BIMODAL BILINGUAL CROSS-LANGUAGE INFLUENCE IN UNEXPECTED DOMAINS*

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1. Issues in Bilingual Language Acquisition

Many studies of bilingual language acquisition have addressed the following questions: How separate are the young bilingual child's languages? Can one language influence the other during development? Why do children – and adults – mix languages within utterances? In this paper, we will bring some new data to bear on these questions from bimodal bilingual language acquisition.

Research addressing the question of cross-language influence maintains that even if the bilingual child's languages are distinct from a very early age, there may still be 'influence' from one language on the other. One well-known proposal regarding the limits of such influence comes from the work of Hulk & Müller (2000: 228). They proposed conditions on where such influence appears, as summarized in (1).

(1) Cross-linguistic influence occurs:
- At the interface between language modules
- Only if language A has a syntactic construction which may seem to allow more than one syntactic analysis and, at the same time, language B contains evidence for one of these two possible analyses

Questions can be raised about cross-linguistic influence in development and the conditions proposed by Hulk & Müller. What is the nature of these proposed conditions on cross-language influence? How do

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two separate grammars interact in such a way that leads to non-target productions? What is the mechanism by which one grammar is influenced by surface strings appearing in a different language?

To pursue these questions, we examine a model which makes explicit connections between the two languages of bilinguals: MacSwan's (2000, 2005) model of code-switching. MacSwan proposes a minimalist model of code-switching, which he argues can be accounted for using only the mechanisms needed to describe monolingual competence; that is, no special mechanisms are needed to account for constraints on where code-switching can and cannot apply. Although MacSwan's proposal applies specifically to code-switching, we apply it also to code-blending, a phenomenon unique to bimodal bilinguals. Additionally, we investigate the potential of this model for explaining cross-language influence observed in bilinguals.

Our research goals are to address questions about the development of bilingualism in a different setting: bilingualism between a sign language and a spoken language, or bimodal bilingualism.

2. Bimodal Bilingualism

With the consideration of sign languages, bilinguals can be divided into two types: unimodal (or monomodal) bilinguals, those with two spoken languages or two sign languages, and bimodal bilinguals, those who use a spoken language and a sign language. It is important to bear in mind that sign languages are not merely representations of spoken languages on the hands, but display distinct grammatical characteristics (see, for example, Sandler & Lillo-Martin 2006 for information on American Sign Language, and Quadros & Karnopp 2004 for information on Brazilian Sign Language).

Recent research has begun to examine the language production of bimodal bilingual adults (e.g. Bishop & Hicks 2008; Emmorey, Borinstein, Thompson & Gollan 2008). Usually, bimodal bilinguals are hearing children of Deaf adults (known as codas), who natively acquire both a sign language and a spoken language. Emmorey et al. asked American bimodal bilinguals to engage in several linguistic tasks with other, known bimodal bilinguals. This situation encouraged the use of both languages in narrative and conversation tasks. Emmorey et al. found that code switching occurred in about 6% of the participants' productions. However, about 36% of the time, the participants produced code blends, uttering one or more signs simultaneously with one or more spoken words.

In Emmorey et al.'s study, code-blending generally involved translation equivalents (~82%), that is, the participant produced a sign roughly equivalent in meaning to the spoken word, as illustrated in (2). Sometimes non-equivalent forms were used (~16%). These non-equivalent cases included situations in which different parts of a proposition were conveyed by the hands and the mouth, and situations in which a sign was produced several seconds before its spoken translation equivalent, and (therefore) occurred simultaneously with a non-equivalent word.

(2) Congruent code-blend (Emmorey et al. 2008: 48)

English:	I	don't think he would really live
ASL:		NOT THINK REALLY LIVE

There have been a few previous studies of the development of bimodal bilingualism among coda children. The code-switching and code-blending of bimodal bilinguals has been examined by Petitto et al. (2001), who studied three children (ages 1 to 4) acquiring Langues des Signes Québécoise (LSQ) and French, and van den Bogaerde & Baker (2005), in their study of three children ages 1-3 acquiring Nederlandse Gebarentaal (NGT) and Dutch. Both of these studies found that bimodal bilingual children produce a small number of code switches (<10% of all mixes) and a much higher proportion of code blends (90%). As with Emmorey et al.'s study of adults, these studies reported that the majority of blends are congruent (>80%). Van den Bogaerde & Baker point out that the children's productions reflect mixing in their input. In addition, they conclude that the children must have considerable competence in their two languages, as code blending generally uses structures that simultaneously conform to the grammar of both languages. In rare cases, mixing becomes incongruent in order to conform to conflicting grammatical requirements of the two languages, as illustrated in (3). In this example, the speech satisfies the French noun-adjective word order, while the sign satisfies the adjective-noun word order of LSQ.

(3) Incongruent code-blend with language-specific syntax (Petitto et al. 2001: 489)

French:	vache	petite	vache	*cow*	*small*	*cow*
LSQ:	PETITE	VACHE	VACHE	*SMALL*	*COW*	*COW*

Data from another pair of sign and spoken languages come from Donati & Branchini (2009, in press), who studied older children (ages 6 to 8) using Italian and Italian Sign Language (LIS). Their study addressed the question of whether word order is a part of syntax, or the byproduct of the linearization process required for articulation at the PF interface. They found that children often produced bimodal utterances with contradictory Italian and LIS word orders, as illustrated in (4) – the situation which Petitto et al reported as rare (17% of all incongruent mixes, which in turn represented only 11% of all mixes). Donati & Branchini proposed that linearization is phonological, forced by the typical availability of a single articulatory channel. Exceptional availability of two channels suspends this linearization requirement, allowing blends of different word orders to take place. In this respect, Donati & Branchini study inadvertently appeal to the same model Cantone & Muller (2005) advocate for unimodal bilinguals: a code-switching model, but with one obvious difference—that to the degree that two articulatory channels are available, a code-blend, and not a code-switch, will occur.

(4) Italian coda Code-Blending

Italian:	Chi	ha	telefonato?
	who	*have.3SG*	*call.PAST*
LIS:	CALL	WHO?	
	'Who called?'		

A study of child ASL/English mixing was conducted by Chen Pichler & Quinn (2008). In this preliminary analysis of mixing by three male U.S. child codas (=kodas) ages 1;10-3;6, two sessions per child were analyzed. Chen Pichler & Quinn found, like previous researchers, that code blends were much more common than code-switches; furthermore, they found a predominance of congruent over incongruent forms.

Thus, examining language development in bimodal bilinguals can help address the issues of language separation and interaction raised here. There is little conflict between the phonologies of the sign and spoken languages, so it is an excellent population on which to test questions of language interaction. Here, we look at the questions of language separation through data on cross-language influence and code mixing.

3. Binational Study of Bimodal Bilingual Language Acquisition

In our project, we examine the development of a sign language and a spoken language in two language pairs: American Sign Language (ASL) and American English (AE), or Brazilian Sign Language (LSB) and

Brazilian Portuguese (BP). By studying the development of bimodal bilingualism across language pairs, we can both increase the number of participants observed and perform cross linguistic comparisons, thereby increasing the generalizability of our results. Of course, due to the time-intensive quality of longitudinal studies like ours, we are limited to a small number of subjects, so our results will require replication.

3.1 Participants

All participants have at least one Deaf parent and relatively equal exposure to both sign and spoken languages. The data analyzed for the current paper are summarized in Table 1.

Table 1. Participants

Name	Languages	AgeRange	Sessions	Utterances
Ben	ASL / AE	2;01-2;03	2	715
Tom	ASL / AE	2;00-4;00	4	592
Igor	LSB / BP	2;01-2;10	4	1035

3.2 Data collection

Data were collected in weekly video-taped naturalistic sessions, alternating between sign target and speech target (by changing interlocutors). However, all interlocutors are bilingual and in some cases they used code-blending with the children. In addition, the children were often filmed in clearly bilingual environments, such as Gallaudet University and the children's homes.

3.3 Transcription and coding

Video sessions were transcribed and coded using ELAN software (http://www.lat-mpi.eu/tools/elan). This program allows annotations to be connected to the digitized video in time-aligned tiers, with each tier representing a different kind of information. Our initial transcript included all signed and spoken utterances produced by the target child or any adults interacting with the child. See Chen Pichler et al. (in press) for a summary of our transcribing practices.

Coding was done on additional tiers appended to the ELAN file subsequent to initial transcription. For the present project we have focused on the children's spoken language; in other work, we examine their sign language (see, for example, Chen Pichler et al. 2009; Quadros et al. to appear). Coding excluded routines, interjections, and complete imitations of the experimenter's immediately previous utterances. Remaining child utterances were coded as unimodal or bimodal. Bimodal utterances were coded for the leading language (the predominant language of the utterance), and whether the spoken and signed utterances were congruent (the spoken and signed words were translation equivalents) or not.

Spoken utterances were further coded as Completely Adult-Like (CAL), Fragment Adult-Like (FAL), or Non Adult-Like (NAL). Those utterances deemed NAL were examined in more detail to determine whether their deviance was due to potentially sign-influenced word order or other non-target devices (generally, these were missing/null elements).

3.4 Results

Because of the small number of sessions analyzed for this initial study, we note that variability across sessions may be due to age differences, but they may also be due to differences in interlocutors (target language), and other factors. Overall, the general patterns observed provide indications that the children are much like the adults studied by Emmorey et al. (2008), though not in all ways.

First, we present a summary of our characterization of all utterances as unimodal vs. bimodal, and congruent vs. incongruent, in Figure 1.

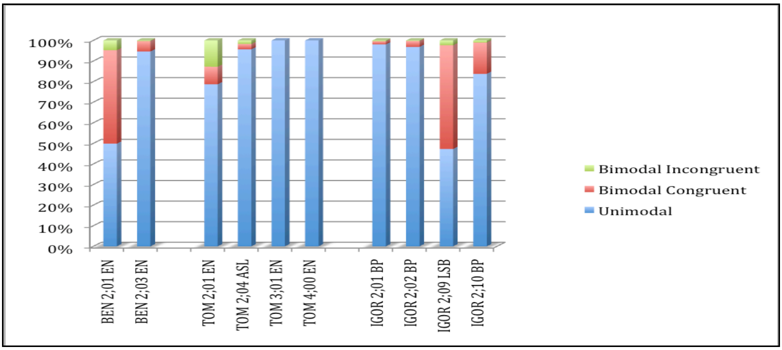

Figure 1. Frequency of bimodal vs. unimodal utterances

Note that Emmorey et al observed an average proportion of 42% bimodal productions in their study of bimodal bilingual adults. The context of their study, interacting with familiar co-bimodal bilinguals, was likely to lead to a relatively high proportion of code blending. Similarly, some of our sessions involved a high degree of blending, although this varies by child and by session.

Next, we present the proportion of adult-like and non adult-like spoken language utterances in Figure 2.

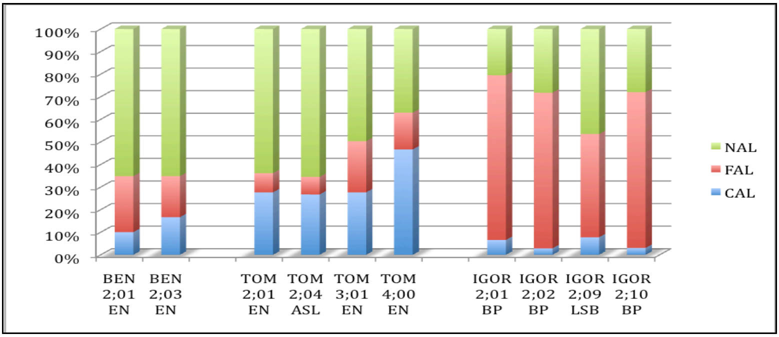

Figure 2. Adult-like and non adult-like spoken language utterances

We see that the number of adult-like utterances (CAL and FAL) generally increases over time.[1]

Finally, we turn to a more in-depth analysis of the non-adult utterances, as depicted in Figure 3.

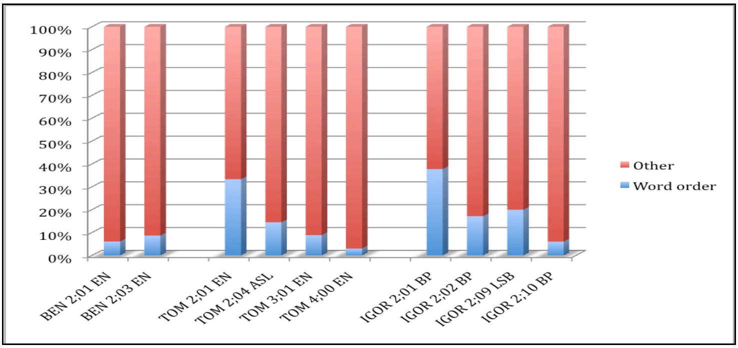

Figure 3. Non-adult spoken language utterance types

The majority of non-adult utterance types contain missing elements (e.g., inflection, determiners, etc.). However, at each session, there are spoken utterances which involve non-target word orders, and these are all

[1] Note that BP permits more frequent use of fragments, particularly those with null arguments, than English does.

word orders sanctioned by the children's sign language. Examples of possible sign language influence on spoken language are given in (5)-(8) below.

(5)	O-V order		
a.	Igor (2;10)	BP:	em casa a vovó taí
		Target BP:	A vovó está em casa?
			Is grandmother at the house?
b.		BP:	Mãe, Laura cabeça bateu
		Target BP:	Mãe, a Laura bateu a cabeça.
			Mom, Laura hit her head.
c.	Ben (2;01)	AE:	chocolate eat
		ASL:	HOT CHOCOLATE IX EAT
(6)	Doubling		
	Ben (2;01)	AE:	sleeping mouse sleeping
(7)	SPC		
	Ben (2;03)	AE:	stuck it
(8)	WH in situ		
	Tom (2;04)	AE:	bug go where

All of these cases involve spoken language sentences which are non-target for the spoken language, but would be perfectly acceptable in the sign language. One, example (5c), involves code-blending, but the others do not. Why do bimodal bilingual children produce utterances such as these?

4. Discussion

We must consider why sign-influenced spoken utterances would occur. Is it because the sign language of blended utterances is leading speech? Although this explanation might hold for example (5c), it does not in general. The sign-influenced utterances appear just as often (or more) in unimodal speech as in code-blending.

Is it because the grammar of the children's spoken language is trying out a non-target hypothesis? This is how we interpret the proposal of Hulk & Müller (2000) regarding cross-language influence: a temporary grammatical setting which permits structures in Language A through the influence of strings in Language B. Aside from some conceptual difficulties with this position, we think it is hard to maintain because the number of examples displaying any particular non-target 'grammar' is quite small. So, then, are these examples just coincidence? To this question, we have a similar response to that of Liceras et al. (2005) on the low frequency of code-mixing examples in their study. Although the number of examples is small, they are systematic and suggestive of a clear trend which calls for an explanation. Here, we propose a hypothesis which we will continue testing in our future work.

Our proposal follows MacSwan's model of code-switching, in that it contains one computational system with separate lexicons, and separate PFs for the different languages (cf. MacSwan 2000, 2005; see Figure 4). Like Liceras et al. (2005), we assume late insertion of lexical items (a la Distributed Morphology). As Emmorey et al. claim, late language selection means code-blends are possible – since there is no articulatory conflict, both PFs can be simultaneously output. Under this model, the choice of a (possibly null) functional element from the 'other' language may lead to 'cross-language influence' effects, just as the choice of lexical elements from one language or the other leads to code-switching.

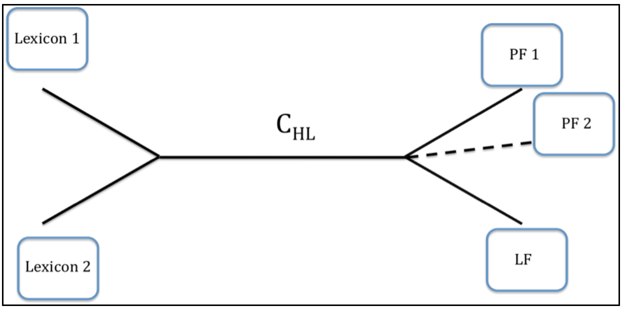

Figure 4. A minimalist model of code-switching, code-blending, and cross-language influence

To see how our proposal works, let us take the example of doubling, as seen in (6) above. Doubling in ASL and LSB can be described as resulting from choosing a functional element with a strong [+focus] feature. Morphological fusion of the focus head with the focused element permits both copies to be pronounced (Nunes & Quadros 2007). If a head with this feature is chosen during a 'spoken language' derivation, the non-target structure will result.

For another example, consider OV order. Both AE and BP spoken languages permit topicalization, but they vary in the contexts of its use. Learning about such contextual requirements does seem to be influenced by the presence of input in a second language (Paradis & Genesee 1996). Since ASL and LSB are 'topic-prominent', the topic feature is licensed in a larger set of environments. Again, if the sign language topic structure feature is chosen during a derivation whose output consists only of spoken words, the non-target sign-influenced OV order will result.

Our hypothesis about cross-language influence remains to be further tested in a number of domains. First, we will continue to analyze the koda data we have collected. Furthermore, this account needs to be tested against other areas of cross-language influence (see, e.g., Tieu 2009). It is especially important to see if the model is sufficiently constrained to correctly explain all the cases where cross-language influence is *not* seen. Along the minimalist lines of MacSwan, and Liceras et al., we would expect such constraints to be no more than the requirements of the two languages themselves.

5. Conclusions

Our revised minimalist model captures both cross-linguistic influence and code-switching/blending. Along with MacSwan, we see no need for appealing to a notion of 'language dominance' or 'third grammar' to explain these phenomena. Instead, there is only one computation, even when more than one language is being produced. What accounts for these two languages being output simultaneously (code-blending) or complementarily (code-switching) is whether more than one phonological system is available. This proposal then contributes to the discussion about one or two systems, since there are both: there is one computational system, with two phonological systems. Our proposal can also explain why the debate is so protracted, as there is evidence for both views. With this model, we can capture both types of data.

The proposal of cross-language influence cannot account for all the data presented here, as there is no surface overlap in some of the non-target examples. Additionally, a separate account for blending would be needed. Our proposal collapses the two phenomena and makes further predictions which we are currently testing.

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