

A Longitudinal Study of Pragmatic Differentiation in Young Bilingual Children

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Current evidence indicates that young bilingual children can use their languages differentially and appropriately in different language contexts at about two years of age. We examined whether there is an even earlier developmental stage when bilingual children do not use their languages in pragmatically differentiated ways. We recorded natural language samples from 4 French-English bilingual children during free play sessions with their mothers and fathers, all of whom were native speakers of one of the languages and habitually used that language with their children. We observed the children 7 times between approximately 1;7 and 3;0 years of age. We analyzed 2 aspects of pragmatic differentiation: (a) use of French-only and English-only utterances and (b) use of translation equivalents. Analysis 1 indicated that none of the children showed differentiated and appropriate use of

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French and English during the initial recording sessions but that all did so in later sessions. Analysis 2 indicated a shift in their use of translation equivalents from generally inappropriate to generally appropriate; this shift coincided with the emergence of differential usage with both parents, as revealed in Analysis 1. Taken together, the analyses suggest a stage very early in development when bilingual children do not show pragmatic differentiation in language use.

Whether or not young bilingual children can differentiate between their developing languages has been a focus of attention in research on children acquiring two languages simultaneously (see De Houwer, 1995; Genesee, 1989; Meisel, 1994, for reviews). The question of bilingual differentiation encompasses two different, but interrelated, issues. One concerns differentiation of bilingual children's representation of their languages—that is, of their underlying competence, in the Chomskyan sense. The other concerns differentiation of their language use and, more specifically, their ability to use their developing languages in differentiated and appropriate ways with different interlocutors. These issues are interrelated because competence cannot be studied directly; inferences about competence can rest only on evidence from performance. Evidence that children use their languages differentially and appropriately in different language contexts would support arguments for underlying differentiation and, conversely, would contradict arguments for representation of the two languages in a unitary or fused system, as some researchers have argued (e.g., Leopold, 1949; Volterra & Taeschner, 1978). At the same time, these are different issues, because performance data can provide only indirect and, at times, ambiguous evidence about competence. For example, evidence that bilingual children do not use their languages differentially could be due to their not having acquired the sociolinguistic rules concerning appropriate language use in different contexts and not to lack of differentiation of their language competence. We report here on pragmatic differentiation; that is, the ability of bilingual children to use their

developing languages appropriately with interlocutors who speak different languages.

Although bilingual children mix elements from their two languages in the same utterances or stretch of conversation at times, the incidence of such usage is relatively low; moreover, these same children otherwise use their languages differentially and appropriately with different interlocutors (e.g., De Houwer, 1990; Genesee, Nicoladis, & Paradis, 1996; Goodz, 1989; Lanza, 1992; Meisel, 1994; Padilla & Liebman, 1975). For example, we have found that although the two-year-old French-English bilingual children we observed code-mixed somewhat with their parents (between 4% and 7% of their utterances were mixed), overall, they used more English-only utterances with their English-speaking parent than with their French-speaking parent, and vice versa for French-only utterances (Genesee, Nicoladis, & Paradis, 1996). This was true even when both parents were interacting together with the child, a situation that might be expected to reduce differential use of the two languages. We have similarly found that 2-year-old bilingual children can use their languages differentially and appropriately with unfamiliar, monolingual interlocutors about whom they have no prior linguistic experience or knowledge; we suggest that the pragmatic differentiation they evidence with their parents is part of a general communicative competence that functions on-line with other interlocutors (Genesee, Boivin, & Nicoladis, in press).

The available evidence is inconclusive with respect to the possibility of an even earlier stage in development when bilingual children do not differentiate pragmatically. First, and most obviously, many studies, including our own, have studied children who were two years of age or older (De Houwer, 1990; Genesee, Nicoladis, & Paradis, 1996; Lanza, 1992; Lindholm & Padilla, 1978; Padilla & Liebman, 1975; Petersen, 1988; Redlinger & Park, 1980). Second, some studies have not examined the children's language use in different language contexts (Padilla & Liebman, 1975; Volterra & Taeschner, 1978). Examining bilingual children's language use in only one context cannot provide adequate evi-

dence of differential usage with different interlocutors. As well, children's language performance in a given context may reflect factors unrelated to the ability to differentiate pragmatically, including proficiency in the language of the interlocutor, familiarity with the interlocutor, or simply episodic fluctuations in patterns of usage. It is therefore essential, when examining differentiation, to systematically observe children's language use in different language contexts.

Researchers have commonly examined code-mixing as the primary source of evidence for differentiation (Arnberg & Arnberg, 1992; Lindholm & Padilla, 1978; Redlinger & Park, 1980; Vihman, 1982; Volterra & Taeschner, 1978). We here use the term code-mixing, or simply mixing, to refer to the use of elements from both languages in the same utterance or stretch of conversation. Code-mixing can occur within a single utterance, in which case the utterance must consist of at least two words or morphemes. It can also occur across utterances, in which case there is a switch from one language to the other and single- or multiword utterances can be involved. Researchers customarily refer to similar phenomena in adult bilingual usage as "code switching." We use the more neutral term "code-mixing," because there is not sufficient evidence to establish whether these phenomena have the same formal and functional properties in child and adult language. (Meisel, 1994, discussed these issues.)

A number of problems associated with using code-mixing in bilingual child language as evidence for lack of differentiation warrant discussion here, because they are widespread. Some researchers have presented only anecdotal or episodic instances of code-mixing (e.g., Volterra & Taeschner, 1978). However, isolated instances of code-mixing do not necessarily represent children's overall rates of mixing or their entire language output; therefore, we cannot take them as evidence about overall performance. Other researchers report overall rates of code-mixing and interpret decreases in overall rates with age as evidence for the gradual emergence of differentiation (e.g., Redlinger & Park, 1980). However, there are alternative, equally plausible explanations. Our

previous research, for example, has suggested that bilingual children code-mix, in part if not wholly, in order to fill lexical gaps in their knowledge of each language (Nicoladis, 1995; cf. Lindholm & Padilla, 1978, for similar arguments). We base this interpretation on evidence that bilingual children are more likely to code-mix when using their less proficient language (Genesee, Boivin, & Nicoladis, in press; Genesee, Nicoladis, & Paradis, 1996), and that code-mixed words more probably lack translation equivalents than do words that are not code-mixed (Nicoladis, 1995). Mixing to fill lexical gaps could result in a high incidence of code-mixing in certain contexts early in development, when the children's stock of words in each language is limited. This stage could be followed by declining rates of code-mixing as the children's lexical repertoire in each language expands. The important point is: Code-mixing may be a pragmatic strategy bilingual children use to communicate in language contexts where they lack proficiency, not a fusion of their language systems or confusion about the appropriate language. In short, analysis of code-mixing alone does not suffice to examine pragmatic differentiation in bilingual children; researchers also need to examine the distribution of the children's nonmixed utterances.

Whether children acquiring two languages simultaneously first go through a period when they do not differentiate their languages pragmatically must be investigated in longitudinal research on their overall language use (including their use of nonmixed utterances) beginning before two years of age and extending into the third year. Therefore, we observed the language use of four bilingual children from when they were about 1 year 7 months old until they were 3 years old, on average. The children lived in homes in which each parent used predominantly either English or French. To vary language context systematically, we observed the children in interaction with each parent on separate occasions. By observing the children longitudinally, we could examine whether they used their developing languages differentially at all ages and, if not, document a developmental shift in their ability to differentiate.

We examined evidence for pragmatic differentiation in two ways. First, we looked at the children's use of each language, excluding code-mixed utterances, with each of their parents. Assuming that young bilingual children not equally proficient in both languages cannot use each language equally, we expected that, if they could not differentiate their languages pragmatically, the children would use their two languages in proportion to their relative proficiency in each. Conversely, if the children could differentiate pragmatically, they should use more of each parent's native language with that parent than would be expected from their relative proficiency in that language. Support for these assumptions came from our previous findings that young bilingual children are often more proficient in one language than the other and that they tend to use their more proficient language more in all contexts (Genesee, Nicoladis, & Paradis, 1996; Nicoladis, 1995). Thus analyzing the data permitted us to accommodate individual differences in relative proficiency.

Second, we examined the children's use of translation equivalents, assuming that use of translation equivalents in appropriate context-sensitive ways is evidence for pragmatic differentiation. Translation equivalents are words in two languages that nominally have the same referential meaning (e.g., *chien* in French and *dog* in English). According to the principle of mutual exclusivity in word learning (Clark, 1987; Markman & Wachtel, 1988), children assume that words pick out mutually exclusive categories. Therefore, each referent should have only one category label. More simply, children (and adults) resist assigning two labels to the same referential category. Bilingual children's acquisition of translation equivalents would violate this principle if they were, in fact, acquiring a single language. Thus evidence that bilingual children have translation equivalents would attest to the acquisition of two languages. Indeed, a number of recent studies report that bilingual children have translation equivalents during the one-word stage (Genesee, Wolf, & Paradis, 1995; Pearson, Fernández, & Oller, 1993; Quay, 1996). The question remains, however: Do bilingual children in the one-word stage use transla-

tion equivalents in accordance with the language of their interlocutors? Evidence that they do could be taken as evidence for pragmatic differentiation.

Method

Participants

The children. We observed four boys (Mat, Nic, Stt, Yan) being raised in bilingual families in Montreal, Quebec; the gender distribution was due to chance. The boys are identified by abbreviations of their full names. They were all first-borns and did not have siblings at the time of the study. Their average age was 1;7 (years; months) at the start of the study and 3;0 years at the end. (Table 1 gives exact ages for each child at each session.) Their average age at the outset was somewhat elevated due to Yan, who was 2;0. We included Yan despite his relatively advanced age because he was in the one-word stage; this was a criterion for inclusion of the others. Stt's language development was in line with the others' at the outset of the study, although we observed that it was delayed overall in comparison to the others'. We kept him in because we wanted to ascertain our results' generalizability to a wide range of children.

The parents. All the parents had at least a high school or community college degree. One mother had a university degree; none of the fathers did. Two of the fathers worked full-time outside the home; one father worked on call; and one stayed home full-time caring for his child. One mother worked full-time outside the home; one mother worked part-time outside the home; one mother was a student during the study; and the fourth mother was unemployed at the study's start and then started a full-time job about four months into it. Three of the children were cared for by their parents in the home; Yan attended a full-time bilingual daycare during the first 5 observation sessions and a full-time French daycare during the last 2.

Parents' language. In all cases except Yan, the father's

Table 1
Ages, Word-Type Scores, and Multiword Scores for Each Session

Session	Age	Mat			
		Word Types		Multiword Units	
		French	English	French	English
1	1;5	2 6.67%	28 93.33%	– –	9 100.00%
2	1;7	19 30.65%	43 69.35%	17 40.48%	25 59.52%
3	1;9	19 37.25%	32 62.75%	15 83.33%	3 16.67%
4	1;11	29 33.33%	58 66.67%	23 45.10%	28 54.90%
5	2;1	42 37.17%	71 62.83%	38 32.48%	79 67.52%
6	2;3	27 26.21%	76 73.79%	24 40.00%	36 60.00%
7	2;11	35 19.89%	141 80.11%	26 13.07%	173 86.93%

Note. Age in years; months.

native language was French and the mother's native language was English; the situation was reversed for Yan. To facilitate understanding, we refer to the mother's native language as Mother's Language (ML) and the father's native language as Father's Language (FL). All the parents reported some fluency in their spouse's native language. Because parental reports of how they use their languages often do not correspond to what they do (Goodz, 1989), we examined the parents' actual language use with their children during our observation sessions.

Procedure

We audio- and video-recorded the children during their free

Table 1 (continued)
Ages, Word-Type Scores, and Multiword Scores for Each Session

Session	Age	Nic			
		Word Types		Multiword Units	
		French	English	French	English
1	1;6	3 33.33%	6 66.67%	– –	1 100.00%
2	1;9	5 9.43%	48 90.57%	– –	3 100.00%
3	1;1	1 1.92%	51 98.08%	– –	33 100.00%
4	2;1	8 9.76%	74 90.24%	– –	32 100.00%
5	2;3	8 8.99%	81 91.01%	1 1.69%	58 98.31%
6	2;5	4 3.42%	113 96.58%	– –	39 100.00%
7	3;1	23 12.71%	158 87.29%	4 3.01%	129 96.99%

play with their parents. We held separate sessions with each parent, usually during the same week, in order to create relatively distinct linguistic contexts. The first 6 sets of sessions were approximately eight weeks apart. To examine the stability of our results, we observed and recorded the children and their parents during a seventh, final session approximately six months later. We asked the parents to play with their children as they would normally; in most families, this consisted of playing with favorite games and toys. On some occasions, free play led into meal time. A young bilingual woman conducted all sessions; they lasted between 45 and 60 minutes. The researcher interacted and communicated as little as possible with the families during the actual recording times. Interactions before and after recording

Table 1 (continued)
 Ages, Word-Type Scores, and Multiword Scores for Each Session

Session	Age	Stt			
		Word Types		Multiword Units	
		French	English	French	English
1	1;5	2 40.00%	3 60.00%	— —	— —
2	1;8	1 10.00%	9 90.00%	— —	3 100.00%
3	1;9	— —	6 100.00%	— —	1 100.00%
4	2;0	6 46.15%	7 53.85%	1 50.00%	1 50.00%
5	2;2	8 44.44%	10 55.56%	— —	1 100.00%
6	2;4	13 54.17%	11 45.83%	5 62.50%	3 37.50%
7	3;1	40 37.04%	68 62.96%	10 27.03%	27 72.97%

Note. Age in years; months.

times took place primarily in the parents' respective native languages.

Transcription and Coding

We made transcriptions of the first 20 minutes after the first 5 minutes of each session in accordance with the CHAT transcription system (MacWhinney & Snow, 1990). We ignored the first 5 minutes in order to allow time for the children to become accustomed to the presence of the recording equipment and for the parents' and children's language use to normalize (cf. Demetras, Post, & Snow, 1986). We transcribed the children's utterances in regular orthography when they clearly were using words based on

Table 1 (concluded)
Ages, Word-Type Scores, and Multiword Scores for Each Session

Session	Age	Yan			
		Word Types		Multiword Units	
		French	English	French	English
1	2;0	30	30	14	14
		50.00%	50.00%	50.00%	50.00%
2	2;3	36	33	33	42
		52.17%	47.83%	44.00%	56.00%
3	2;5	37	31	46	36
		54.41%	45.59%	56.10%	43.90%
4	2;7	54	31	34	29
		63.53%	36.47%	53.97%	46.03%
5	2;1	88	63	95	96
		58.28%	41.72%	49.74%	50.26%
6	3;1	45	74	27	68
		37.82%	62.18%	28.42%	71.58%
7	3;8	226	279	279	10
		91.50%	8.50%	96.54%	3.46%

adult forms; otherwise, we used broad phonetic transcription. The bilingual observer transcribed the recording session using both the video and audio records. An assistant, a native speaker of Quebec French fluent in English checked all transcripts for accuracy. Interrater agreement of the transcriptions averaged 93.74% (range=71.32% to 99.94%). We resolved any discrepancies by discussion.

The observer and an independent bilingual research assistant coded every utterance for addressee and language. When adults were talking, it was usually clear who was being addressed. When the children were talking, particularly at the beginning of the study, they sometimes did not address utterances to anybody

in particular. When an utterance clearly was not addressed to anybody, we coded the addressee as the “speaker” (i.e., the child addressing himself). When an utterance was addressed externally, although with no clear referent, we coded the addressee as all of the people present. Though this coding scheme called for judgment, there was a high rate of agreement between the two coders. The average interrater agreement for coding all the children in all sessions with respect to “addressee” was 99.28% (range=96.63% to 100%) and with respect to “language of utterance” was 99.25% (range=90.65% to 100%). We resolved discrepancies by discussion.

Analysis 1

In Analysis 1, we examined the children’s use of English-only and French-only utterances, assuming that the children’s using each language differentially and appropriately with each parent demonstrated pragmatic differentiation. Examining the children’s use of their languages with their parents from the earliest recording session to later sessions would indicate if children demonstrated differentiation from the beginning and, if not, when it emerged. Thus the main analyses were done for each observation period separately in order to pinpoint when differentiation was demonstrated.

We coded an utterance as French-only or English-only if, and only if, all the words within the utterance belonged to a single language. We excluded 3 kinds of utterances: mixed, both, and unintelligible. A mixed utterance contained words from both French and English; for example *doggy dodo* (“doggy sleeping”). There were 150 mixed utterances in the entire corpus, accounting for only 2.05% of the children’s total output. We also excluded utterances composed solely of words common to both French and English, referred to as “both” utterances. This category included many interjections (e.g., *oh, eh, uhoh*), onomatopoeic sounds (e.g., *bang, boing, rrrr*), and proper nouns (e.g., *Maman, Cookie Monster, Barney*). We included proper nouns on the list following

Saunders' (1988) suggestion. When a word common to both languages appeared in an utterance otherwise completely in one language, we assumed that the word became a lexical item of that language; for example, if a child said, "uhoh chien!" ("uhoh dog"), we counted the utterance as French. We also excluded unintelligible utterances—those utterances not clearly identifiable as French or English (e.g., idiosyncratic onomatopoeia or babbling).

Analysis 2

In Analysis 2, we examined the children's use of translation equivalents, assuming that appropriate use of them in different linguistic contexts would reflect pragmatic differentiation. More specifically, we examined the children's use of translation equivalents in the sessions just before and just after the sessions in which they first showed pragmatic differentiation with both parents according to Analysis 1. We expected that the children would use translation equivalents more appropriately in the session after they had first shown differentiation. We defined appropriate usage as use of the French member of each pair of translation equivalents with the parent who habitually spoke French, and vice versa for the English member of each pair.

We counted words in each language as translation equivalents if they had equivalent referential meaning as judged by one of the coders (e.g., *chapeau-hat*, *verre-glass*); the children had to use the words with the mother or father during the same observation period (e.g., during Session 3). We limited translation equivalents to content words. We ignored function words like *the*, *a*, *le*, and so forth, and proper nouns, because children often have only one name for people, places, pets, and so forth (Saunders, 1988; cf. Pearson et al., 1993). We classified the children's use of translation equivalents into one of 3 categories: (a) appropriate context only (i.e., English word with English-speaking parent and French word with French-speaking parent); (b) both contexts (i.e., a word for which a translation equivalent is known was used with both the mother and father); and (c) inappropriate context only

(i.e., English word with French-speaking parent only or French word with English-speaking parent only).

Results

Analysis 1: Differential Use of French and English

Before examining the children's language use with their parents, we report on the parents' language use in order to establish that we presented the children with distinct linguistic contexts and therefore they could be expected to use their languages differentially with their parents. If the parents themselves did not use their languages differentially with their children, then the children would not differentiate either. Table 2 summarizes the parents' use of their native language with their

Table 2
Parents' Use of Native Language With Children

Child	Parent	
	Mother	Father
Mat		
<i>M</i>	96.26%	83.91%
<i>SD</i>	3.01	8.26
Range	90.26–98.56	73.91–96.36
Nic		
<i>M</i>	99.41%	94.28%
<i>SD</i>	0.68	2.60
Range	98.28–100.00	91.39–98.02
Stt		
<i>M</i>	91.99%	84.30%
<i>SD</i>	5.21	17.07
Range	85.49–98.10	51.48–96.05
Yan		
<i>M</i>	95.02%	86.85%
<i>SD</i>	6.74	5.40
Range	81.53–98.93	77.54–93.30

children averaged across all 7 sessions, expressed as a percentage of the total utterances they produced. All the parents clearly used their native language most of the time with their children. In all cases, except for Stt's father, the standard deviations indicate that there was little variation across sessions.

These results conform to our informal observations of the parents' language use in their homes when they were not being recorded, but they do not accord with all of the parents' reports. For example, Yan's mother reported using only her native language with her son, yet she was recorded using her second language with him 5% of the time; moreover, her actual usage did not differ greatly from that of Mat's mother, who reported using both languages "freely." Goodz (1989) has noted similar discrepancies between what parents report they do and what they do. Notwithstanding these discrepancies, the empirical results indicate clearly that the parents presented the children with distinct language contexts.

To examine whether and when the children were using French and English differentially with their parents, we compared their use of each language in each session with what we would expect were they unable to use their languages differentially; we used chi-square analyses to make these comparisons. Determining their use of language was straightforward—it consisted of the numbers of English-only and French-only utterances addressed to the fathers and mothers. The expected values we estimated on the basis of the children's proficiency in each language (described below), assuming that if they lacked pragmatic differentiation they would use each language in proportion to their relative proficiency in it, regardless of context. If a child were equally proficient in both languages, then we would expect him to use both equally with his mother and father. If his proficiency in his two languages differed, then we adjusted the expected use of the languages accordingly.

In a discriminant-function analysis of language proficiency in young French-English bilingual children, Genesee, Nicoladis, and Paradis (1996) found it possible to discriminate reliably

between children's relative proficiency in their two languages through a combination of measures, including mean length of utterance (MLU), upper bound, word types, and multiword utterances. Two adults who were familiar with the children judged the children's relative proficiency in each language. Using a *dominance index* composed of measures of word types and multiword utterances only, Nicoladis (1995) also found reliable discriminability of proficiency in a group of English-French bilinguals. Nicoladis' index has the advantage of not including MLU, which is problematic in the case of languages with different morphosyntactic patterns. Therefore, we used Nicoladis' dominance index to estimate the relative proficiency of our four young children.

We calculated multiword subscores for each child as the percentage of multiword utterances (i.e., utterances composed of 2 or more words) in French and English out of the total of multiword utterances in both languages (Table 1). We calculated word type subscores as the percentage of different words in French and English out of the total of word types in both languages. We averaged the multiword utterance and word type subscores in French to create a single French dominance (or proficiency) score, and did the same with English to create a single English dominance (or proficiency) score (Table 3). If the children did not use any multimorphemic utterances in either language, then we used only word types in each language to determine their proficiency.

Table 3 summarizes the dominance scores for each child in each language for each session. According to these indices, Mat and Nic were more proficient in their mother's language; Yan was fairly balanced; and Stt showed somewhat more proficiency in his mother's language at the beginning of the study, although his output at this time was so small that this may not be reliable. By the end of the year, Stt was fairly balanced in both languages. These results conform with our impressions of the children's proficiencies drawn from our interactions with them during the study.

Table 3
Children's Dominance Scores in French and English

Session	Nic		Mat	
	French	English	French	English
1	16.67	83.34	3.33	96.67
2	4.72	95.29	35.56	64.44
3	0.96	99.04	60.29	39.71
4	4.88	95.12	39.22	60.79
5	5.34	94.66	34.82	65.18
6	1.71	98.29	33.11	66.90
7	7.86	92.14	16.48	83.52

Session	Yan		Stt	
	French	English	French	English
1	50.00	50.00	40.00	60.00
2	48.09	51.92	4.55	95.46
3	55.25	44.75	—	100.00
4	58.75	41.25	48.08	51.93
5	54.01	45.99	22.22	77.78
6	33.12	68.88	58.33	41.67
7	93.32	6.68	32.04	67.95

Because some of the children spoke to one parent more than to the other, our calculation of the expected values for the chi-square analyses took into account the total of utterances addressed to each parent. Thus, we calculated the expected values by multiplying a child's dominance scores in French and English by the total number of utterances to each parent. For example, if a child who was 60% dominant in French addressed 100 utterances to his father, then his expected values were 60 utterances in French and 40 utterances in English. The number of French-only and English-only utterances addressed by each child to each parent during each observation session, and the corresponding chi-square results, are summarized in Table 4. From these results, we classified the children in one of 3 categories: (a) differentiation with neither parent—their language use did not

Table 4

Number of Children's Utterances in Father's Language (FL) and Mother's Language (ML) to Father and Mother and Chi-Square Values of Children's Pragmatic Differentiation^a

	Nic			Mat			Yan			Stt		
	FL	ML	χ^2	FL	ML	χ^2	FL	ML	χ^2	FL	ML	χ^2
Session 1												
To Father	2	3	2.5	2	3	4.1*	35	19	4.7*	1	3	0.3
To Mother	1	4	0.2	1	4	1.4	34	22	1.6	1	3	1.0
Session 2												
To Father	4	3	69**	20	75	8.7**	49	9	25**	1	3	3.9*
To Mother	2	88	0.3	2	19	7.7**	29	56	19**	0	13	0.6
Session 3												
To Father	0	32	0.1	15	31	14**	34	29	2.2	0	5	0.0
To Mother	1	102	1.1	5	35	47**	42	85	32**	0	3	0.0
Session 4												
To Father	11	25	49**	14	4	0.0	44	31	9.4*	3	7	1.3
To Mother	0	83	4.4*	23	37	18**	42	71	35**	0	3	2.8
Session 5												
To Father	6	69	8.9**	5	20	2.4	88	76	3.9*	5	4	5.8*
To Mother	1	174	6.3*	31	109	27**	81	138	55**	11	22	3.2

Session 6												
To Father	1	96	0.1	17	17	4.6*	135	33	13**	22	6	5.4*
To Mother	0	165	1.2	19	162	54**	56	33	9.6**	5	10	9.8**
Session 7												
To Father	28	97	36**	43	83	29**	173	20	4.2*	82	49	56**
To Mother	1	154	11**	12	155	10**	278	4	13**	14	101	21**

Note. Sessions in which pragmatic differentiation is shown to both parents are in bold type.

^aWhen interpreting the results, it is important to remember that the chi-square analyses controlled for relative proficiency. Thus, it is possible for a child to use more of a parent's nonnative language and still show appropriate differentiation with that parent. For example, in Session 6, Yan used more utterances in the father's language with his mother, and still more of the mother's language with his mother, than would be expected given his relative proficiency in her language.

* $p < .05$. ** $p < .01$.

differ significantly from predictions based on dominance, suggesting they could not differentiate pragmatically; (b) differentiation with only one parent—their language use with one, but not the other, parent differed significantly from their dominance, suggesting a preliminary attempt to differentiate pragmatically; and (c) differentiation with both parents—they used the mother's language more with the mother (than with the father) than we expected according to their dominance, and vice versa for the father's language.

Table 4 indicates that 2 of the 4 children (Nic, Stt) showed no differentiation with either parent during the first observation sessions. The other 2 boys (Mat, Yan) showed differentiation with only one parent¹. By the sixth sessions, 3 of the children (Mat, Yan, Stt) showed pragmatic differentiation with both parents. The only child, Nic, who did not show significant differentiation at this time had shown differentiation in 2 earlier sessions, suggesting that his performance in the sixth session was anomalous. Nic was very dominant in his mother's language and had little proficiency in his father's language; this may account for his lack of consistent differentiation. By the final sessions, all the children showed statistically significant differentiation with both parents.

As expected, there were individual differences in the age of first appearance of differentiation. Yan first showed differentiation at the age of 2;3, Mat at 1;9, Nic at 2;1, and Stt not until 2;4. The relatively late emergence of differentiation in Stt may reflect his very low level of language development before this session.

Three of the children did not differentiate their languages with both parents during 1 or 2 sessions following the session in which they had first shown differentiation to both: Mat in Sessions 4 and 5, Nic in Session 6, and Yan in Session 3. We have already discussed Nic's performance in Session 6. These inconsistencies may reflect, in part, episodic variations likely to emerge in short-term recording sessions of this sort. Perhaps also pragmatic differentiation is developmentally variable when it first emerges. Indeed, Yan showed appropriate differentiation to both parents in Session 3, but it was statistically significant only with his mother.

Similarly, Mat showed appropriate differentiation with both parents in Session 4 and with his mother in Session 5, but only his performance with his mother was statistically significant at these times.

In summary, none of the 4 children showed complete differentiation with both parents during the first recording sessions; 3 showed complete differentiation by the sixth sessions and continued to do so 6 months later, during the final sessions. The only child who did not show complete differentiation by Session 6 had previously done so. The children did not reliably show differentiation with one parent before differentiation with both, suggesting (contrary to our initial thinking) that using more of one parent's language than predicted by their dominance is not necessarily a preliminary step to full pragmatic differentiation.

Analysis 2: Differential Use of Translation Equivalents

Table 5 summarizes the number and percentage of translation equivalents (word types) used appropriately or inappropriately. We carried out this analysis for the recording session immediately before the children first showed differentiation according to Analysis 1 and for the session immediately after.

On average, before they used English-only and French-only utterances differentially, the children used fewer than half of their translation equivalents in the appropriate context only. Caution is necessary when interpreting some of these results, because of very low frequency counts (e.g., Nic and Stt before differentiation). In contrast, on average, after they first used English- and French-only utterances differentially, the children used over 80% of their translation equivalents in the appropriate context only. Thus, their context-sensitive use of translation equivalents increased noticeably around the time when they began to use English-only and French-only utterances differentially. These findings corroborate our classification of the age of emergence of differentiation from Analysis 1.

Table 5
Number and Percentage of Translation Equivalents Used by the Children in Various Contexts Before and After Showing Pragmatic Differentiation

	Appropriate Context		Both Contexts		Inappropriate Context	
	Before	After	Before	After	Before	After
Mat						
<i>P</i>	29	80	29	10	43	10
<i>f</i>	2	8	2	1	3	1
Nic						
<i>P</i>	50	92	50	8	–	–
<i>f</i>	1	11	1	1	–	–
Stt						
<i>P</i>	–	83	–	17	100	–
<i>f</i>	0	5	0	1	2	0
Yan						
<i>P</i>	43	75	29	13	29	13
<i>f</i>	6	12	4	2	4	2

Note. Percentages are based on the total number of translation equivalents used in a session.

Discussion

Our results suggest an initial period when bilingual children do not differentiate their languages pragmatically. Comparing other studies, we found considerable variation in the age of emergence of differentiation, varying from 1;9 to 2;4 years (cf. Arnberg, 1981; De Houwer, 1990; Genesee et al., 1995; Köppe & Meisel, 1995; Pavlovitch, 1920; Vihman, 1985). This developmental pattern was evidenced in our 4 children's overall use of their languages and in their use of translation equivalents (cf. Quay, 1992). The present results are tentative and suggestive only; they clearly warrant replication with more children and more extended language samples.

We have discussed the emergence of pragmatic differentiation in terms of the children's ages; however, age per se is not causal or explanatory. In this regard, Redlinger and Park (1980) have suggested that a threshold mean length of utterance (MLU) and perhaps, therefore, some minimal level of syntactic development, is necessary for children to differentiate their languages. Two of our children (Mat and Stt) showed differentiation while they were in the one-word stage, indicating that they could differentiate well before their language contained any overt signs of syntactic organization. Snow (1988) has suggested that young bilingual children may have to acquire a minimum vocabulary (50–100 words) in order to extract the phonological properties of their respective languages and, in turn, to differentiate their developing lexicons. According to this proposal, bilingual children's differential use of their 2 languages would emerge only once they develop differentiated lexicons (cf. Volterra & Taeschner, 1978, for a similar argument). We lack the data needed to examine this possibility systematically. Perhaps bilingual children have to acquire some minimum repertoire of vocabulary in each language in order to express themselves adequately without resorting to extensive borrowing between languages. In other words, early in development, bilingual children's limited resources in each language, and especially their restricted vocabulary, may compel them to use whatever lexical items they know, regardless of language, to express themselves. Only once their vocabularies have reached some critical size might they use only one—or a predominance of one—language to meet their communicative needs in particular language contexts. We cannot examine these possibilities with confidence because we cannot estimate the children's vocabularies accurately, given the limited language samples acquired. Pending further research, the present findings cannot be taken as evidence of underlying linguistic fusion or unity, because there may be these sorts of pragmatic explanations for them.

Finally, until now bilingual differentiation has been investigated only with respect to language production. This leaves

differentiation in bilingual speech perception unexplored (e.g., Genesee & Habra, 1995). Research on the nature of bilinguals' perception of lexical and sublexical units from their two languages during the preverbal period could shed light on bilingual differentiation at an even earlier stage of language acquisition than we have examined here.

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Note

¹Because the frequencies for Nic at Session 1, Mat at Session 1, and Stt at Sessions 1 and 4 were so small, they were also analyzed using Fisher's exact test. The results of these analyses were also not statistically significant.

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