preference for a particular code-mixed word. Frequently the children used code-mixed words more often than their translation equivalents in a single session. This is not inconsistent with the proposal that children simply prefer some words to others. There were some similarities across the children for words they used in a code-mixed way even though they knew the translation equivalent (see Appendix 11). Particularly common were the English "no" and the French "*là*". As for "no", the children in this study were often interested in negating parental requests and may have found the English way of intensifying the negative (lengthening the vowel) more satisfying than the French way of intensifying the negative (repetition of the word). As for "*là*", this was counted as translation equivalent of "there" even though they are not necessarily equivalent in Quebec dialects. The word "*là*", as noted in Chapter 1, is frequently used as a discourse marker in Quebec French. While "there" is sometimes used as a discourse marker among native Quebec anglophones (of whom there were two in this study), it is used less frequently as such.

In sum, the results of this chapter suggest that children's inter-utterance mixing may be due their dominance. They seem to code-mix because they do not know a word in the language they are trying to speak. When they use code-mixed words for which they knew the translation equivalents. there is some evidence to suggest that children prefer the words that they use.

CHAPTER 9
Conclusions

This thesis examined several explanations of bilingual children's code-mixing. In this chapter, I first review the findings of this thesis in order to reconcile the present findings with those in previous studies. I then discuss the more general implications of these findings for our understanding of bilingual development, suggesting that code-mixing is largely due to performance factors. Lastly, I suggest some possible directions for future research.

Results of this thesis

Issues in both linguistic competence and performance relative to young bilingual children's code-mixing were examined in this thesis. Children's competence was examined by looking at their language use of their two languages with both parents, testing the undifferentiated language system (ULS) hypothesis. The findings from this analysis have implications for how children's languages might be represented. In addition, several performance issues in children's code-mixing were examined. Specifically, the effects of parental input and children's proficiency were analyzed.

These issues were examined using data from interactions between parents and children in six French-English bilingual families. Each parent in these families spoke either primarily French or primarily English with their child. The children were observed between the ages of 18 and 30 months, interacting with their mothers and their fathers on separate occasions, as well as with both parents together. These separate observation sessions allowed careful examination of young bilingual children's code-mixing with different interlocutors.

The specific questions posed at the beginning of this thesis were:

-Does the ULS hypothesis explain bilingual children's language use?

-Is children's code-mixing related to rates of parental code-mixing?

-Can parental discourse strategies in response to children's code-mixing affect whether or not they continue to code-mix?

-What is the relationship between dominance and code-mixing?

I discuss each of these questions briefly now.

ULS hypothesis

Two versions of the ULS hypothesis were tested in Chapter 5, one which took the children's dominance into account and one which did not. When children's dominance was not taken into account, it was shown that children tended to speak more of their dominant language to both parents. When children's dominance was taken into account, it was found that the children showed pragmatic differentiation of their languages as early as 19 months of age, although there were individual differences between children in initial age and consistency of context sensitivity. Additional analyses of the data suggest that a productive vocabulary base of about 35 words might be necessary, but not sufficient for bilingual children to show pragmatic differentiation. These findings suggest that children's code-mixing after the age of 19 months cannot be ascribed to a lack of differentiation of their underlying linguistic systems (see also Quay, 1992, for similar results).

The results of the present study shed light on why previous studies have proposed such a wide age range for bilingual children's pragmatic differentiation. The primary difference between the ULS and the dual language system hypothesis is the age at which children are hypothesized to show signs of differentiation. Proponents of the ULS hypothesis posit the two languages of bilingual children are initially represented in a single system that is gradually differentiated between $2^1/_2$ and 3 years of age (Leopold, 1949; Swain & Wesche, 1975; Vihman, 1985; Volterra & Taeschner, 1978). While some proponents of the dual system hypothesis have suggested that bilingual children can differentiate their languages at least as soon as they begin to use them, these studies did not examine children's language use with different interlocutors (Bergman, 1976; Pavlovitch, 1920; Ronjat, 1913). In studies that have carefully taken children's interlocutor into account, bilingual children have been found to show signs of differentiation between the ages of 22 months and two years (Genesee, Nicoladis, & Paradis, in press; Köppe & Meisel, to appear; Quay, 1992). In these studies, researchers have not attempted to explain why children initially do not show signs of differentiation and then do, even when their data suggest that this might be the case (e.g., Quay, 1992; see also Note 3).

In Chapter 5, I examined three possible variables that might explain this wide age range. First, children's dominance had to be taken into account in order to show their pragmatic differentiation. It is possible that past studies on bilingual children have considered children who were strongly dominant in one language (e.g., perhaps Leopold, 1949). If this were the case, then it would not have been evident to the researchers that the children were trying to speak their less proficient language within the limits of that proficiency. As well, previous studies have not considered the possibility that a certain base vocabulary may be necessary before children can show pragmatic differentiation. In the present study it was suggested that having a minimal vocabulary base might be a necessary, but not sufficient, for context sensitivity. Individual differences may also account for the variable ages reported in past studies for pragmatic differentiation. Neither dominance nor vocabulary could account for all the individual differences in pragmatic differentiation seen in the present study. While some children showed clear and consistent pragmatic differentiation from an early age, other children did not. Thus, it is possible that some of the inconsistency reported for pragmatic differentiation in other studies is due simply to individual differences between children. Thus, there may be factors involved in pragmatic differentiation that have yet to be discovered.

Parental input

In Chapter 6, the effects of parental code-mixing on children's context sensitivity and rates of code-mixing were examined. It was found that parental rates of code-mixing had only a minimal and inconsistent effect on both. For example, OLI's parents code-mixed significantly less than the parents of MAT and STT, and OLI showed signs of differentiation from the time he was first observed. In comparison, MAT and STT did not show early and consistent signs of differentiation. However, there were other children (ELI and YAN) whose parents' rates of code-mixing were not particularly low but they showed signs of early differentiation nevertheless. These results suggest that strict avoidance of code-mixing by parents is not a sufficient factor in children's early pragmatic differentiation. Furthermore, in most families, parental rates of code-mixing did not correlate with their children's rates of code-mixing (cf. Goodz, 1989), suggesting that children's code-mixing at this age cannot be attributed to their parents' code-mixing. This finding contrasts with Goodz's (1989) finding that parental and child rates of code-mixing correlate. However, Goodz's study covered a wider age range for the children (up to five years of age) than the present study. Thus, as children get older, their rates of code-mixing may come to correlate with their parents' rates of code-mixing. Also, in families in which both parents speak a code-mixed variety of language rather than primarily one language, children's rates of code-mixing might reflect parental rates of code-mixing (see, for example, Tabouret-Keller, 1962).

In Chapter 7, parents' discourse strategies in response to their children's code-mixing was found to have very little effect on the children's rates of code-mixing. Certain conversational strategies, however, could influence whether or not the children's next conversational turn was code-mixed or not, (cf. Lanza, 1992).

Overall, these results suggest that parental discourse strategies are not a strong predictor of children's code-mixing. There are a few possibilities as to why this study found different results from Lanza. First, Lanza's study observed only one family, thus it is possible that the parents' discourse strategies affected the child's code-mixing in only that family. Second, it was suggested that the different sociolinguistic contexts in Lanza's (1992) study and the present study may account for the contradictory findings.

In contrast to other studies, this study was conducted in a bilingual sociolinguistic context. The sociolinguistic context may have affected the parents' attitudes toward their children's language use in several different ways, and thus it may explain differences between the results of Lanza's study and the present one. Lanza's study was conducted in Norway, a sociolinguistic context where there is a strong majority language, the language that is most frequently used in public transactions (Romaine, 1989). It is often useful to identify the majority language of the community, because, as Döpke (1992) points out, the minority language is almost always the harder for young children to learn. Grosjean (1982) has suggested that children can be encouraged to use a language if they see the language as a useful tool of communication. In Montreal, both French and English are useful tools of communication and there is a great deal of community support for bilingualism.

One way in which the sociolinguistic context may have affected parents' language use is that they may have assumed that their children would eventually learn both French and English. The parents of the children in this study have all at one time or another expressed their desire to try to equalize eventually the input of French and English for their children. For example, the parents of one child who had more English input at the time of this study were planning to send the child to French school. One of the families who bought a house and moved to the suburbs said that one important factor in their decision to buy where they did was that the neighborhood had a particularly bilingual atmosphere.

If parents assumed that their children would eventually learn both languages, this would explain why their choice of language often seemed less important than meaning (see also Goodz, 1994). Parents were likely to use a term a child understood, even if it was in the language they did not normally speak with the child. An example comes from an exchange between ELI and her francophone father in session 6F:

Child: (*holds up a toy gate*) horse horse!
Father: horse?
Father: *mais non, c'est pas un* horse!
<no, it's not a horse>
Father: it's a gate.
Father: *c'est un* gate *pour le cheval.*
<it's a gate for the horse>

In this example, ELI's father uses two instances of intra-utterance mixing and two of inter-utterance mixing to correct ELI's overgeneralization of the word "horse". He never gives her the word for "gate" in French; instead, he provides ELI with a correct word in her dominant language. This recalls the classic finding that parents have great tolerance for syntactic errors, but very little tolerance for semantic mistakes (McNeill, 1970). Parents seem to assume that children will eventually learn "correct" syntax simply with exposure.

Similarly, parents of bilingual children seem to assume that their children will eventually learn both input languages with enough exposure (see discussion in Chapter 7, for an example; see also Goodz, 1994).

Additionally, because of the sociolinguistic context in Montreal, the children in this study may also have had little experience with true monolinguals. Some children were aware of their parents' bilingualism and may not have felt obliged to accommodate "pseudo-monolingualism" on the parents' part (see discussion in Chapter 7). Thus, sociolinguistic context may play an important role in code-mixing by bilingual children.

While other studies have suggested that parental input might be important in young bilingual children's language usage, in this thesis, parental avoidance of code-mixing was not clearly related to children's early pragmatic differentiation or their rates of code-mixing. However, parental language use was examined only within a 20-minute session every two months. It is possible that parents must *consistently* avoid code-mixing on a day-to-day basis in order for children to show early pragmatic differentiation. It is also possible that it may take longer than 20 minutes for the parental rates of code-mixing to affect children's rates of code-mixing. These possibilities can be examined in future research.

Children's proficiency

In contrast to studies in which parental input was thought to play a role in children's code-mixing, this study found that their code-mixing appeared to be largely child-driven. Children's dominance and lack of translation equivalents were shown to be a possible explanation of their code-mixing in Chapter 8. Children's dominance was shown to be correlated with their rates of inter-utterance mixing (see also, Genesee, Nicoladis, & Paradis, in press; Leopold, 1949). Also, there was little evidence that children knew translation equivalents for words they used in both intra-utterance and inter-utterance mixing. Thus, the results here are consistent with the proposal that children code-mix because they have gaps in their vocabulary (see also Lindholm & Padilla, 1978).

The results suggest that young children's code-mixing can be attributed to performance factors by the time they are 19 months of age. Children showed signs of context sensitivity as young as this age and their code-mixing could be explained largely by their dominance and lack of translation equivalents. The data for context sensitivity and for code-mixing are necessarily performance measures rather than representation or competence measures. However, any explanation at the representational level must be able to account for the performance results reported in this thesis. The two languages may or may not be represented in two separate representational stores (but, see Cummins, 1981, for an argument that children's languages must be in two representational stores), but they must somehow be distinguishable for children as young as 19 months. Thus, in contrast to previous studies (e.g., Vihman, 1985; Volterra & Taeschner, 1978), the findings from the present study suggest that, after the age of 19 months, it is likely that children's code-mixing can be attributed to performance rather than competence.

Longitudinal studies of bilingual children less than two years of age (including this one) have generally found that bilingual children do not initially show pragmatic differentiation (Köppe & Meisel, to appear, see Note 3; Leopold, 1949; Quay, 1992; Vihman, 1985). Before children show signs of pragmatic differentiation, it is quite probable that their language use can be explained by a lack of pragmatic competence. Specifically, in this thesis, it was hypothesized that in order to differentiate their languages pragmatically, bilingual children need to know about 35 words (see also Leopold, 1949, for a similar argument). This hypothesis was based exclusively on children's productive vocabulary in relatively short observation sessions. A follow-up study that uses parental reports of children's vocabulary in addition to regular filming sessions would lend further support to the present hypothesis (as in Hoek, Ingram, & Gibson, 1986). Given research in monolingual development, this hypothesis is not unreasonable. Researchers in monolingual development have often suggested that children need to know some words before they can learn rules that apply over the words (e.g., Pinker, 1984; Walley, 1993). Thus, it may be the case that children first learn a number of words, then learn rules over the words that are relevant to communication in their environment.

This initial lack of pragmatic competence is probably not unique to bilingual children. Monolingual children have generally been found to show signs of pragmatic sensitivity between the ages of two and four years, somewhat later than the bilingual children in the present study. The reason for this age difference may be because pragmatic sensitivity is not as relevant for or as transparent in monolingual children as bilingual children. For example, monolingual children as young as four years of age have been shown to use baby talk with younger children (Shatz & Gelman, 1973). The baby talk register may not be transparent in monolingual children this age until they can control their syntax well enough to show syntactic variation in language. Also, two-year old monolingual children have been shown to make slight adjustments to their speech when interacting with strangers (Tomasello, Farrar, & Dines, 1984). Bilingual children's adjustments in language use may be transparent early in development because it is relevant for communication with their parents. Their pragmatic differentiation is clearly evident because they are using two languages.

If the hypothesis that a certain vocabulary threshold is necessary to show pragmatic differentiation holds up under closer scrutiny, it would suggest that children can acquire pragmatic rules at quite a young age. It would also suggest that while bilingual children may show an initial lack of pragmatic differentiation, this lack is not unique to bilingual development. In this formulation, code-mixing can be seen as an emergent property of normal language development with two input languages.

General implications and future directions

There are several questions raised in this thesis that can only be answered by future research. First, with regard to context sensitivity, do children show evidence of such sensitivity at a phonological level before the lexical level (the level tested here)? Ronjat's (1913) analysis of his son Louis's speech production suggests that Louis was using two distinct phonological systems from the time that it was clear he was using language. In order to determine the generalizability of Ronjat's finding, it would be necessary to do a fine phonological analysis of very young children's production to see if they distinguish two phonological systems by context (Deuchar & Clark, 1987).

Another question about context sensitivity that arises from this thesis concerns children's dominance. Children's dominance had to be taken into account before their context sensitivity could be seen. With continued exposure, children's proficiency in both languages should increase. At some point, children's proficiency in both languages might be good enough so that they would never resort to code-mixing to express themselves (see Cummins, 1981, for a similar argument). It remains to be determined at what level of proficiency dominance no longer has to be accounted for in order to see children's context sensitivity.

An important implication from the evidence presented here is that bilingual development may not be quantitatively or qualitatively different from monolingual development. The evidence presented in Chapter 3 suggested that bilingual children are not delayed (or advantaged) in comparison to monolingual children in the rate that they pass through developmental milestones. The bilingual children's first words, rates of intelligible utterances, vocabulary, MLU, and rates of multimorphemic utterances fell within the range of monolingual norms. In addition, in chapters 5 through 8, no evidence was found to suggest that bilingual children pass through an extra stage of language development compared to monolingual children (cf. Ben-Zeev, 1977). In support of this statement, I show in this section that bilingual children's code-mixing is largely explained by performance factors. There is some evidence suggesting that their code-mixing might initially be explained by a lack of pragmatic competence, however, this lack is likely a part of general language development, both monolingual and bilingual.

It follows, then, that bilingual children's data can be used to answer questions of general interest in language and cognition. In particular, some phenomena might be clearer in bilingual children than in monolingual children because bilingual children are using two languages and/or because they usually dominant in one language. This could not be done before because it was generally thought that bilingual development differed radically from monolingual development (see Bowey, 1986, for a review). Thus, examining bilingual children's language development can shed light on what is universal and core to language and what is peripheral and requires additional input for change. To the extent that children use language in the same way in both their dominant and non-dominant language that part of language may be considered to be universal (or due to developmental stage). For example, if one were interested in whether certain phonological properties in children's language acquisition emerged as a result of their cognitive development or their linguistic development, one could compare children's phonology in their dominant language as compared with their non-dominant language. In this way bilingual children's data could provide insight into general developmental issues.

Notes

Note 1: Thanks to Johanne Paradis for pointing this out.

Note 2: While Lanza (1992) defines code-mixing as intra-utterance mixing ("the unit of analysis was the MIXED UTTERANCE. [...] A mixed utterance consists of co-occurrence of both languages either within one word [...] or a group of words...", p. 638, emphasis in the original), the rates of mixing are only reported as both intra-utterance and inter-utterance mixing (see p.646).

Note 3: While Köppe and Meisel (1992) started observing the bilingual children in their study at the age of 1;3 and 1;4, they only report on the children's pragmatic separation of their languages starting at about the age of two years. They do not explain why.

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Appendix 1
All words counted as part of both languages

Note: words that were optional are in parentheses.

ah
Akila
Ali
Anthony
Arnaud
ayayay
baa
Babar
Bagira
bakbak
Balloo
bam
bang
Batman
bee
beep
Bert
bing
Bob
boing
bong
boom
boop
brumbrum
bye(bye)
bzz
Caillou
Cheryl
Chitty Chitty Bang Bang
choochoo
Cookie (Monster)
Cuckoo Burra
dada
Dad
Daddy
Daffy Duck
Dagwood
Daisy (Duck)
Danielle
ding
Donald Duck
eh
Einstein
Elena
Eléna
Elise
Ernie
Flopsy
Frère Jacques
George
Germain
Gonzo
Grover
Gumby
heehee
hé
Hélène
hip hip hooray
hmm
hoho
hoohoo
Hubert
huh
Jeopardy
Jessica
Josée
Julia
Juliette
kaka
ketchup
klikklik
lala
Laselle
Mama
Maman
Mathieu
Matthew
Old MacDonald
meu
mew
miau
Mickey (Mouse)
Minnie (Mouse)
Mister MacGregor
mm
mmhm
Mogli
Mom
Mommy
Mopsy
Nancy
Nanny
neigh
Nicholas
Nicole
Nicoletta
Nisha
num
ohlàlà
oh
oho
okay
Olivier
pap
Papa
Pappy
Passe Partout
Peter Cottontail
Peter Pan
Pierre
pipi
piupiu
pop

Appendix 1, con't.

pow
Raffi
rmrm
Roscoe
rrow
Rudolf
ruff
Sesame Street
sh
Sheila
Snoopy
sss
Stef
Stefan
tadum
tata
tweettweet
uh
uhhuh
unhunh
um
vam
Vicki
Victor
vmvm
voom
vrum
vumvum
whoa
woof
wouwou
wow
Yann
Yanny
yea
yoohoo
Youppi!
zup

Appendix 2

Number of word types (type), word tokens (tok.), and type/token ratio (ratio) of each child in each session

a) ELI, MAT, and NIC

	ELI			MAT			NIC		
	type	tok.	ratio	type	tok.	ratio	type	tok.	ratio
1B	21	52	.404	23	184	.125	26	65	.400
2F	18	95	.189	22	99	.222	13	20	.650
2M	26	67	.388	27	11	.243	8	19	.421
4F	-	-	-	48	291	.165	22	48	458
4M	-	-	-	33	95	.347	62	[illegible]	371
6F	22	45	.489	53	227	.233	14	54	.259
6M	41	122	.336	43	116	.371	54	171	.316
7B	85	409	.208	49	161	.304	43	135	.319
8F	-	-	-	51	239	.213	25	67	.373
8M	-	-	-	78	209	.373	76	177	.429
10F	-	-	-	72	307	.235	37	143	.259
10M	-	-	-	94	369	.255	84	289	.291
12F	-	-	-	31	104	.298	45	183	.246
12M	-	-	-	100	343	.292	103	317	.325
13B	-	-	-	80	201	.398	57	118	.483

b) OLI, STT, and YAN

	OLI			STT			YAN		
ses.	type	tok.	ratio	type	tok.	ratio	type	tok.	ratio
1B	-	-	-	6	27	.222	23	116	.198
2F	-	-	-	5	31	.161	42	179	.235
2M	-	-	-	8	48	.167	45	150	.300
4F	-	-	-	9	95	.095	42	162	.259
4M	-	-	-	14	125	.112	53	221	.240
6F	-	-	-	7	34	.206	31	145	.214
6M	-	-	-	7	60	.117	57	260	.219
7B	83	267	.311	3	6	.500	52	225	.231
8F	52	172	.302	11	44	.250	39	156	.250
8M	73	212	.344	19	115	.165	77	219	.352
10F	150	453	.331	12	32	.375	105	426	.246
10M	113	314	.360	22	102	.216	101	444	.227
12F	193	656	.294	26	65	.400	100	382	.262
12M	114	331	.344	26	143	.182	60	220	.273
13B	149	420	.355	20	70	.286	106	511	.207

Appendix 3

Children's markers of language development in French (Fren) and English (Eng)

			utterances		word types		word tokens		MLU	UB	MMU	
Child	Ses.	Lang.	#	%	#	%	#	%			#	%
ELI	1B	Fren	2	14.29	3	25.00	3	16.67	1.500	2	1	25.00
		Eng	12	85.71	9	75.00	15	83.33	1.250	2	3	75.00
ELI	2	Fren	6	18.18	4	19.05	6	13.64	1.000	1	0	0.00
		Eng	27	81.82	17	80.95	38	86.36	1.481	5	6	100.00
ELI	6	Fren	9	10.34	9	18.75	11	9.91	1.222	2	2	8.70
		Eng	78	89.66	39	81.25	100	90.09	1.282	3	21	91.30
ELI	7B	Fren	8	4.10	8	10.39	11	3.21	1.375	4	1	1.11
		Eng	187	95.90	69	89.61	332	96.79	1.791	7	89	98.89
MAT	1B	Fren	12	27.27	8	61.54	14	24.56	1.250	3	1	10.00
		Eng	32	72.73	5	38.46	43	75.44	1.344	3	9	90.00
MAT	2	Fren	3	3.85	2	6.67	3	3.37	1.000	3	0	0.00
		Eng	75	96.15	28	93.33	86	96.63	1.133	3	9	100.00
MAT	4	Fren	26	21.31	19	30.65	50	28.25	1.923	4	17	40.48
		Eng	96	78.69	43	69.35	127	71.75	1.302	4	25	59.52
MAT	6	Fren	30	27.27	19	37.25	52	36.88	1.433	6	15	83.33
		Eng	80	72.73	32	62.75	89	63.12	1.038	3	3	16.67
MAT	7B	Fren	9	22.50	12	35.29	16	28.07	1.778	3	10	66.67
		Eng	31	77.50	22	64.71	41	71.93	1.290	2	5	33.33
MAT	8	Fren	57	32.57	29	33.33	88	36.51	1.579	4	23	45.10
		Eng	118	67.43	58	66.67	153	63.49	1.271	3	28	54.90
MAT	10	Fren	72	26.09	42	37.17	114	28.01	1.597	4	38	32.48
		Eng	204	73.91	71	62.83	293	71.99	1.456	3	79	67.52
MAT	12	Fren	46	20.26	27	26.21	74	24.92	1.609	4	24	40.00
		Eng	181	79.74	76	73.79	223	75.08	1.232	4	36	60.00
MAT	13B	Fren	38	36.19	22	36.07	59	40.41	1.658	3	16	47.06
		Eng	67	63.81	39	63.93	87	59.59	1.284	3	18	52.94
NIC	1B	Fren	6	35.29	3	30.00	6	31.58	1.000	1	0	0.00
		Eng	11	64.71	7	70.00	13	68.42	1.182	2	2	100.00
NIC	2	Fren	3	30.00	3	33.33	3	27.27	1.000	1	0	0.00
		Eng	7	70.00	6	66.67	8	72.73	1.143	2	1	100.00

Appendix 3, con't.

NIC	4	Fren	6	6.19	5	9.43	6	5.94	1.000	1	0	0.00
		Eng	91	93.81	48	90.57	95	94.06	1.044	3	3	100.00
NIC	6	Fren	1	0.73	1	1.92	1	0.57	1.000	1	0	0.00
		Eng	136	99.27	51	98.08	173	99.43	1.272	3	33	100.00
NIC	7B	Fren	1	1.14	1	2.94	1	0.91	1.000	1	0	0.00
		Eng	87	98.86	33	97.06	109	99.09	1.253	3	19	100.00
NIC	8	Fren	15	10.07	8	9.76	15	7.94	1.000	1	0	0.00
		Eng	134	89.93	74	90.24	174	92.06	1.299	5	32	100.00
NIC	10	Fren	9	3.44	8	8.99	12	3.48	1.333	4	1	1.69
		Eng	253	96.56	81	91.01	333	96.52	1.324	5	58	98.31
NIC	12	Fren	4	1.41	4	3.42	4	0.89	1.000	1	0	0.00
		Eng	279	98.59	113	96.58	444	99.11	1.588	8	39	100.00
NIC	13B	Fren	8	10.67	6	12.24	8	7.62	1.000	1	0	0.00
		Eng	67	89.33	43	87.76	97	92.38	1.448	4	21	100.00
OLI	7B	Fren	75	65.79	52	66.67	128	68.09	1.733	4	42	68.85
		Eng	39	34.21	26	33.33	60	31.91	1.513	4	19	31.15
OLI	8	Fren	78	56.12	55	53.40	180	62.94	2.295	9	60	68.18
		Eng	61	43.88	48	46.60	106	37.06	1.770	4	28	31.82
OLI	10	Fren	222	87.06	161	83.42	590	91.33	2.860	8	169	91.35
		Eng	33	12.94	32	16.58	56	8.67	1.758	4	16	8.65
OLI	12	Fren	282	90.10	188	83.56	827	93.87	3.004	8	216	87.45
		Eng	31	9.90	37	16.44	54	6.13	1.774	7	31	12.55
OLI	13B	Fren	108	83.72	106	76.81	345	88.24	3.269	8	90	88.24
		Eng	21	16.28	32	23.19	46	11.76	2.190	5	12	11.76
SIT	1B	Fren	1	33.33	1	33.33	1	33.33	1.000	1	0	0.00
		Eng	2	66.67	2	66.67	2	66.67	1.000	1	0	0.00
SIT	2	Fren	2	22.22	2	40.00	2	22.22	1.000	1	0	0.00
		Eng	7	77.78	3	60.00	7	77.78	1.000	1	0	0.00
SIT	4	Fren	1	6.67	1	10.00	1	5.26	1.000	1	0	0.00
		Eng	14	93.33	9	90.00	18	94.74	1.267	3	3	100.00
SIT	6	Fren	0	0.00	0	0.00	0	0.00	0.000	0	0	0.00
		Eng	7	100.00	6	100.00	9	100.00	1.125	2	1	100.00

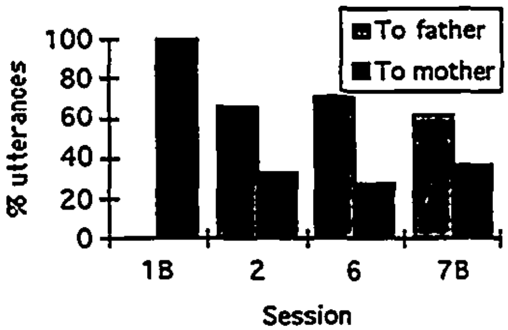
Appendix 3, con't.

SIT	7B	Fren	0	0.00	0	0.00	0	0.00	0.000	0	0	0.00
		Eng	1	100.00	1	100.00	1	100.00	1.000	1	0	0.00
SIT	8	Fren	5	22.73	6	46.15	7	28.00	1.400	3	1	50.00
		Eng	17	77.27	7	53.85	18	72.00	1.000	2	1	50.00
SIT	10	Fren	16	34.78	8	44.44	16	34.04	1.000	1	0	0.00
		Eng	30	65.22	10	55.56	31	65.96	1.000	2	1	100.00
SIT	12	Fren	22	47.83	13	54.17	27	50.00	1.227	2	5	62.50
		Eng	24	52.17	11	45.83	27	50.00	1.125	2	3	37.50
SIT	13B	Fren	16	72.73	5	62.50	16	72.73	1.000	1	0	0.00
		Eng	6	27.27	3	37.50	6	27.27	1.000	1	0	0.00
YAN	1B	Fren	4	19.05	4	40.00	4	19.05	1.000	1	0	0.00
		Eng	17	80.95	6	60.00	17	80.95	1.000	1	0	0.00
YAN	2	Fren	44	36.97	30	50.00	60	39.74	1.341	3	14	50.00
		Eng	75	63.03	30	50.00	91	60.26	1.187	3	14	50.00
YAN	4	Fren	68	45.95	36	52.17	108	45.57	1.588	3	33	44.00
		Eng	80	54.05	33	47.83	129	54.43	1.575	3	42	56.00
YAN	6	Fren	166	68.60	37	54.41	167	58.19	1.431	4	46	56.10
		Eng	76	31.40	31	45.59	120	41.81	1.579	4	36	43.90
YAN	7B	Fren	45	56.25	26	56.52	65	58.56	1.444	4	13	59.09
		Eng	35	43.75	20	43.48	46	41.44	1.286	3	9	40.91
YAN	8	Fren	109	54.77	54	63.53	152	55.88	1.394	3	34	53.97
		Eng	90	45.23	31	36.47	120	44.12	1.333	3	29	46.03
YAN	10	Fren	234	54.93	88	58.28	345	52.75	1.479	4	95	49.74
		Eng	192	45.07	63	41.72	309	47.25	1.583	3	96	50.26
YAN	12	Fren	76	25.08	45	37.82	112	25.23	1.474	5	27	28.42
		Eng	227	74.92	74	62.18	332	74.77	1.414	5	68	71.58
YAN	13B	Fren	105	54.69	63	63.64	241	63.93	2.295	6	68	70.10
		Eng	87	45.31	36	36.36	136	36.07	1.563	5	29	29.90

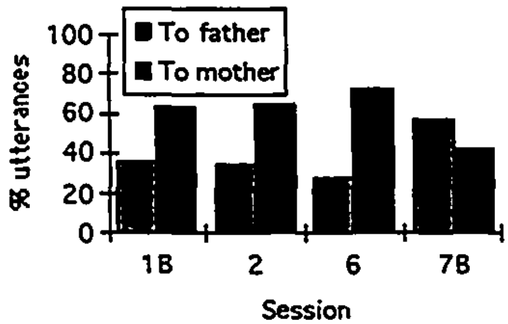
Appendix 4
Percentage of utterances in father's language and in the mother's language used by the children to address their father and mother

a) ELI

Use of father's language

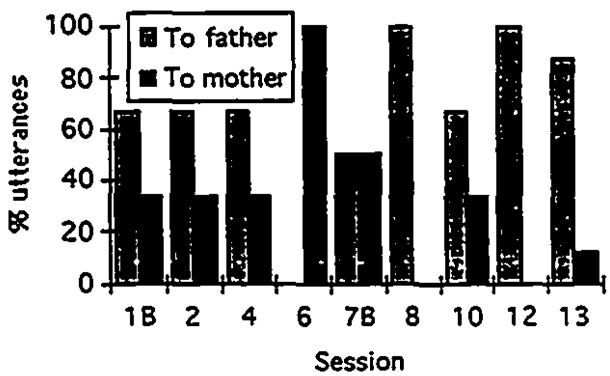


Use of mother's language

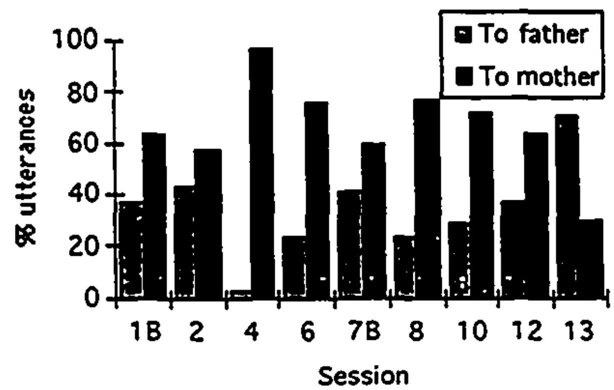


b) NIC

Use of father's language

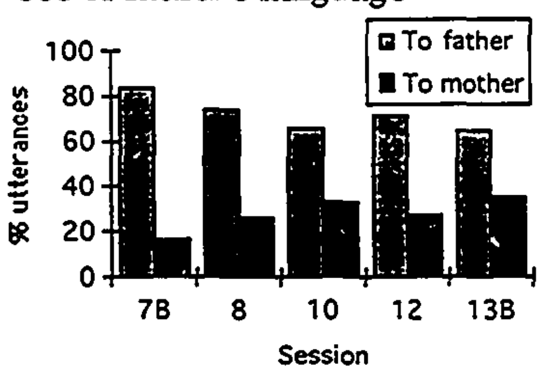


Use of mother's language

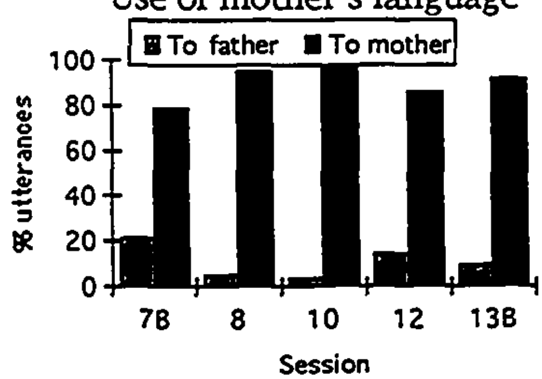


c) OLI

Use of father's language



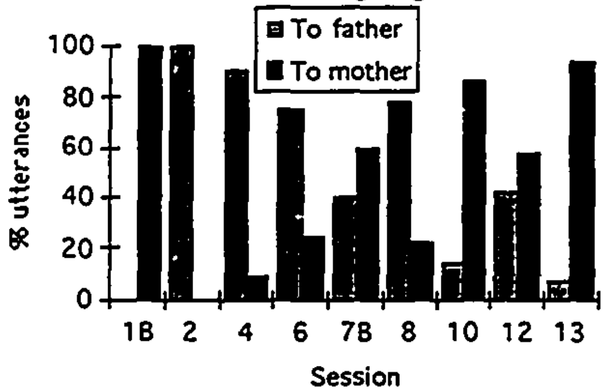
Use of mother's language



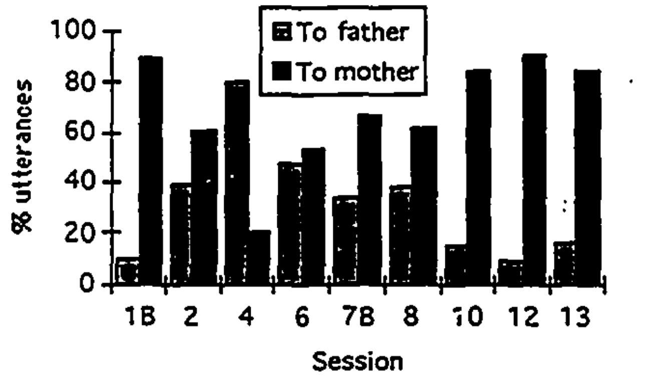
Appendix 4, con't.

d) MAT

Use of father's language

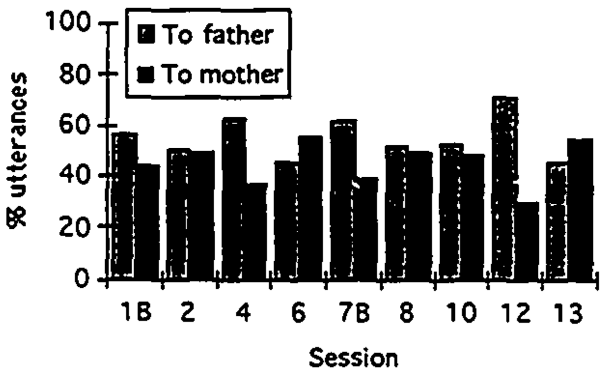


Use of mother's language

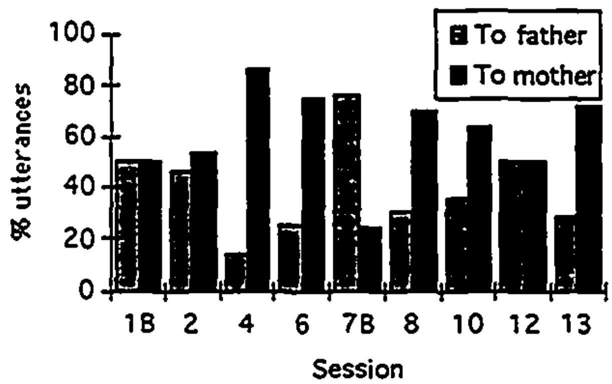


e) YAN

Use of father's language

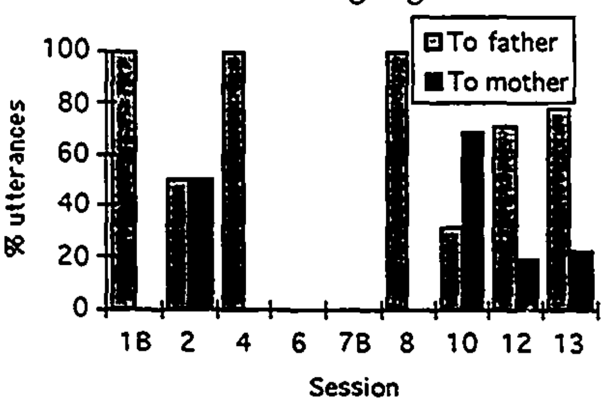


Use of mother's language

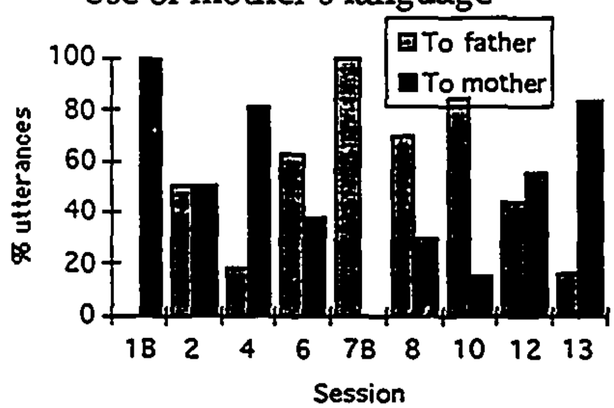


f) STT

Use of father's language



Use of mother's language



Appendix 5.

Children's number of utterances in French and English to Father (Fat) and Mother (Mot) in three conditions: Observed (Obs), Expected by the 50/50 version of the ULS hypothesis (Exp-50), and Expected by the dominance version of the ULS hypothesis (Exp-dom).

a) ELI, MAT, and NIC

		ELI						MAT						NIC					
		Obs		Exp-50		Exp-dom		Obs		Exp-50		Exp-dom		Obs		Exp-50		Exp-dom	
Session	Lang.	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot
1B	French	0	2	2	4.5	1	2.3	0	10	1.5	18	1.1	12.9	4	2	4	4.5	1.4	1.6
	English	4	7	2	4.5	3	5.3	3	26	1.5	18	1.9	16.7	4	7	4	4.5	6.6	5.8
2	French	4	2	6	8.5	1.1	1.6	3	0	15	21	1	1.4	2	1	2.5	2.5	0.8	0.8
	English	8	15	6	8.5	10.9	13.6	27	42	15	21	29	40.6	3	4	2.5	2.5	4.3	3.4
4	French	-	-	-	-	-	-	20	2	47.5	10.5	33.8	7.5	4	2	3.5	45	0.2	2.8
	English	-	-	-	-	-	-	75	19	47.5	10.5	61.2	12.2	3	88	3.5	45	6.8	85.3
6	French	5	2	10	20.5	2.7	5.6	15	5	23	20	27.7	24.1	0	1	16	51.5	0.1	0.4
	English	15	39	10	20.5	17.3	33.6	31	35	23	20	18.3	13.9	32	102	16	51.5	31.9	101.6
7B	French	5	3	51.5	38	5.9	4.4	2	3	4.5	8.5	4.6	8.7	1	1	19	27.5	0.2	0.3
	English	98	73	51.5	38	97.1	68.8	7	14	4.5	8.5	4.4	6.9	37	54	19	27.5	37.8	53.7
8	French	-	-	-	-	-	-	14	4	18.5	20.5	14.5	16.1	11	0	18	41.5	1.8	4.2
	English	-	-	-	-	-	-	23	37	18.5	20.5	22.5	22.5	25	83	18	41.5	34.2	78.8
10	French	-	-	-	-	-	-	5	31	12.5	70	8.7	48.8	6	3	37.5	88.5	1.9	4.5
	English	-	-	-	-	-	-	20	109	12.5	70	16.3	71	69	174	37.5	88.5	73.1	169.5
12	French	-	-	-	-	-	-	14	19	15.5	90.5	10.3	59.9	1	0	48.5	82.5	0.7	1.2
	English	-	-	-	-	-	-	17	162	15.5	90.5	20.7	108.4	96	165	48.5	82.5	96.3	163.8
13B	French	-	-	-	-	-	-	2	27	5.5	37	4.6	30.8	7	1	26.5	10	2.8	1.1
	English	-	-	-	-	-	-	9	47	5.5	37	6.4	43.2	46	19	26.5	10	50.2	18.9

Appendix 5, con't.

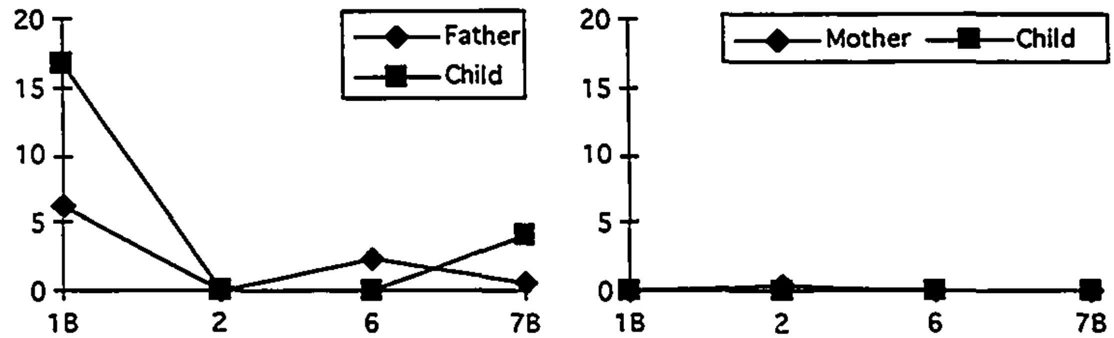
b) OLI, STT, and YAN

		OLI						STT						YAN					
		Obs		Exp-50		Exp-dom		Obs		Exp-50		Exp-dom		Obs		Exp-50		Exp-dom	
Session	Lang.	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot
1B	French	-	-	-	-	-	-	1	0	0.5	1	0.3	0.7	2	2	5.5	4.5	4.4	3.6
	English	-	-	-	-	-	-	0	2	0.5	1	0.7	1.3	9	7	5.5	4.5	6.6	4.2
2	French	-	-	-	-	-	-	1	1	2	2	1.6	1.6	19	22	27	28	27	28
	English	-	-	-	-	-	-	3	3	2	2	2.4	1.8	35	34	27	28	27	17
4	French	-	-	-	-	-	-	1	0	1.5	6.5	0.1	0.6	9	56	29	42.5	27.9	40.9
	English	-	-	-	-	-	-	2	13	1.5	6.5	2.9	12.4	49	29	29	42.5	30.1	15.1
6	French	-	-	-	-	-	-	0	0	2.5	1.5	0	0	29	85	31.5	63.5	34.8	70.2
	English	-	-	-	-	-	-	5	3	2.5	1.5	5	3	34	42	31.5	63.5	28.2	18.8
7B	French	61	13	35	23	47.4	31.2	0	0	0.5	0	0	0	34	11	28	12.5	32.4	14.5
	English	9	33	35	23	22.6	10.6	1	0	0.5	0	1	0	22	14	28	12.5	23.6	5.9
8	French	57	20	30	39	36.5	47.4	3	0	5	1.5	4.8	1.4	31	71	37.5	56.5	44.1	66.4
	English	3	58	30	39	23.5	22.7	7	3	5	1.5	5.2	1.6	44	42	37.5	56.5	30.9	17.3
10	French	141	72	71	51	124.1	89.1	5	11	4.5	16.5	2	7.3	78	138	83	109.5	89.7	118.3
	English	1	30	71	51	17.9	3.8	4	22	4.5	16.5	7	17.1	88	81	83	109.5	76.3	37.3
12	French	194	73	99	48.5	169.3	82.9	12	5	10	7.5	11.7	8.8	33	33	84	44.5	55.6	29.5
	English	4	24	99	48.5	28.7	3.5	8	10	10	7.5	8.3	4.2	135	56	84	44.5	112.4	37.5
13B	French	74	40	38	30	62.7	49.5	7	2	4	3.5	5	4.4	31	79	35.5	63.5	47.5	84.9
	English	2	20	38	30	13.3	3.5	1	5	4	3.5	3	2.6	40	48	35.5	63.5	23.5	42.1

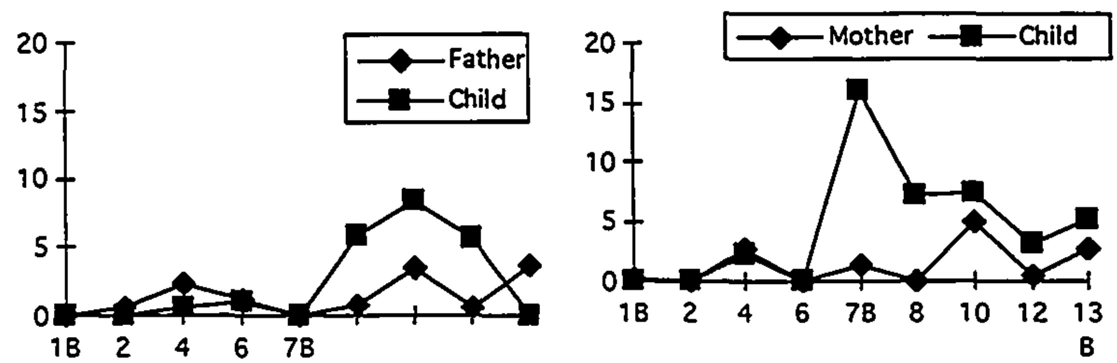
Appendix 6

Intra-utterance code-mixing as a percentage of total utterances by the father and the child (left) and by the mother and the child (right)

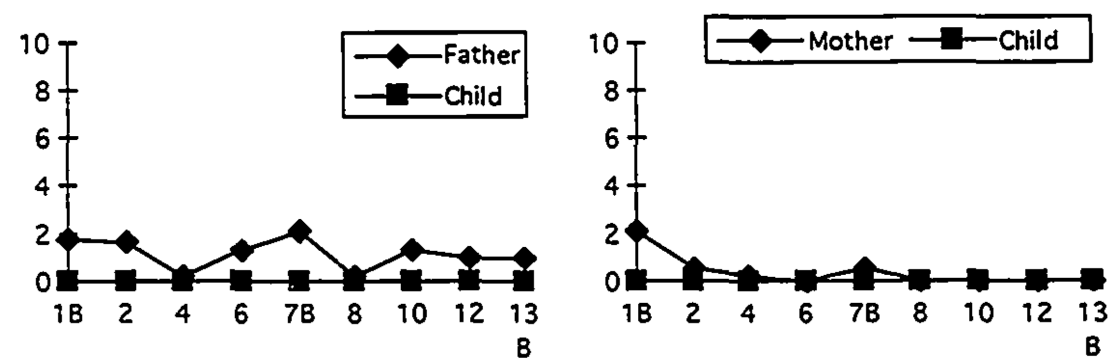
a) ELI



b) MAT

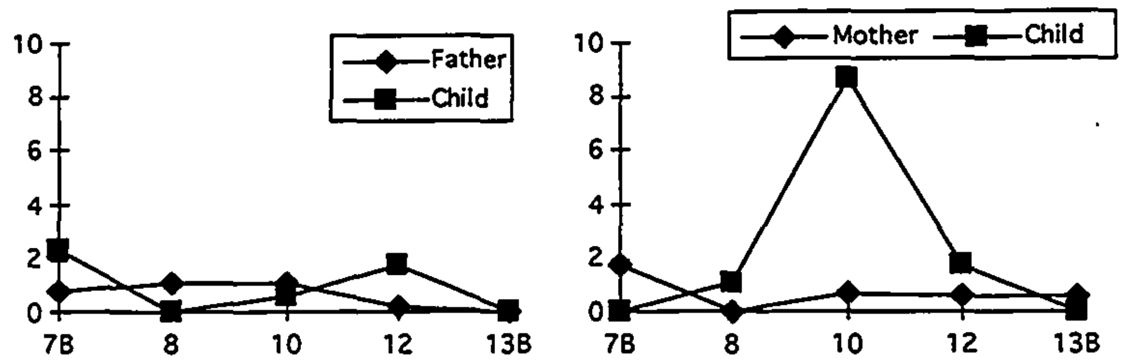


c) NIC

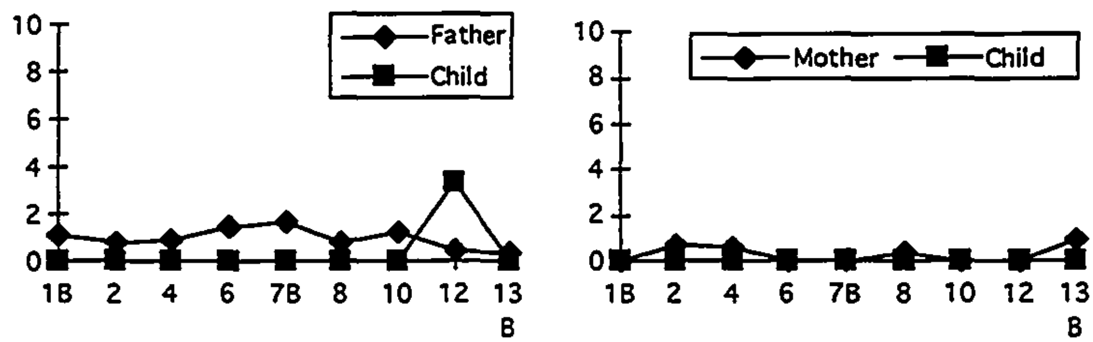


Appendix 6, con't.

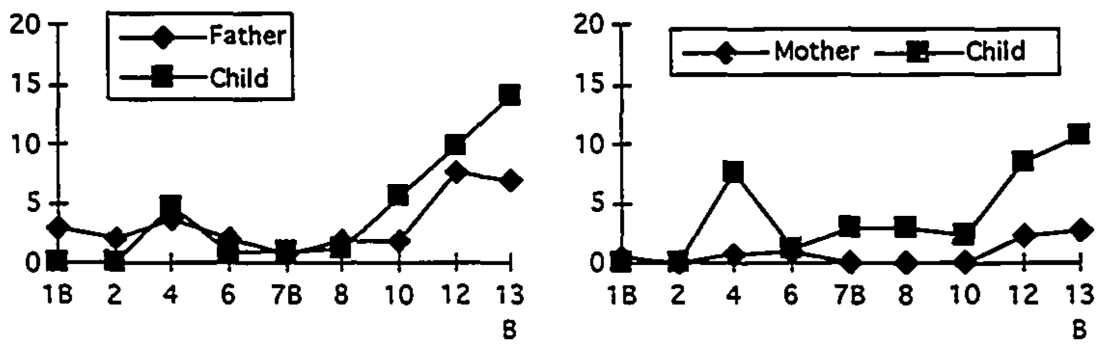
d) OLI



e) STT

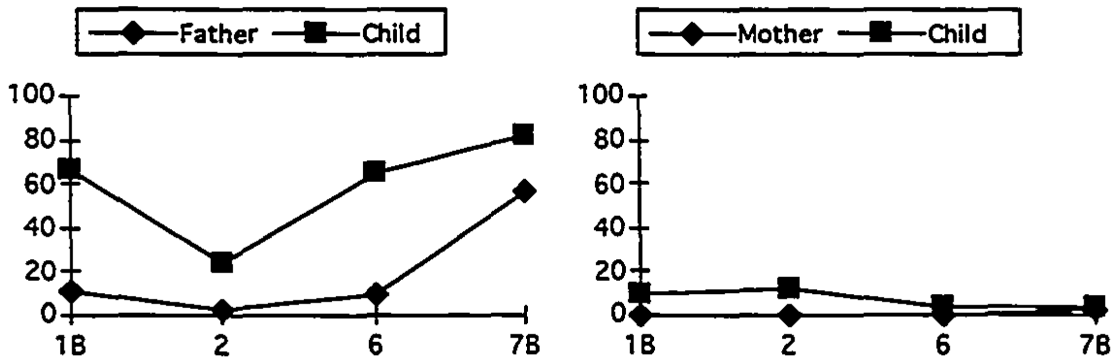


f) YAN

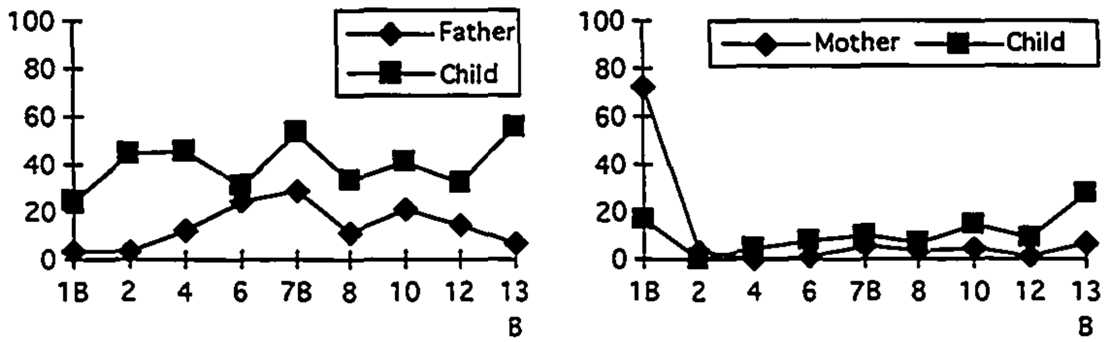


Appendix 7
Inter-utterance code-mixing as a percentage of total utterances by the father and the child (left) and by the mother and the child (right)

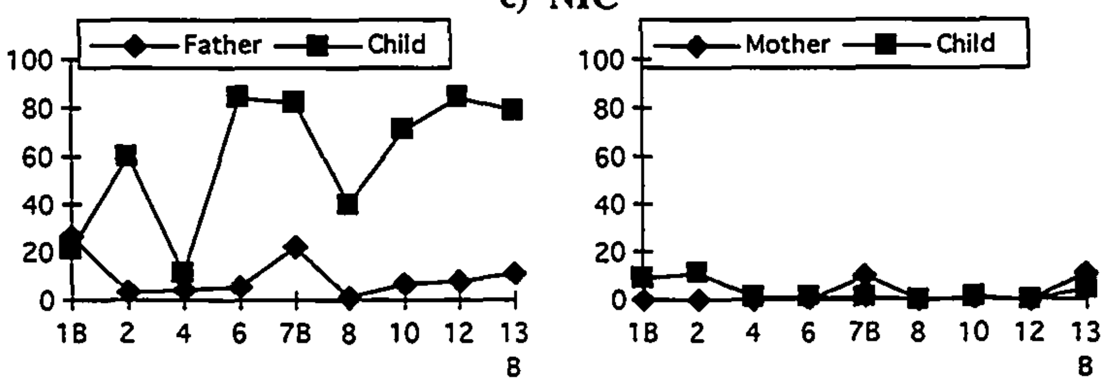
a) ELI



b) MAT

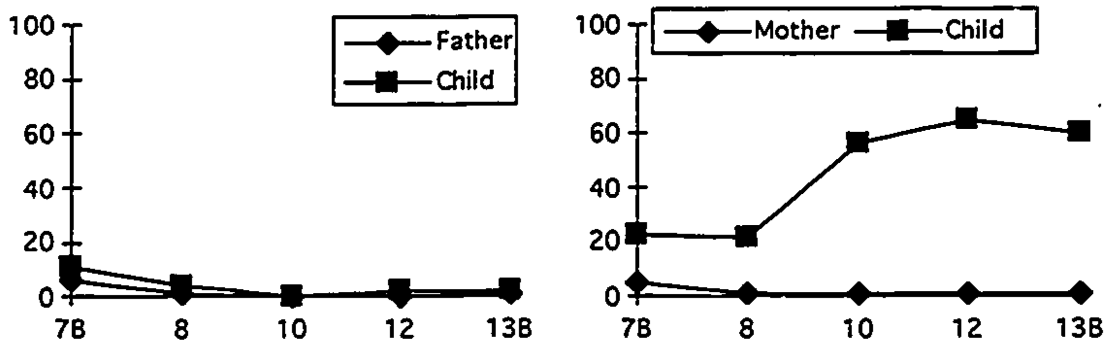


c) NIC

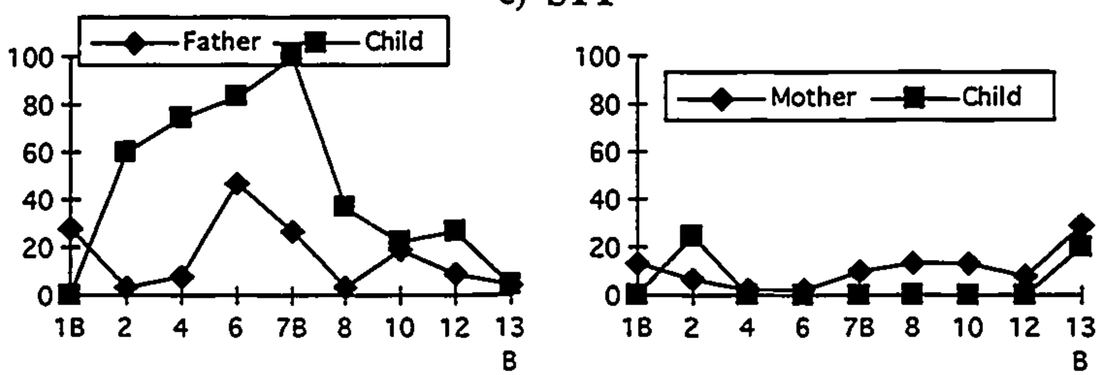


Appendix 7, con't.

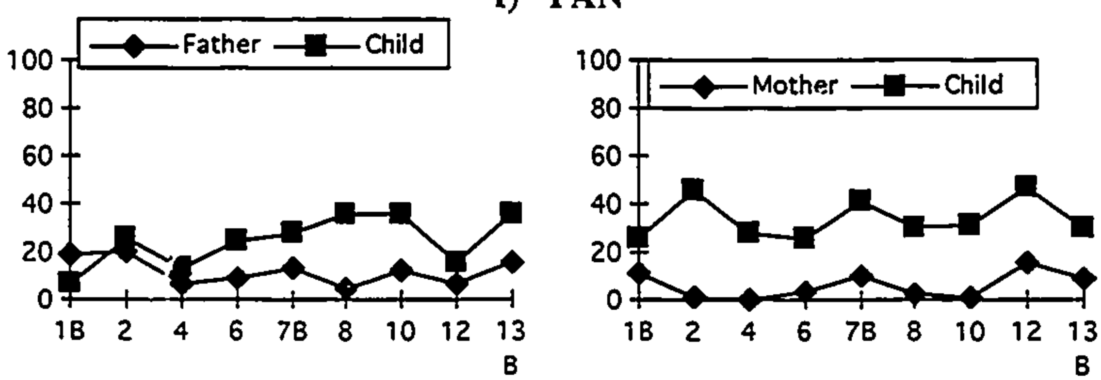
d) OLI



e) STT



f) YAN



Appendix 8
Parental score on Lanza's continuum for fathers (Fat) and mothers (Mot)

Ses.	ELI		NIC		OLI		MAT		YAN		STT	
	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot
1B	2.57	2.00	3.25	2.50	-	-	2.50	2.63	3.00	2.43	0	0
2	2.38	3.67	4.00	4.00	-	-	2.36	0	2.22	3.44	3.33	3.00
4	-	-	3.67	4.50	-	-	1.99	2.00	2.75	2.67	2.50	0
6	3.11	3.67	3.36	4.00	-	-	2.35	3.00	2.70	2.34	3.00	0
7B	2.59	3.33	2.79	0	3.00	2.54	1.00	2.00	2.34	2.50	2.86	0
8	-	-	2.75	0	3.00	3.64	2.42	2.38	2.32	3.08	2.00	0
10	-	-	3.07	3.75	1.00	3.43	2.28	2.56	2.56	3.01	3.40	2.50
12	-	-	2.26	0	3.75	3.36	2.58	2.86	3.26	2.61	3.00	3.00
13B	-	-	2.02	2.00	6.00	3.39	2.00	2.40	1.97	2.21	3.00	1.00

Appendix 9
Parental score on re-ordered continuum for fathers (Fat) and mothers (Mot)

a) original families

Ses.	ELI		NIC		OLI		MAT		YAN		STT	
	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot
1B	4.00	3.00	2.50	3.50	-	-	2.50	3.38	3.50	3.29	0	0
2	2.88	3.00	4.00	1.00	-	-	2.75	0	3.06	2.63	2.67	2.00
4	-	-	3.00	2.00	-	-	3.38	3.67	2.75	3.00	2.50	0
6	2.22	3.33	3.00	1.00	-	-	2.91	2.00	2.57	3.17	2.67	0
7B	3.06	2.67	3.11	0	2.50	3.00	4.00	3.71	2.94	2.71	5.00	0
8	-	-	2.63	0	2.00	3.00	2.97	2.63	2.74	2.61	2.14	0
10	-	-	3.34	1.25	4.00	2.99	2.92	3.10	2.77	2.73	2.60	3.10
12	-	-	3.18	0	3.00	2.59	2.95	2.82	2.48	2.91	2.63	2.25
13B	-	-	3.18	5.00	6.00	2.64	3.00	2.80	3.28	3.22	2.00	4.00

b) new families

Ses.	BAN		GEN		JOE		LEI		TAN		WIL	
	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot	Fat	Mot
Alo	2.54	2.00	2.90	3.04	3.15	4.67	3.37	3.50	2.34	2.00	3.20	2.64
Tog	2.85	2.83	3.00	3.31	2.65	3.06	3.27	4.00	2.35	2.00	2.73	2.73

Alo=filming session with one parent alone with child; Tog=filming session with both parents with child.

Appendix 10

Number of words in children's code-mixing with a translation equivalent (TE) and without a translation equivalent (no TE) addressed to mothers and fathers

Note: The number of word types are listed alone in the table; the number of word tokens are in parentheses.

a) Code-mixing with mothers

ses.		ELI	NIC	OLI	MAT	YAN	STT
1B	TE	0	0	-	0	1 (4)	0
	no TE	2 (2)	1(2)	-	3 (9)	3 (3)	0
2M	TE	0	0	-	0	3 (20)	0
	no TE	2 (2)	1 (1)	-	0	9 (18)	1 (1)
4M	TE	-	1 (1)	-	1 (3)	3 (11)	0
	no TE	-	1 (1)	-	2 (4)	6 (33)	0
6M	TE	2 (2)	0	-	1 (3)	4 (13)	0
	no TE	0	1 (1)	-	3 (9)	5 (32)	0
7B	TE	1 (1)	1 (1)	5 (8)	1 (1)	1 (5)	0
	no TE	1 (2)	0	4 (5)	3 (7)	5 (10)	0
8M	TE	-	0	4 (13)	3 (8)	3 (19)	0
	no TE	-	0	4 (16)	5 (15)	11 (30)	0
10M	TE	-	3 (3)	12 (53)	5 (25)	6 (69)	1 (4)
	no TE	-	0	40 (88)	8 (33)	13 (40)	4 (7)
12M	TE	-	0	8 (26)	3 (6)	6 (40)	0
	no TE	-	0	33 (112)	5 (27)	5 (40)	3 (4)
13B	TE	-	0	6 (11)	4 (16)	7 (31)	0
	no TE	-	1 (1)	39 (69)	11 (24)	15 (47)	2 (2)

Appendix 10, con't.

b) Code-mixing with fathers

ses.		ELI	NIC	OLI	MAT	YAN	STT
1B	TE	0	0	-	0	1 (1)	0
	no TE	3 (5)	3 (5)	-	2 (5)	0	0
2F	TE	0	0	-	1 (2)	2 (5)	0
	no TE	5 (9)	3 (3)	-	9 (25)	8 (23)	3 (5)
4F	TE	-	1 (1)	-	2 (26)	0	0
	no TE	-	2 (2)	-	10 (50)	6 (11)	2 (3)
6F	TE	1 (2)	0	-	1 (3)	4 (13)	0
	no TE	10 (12)	1 (1)	-	3 (9)	5 (32)	0
7B	TE	3 (7)	0	6 (9)	1 (1)	1 (1)	0
	no TE	35 (120)	10 (40)	2 (2)	2 (7)	16 (31)	1 (1)
8F	TE	-	1 (9)	0	1 (29)	2 (2)	1 (1)
	no TE	-	11 (16)	3 (3)	9 (16)	9 (30)	1 (7)
10F	TE	-	0	0	4 (17)	7 (30)	1 (1)
	no TE	-	14 (71)	2 (2)	18 (75)	24 (66)	2 (3)
12F	TE	-	2 (2)	3 (4)	1 (15)	7 (23)	0
	no TE	-	22 (129)	2 (4)	4 (4)	16 (39)	4 (9)
13B	TE	-	2 (30)	0	1 (7)	2 (6)	1 (1)
	no TE	-	14 (21)	3 (3)	2 (2)	19 (72)	0

Appendix 11

Word types used by children in code-mixing, even when translation equivalent known to father and mother

Note: The number of tokens of the actual word is on the left-hand side of the word; number of tokens of the word's translation equivalent used in the same session is in parentheses.

	ELI		NIC		OLI		MAT		YAN		STT	
session	Father	Mother	Father	Mother	Father	Mother	Father	Mother	Father	Mother	Father	Mother
1B	-	-	-	-	-	-	-	-	1 non (1)	4 no (0)	-	-
2	-	-	-	-	-	-	2 there (1)	-	2 oiseau (2) 3 non (13)	1 cat (1) 15 no (1) 4 there (2)	-	-
4	-	-	1 no (1)	1 orange (1)	-	-	20 no (3) 6 there (14)	3 là bas (0)	-	3 (a)book (2) 7 my (2) 1 there (18)	-	-
6	2 duck (1)	1 âllo (1) 1 ici (1)	-	-	-	-	19 no (2)	3 verre (1)	5 non (15) 1 oui (0)	9 no (15) 2 that (3) 1 yeah (4)	-	-
7B	2 bird (1) 4 horse (0) 1 sleeping (2)	1 cheval (2)	-	1 blanc (1)	1 all gone (6) 1 baby (1) 2 bike (1) 2 no (2) 1 park (4) 2 there (10)	1 bobo (1) 2 cassé (1) 2 là bas (0) 1 non (3) 2 parti (1)	1 fall (1)	1 pain (1)	1 ça (1)	5 no (1)	-	-

Appendix 11, con't.

8	-	-	9 no (1)	-	-	6 âllo (1) 1 parti (3) 1 tracteur (5) 5 vélo (1)	29 no (2)	1 à terre (1) 5 fini (1) 2 va (1)	1 encore (3) 1 non (21)	11 there (5) 6 two (4) 2 yeah (5)	1 no (1)	-
10	-	-	-	1 camion (7) 1 papillon (1) 1 pomme (5)	-	3 ça (7) 2 camion (1) 12 dans (1) 1 dedans (1) 4 non (4) 1 oui (1) 2 parti (1) 4 qu'est-ce qu'il y a (3) 9 quoi (3) 4 sac (5) 12 tracteur (3) 1 vâche (1)	5 balloon (1) 9 car (6) 3 down (3) 6 no (2)	1 à terre (1) 5 fini (3) 1 "h" (1) 17 là (5) 1 le (36)	1 bateau (1) 1 là (2) 3 nounours (1) 1 où (1) 20 oui (3) 1 pas (0) 3 serpent (1)	1 man (1) 37 no (9) 1 no (=not) (0) 26 that (9) 2 there (5) 2 yeah (29)	1 there (0)	4 là (0)

Appendix 11, con't.

12	-	-	1 man (1) 1 one (1)	-	1 Captain Hook (8) 2 doggy (1) 1 tomato (1)	1 bateau (1) 2 bébé (3) 2 en bas (1) 10 gros (1) 1 non (9) 1 petite (1) 1 tomate (1) 8 va (2)	15 no (2)	3 bonhomme (4) 1 dedans (1) 1 fini (3)	1 avec (1) 1 bateau (1) 3 bébé (5) 1 bobo (0) 5 en haut (9) 3 fini (0) 2 là (0) 7 lolo (1)	3 all done (7) 1 (a) boat (1) 1 booboo (0) 24 no (2) 1 that (3) 1 there (7) 9 yeah (1)	-	-
13B	-	-	29 no (2)	-	-	1 dans (1) 2 deux (1) 1 grand (1) 4 manger (1) 1 quatre (1) 2 vilain (1)	7 no (1)	1 auto (1) 8 autobus (2) 4 là (1) 3 lune (5)	2 bébé (1) 4 là (0)	1 baby (7) 10 four (2) 1 here (2) 1 my (1) 7 no (3) 2 there (8) 9 yeah (1)	1 no (2)	-