FAMILY MATTERS: DETERMINERS OF LANGUAGE CHOICE IN EARLY BILINGUAL DEVELOPMENT

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1. Introduction

The goal of the present paper is to evaluate the determining factors involved in child simultaneous bilingual acquisition at home as an individual choice on the part of the parents. The term *planned* or *élite* bilingualism (Harding & Riley, 1986; Lanza, 1997) is used in the literature to designate bilingualism as a consequence of a parental effort to teach and maintain two languages in the child. Children growing up in a bilingual family, that is, exposed since early infancy to two languages at the same time from their main caregivers, are potentially able to become competent bilinguals. Many studies in the literature (such as Grosjean, 1982; De Houwer, 1990; Döpke, 1992; Lanza, 1997; Deuchar & Quay, 2000) suggest that the degree of bilingual success depends on factors such as parental consistency of language use, amount of exposure, social support, etc., but so far no formal analysis to assess which factors determine child bilingualism has been carried out to date.

The model of analysis of bilingual development put forward in this paper aims at predicting whether children receiving dual input have availability of language choice; namely, to what extent they possess knowledge of two languages and are able to apply it appropriately in conversation[2]. The conditions, amount, and patterns of exposure to input from two languages which determine the kind of bilingual the child will become are measured, classified and evaluated with respect to competence and performance dimensions. Linguistic knowledge in both languages and appropriateness of response to input in conversation are assessed in six bilingual subjects. Analysis results yield a series of conditions under which a child, exposed on a regular basis to two languages in the home, is likely to develop into a productive balanced bilingual.

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[2] Children respond "appropriately" to input in conversation when they comply with the choice of language of their interlocutors (see Nicoladis & Genesee, 1996: 441).

2. Research methodology

2.1. Research question

Two aspects of language differentiation are addressed here: 1) the level of linguistic representation (speaker's competence), and 2) language use (emerging languages functioning in a manner appropriate to the interlocutor and context in conversation).

The general research problem concerns both of these aspects and poses the following questions: does representation of linguistic knowledge exhibit differentiation that correlates with language use? Specifically, during speech production, is there a choice of code available to very young children simultaneously exposed to two languages from birth? If this turns out to be the case, do psycholinguistic or sociolinguistic factors, or an interaction of both aspects of language differentiation, influence this choice?

2.2. Hypotheses

1. If language choice is available to very young bilinguals, it is hypothesized that they will respond appropriately, i.e., within normative boundaries, to the input language of their interlocutor(s) and to the context in conversation.

2. I hypothesize a strict correlation between linguistic competence (in both languages) and the availability of language choice. Hence, the degree of linguistic competence is predicted to correlate with appropriateness of language use as a response to input.

3. If the general hypotheses established in 1) and 2) are correct, it is possible to predict a correlation between the degree of linguistic competence (along with adequacy of code selection by association) and alternating use of both languages (mixing). If the speaker displays a low degree of linguistic/grammatical competence, and responds inappropriately to the language of the interlocutor, more cases of mixing may be expected. Alternatively, if the speaker has a higher command over the grammar of the conversation code(s), less mixing may appear.

4. A correlation between input conditions and bilingual competence, as well as input and appropriate language use, is predicted. The higher the amount and quality of exposure to a language, the higher the level of competence and the higher the

appropriateness of use for that language will be. Subsequently, a correlation between input factors and mixed utterances is predicted to result.

Summarizing, it is hypothesized that *bilinguality*, i.e., availability of language choice (cf. Hamers & Blanc, 1989), is driven by input conditions and subsequently determined by the level of linguistic competence (grammatical knowledge of two languages) and performance (appropriateness of language use as a response to input).

2.3. Research design

Empirical results to test the proposed hypothesis are obtained from original longitudinal case studies. The 6 subjects, between the ages of 1;8 and 3;3, were exposed simultaneously to two languages (English and Spanish) from parental input in the home on a daily basis. The participant families (middle-class) live in monolingual areas of the United States without support for the minority language. Data were collected longitudinally by means of parental audio-recordings and analyzed integrating competence and performance elements. The corpus consists of 50 hours of audio recordings in child-parent(s) dyadic and triadic interactions. Diary entries and notes from personal observations rendered valuable support data.

3. Data analysis

Experimental variables in the current study combine both psycholinguistic and sociolinguistic features a formally unified analysis.

3.1. Independent variables

Independent variables are related to linguistic input encountered by the child in the home and encompass parental linguistic circumstances as conditioning factors in child linguistic development, as well as characteristics from recorded family conversations.

Table 3.1 presents an inventory of the different independent variables applied in the analysis, which are divided into two segments according to the source of information:

1. Preconditions, divided into parental (linguistic and cultural) background and general language exposure conditions in the home, based on anecdotal information from interviews carried out during the time of data recording.

2. Conversational (recorded) data, revealing parental language use and the contextual circumstances in which conversation exchanges take place with the child at home.

INDEPENDENT VARIABLES (parental input)

SOURCE	FOCUS	VARIABLE
Preconditions (anecdotal)	Parental Background	Parental Linguistic Competence
		Parental Attitudes to Child Bilingualism
	Language Exposure	Language Exposure Patterns in the Home
		Time Under Parental Supervision
		Language Exposure Outside the Home
Conversational Data (empirical)	Input	Parental Language Input in Conversation
		Context / Activity of Conversation
		Topic of Conversation
		Parental Response to Child's Mixing

Table 3.1. Summary of Independent Variables.

3.1.1. Parental Linguistic Competence in each Language

Given the level of grammatical competence exhibited by each parent, in English and Spanish, their stronger language may serve as the medium for interactions with their spouse and child. Evaluation of parental linguistic competence in each grammar is encoded for quantifying purposes based in part on the ACTFL Oral Proficiency Guidelines (see Breiner-Sanders *et al*., 2000): 5=native; 4=superior; 3=advanced; 2=intermediate; 1=novice; 0=insufficient evidence.

Grammatical competence elements (syntax, phonetics and lexicon) are charted for each parent and language. The score that best depicts the speaker's classification in that particular area of linguistic knowledge is assigned. Each value obtained is averaged (excluding 0) and rounded up to the next .5 value. For statistical purposes, the results obtained from evaluating competence are classified into two groups: 0 (1, 2, 3) and 1 (ranging from 3.5 to 5).

3.1.2. Parental Attitudes to Child Bilingualism

This variable concerns how parents value their child's developmental bilingual experiences, especially as they relate to the minority language (Spanish). Issues include: a) motivation: to use (or approve the use of) a language at home other than the community's or her/his own in order to provide their child with a richer linguistic input;

b) value of minority language: parents consider Spanish, as a linguistic (and cultural) asset for their child; c) identification with minority culture: parents may identify themselves with the minority language/culture, due to their own linguistic and cultural background or that of their spouses.

These properties are captured in an incremental "high-low" scale for each parent, (ranging from "very high motivation / value of language / identification" to "minimal motivation/ minimal value of language / no identification"), in order to capture parental commitment to their child's bilingual development. The values obtained for each aspect are averaged (excluding 0) and rounded up to the next .5 value. For the statistical analysis, the averages obtained are divided into two categories: 0, which ranges from 1 to 3 and 1, which covers from 3.5 to 5.

3.1.3. Language Exposure Patterns in the Home

The third variable comprises parental choice of language in the home: (a) with the spouse, (b) as a family (triadic interactions) and (c) with the child separately (dyadic interactions). It is classified independently according to the language used by each parent with the child for statistical purposes.

3.1.4. Time Under Parental Supervision

This information is especially important to determine the total amount of contact the child has with the minority language, particularly if the parent(s) are the only source of Spanish input. The time that each parent spends with the child on a daily basis, according to the parent's declarations, is measured in the number of weekly hours. The percentage of time the child spends with each parent and with both parents together is calculated with respect to the overall sum of waking hours, in which the child can be exposed to linguistic input. Parental reports serve as the basis for the calculation projecting the children's exposure to language input as an average of 70 hours per week. The average time that each parent spends with the child is encoded as a binary alphabet, with the categories "0" corresponding to 1-50% (which equals less than 5 hours a day); and "1" for 51-100% of the time (equivalent to more than 5 hours a day, since both parents work).

3.1.5. Language Exposure Outside the Home

Child participation in preschool and playgroups supplies significant input from one (or both) language(s) and influences the communicative needs of the child. Variable # 5 computes the number of hours the child spends away from main caretakers daily. Under the same rule as variable 4, the percentage of weekly time a child is exposed to each language is calculated. The amount of exposure to each language outside the home is assessed quantitatively. Only the period of exposure to the minority language away from home is analyzed to determine any difference in the general amount of exposure to Spanish. Time away from the parents in which the child is exposed to one particular language 50% or less overall is encoded as "0", while more than 50% is assigned a value of "1".

3.1.6. Parental Language Input in Conversation

In this study it is considered that the input language in which a conversation takes place dictates the appropriateness of the language of response. The analysis of input in conversation consists of a sequential turn-by-turn breakdown. Turns corresponding to parent-child dyadic and triadic interactions in all recordings are added and classified according to language. Only child turns which follow a parent's initiating turn are included in the analysis, that is, child turns which together with parental turns form adjacency pairs (cf. Lanza, 1997: 204). The base language of conversation for the participants is assessed according to three types: Spanish, English and mixed conversations. The language of the conversation is ascribed based on the absolute majority of the initiating turns articulated by the parent(s) in one specific language or mixed languages in each recording session. Subsequently, the absolute number of turns is computed per language and per type of interaction (dyadic or triadic), and is broken down into percentages. The results obtained from adding all the percentages (of turns) of parental language use (English/ Spanish/ mixed) in all the recordings represent the amount of linguistic input the child receives in the home according to the data. For statistical purposes, the turn count is tallied longitudinally by grouping the recording sessions into monthly increments, according to the age of the child.

3.1.7. Context / Activity of Conversation

The purpose of considering the contextual variable is to observe if parental language use may change through different conversational contexts. The contexts or

activities are classified into: a) free conversation, which includes playing, meals, getting ready (for bed, to go out) and chatting; and b) story telling, as a gerneral term to cover story reading and telling, rhymes and numbers, and singing. Story telling is a more highly controlled situation. Depending on in which language the story is read, language choice may diverge from the accustomed language the parent uses with the child. This variable is catalogued in absolute percentages with respect to the total amount of data collected. The amount of speech in conversation for each context is classified for each parent separately and averaged for both parents together.

3.1.8. Topic of Conversation

For reasons of expediency the topics of conversation are condensed into two general categories: a) culturally-neutral topics (with no value attached to a specific culture) and topics related to the minority culture, and b) topics related to the community culture. Tabulation is identical to variable # 7.

3.1.9. Parental Response to Child's Mixing and/or Inappropriate Choice of Language

This aspect provides information on the effects of parental feedback when the child mixes and/or makes inappropriate language choices in particular conversational exchanges. Lanza (1997) postulates that parents employ strategies towards child language mixing in discourse, thus construing a monolingual or bilingual context that may influence the child's subsequent choice of code. This variable is categorized qualitatively according to a classification of parental strategies adapted from Lanza (1992) and Mishina's (1999), as depicted below:

Monolingual context				**Bilingual context**
Minimal Grasp ↓ overt clarification request	**Expressed guess** ↓ clarification request by reformulation	**Adult repetition** ↓ restatement in adult's language of use	**Move-on strategy** ↓ conversation continues	**Code switching** ↓ adult switches codes

Figure 3.1. Parental Discourse Strategies towards Child Code Mixing.

The categories are quantified as: 1= minimal grasp, 2= expressed guess, 3= adult repetition, 4= move-on strategy and 5= code-switching. At a deeper level of examination, these strategies are measured in percentages of frequency with respect to

their categorical distribution. For the statistical analysis, the five categories are reduced to two basic tendencies: attempt to correct the child (1 and 2) or acceptance of the child's utterance (3 to 5).

In sum, independent variables encompass input conditions, that is, the (external) linguistic circumstances affecting the child's exposure to each language. These aspects are overwhelmingly liable to parental behavior in the child's presence.

3.2. Dependent variables

Dependent variables analyze child bilingual behavior with respect to bilingual linguistic competence and language use. Table 3.2 offers an outline of these variables:

DEPENDENT VARIABLES (child behavior)

SOURCE	FOCUS	VARIABLE
Conversational Data (empirical)	Linguistic (bilingual) Competence	Grammatical Complexity (MLUm/w; MLUmax)
		Lexical Diversity (TTR; VOCD)
		Morphosyntactic Development (linguistic milestones)
	Language Use	Code of Response to Input Language in Conversation
		Amount of Mixing of Child Codes in Conversation

Table 3.2. Summary of Dependent Variables.

Dependent variables consist of:

3.2.1. Child's bilingual competence

The *utterance*, identified by a single intonational contour (cf. Lanza, 1997: 124), is the unit of analysis to measure 3 selected aspects of linguistic competence:

i. Grammatical Complexity (MLU in morphemes and words; MLUmax)

Brown's (1973) categorization, based on the *mean-length-of-utterance* (MLU), to test grammatical complexity in English-speaking monolinguals, is employed. As bilingual linguistic competence can only be measured through observable performance (Nicoladis & Genesee, 1996), the child's grammatical competence is assessed in natural speech, based on morpheme calculation (MLUm) as well as word calculation (MLUw) of the child's utterances for each language separately. The criteria chosen for morpheme count in English utterances corresponds to the norms outlined in Brown (1973: 54). The chosen criteria to calculate MLU for Spanish utterances is outlined in Siguán, Colomina & Vila (1990: 56).

A sample of 50 utterances (following Miller, 1981; Pan, 1994) is extracted from each group of recordings and the MLU is calculated for morphemes and words using CHILDES' software program CLAN. Imitations, repetitions and yes/no answers are excluded from the sum (per Wells, 1985) to measure actual child competence in production. The five most complex sentences uttered in the complete recording sessions for each month receive a morphemic and word MLU analysis (MLUmax in morphemes and words), in order to establish "the upper limits of the child's production at a given point in time" (see Solokov & Snow, 1994: 32; Wells, 1985). For organizational purposes, the data are classified into recording session groups by child's age in monthly increments.

ii. Lexical Diversity (TTR; VOCD)

Parameter D denotes lexical diversity in the instrument designed by Malvern & Richards (1996) based on the TTR (Type-Token Ratio) index from Templin (1957). Since TTR is computed by dividing the number of different words a speaker uses by the total number of words produced in a speech sample, this index tends to decrease with growing token size. VOCD is a linear transformation that allows for increasing lexical diversity over time (as children's vocabulary expands). The speech sample chosen for analysis in the present study corresponds to MLU measurement of 50 utterances from each group of recordings (as in Miller, 1981). Both measurements for lexical diversity, TTR and VOCD are calculated with the assistance of CLAN.

iii. Morphosyntactic Development (Linguistic Milestones)

Each child's morphosyntactic development is measured using previously existing scales of grammatical development in monolinguals (Miller, 1981 for English and Hernández-Pina, 1990 for Spanish).

The results from the analyses to test grammatical complexity, lexical diversity and morphosyntactic development corresponding to the subjects in this study are directly compared to data from normally developing monolinguals published in the literature, with the purpose of evaluating whether the rate of development in each language is equivalent to monolingual standards. For comparing grammatical complexity and lexical diversity the data used for Spanish comes from the subjects María (López-Ornat, 1994) and Koki (Montes, 1992); and for English from Adam and Sarah (Brown, 1973). The data basis stems from CHILDES system and the analyses are

carried out in the same way as for the subjects in this study, using the software program CLAN. Morphosyntactic development for Spanish is weighed against results from subjects from several studies, such as Hernández Pina (1990) and Fernández (1994), whereas the results from English originate from the linguistic milestones in Miller (1981).

3.2.2. Child's Code of Response to Input Language in Conversation

Essentially, dependent variable # 2 reflects the subject's choice of code with each parent in order to evaluate the appropriateness of response to parental input. In cases of parentally elicited speech, as it is most frequent in family conversations with very young children, children's appropriate choice of code should comply with the language used by their parent(s). The child's code of response to the input language is measured in turns. In direct comparison with parental input, only responses to parents' elicitation are tallied in this variable. Using the *conversational turn* as a unit of analysis, the measurement of the child's language choice takes place in several steps:

a) Percentages of the child's turns with Spanish, English and mixed utterances in conversations with each parent and with both parents together are calculated. Mixed utterances are classified within the utterance and within the turn (across utterances).

b) Resultant values obtained by calculating the average percent of language use of one particular language, e.g. Spanish, in the parent's turn initiators are plotted against the amount of Spanish used in the child's turns. In dyadic interactions, percentages of language use are calculated for each parent separately and for the child, whereas in triadic interactions the speech of each parent is extracted and added to that of dyadic interactions.

c) Absolute percentages are calculated and responses are compared to parental input in order to determine the percentage of language use correspondence (compliance with input language) in child-parent interactions.

d) Statistical significance tests are run to check the correlation of appropriate language use of the child with respect to the parental input for each parent separately, regardless of type of interaction (dyadic or triadic).

e) Different contexts/activities in which recordings take place are evaluated for each child to find similar or dissimilar patterns.

f) Different conversational topics are taken into account to detect differences in language use.

3.2.3. Amount of Mixing of Child Codes in Conversation

Calculation of mixing of codes as used by the child in conversation takes place at the turn level with respect to parental turn initiators[3]. Language selection that does not correspond to that of the parental last utterance of the turn in a minimal pair is considered mixing (and consequently, inappropriate choice of code). In order to avoid overlapping in the count, turns containing one or more mixed utterances (at the internal utterance level) are computed as "utterance mixing", while turns containing utterances in different codes (at the internal turn level) are considered as "turn mixing" (within turns). Research studies on bilingual acquisition estimate that their normally developing subjects display about 4% of mixing in their speech[4]. Taking into account possible differences in the assessment of language mixing in bilingual children, I have allowed a 5% plus or minus difference and considered this as the normal range to measure against results from the subjects in the current study. This means that a mixing rate of 10% or above is considered as not comparable to the norm.

The dependent variables described comprise the child's linguistic response(s) to parental input as represented by the independent variables. If the proposed hypotheses prove correct, child's bilingual development and choice of code in conversation in the home will be highly influenced by parental linguistic behavior.

4. Results

4.1. Data evaluation

Tables 4.1 and 4.2 below summarize the classification of variables for Spanish and English (respectively) from the six participants in the study:

3 "Mixing" is understood as the alternation of codes in child speech. Mixing categories in developing bilingualism (code-switching, code-mixing and borrowings), distinguished according to bilingual ability and speaker's intentions, are not considered in such young children at this point, due to the difficulty in determining the specific reasons behind a mixing manisfestation.

4 See, for instance, Redlinger & Park (1980) and De Houwer (1990).

Table 4.1. Variables for Spanish.

VARIABLES			Parent	CAR	ALB	JOH	TIN	SHE	ANT
INDEPENDENT									
Pre-conditions (anecdotal)	Parental Background	Parental Ling. Comp. (Spanish)	M	1	1	0	1	1	1
			F	1	0	1	1	0	0
		Parental Attitudes	M	1	1	0	1	1	1
			F	1	0	1	1	0	0
	Language Exposure	Lang. Exp. Patterns	M	1	1	0	1	1	1
			F	1	0	1	1	0	0
		Time U. Parental Supervision	M	1	1	1	1	1	1
			F	1	0	0	0	0	0
		Spanish Exposure Outside		0	0	0	0	0	0
Conversat. Data (empirical)	Language Exposure	Parental Lang. Input (Spanish)	M	95%	65%	7%	90%	86%	94%
			F	92%	38%	95%	90%	0%	0%
		Parental Response to Mixing	M	0	0	0	0	0	0
			F	0	0	0	0	—	—
DEPENDENT									
Conversat. Data (empirical)	Linguistic Competence (Spanish)	Grammat. complexity (MLU)		1	0	0	1	0	0
		Lex. Divers. (TTR; VOCD)		1	0	0	1	1	1
		Morphosyntactic Developm.		1	0	0	1	0	0
	Language Use	Child Response to Parental Input (Sp.)	M	95%	31%	5%	94%	37%	65%
			F	92%	12%	30%	90%	0%	0%
		Mixing (Sp. to Eng.)	M	1	0	1	1	0	0
			F	1	0	0	1	1	1

Table 4.2. Variables for English.

VARIABLES			Parent	CAR	ALB	JOH	TIN	SHE	ANT
INDEPENDENT									
Pre-conditions (anecdotal)	Parental Background	Parental Ling. Comp. (English)	M	1	1	1	1	1	1
			F	1	1	1	1	1	1
		Parental Attitudes	M	1	1	0	1	1	1
			F	1	0	1	1	0	0
	Languge Exposure	Lang. Exp. Patterns	M	1	1	0	1	1	1
			F	1	0	1	1	0	0
		Time U. Parental Supervision	M	1	1	1	1	1	1
			F	1	0	0	0	0	0
		English Exposure Outside		0	0	1	1	1	1
Conversat. Data (empirical)	Language Exposure	Parental Lang. Input (English)	M	2%	25%	81%	1%	7%	1%
			F	3%	54%	3%	5%	100 %	100 %
		Parental Response to Mixing	M	0	0	0	0	0	0
			F	0	0	0	0	—	—
DEPENDENT									

Conversat. Data (empirical)	Linguistic Competence (English)	Grammat.complexity (MLU)		1	1	1	0	1	0
		Lex. Divers. (TTR; VOCD)		1	1	1	0	1	0
		Morphosyntactic Developm.		1	1	1	0	1	1
	Language Use	Child Response to Parental Input (E.)	M	3%	65%	87%	7%	51%	22%
			F	5%	83%	55%	5%	100 %	100 %
		Mixing (Eng. to Sp.)	M	1	1	1	1	1	1
			F	1	1	1	1	1	1

Key: Parental Linguistic Competence: 0= 1 - 3; 1= 3.5 - 5.
Parental Attitudes to Child Bilingualism: 0= 1 - 3; 1= 3.5 - 5.
Language Exposure Patterns in the Home: 0=English; 1=Spanish
Amount of Time Under Parental Supervision: 0=0 – 50%; 1=51 – 100%
Language Exposure Outside the Home: 0=0 – 50%; 1=51 – 100%
Parental Language Input in Conversation: absolute percentage of Spanish or English language use
Parental Response to Child's Mixing: 0=acceptance; 1=correction
Child's Linguistic Competence (Spanish or English): 0=not comparable to monolingual data; 1=comparable to monolingual data
Child (Code of) Response to Parental Input (Spanish or English): absolute percentages
Amount of Language Mixing: 0=not comparable to bilingual data; 1=comparable to bilingual data
– = information not available or insufficient

An alteration in parental language choice, influenced by context and topic of conversation, could be observed. All children showed responsiveness to the adults' linguistic behavior and matched their parents' choice, but it was not possible to determine whether children were sensitive to their interlocutor only, or to the context of conversation as well. Both variables (#7 and 8) were consequently eliminated from further analysis.

With respect to the subjects' *bilinguality*, all 6 children in this study displayed the appropriate English skills with respect to competence and adequacy of use in conversation[5]. For this reason, information about the competence and use of English in these bilingual children is excluded from the statistical tests, while only the values obtained from the analysis of Spanish-related factors (as minority, non-supported language) will be further considered in order to determine the degree of bilingualism in

5 TIN and ANT are an exception, due to the lack of English interactions in the recordings. Supplementary non-audio data obtained from diaries, interviews with daycare providers, and my own observations, lead to the conclusion that these subjects' linguistic development in English is overall within the normal range during the time of data collection.

the subjects. Data results pertaining to the degree of competence in Spanish (confirmed by additional non-audio data) exhibit uneven results across subjects (irregular patterns of competence at different ages). Given that these six children are growing up in a monolingual English community, it can be inferred that although the community language may not be spoken at home in all cases, it is being acquired within a normative range. On the other hand, background conditions and Spanish input for these children from their parents at home (summarized in the independent variables corresponding to Spanish) seem to be the determining factors to consider whether they acquire the minority language to the same degree as monolinguals. In order to assess which features are influencing (or predicting) the development of Spanish within a normative range, these variables need to be tested statistically.

4.2. Statistical analysis

Statistical tests were carried out in order to reveal which of the independent variables are better predictors of the dependent ones (i.e., which conditioning factors from the parental background and input are more likely to explain the child's linguistic behavior) with respect to bilingual competence and use in conversation. For statistical purposes, the variables analyzed in this study were broken down into specific categories for parental discrimination, as tables 4.3 and 4.4 illustrate. The independent variables are the predictive factors for the dependent variables. Indexes in the last column correspond to the classification of variables used in the statistical tests.

Table 4.3. Independent Variables for Statistical Analysis.

INDEPENDENT VARIABLES		
ASPECT	VARIABLE	INDEX
Parental Linguistic Competence	Mother's Spanish Competence	X1
	Father's Spanish Competence	X2
Parental Attitudes to Child Bilingualism	Mother's Attitudes	X3
	Father's Attitudes	X4
Language Exposure Patterns in the Home	Mother's Language of Exposure	X5
	Father's Language of Exposure	X6
Time Under Parental Supervision	Mother's Time with Child	X7
	Father's Time with Child	X8
Language Exposure Outside the Home	Spanish Exposure Outside	X9
Parental Language Input in Conversation	Mother's Spanish Input	X10
	Father's Spanish Input	X11
Parental Response to Child Mixing	Mother's Response to Child Mixing	X12
	Father's Response to Child Mixing	X13

Table 4.4. Dependent Variables for Statistical Analysis.

DEPENDENT VARIABLES

ASPECT	VARIABLE	INDEX
Child's Bilingual Competence	Grammatical Complexity (MLU)	Y1
	Lexical Variety (VOCD)	Y2
	Morphosyntactic Development	Y3
Language of Response to Input in Conversation	Spanish Use with Mother	Y4
	Spanish Use with Father	Y5
Amount of Mixing of Child Codes in Conversation	Mixing with Mother	Y6
	Mixing with Father	Y7

Data is grouped in time intervals: t1 (2;0-2;4); t2 (2;5-2;9); t3 (2;10-3;3) to include data variation in this longitudinal study and for statistical expediency.

Table 4.5 below contains a summary of results formatted for statistical testing.

Table 4.5. Summary of Variables for Statistical Testing.

Ind	Time	Y1	Y2	Y3	Y4	Y5	Y6	Y7	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	X11	X12	X13
				m-synt	Sp use	Sp use	mixing	mixing	M's	F's	M's	F's	M's	F's			Sp			M's	F's
		MLU	VOCD	dev	w/ M	w/ F	w/ M	w/ F	compet	compet	attitudes	attitudes	exposur	exposur	M's time	F's time	outside	M's input	F's input	resp mix	resp mix
CAR	t1	1	1	1	0.95	0.91	1	1	1	1	1	1	1	1	1	1	0	0.95	0.90	0	0
CAR	t2	1	1	1	0.96	0.94	1	1	1	1	1	1	1	1	1	1	0	0.97	0.93	0	0
CAR	t3	1	1	1	0.93	-	1	-	1	1	1	1	1	1	1	1	0	0.95	-	0	-
ALB	t1	1	1	1	0.31	0.18	0	0	1	0	1	0	1	0	1	0	1	0.69	0.44	0	0
ALB	t2	0	0	0	0	0.13	1	0	1	0	1	0	1	0	1	0	0	0	0.36	0	0
ALB	t3	0	0	0	-	0.04	-	0	1	0	1	0	1	0	1	0	0	na	0.36	-	0
JOH	t1	0	0	0	0.05	0.15	1	0	0	1	0	1	0	1	1	0	0	0.07	0.94	0	0
JOH	t2	1	0	0	0.14	0.32	0	0	0	1	0	1	0	1	1	0	0	0.5	0.99	0	0
JOH	t3	0	0	0	0	0.49	1	0	0	1	0	1	0	1	1	0	0	0	0.95	0	0
TIN	t1	1	1	1	0.87	0.90	1	1	1	1	1	1	1	1	1	0	0	0.92	0.90	0	-
TIN	t2	1	1	1	0.97	0.90	1	1	1	1	1	1	1	1	1	0	0	0.98	0.90	0	-
TIN	t3	1	1	1	0.85	0.90	1	1	1	1	1	1	1	1	1	0	0	0.92	0.90	0	-
SHE	t1	1	1	1	0.37	-	0	1	1	0	1	0	1	0	1	0	0	0.85	-	0	-
SHE	t2	0	0	0	0.31	-	0	1	1	0	1	0	1	0	1	0	0	0.9	-	0	-
SHE	t3	0	0	0	0.47	-	0	1	1	0	1	0	1	0	1	0	0	0.96	-	0	-
ANT	t1	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
ANT	t2	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

The statistical analysis is carried out using two different types of tests:

Logistic regressions, used for dependent variables with binary responses (Y1, Y2, Y3, Y6 and Y7). Values 1 and 0 correspond to the classification of the variables: 1=comparable to monolingual data and 0=not comparable to monolingual data. The logistic regression model describes how the probability of an individual category depends on the values of explanatory (independent) variables. Logistic regressions are implemented with the aim of estimating the probability that 1 will occur.

Multiple regressions are implemented for quantitative values measured in percentages (variables Y4 and Y5), since they allow variation in the prediction.

A set of analyses was run for each dependent variable. Displayed values are significance levels of Wald tests for logistic regressions and T-stats for multiple regressions. The resulting relationships are tabulated in Table 4.6 below. Highlighted figures correspond to values for the predictors (independent variables or X) of each dependent variable (Y):

Table 4.6. Statistical Test Results.

				DEPENDENT VARIABLES						
			ASPECT	Bilingual Competence			Response to Input		Mixing of Codes	
			VARIABLE	MLU	VOCD	Mor-synt	Sp use w/ M	Sp use w/ F	Mix w/ M	Mix w/ F
INDEPENDENT VARIABLES	ASPECT	VARIABLE	INDEX	Y1	Y2	Y3	Y4	Y5	Y6	Y7
	Parental Competence	M's comp	X1	389	862	866	013	747	792	858
		F's comp	X2	061	346	142	163	000	016	833
	Parental Attitudes	M's attitu	X3	389	862	866	013	747	792	858
		F's attitu	X4	061	346	142	163	000	016	833
	Lang. Exposure Patterns	M's expo	X5	389	862	866	013	747	792	858
		F's expo	X6	061	346	142	163	000	016	833
	Time U. Parental Supervision	M's time	X7							
		F's time	X8	871	871	866	024	038	114	.898
	Spanish Exposure Outside		X9	894	894	890	582	607	205	884
	Parental Input in Conversation	M's input	X10	089	100	122	000	305	384	996
		F's input	X11	.092	609	225	466	001	027	334

4.3. Interpretation of results

Variables displaying no variation across subjects, i.e., independent variables X12 (mother's response to child mixing) and X13 (father's response to child mixing), were irrelevant in the statistical test. Since variable X7 (time children spend under maternal supervision) remains constant across subjects, the statistical analysis disregards it.

In short, the most effective predictors of these children's *competence* in Spanish are the amount of input received from the mothers, as (and if) the primary sources of exposure to the minority language, together with the Spanish background conditions

contributed by the fathers. The fact that the mother commands and uses Spanish in the home with the child is a necessary but not a sufficient condition for the child to speak Spanish as well, or to be competent in that language. Lexical items may be learned based on the mother's Spanish input alone, but in order to develop morphosyntactic complexity, the statistical results indicate a relation between morphosyntax and father, such that the child needs to be exposed to Spanish input from the father as well.

The multiple regression analyses reveal that the amount of Spanish input coming from the mother (X10) is the best predictor for children's *use* of Spanish (as appropriate choice of language) with their mothers (Y4). The amount of Spanish that the child uses with the father (Y5) is best predicted by the paternal background (competence, attitudes to child bilingualism and exposure patterns at home). Children used Spanish with their fathers if the parent is a competent speaker of Spanish who speaks this language with the child on a regular basis. Besides, the data show that children avoid using Spanish with parents who only speak English to them.

The more input the subjects received exclusively in Spanish, the less *mixing* by the child is observed. As far as children's code mixing with the father (Y7) is concerned, none of the independent variables emerge as overarching predictors according to the statistical model. The reason for this effect may be the fact that values are included in the statistical analysis regardless of directionality of code mixing. Children whose fathers speak exclusively English or Spanish at home avoided mixing with them. Correspondingly, there is no logical correlation between, for instance, the father's Spanish competence and the amount of mixing the child exhibits in paternal interactions. In the same way, X9 (Spanish exposure outside the home) did not have enough predicting power due to lack of variation across subjects.

The independent variables X2 (father's competence in Spanish), X4 (father's attitudes to child bilingualism), and X6 (father's language of use with the child), exhibit the same value across the analysis producing a correlation between them. It would be possible to combine these variables into one general factor, such as "Father's Background". The same occurs with variables X1 (mother's competence in Spanish), X3 (mother's attitudes to child bilingualism), and X5 (mother's language of use with the child), corresponding to "Mother's Background".

Table 4.7 summarizes the relationships between the dependent variables predicted (competence and appropriate language use) and those independent variables (background circumstances) with predictive power according to the statistical tests.

The independent variables that better predict the dependent ones were evaluated and further tested against data from one subject (an English/Spanish bilingual) from the CHILDES data pool. The resultant inventory of predictors from the statistical analysis was applied to external data and verified.

Table 4.7. Overview of Relationships Among Variables.

FOCUS	ASPECT	SETTING	
Bilingual Competence	MLU	Father's background	Mother's input
		Mother's input	
		Father's input	Father's background
	VOCD	Mother's input	
	Morphosyntactic Development	Mother's input	Father's input
		Father's background	
		Father's input	
Bilingual Use	Language of Response to Input in Conversation	Parental input (Mother's & Father's)	
		Parental background (Mother's & Father's)	
		Father's time with child	
	Amount of Mixing of Child Codes in Convers.	Father's background	
		Father's input	

5. Conclusions

The results tentatively suggest that the most powerful predictors of the dependent variables are the amount of (Spanish) input children receive from their mothers, followed by the fact that the fathers know Spanish and speak it with their children. Both conditions appear to be the strongest factors that influence children's competence and use of the minority language (Spanish) at home in a monolingual community. In this study, subjects displaying (over time) normative levels of Spanish competence and adequate use received at least 90% of Spanish input from each parent. These facts imply that the minority language in a monolingual community may only be developed within the norm if it is the only language of interaction in the home, while the community language is acquired without noticeable parental input.

The four testable hypotheses formulated above are addressed as follows:

1) and 2) suggested that language choice is available to children if they have *normative competence* in both languages. In such a case, children will *respond appropriately* to the input language of their interlocutor(s) and to the context in conversation. Results from the empirical analysis showed that only those children who demonstrated proficiency in both languages replied to their parents appropriately in conversational interactions. Moreover, the degree of linguistic competence along with the appropriateness of code selection in conversation was hypothesized to correlate with *language mixing* (the alternating use of both languages in one stretch of conversation, with respect to the input received). In fact, children with a normative competence and use in both languages (CAR and TIN) complied with parental language selection and mixed codes within average, while children with lower Spanish competence tended to use more English than their bilingual interlocutors.

A correlation between *input conditions* and bilingual competence, as well as input and appropriate language use, was predicted. The amount and quality of exposure to a language was assumed to have a direct influence on the level of competence and the suitability of use for that language. Results show that all subjects, regardless of the patterns of language exposure in their families, are equipped with English knowledge and are capable of using it appropriately in conversation. On the other hand, only those children who received constant Spanish input from both parents exhibited normative competence and appropriate use in Spanish, that is, had a choice of code.

A correlation between input factors and mixing types was predicted to result. The subjects do not appear to alternate languages in English-only conversations because they have sufficient knowledge of this language. Only those children with Spanish competence below the norm exhibit recurring mixing patterns from Spanish into English in Spanish conversations. Overall, children regularly and intensively exposed to the minority language from both parents exhibited lesser mixing (both at utterance and turn levels) than children receiving a smaller amount of Spanish input.

In a nutshell, while children apparently acquire the language of the wider community regardless of the linguistic strategy employed in the family, they develop the minority language (in a non-supportive monolingual society) under normal circumstances and timing in cases when a high amount of input from both parents is received. The parental role proves to be essential (in planned bilingualism), but apparently only for the development of the minority language. This implies that the

success rate in balanced child bilingualism basically relies on the quantity and quality of the input received from the minority language, in this particular case, in the home.

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