

Language interaction effects in bimodal bilingualism

Argument omission in the languages of hearing ASL-English bilinguals

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The focus of the paper is a phenomenon well documented in both monolingual and bilingual English acquisition: argument omission. Previous studies have shown that bilinguals acquiring a null and a non-null argument language simultaneously tend to exhibit unidirectional cross-language interaction effects — the null argument language remains unaffected but over-suppliance of overt elements in the null argument language is observed. Here subject and object omission in both ASL (null argument) and English (non-null argument) of young ASL-English bilinguals is examined. Results demonstrate that in spontaneous English production, ASL-English bilinguals omit subjects and objects to a higher rate, for longer, and in unexpected environments when compared with English monolinguals and bilinguals; no effect on ASL is observed. Findings also show that the children differentiate between their two languages — rates of argument omission in English are different during ASL vs. English target sessions differ. Implications for the general theory of bilingual effects are offered.

Keywords: argument omission, bimodal bilingualism, cross-linguistic influence

1. Introduction

A new dimension has recently entered the discussion of bilingual experience: *uni-modal* vs. *bimodal* bilingualism. The former refers to an ability to use more than one language in the same modality — i.e. spoken-spoken or signed-signed, as in the classic understanding of bilingualism (e.g. Spanish-English, Japanese-French, American Sign Language (ASL)-French Sign Language (LSF), i.a.). The latter describes the knowledge of two languages in two different modalities — spoken and

signed (e.g. English-ASL, Japanese-LSF, i.a.). On the assumption that sign languages are, in fact, natural languages (Sandler & Lillo-Martin, 2006), examination of language acquisition by bimodal bilinguals has potential to offer a particular contribution to bilingualism research: if, for instance, bimodal bilinguals develop in the manner documented for unimodal bilinguals, then bilingualism effects (whatever they might be) are modality insensitive. However, if bimodal bilinguals behave differently, then a contribution of (cross-)modality must be accounted for. This paper focuses on one instance of bilingualism effects in one type of bimodal bilingual population — young hearing children of Deaf adults (a.k.a. *kodas*)¹ acquiring ASL and English simultaneously.

Linguistic patterns of this population have been examined by various researchers over the past three decades (Todd, 1971; Schiff & Ventry, 1976; Sachs, Bard, & Johnson, 1981; Murphy & Slorach, 1983; Schiff-Myers, 1988; Johnson, Watkins, & Rice, 1992; Seal & Hammet, 1995; Messing, 1999; Marshall, Atkinson, Woll, & Thacker, 2005; Pizer, 2008; Chamberlain & Mayberry, 2008; Kovelman, Baker, & Petitto, 2008; Kovelman et al., 2009; Bishop, 2009; Jarque, 2010). Studies concur that the findings mirror what is known about unimodal bilinguals: children exhibit parallel lexical growth in sign and spoken languages, produce “translation equivalents,” and are sensitive to the language of the interlocutor (cf. Petitto et al., 2001; Petitto & Holowka, 2002; Petitto & Kovelman, 2003; Brackenbury, Ryan, & Messenheimer, 2006); their linguistic patterns are affected by the nature of the input (Capirci, Iverson, Montanari, & Volterra, 2002; van den Bogaerde & Baker, 2005). Also, both spoken and sign languages of this population often exhibit what appears to be incorporation of grammatical properties from the other language, a.k.a. cross-linguistic influence (henceforth CLI). These effects have been recorded for at least five language pairs: ASL-English (cf. Todd, 2008; Lillo-Martin, Koulidobrova, Quadros, & Chen Pichler, 2010), Brazilian Sign Language (Libras)-Brazilian Portuguese (Lillo-Martin et al., 2010; et seq.), Italian Sign Language (LIS)-Italian (Donati & Branchini, 2009), the Sign Language of the Netherlands (NGT)-Dutch (van den Bogaerde & Baker, 2005) and British Sign Language (BSL)-English (Morgan, 2000). The focus of this study is one domain that has drawn much attention in the literature on CLI in child bilingual acquisition — argument omission null- (ASL) and non-null (English) argument languages. The findings of a longitudinal study demonstrate ASL-English bilinguals behave differently from their monolingual and unimodal bilingual comparisons.

1. Following Lillo-Martin, Quadros, Koulidobrova, & Chen Pichler (2009), i.a., I refer to young hearing children of Deaf adults as ‘*kodas*’, vs. adult hearing children of the Deaf — *codas*. Additionally, by convention, signed utterances are recorded in CAPs and English translations in quotes.

2. Previous research: Argument omission in english

2.1 Monolinguals

English forces verbal arguments to be overt, despite the fact that under restricted syntactic, pragmatic, and semantic conditions, argument omission appears possible. For example, at the left edge (Sigurðsson & Maling, 2010; Sigurðsson 2011) and in reference to the 1st-person singular (1SG), subjects may be omitted. In (1), the auxiliary ‘do’ is generally compatible with either 1SG or any 1st-/2nd-/3rd-person plural (1-/2-/3PLU), and ‘should’ with any person or number. Yet, in (1), only one reading is available — 1SG, and the sentence is grammatical only if the left-most element is omitted.

- (1) a. ___Don’t think we can make it tonight.
 = I don’t think...
 ≠ {We / you / they} don’t think...
 b. ___ Should really go to the gym tomorrow. (adptd. Weir, 2009)
 = I should...
 ≠ {We / you / they / she / he} should...
 c. *Tomorrow ___ should really go to the gym.
 d. *She_{*ij*} said ____{*ij*} will come.
 e. *Where did ___ go.

Objects of transitive verbs, such as *buy*, *read*, and *hear*, can also be omitted; however, these arguments (a.k.a. ‘implicit’) have been argued to be the property of the verbs themselves (Bhatt & Pancheva, 2006; AnderBois, 2011) and not a general principle in the language. For example, while the omitted argument of *buy* refers to a kind, the argument of *read* (2b) has an indefinite reading only, and the argument of *hear* (2c) disallows both.

- (2) a. Let’s go out. Mary is buying ({^{ok}drinks / *the drinks}) today.
 b. She is reading ({^{ok}something / *the news}).
 c. Have you heard ({ *anything / ^{ok}the news / *sounds})?

Overall then, English is not a language that allows productive argument drop. Yet, young English-speaking children omit subjects more than it seems they should. Because of this, the study of argument omission in monolingual English learners has served as a vehicle for a variety of proposals for the general view of early grammar, such as (i) processing difficulties in linguistic performance (Bloom, 1990; Boster, 1997), (ii) metrical effects in child language (e.g. Gerken, 1991), (iii) parameter triggering mechanisms (Borer & Wexler, 1987; Roberts & Holmberg, 2010, i.a.), (iv) the amount of structure initially available to the child and how much of it ‘comes on-line maturationally’ (Borer & Rohrbacher, 2002; Rizzi, 2005;

i.a.); (v) the role of information structure in children's language (Allen, 2000, Guerriero, Cooper, Oshima-Takane, & Kuriyama, 2001; Hughes & Allen, 2008; i.a.), and many others. While the study reported here will not shed light on any of the aforementioned issues, what will become relevant is that among the findings in the monolingual literature are a) the root position effects (Roeper & Weissenborn, 1990; Valian, 1991, i.a.) and b) the dissociation of argument omission rates in the English-type from the Italian-type languages (Lillo-Martin, 1991; Valian, 1991). Although the results (as well as methodologies) of studies cited above vary, it is by now well documented that in spontaneous production, monolingual English children exit the stage in which they incorrectly omit arguments (primarily subjects) by the age of 3 and $MLU_w > 3$, more or less concurrently with having demonstrated the knowledge of morpho-syntax, as evidenced by knowledge of C-domain related processes (see Hyams, 2011 for a detailed historical overview of the inquiry). While they often omit required subjects (~50%) and objects (~5%) when younger, at this stage of development the rate of subject omission tends to hover well below 10%; the rate of object omission is typically recorded to be below 1% and non-existent after the age of 3. Crucially, at any age, while potentially missing at the left edge (as in (1)) and in non-finite clauses, subjects are never omitted in finite embedded clauses, and null objects are always 3rd person singular. This sharply contrasts with parallel data from languages like Italian (see Serratrice & Sorace, 2003, for an overview) and Chinese (Wang, Lillo-Martin, Best, & Levitt, 1992), where children's rates of argument omission mirror the adult rates from early ages — typically above 50%.

2.2 Bilinguals

Many of the bilingual studies on argument omission (cf. Juan-Garau & Pérez-Vidal, 2000; Serratrice, Sorace, & Paoli, 2004; Pinto, 2006; Hacoheh & Schaeffer, 2007; Schmitz, Patuto, & Müller, 2012; Mishina-Mori, 2007; Blais, Oshima-Takane, Genesee, & Hirakawa, 2010; Huang, 1999; Haznedar, 2010; Zwanziger, Allen, & Genesee, 2005; i.a.) focus on the influential account of CLI in (3), which has been much discussed and which I will not motivate here.

- (3) a. Cross-linguistic influence occurs at the interface between two modules of grammar, and more particularly at the interface between pragmatics and syntax in the so-called C-domain [...].
- b. Syntactic cross-linguistic influence occurs 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 [...] (Hulk & Müller, 2000:228–229)

Serratrice, Sorace and Paoli (2004) further elaborate on (3), distinguishing the stages of linguistic behavior pre- (as in (4)) and beyond (as in (5)) establishment of the C-domain — past the time when children may be said to entertain analyses other than based on the syntactic requirements of their language(s).

- (4) [...] When the C-system is not yet in place, [...] (t)he bilingual child would [...] omit more subjects in English than his MLU_w -matched monolingual peers whenever a discourse strategy could rescue the licensing of the null subject. [...] These null subjects in English would only appear in the specifier of the root.
- (5) By this stage children are past the phase in which they omit obligatory arguments by relying on discourse licensing [...] and comply with the language-specific syntactic requirements of their language. [...] CLI will go unidirectionally from the language with fewer pragmatic constraints in the distribution of overt pronominal subjects (English), to the language where the appearance of pronominal subjects is regulated by pragmatically complex constraints such as topic and focus. (Serratrice et al., 2004: 201)

Serratrice et al. (2004) examine the rates of argument omission in the languages of a balanced Italian-English bilingual named Carlo (age 1;10–4;06) and illustrate that he converges on the target English grammar in terms of subject and object suppliance without delay. They isolate four stages of linguistic development based on the MLU: Stage 1 (MLU_w 1.5–2.0), Stage 2 (MLU_w 2.0–3.0) Stage 3 (MLU_w 3.0–4.0), and Stage 4 ($MLU_w > 4.0$) and show that at the stages of development when monolingual English speakers exhibit mastery of the language's requirement for the (i) overt subject of the clause, and (ii) overt object/complement if one is required in the adult grammar ($MLU_w > 3$, age 3), Carlo behaves similarly: although subjects tend to remain null in his other language, Carlo begins supplying subjects in English correctly even earlier than monolingual English children (Brown, 1973; Suppes, 1974; and Sachs, 1983, respectively).² The rare cases of null arguments in Carlo's English are consistent with the English grammar — his null arguments are not qualitatively different either. And since, Serratrice et al. argue, overt argument suppliance in Italian occurs in shifted topic scenarios (Frascarelli, 2007) — i.e. there is additional pragmatics-related learning to be done on the part of the child — Carlo oversupplies overt arguments in his Italian at the later stages of linguistic development. That is, he exhibits the unidirectional CLI as in (5).

This finding has been replicated in a number of other language combinations. Although varying in methodology, a number of studies have demonstrated no visible effect on the bilingual child's non-null argument (NA) language with respect

2. Notably, the data do not support (4).

to subject omission, irrespective of the *type* of NA (Roberts & Holmberg, 2010) the other language has (see Juan-Garau & Pérez-Vidál, 2000 [Spanish-English]; Serratrice et al., 2004 [Italian-English]; Pinto, 2006 [Italian-Dutch]; Hacoen & Schaeffer, 2007 [French-English, Hebrew-English]; Schmitz et al., 2012 [Italian-German, French-German]; Mishina-Mori, 2007 [Japanese-English]; Blais et al., 2010 [Japanese-French]; Huang, 1999 [Chinese-English]; Haznedar, 2010 [Turkish-English]; Zwanziger et al., 2005 [Inuktitut-English]; i.a.). The reasons for this remain under debate (Serratrice et al., 2004; Sorace, 2011; Tsimpli, 2011; Licerias, Fernández, & de la Fuente, 2012; Pinto, 2013; i.a.), but one thing is clear: unimodal bilingual literature has illustrated that children acquiring a NA and a non-NA language simultaneously show no delay in ‘exiting the NA stage’ in their non-NA language — i.e. they do not show CLI in the domain of argument omission, and whatever the reason, they tend to oversupply arguments in their NA language.

3. Study: ASL-English bilinguals

3.1 Predictions

The language pair under discussion here is ASL-English. Unlike English, and like many Romance and East Asian languages, ASL allows, and often prefers, as indicated by the asterisk on overt pronoun *IX* in (6), nominal arguments to remain silent.

- (6) a. A: Have you seen my candy?
 B: YES, { ___ / IIX } EAT-UP { ___ / *a-IX }
 ‘Yes, (I) ate (it).’ (adptd. Lillo-Martin, 1991)
- b. ARTHUR WORRY { ___ / *a-IX } WILL FALL
 ‘Arthur is worried that (he) will fall.’

Deaf native ASL signing children exhibit this property early: Lillo-Martin (1991), Quadros, Lillo-Martin, and Mathur (2001) and Quadros and Lillo-Martin (2007) demonstrate that between the ages of 1;08–2;10, Deaf ASL signers omit over 75% of subjects and over 10–70% of objects (depending on the verb-type), although at ages 3;06–5;09, rates of argument omission in monolingual ASL signers are reported to drop significantly (Lillo-Martin, 1991). Adult corpus studies record 35–45% of subject suppliance (Wulf, Dudis, Bayley, & Lucas, 2002); currently, no such data are available with respect to object omission. All theoretical accounts of argument omission cite interplay of morphological agreement and discourse factors (Bahan, Kegl, Lee, MacLaughlin, & Neidle, 2000; Lillo-Martin, 1991; i.a.) with the crucial involvement of the latter (Koulidobrova, 2012). Additionally, ASL

relies on intricate interaction of topicalization and focus-movement (see Sandler & Lillo-Martin, 2006, for an overview). For instance, ASL has been argued to exhibit ‘mini-topicalization’ at each phrase level (Fischer, 1990) and more than one type of focus movement per clause (Nunes & Quadros, 2007).

To the degree that the discourse factors, topicalization, and focus mark involvement of the C-domain, condition (3a.) is satisfied. Considering (1a.-b.), (2) and (6), so is (3b). Three types of predictions arise here based on (3)–(5):

- (7) English of ASL-English bilinguals at early stages of linguistic development may be expected to exhibit effects of CLI in the domain of argument omission; consequently, they may omit more arguments in English than monolinguals. (If this were to be found, an independent explanation would be needed for the unimodal bilingual studies’ consistent failure to deliver this result.)
- (8) At the later stages, the rate of argument omission in the NA-language of ASL-English bilinguals (ASL) will be lower than what is observed in monolingual ASL production. Further, even at later stages of development, some overt arguments in ASL will occur in the environments dispreferred by the ASL adult grammar.

Finally, based on the findings in the previous literature, the contexts in which null arguments might be found are limited:

- (9) At no stage will the null arguments in English be found in syntactic environments disallowing argument omission (i.e. they will only occur in the specifier of the root clause).

3.2 Subjects and methodology

In this study, I examine the languages of two young kudas: TOM and LEX from the BIBIBI project (Lillo-Martin et al., 2009; Chen Pichler, Hochgesang, Lillo-Martin, Quadros, 2010; Quadros, Lillo-Martin, & Chen Pichler, 2014). Both of TOM’s parents and one of LEX’s are Deaf and serve as primary source of ASL input. Input in English is provided by a number of hearing family members as well as the English-based daycare and playgroups which both TOM and LEX began to attend before the age of 5 months. Both children are being raised bilingually.

Children were filmed biweekly either at home, daycare, or a play session at the Gallaudet University, interacting with either Deaf parents or familiar Deaf researchers during ASL sessions and with native English speaking family members or familiar researchers (all with knowledge of ASL) during the English sessions. Sessions range between 35–50 min. Data were transcribed, coded and analyzed

using ELAN (<http://www.lat-mpi.eu/tools/elan/>) following the conventions established by Chen Pichler et al. (2010), many of which parallel those used in CHILDES (MacWhinney, 2004). English MLU_w was calculated based on the guidelines from Brown (1973). ASL MLU_w is not reported for various reasons, one of which is the lack of standard methodology, making it difficult to use it as a predictor (Berk & Lillo-Martin, 2012; Lillo-Martin, Berk, Hopewell-Albert, & Quadros, 2015). Descriptive statistics for each child are recorded in Table 1.

Table 1. Descriptive statistics data for each child

Child	Nu of transcrs	Age range	MLU_w range	N of English utters	N of ASL utters
Tom	19	1;11–4;11	1.2–4.3	5801	532
Lex	9	3;03–5;04	2.91–4	4745	637

Four stages of linguistic development were isolated: Stage 1 (MLU_w 1.5–2.0), Stage 2 (MLU_w 2.0–3.0) Stage 3 (MLU_w 3.0–4.0), and Stage 4 ($MLU_w > 4.0$). All non-linguistic utterances (i.e. vocalizations, *xxx*, *yyy*, and gestures,³ as determined by trained transcribers), repetitions, and direct imitations were excluded. Only utterances containing verbs were subjected to the analysis and were coded according to their compatibility with the adult language in a given context: CAL (consistent with adult grammar) vs. NAL (non-adult grammar). These were further coded as “_ / _”, with the first slot reserved for a number indicating whether the verb required an overt subject (e.g. “1/_” if finite and “0/_” if imperative) and the second slot reserved for a number indicating obligatoriness of an overt complement (e.g. “_ /1” if unambiguously transitive, like ‘*kiss*,’ and “_ /0” if intransitive or allowing the argument to remain ‘implicit’). English allows null arguments in a restricted set of cases; consequently, if an argument was omitted in such an environment, the resulting utterance was considered target-like (CAL). If, however, in a given context an overt subject (e.g. with finite verbs) or object (e.g. with unambiguously transitive verbs requiring an overt complement in adult language) was required, the utterance was coded as non-target (NAL). Independent tiers were created for null subjects and objects; utterances were marked as “1” if the relevant argument was omitted. 10% of total utterances were subjected to a reliability check by an independent trained coder, with 99% agreement attained.

3. A LAB reviewer points out a potential problem: what is usually assumed to be a pointing gesture in English may be a linguistic form in ASL (*IX*, often glossed as a pronoun). This makes one wonder to what extent we can know for sure that at least some of the English utterances with null arguments were not actually accompanied by ASL pronouns. A subset of the data was re-examined (3,000 for TOM and 2,000 for LEX), setting aside English utterances with *IX*. There were no significant differences between the sets with *IX* and without it in terms of argument omission ($p > .05$). More detailed examination is in order, however.

The individual child and mean data were compared (when possible) with the findings for target languages for Carlo (Italian-English bilingual) and Adam, Naomi, Nina, and Sarah (Brown, 1973; Suppes, 1974; and Sachs, 1983, respectively) corpora in CHILDES (MacWhinney, 2004) as reported in Serratrice et al. (2004).

3.3 Part 1: English-target

3.3.1 Results

In this part of the study, English-target sessions were examined. At each stage of linguistic development, the rates of null subjects (NSs) and objects (NOs) in TOM and LEX's English were compared to those of the Carlo and English monolinguals Adam, Sarah, Naomi and Nina (Brown, 1973; Suppes, 1974; and Sachs, 1983). The omitted argument was then coded for the person/number as appropriate from the context (1SG, 1PLU, 2, 3SG, 3PLU). Finally, where possible, data were analyzed for reference shift from the previous linguistic context (e.g. the topic to be maintained is 3SG but the null argument is 1SG). The coding system roughly corresponds to the 'informativeness coding' (Allen, 2000, amended in Serratrice et al., 2004). Results are in Table 2 and Figures 1–2.

Table 2. Descriptive statistics for the English-target sessions, English

Subject	Stage	Nu. of utterances with verbs	Nu. of NS (rate)	Nu. of utterances requiring verbal complement	Nu. of NO (rate)	Total nu. of utterances
TOM	1	42	11 (.26)	28	2 (.07)	239
	2	509	92 (.18)	341	24 (.07)	1426
	3	1102	131 (.12)	892	28 (.03)	2222
	4	504	46 (.09)	430	23 (.05)	1045
LEX	1	–	–	–	–	–
	2	177	49 (.28)	168	17 (.11)	336
	3	1058	123 (.12)	984	71 (.07)	1134
	4	533	33 (.06)	470	8 (.02)	1179

Figures 1–2 illustrate that while TOM and LEX exhibit the well-documented (Valian, 1991) asymmetry between the rates of subject- vs. object-omission, koda English differs from Carlo's and monolingual children's in terms of argument omission at every stage of development. In support of the findings in Serratrice et al. (2004), and *pace* (3)–(4), TOM and LEX omit fewer arguments than monolinguals at the early stages of linguistic development (although still more than Carlo);

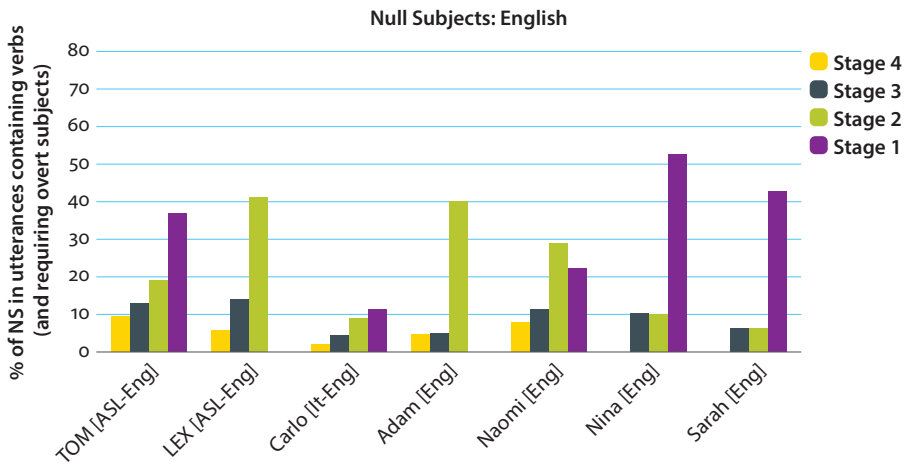


Figure 1. Rates of subject omission in TOM's and LEX's English as compared to Carlo and monolinguals: Adam, Naomi, Nina, and Sarah (from Serratrice et al., 2004)

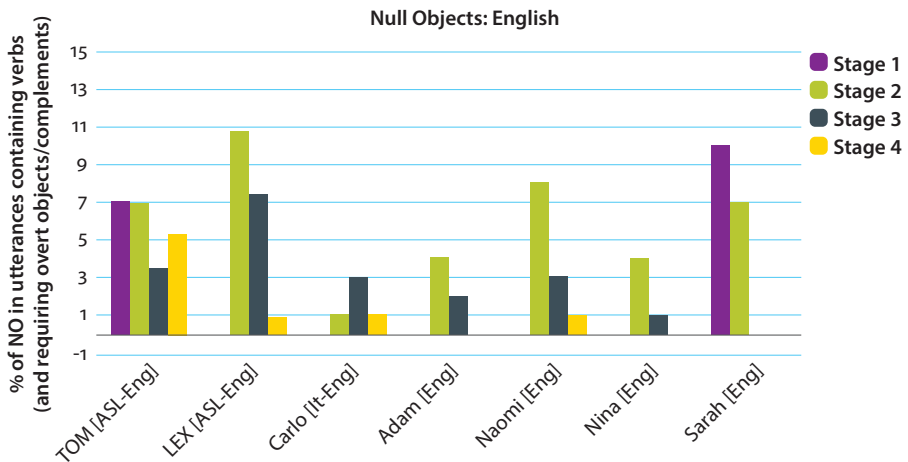


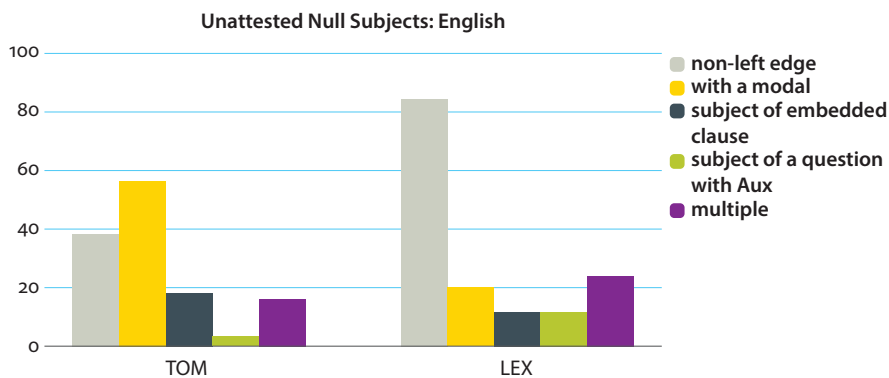
Figure 2. Rates of subject omission in TOM's and LEX's English as compared to Carlo and monolinguals: Adam, Naomi, Nina, and Sarah (from Serratrice et al., 2004)

at Stages 3–4 kodus omit more objects than either English monolinguals or Carlo. This difference is statistically significant: individual children's data, as well as means, were subjected to the Fischer Exact Probability testing, and in cases where the Fisher Exact Test was computationally intractable, the p -value was estimated using a χ^2 Test of Association, with Yates' correction for continuity. The findings are recorded in Table 3; the asterisk indicates a significant difference.

Table 3. Significance of difference between rates of argument omission in koda English compared to Carlo's and monolingual means (from Serratrice et al., 2004)

Subject	Stage	Compared with		Compared with Carlo	
		MEAN _{Adam/Nina/Sarah/Naomi}		Null Subjects	Null Object
		Null Subject	Null Object		
TOM	1	$p = .0321^*$	$p = .636$	$p = .242$	$p = 1$
	2	$p = .0006^*$	$p = .238$	$p < .0001^*$	$p = .002^*$
	3	$p = .0002^*$	$p = .024^*$	$p < .0001^*$	$p = 1$
	4	$p = .0004^*$	$p < .0001^*$	$p < .0001^*$	$p = .021^*$
LEX	1	–	–	–	–
	2	$p < .0001^*$	$p = .015^*$	$p < .0001^*$	$p = .0008^*$
	3	$p = .0006^*$	$p < .0001^*$	$p < .0001^*$	$p = .248$
	4	$p = .102$	$p = .108$	$p = .0006^*$	$p = .763$

Additionally, unlike what is predicted by (9), subjects are omitted in a variety of syntactic environments, including the unattested ones. Of particular relevance are omissions not at the left edge, as subjects of subordinated clauses, and with modals. Figure 3 presents the breakdown by type, with a 'multiple' reserved for a combination of two or more types.

**Figure 3.** Atypical environments for subject omission in English, English-target sessions

Such 'oddities' from the point of view of developmental English (both monolingual and unimodal bilingual as reported in the literature, cf. Liceras et al., 2012) comprise 25% of TOM's null subjects and about 18% of LEX's, and occur at every stage of linguistics development.

3.3.2 *Analysis at later stages (Stages 3–4)*

TOM and LEX pattern with neither monolingual English speakers nor Carlo: at Stages 3 and 4, the rate of non-adult subject omission in koda English hovers above 5%, while both monolinguals and Carlo are well below that. Examples of NSs (with context) are provided in (10)–(11) and NOs in (12)–(13).

- (10) a. Inv: Put it in like that and it will be straight.
 CHI: it's not straight like that
 Inv: Trust me
 CHI: ___ build house
- b. Inv: It's a window. You are right.
 CHI: This is gonna be a cool.
 Inv: It is going to be cool. Yeah.
 CHI: Can ___ give me this?
- c. CHI: He is fast (*talking about a car*)
 Inv: &=imit:car
 CHI: ___ have to build this
 CHI: It says ___ have to build a king of the king horsies
- d. CHI: How did ___ tape it?
- (11) LEX:
- a. CHI: Hmmm, it goes right over there.
 CHI: I think the sheep one might work
 CHI: ___ think this one go with this.
- b. CHI: You got to put it down the very last one
 Inv: Awesome
 CHI: We made it into puzzle &=coughs
 CHI: ___ have a very bad[?] cold
 Inv: You have a cold?
- c. CHI: And now I'll stay my mom.
 Inv: That's right.
 CHI: It's gonna pretty soon.
 MOM DAD SOON
 Inv: Pretty soon.
 CHI: Pretty soon ___ clean cleaned up.
- d. CHI: Thomas need to go.
 CHI: Because he need to go chug fast
 FAST
 Inv: mmhm.
 CHI: Because my train is fast.
 CHI: Mister Conductor said ___ won't crashed# he said

- (12) TOM:
- CHI: We have to make ____ backwards.
 - CHI: Can't fix ____.
 - CHI: Needs ____.
 - CHI: I found ____.
- (13) LEX:
- CHI: I got a wrong ____.
 - CHI: No no no, you gotta do ____ inside the car.
 - CHI: Make a big ____.

No verb favored a particular person/number of a missing argument: around 40 different verbs with missing arguments were produced by TOM and LEX each, each of the verbs with a variety of persons/numbers. The vast majority of NO constructions involve verbs that require an overt complement at all times: only 29% of the verbs in TOM's and 16% in LEX's production allow 'implicit arguments' — i.e. occurrences of NO are unmistakable cases of object omission with verbs like *kiss*.

No correlation between target suppliance of arguments and tense/agreement morphology was found ($R = 0.01, p > .08$). Analysis of verb types vs. person/number revealed that subjects were omitted with both transitive and intransitive verbs (Schmitz et al., 2012), in contexts involving reference shift and not, and with a variety of numbers/persons (though primarily with 1SG and 3SG, the latter particularly prevalent in NO constructions). In utterances with omitted subjects, tense/agreement errors were observed in 27% of 3SG contexts in TOM's speech and in 11% in LEX's. Correct suppliance of 3SG morphology occurred primarily with the verb 'be' (as *is*) but also with lexical verbs such as *pull*, *push*, *want*. As the Table 4 shows, argument omission did not appear to be solely driven by maintaining discourse reference either, which implies that the null argument was not (necessarily) bound by the discourse topic (pace Hulk & Müller, 2000; Schmitz et al., 2012; i.a.). Where available, the koda data were compared to the monolingual and unimodal bilingual data from Serratrice et al. (2004); see Table 4.⁴

Table 4. Stages 3–4: Contexts of subject omission, %

Context	TOM	LEX	Carlo	Adam/Naomi/Nina/Sarah
Transitive	77	64	76	78
Discourse shift	63	30	0	0
3rd person	57	43	58	33

4. Here I deviate somewhat from the presentation of the data by Serratrice et al. (2004) while remaining faithful to their data.

To briefly summarize the results: the rates and types of null arguments in koda English (for individual children and as means) differ significantly from those in the English of monolinguals Sarah, Nina, Naomi, and Adam; moreover, in the relevant respects, kodos perform differently from Carlo — an Italian-English bilingual child, serving here as a representative of bilinguals acquiring English and a null argument language simultaneously (Serratrice et al., 2004). TOM and LEX omit more and in different contexts than the comparison groups; thus, hypotheses in (7)–(9) were not supported. On the whole, however, patterns of argument omission in the English of TOM and LEX are fully consistent with the children’s other language — ASL (see (6)).

Note that the data reported here highlight the path towards answering the first question posed in the previous sections: in the domain of argument omission/suppliance, CLI is not unidirectional, since TOM’s and LEX’s English, unlike what has been reported in the literature on simultaneous acquisition of similar language combinations, exhibit a property that, in the absence of other explanations (see sections 1–2), appears to be affected by ASL. A number of questions arise, which warrant further inquiry:

- (14) a. Will similar effects be observed in the NA language, as reported in much of the literature on unimodal bilingualism?
- b. Does argument omission in the English produced by the kodos reveal the actual state of their English — that is, do the rates of argument omission in koda English remain stable across English- vs. ASL-target sessions?
- c. How can the uniqueness of bimodal bilinguals be accommodated under a general theory of language interaction effects in bilingualism?

The follow-up study reported below is an attempt to answer (14a-b) and provides a possible direction for the answer to (14c).

3.4 Part 2 (follow-up): ASL-target

Systematic investigation of argument omission rates of bilinguals acquiring a null argument language concurrently with English has shown that the null argument language becomes affected (see section 2.2). Therefore, we predicted a similar effect on ASL. Additionally, since a number of works have shown that bimodal bilingual children typically use both languages simultaneously (cf. Lillo-Martin et al., 2009; et seq.; Petroj, Guerrero, & Davidson, 2014), English used during the ASL-target sessions was examined independently. The following hypotheses were tested:

- (15) a. The rate of argument omission in the NA-language of ASL-English bilinguals (ASL) will be lower than what is observed in monolingual ASL production; overt arguments will be supplied in the environments dispreferred by ASL adult grammar (see (8)).
- b. If the data in the previous section reveal the state of TOM's and LEX's English, the rates/patterns of argument omission in koda English in ASL-target sessions should be comparable to the rates in the English-target sessions.

3.4.1 Results

The data for Stages 1–2 are currently unavailable and only Stages 3–4 were examined.

Table 5. Descriptive statistics for ASL-target sessions, ASL

Subject	Stage	Nu. of utterances with verbs	Nu. of NS (proportion)	Nu. of utterances requiring verbal complement	Nu. of NO (proportion)	Nu. of linguistic utterances
TOM	3	7	2 (.30)	6	0	200
	4	20	10 (.50)	6	0	110
LEX	3	113	46 (.41)	41	3 (.07)	406
	4	38	15 (.40)	12	1 (.08)	130

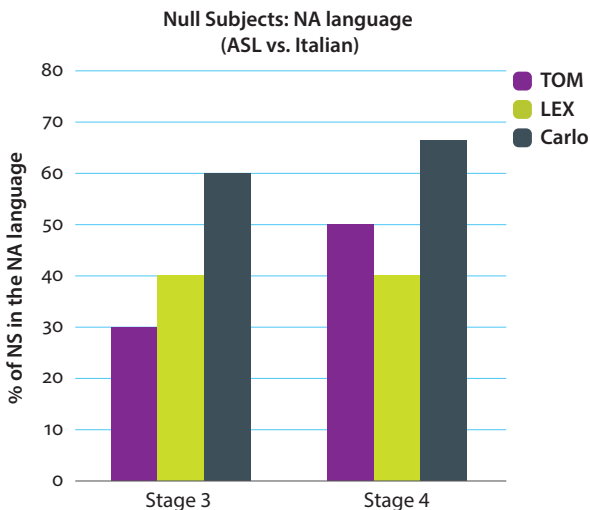


Figure 4. Rates of subject omission in TOM and LEX's ASL vs. Carlo's Italian

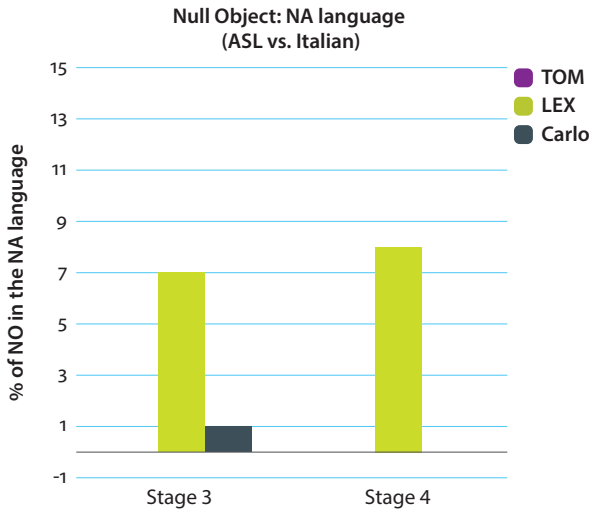


Figure 5. Rates of object omission in TOM and LEX's ASL vs. in Carlo's Italian

Argument omission rates in TOM and LEX's NA language (ASL) were compared to Carlo's NA language (Italian) (where the Fisher Exact Test was computationally intractable, the p -value was estimated using a χ^2 Test of Association with Yates' correction for continuity). Both koda's rates of subject omission differed from those of Carlo's ($p < .0001$); with respect to object omission, LEX differed from Carlo ($p < .0002$). Two ASL consultants found all cases with argument omission acceptable in the adult language. Among the overt arguments supplied by the children, two instances of *I-IX*, typically glossed as the 1SG pronoun, were considered 'redundant' (but not inappropriate) by one adult Deaf consultant.

Sample utterances with omitted arguments are recorded in (16)–(17).

- (16) TOM (two languages simultaneously):
- a. CHI: OUTSIDE ___ GO OUTSIDE NOW
I am going outside now
 - b. CHI: g(no)[+] ___ CLIMB IX(self) NEVER FALL \emptyset CLIMB
I never fall when I climb
- (17) LEX (one language, ASL):
- a. CHI: BECAUSE ___ WANT IX (toy)
'Because (I) want that'
 - b. CHI: IX(self) HAVE ___
'I have (that)'

Table 6 records the rates of subject and object omission in English produced during the ASL-target sessions⁵ and (18)–(19) – examples of utterances with omitted arguments.

Table 6. Descriptive statistics for ASL-target sessions, English

Subject	Stage	Nu. of utterances with verbs	Nu. of NS (proportion)	Nu. of utterances requiring verbal complement	Nu. of NS (proportion)	Nu. of linguistic utterances
TOM	3	91	10 (.12)	84	9 (.11)	345
	4	86	18 (.21)	62	1 (.02)	274
LEX	3	245	25 (.10)	233	4 (.02)	326
	4	74	1 (.01)	58	2 (.03)	303

(18) TOM:

- a. CHI: because ___ want that
- b. CHI: ___ hid the house
- c. CHI: Put them ___

(19) LEX:

- a. CHI: ___ turn and sit just his butt
- b. CHI: ___ think come back here, you tires
- c. CHI: ___ don't know around ___

3.4.2 Analysis

Overall, during Stages 3–4, both kudas omit subjects and objects in their NA language (ASL), although fewer subjects and more objects than Carlo does in his NS language (Italian). At the same time, while kudas' ASL exhibits the subject-object asymmetry noted in the literature (including that on monolingual ASL acquisition), the rates of argument omission do not mirror monolinguals' performance as adults (> 55% of subject omissions in Wulf et al., 2002) or young children (> 70% in Lillo-Martin, 1991). At Stage 4 (age \geq 5), kudas' subject omission hovers around 40% and object omission at 5% – clearly less than in the adult language; however, all cases of argument omission are compatible with adult grammar, and only in two cases of overt argument suppliance (both in reference to self, see (6a)) did native ASL consultants disagree. So, while the answer to the question whether kudas behave like monolingual ASL-signing children at these stages generally must wait until the comparable data from monolinguals are available (but see Reynolds, 2015), TOM and LEX's ASL is target-like with respect to argument omission.

5. Since Serratrice et al. (2004) do not report amount of English uttered during the Italian-target sessions, Carlo's rates of argument omission in English are not recorded here.

These data do not support the hypothesis in (15a). It is clear, however, that TOM and LEX differentiate between their two languages. In both ASL and English, the children omit subjects and objects, but they do so differently depending on the language: the rates of argument omission in ASL are always higher than in English ($p < .0002$). While this is not statistically confirmed for the object omission (which may be due to the ‘floor effect’), it is undoubtedly so for the subject omission: in the same set of sessions, kodas, using both languages, omit subjects on average

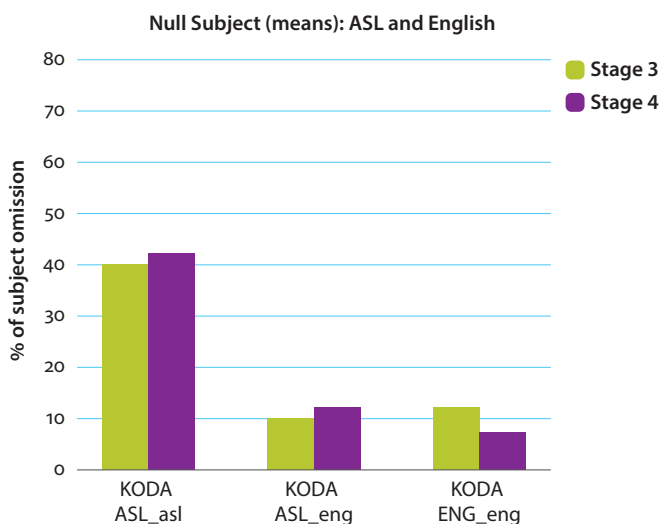


Figure 6. Rates of subject omission in ASL vs. English sessions, Stages 3–4

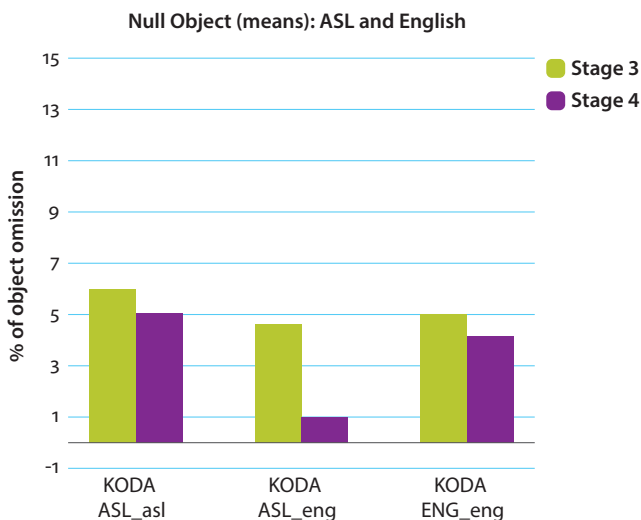


Figure 7. Rates of object omission in ASL vs. English sessions, Stages 3–4

around four times more often in ASL than they do in English. Figures 6–7 show the rates of argument omission at Stages 3–4 per language (where available) per target language session; the target language is capitalized, the language under examination is not.

There was no significant difference between the rates of argument omission between English produced during the ASL vs. English-target sessions ($p > .05$).

4. Discussion

4.1 Overview of the results

The data reported in the previous sections demonstrate the following: at every stage of linguistic development, the English of ASL-English bilinguals TOM and LEX differs from the English of the monolingual (Adam, Sarah, Naomi, and Nina) and unimodal bilingual (Carlo) comparisons. At the early stages (1–2, $MLU_w < 3$), TOM and LEX omit more arguments than monolinguals but fewer than Carlo. At Stages 3 and 4 (the latter capturing the linguistic development of the children over 5 years of age and $MLU_w > 4$), TOM and LEX's rates of argument omission surpass those of both monolinguals and Carlo, whose data are representative of what has been found in the non-null argument language of other bilingual children also acquiring a similar language combination (see section 2). On the other hand, ASL allows arguments to be silent; thus, the most logical next step here is to appeal cross-language interaction effects. However, the formulation of this interaction in Hulk and Müller (2000) (see (3)) or its extension in Serratrice et al. (2004) (see (4)–(5)) will not do. With respect to the latter, no infelicitous overt argument production occurred in the children's ASL. With respect to the former, at every stage, TOM and LEX omit arguments in contexts disallowed in adult and unattested in monolingual and unimodal bilingual child English: the embedded subject position of a finite clause, the subject of a question, and in reference to a non-1st person (see (10)). And although English allows *some* object omission (as in (2)), utterances produced by the children in this study and coded as missing objects (see (11)) are never grammatical in adult, or found in child, English (Snyder, Senghas, & Inman, 2001).

Put differently, the study above demonstrates that the unidirectionality effect in overt argument suppliance observed in many unimodal language pairs does not need to be built into the model of cross-language interaction (as suggested in (5)). And while it seems logical to appeal to the involvement of ASL, the question now is how to capture this involvement, and why this possibility does not arise in unimodal bilingualism. For instance, one cannot simply say that ASL-English

bilinguals mistakenly, though perhaps temporarily, adopt some property of ASL for their English syntax. While TOM and LEX use both languages consistently, irrespective of the pragmatic appropriateness of one vs. the other, they clearly differentiate between the two, omitting arguments to a much higher degree in ASL. At the same time, the children — especially at later ages — appear aware that the English-target discourse necessitates English, while the ASL-target discourse requires ASL: although the numbers did not reach statistical significance, the rates of ASL-like properties of koda English differ based on the target language of the session — more ASL-like English is more appropriate in ASL-target sessions than in the English-target sessions (see also Petroj et al. 2014). In other words, while the languages of kodas appear to be interacting, they remain differentiated. This finding, incidentally, lends independent support to the claim that bilinguals keep certain aspects of their grammars separate. However, it also presents us with another set of puzzles: a) why should any English be used during the ASL session?, and b) why do ASL-English bilinguals stand alone as “victims” of what might be termed ‘a null argument- onto a non-null argument language influence’? I would like to suggest that the answers to both of these questions are rooted in the same phenomenon — an ability to use two languages simultaneously.

4.2 Bimodality

Using converging methodologies, Kroll and colleagues (Kroll, Bobb, & Wodniecka, 2006; see also Costa, Miozzo, & Caramazza, 1999; i.a.) have argued that in the bilingual mind, both languages are always active, and one of them needs to be inhibited for the purposes of production of the other. Arguably, this task demands a certain amount of mental resources; thus, controlled ‘juggling’ of more than one language places a unique cognitive burden on bilinguals. In various works, Sorace (see an overview in Sorace, 2011) has suggested that in this scenario, overt arguments appear. These elements are not ‘grammaticalized’ (Asudeh, 2004); they might be thought of as ‘complexity resumptives’ (Erteschik-Shir, 1992), which, albeit being unnecessary from the point of view of syntax, arise due to processing complexity, as in (20):

- (20) This is the girl that Peter said that John thinks that yesterday his mother had given some cakes to (her). (Erteschik-Shir, 1992)

Crucially, this effect is expected irrespective of (and despite) the language requirements for argument suppliance. The outcome of this view is that what *appears* on the surface to be a case of unidirectional influence from a non-NA language (like English) into a NA language (like Italian or Japanese) may in reality result from some other bilingual effect associated with inhibiting one of the languages. Thus,

even if language-specific interaction resulting in argument omission in the non-NA language were possible, its effects on argument omission/suppliance in production would be obscured by the presence of other (e.g. processing related) factors.

The aforementioned implies that the high rate of overt arguments in Italian of an Italian-English bilingual may not be betraying ‘transfer’ from English. Rather it reflects a *general bilingualism effect* (i.e. a characteristic of a linguistic mind that is unique to bilinguals) and is, then, also predicted to surface in the languages of a bilingual if both of her languages allow NAs, e.g. Spanish-Italian bilinguals. However, it also constitutes a *unimodal bilingualism effect*, since language inhibition due to the availability of only one set of articulators plays a crucial role.

In a number of studies, Emmorey and colleagues have argued that what makes a bimodal bilingual different from a unimodal bilingual is simultaneous access to two modes of conveying a message: bimodal bilinguals may use both oral and gestural systems to produce an utterance in two languages simultaneously, which, in turn, means that neither language *needs* to be inhibited (Emmorey, Borinstein, Thompson, & Gollan, 2008; Emmorey, Luk, Pyers & Bialystok, 2008; i.a.). Such a view suggests that examination of the linguistic patterns of bimodal population allows to hold the *general bilingualism effects* constant: if language users are not required to inhibit (the production of) one of their languages, then the general cognitive resources associated with syntax-pragmatics mappings, arguably involved in anaphora resolution tasks as in (6) and (11d.), are not diminished (Serratrice, Sorace, Filiaci, & Baldo, 2011; Sorace, 2011, et seq.) and language-specific interaction effects will be allowed to surface. Therefore, if the theory of bilingualism effects requires a model of language-specific interactions, independent from the general bilingualism effects related to inhibition, bimodal bilinguals language development is just the place to look.

5. Account and directions

The path just outlined brings us to a surprising revelation: if ASL-English bilinguals in the studies reported here perform differently from unimodal bilinguals due to the lack of forced language choice, then it stands to reason that the field should look to this population for empirical observations regarding bilingual language comprehension/production — in this population, language interaction effects are not masked. The question then is what is behind these effects. At least one influential proposal (Hulk & Müller, 2000 in (3)) did not offer a satisfactory account. Instead, assuming the view that a bilingual linguistic system can be represented via Minimalist-style code-switching à la MacSwan (2000) as in Figure 8 let us see if the effects are derivable in from this model.

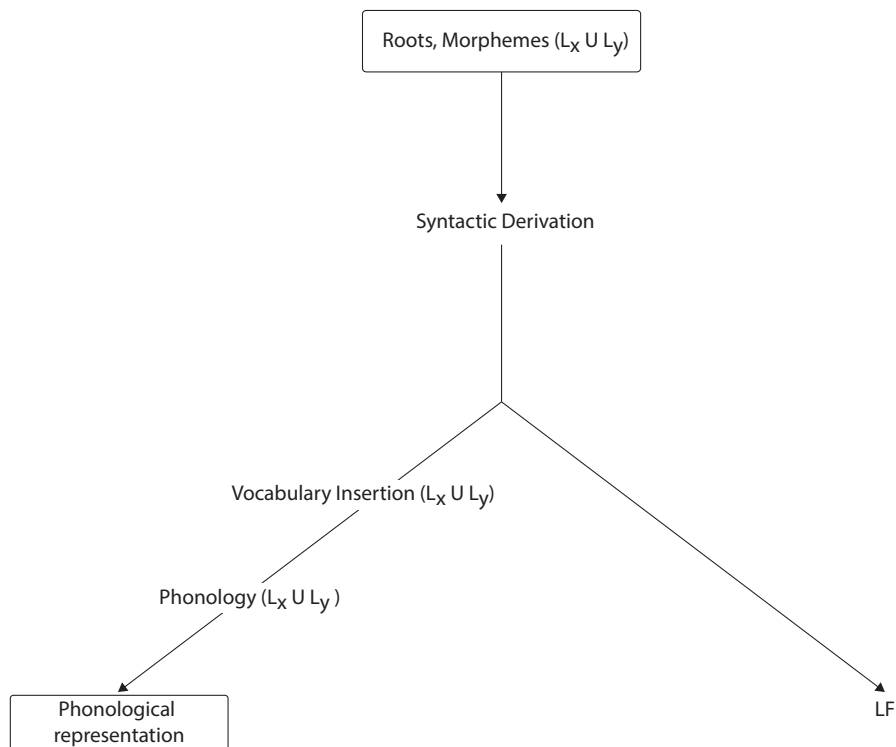


Figure 8. Bilingual architecture: Language synthesis (Lillo-Martin et al., 2009, Koulidobrova, 2012)

The architecture in Figure 8 implies that the linguistic system of a bilingual contains lexical items from both languages (L_X and L_Y). At the point of vocabulary insertion, elements from either language can be inserted, as long as PF requirements are satisfied; otherwise, code-switching is banned precisely because the derivation crashes (see Cantone, 2007 for an account of unimodal code-mixing in child unimodal bilingualism along the same lines). Here is the upshot of such an approach: if argument omission in a language like ASL results from the type of T° and ν° in that language (as in Holmberg, 2005; Saito, 2007; Biberauer, Holmberg, Roberts, & Sheehan, 2010; i.a.), then a derivation becomes possible that would have been ruled out by phonology alone (see González-Vilbazo & López, 2012; i.a., for various other language combinations: German-Spanish, Taiwanese-English, etc.) but isn't, since the phonological rules of L_X and L_Y are not in competition. A potential ASL-English CP of this sort is in Figure 9.

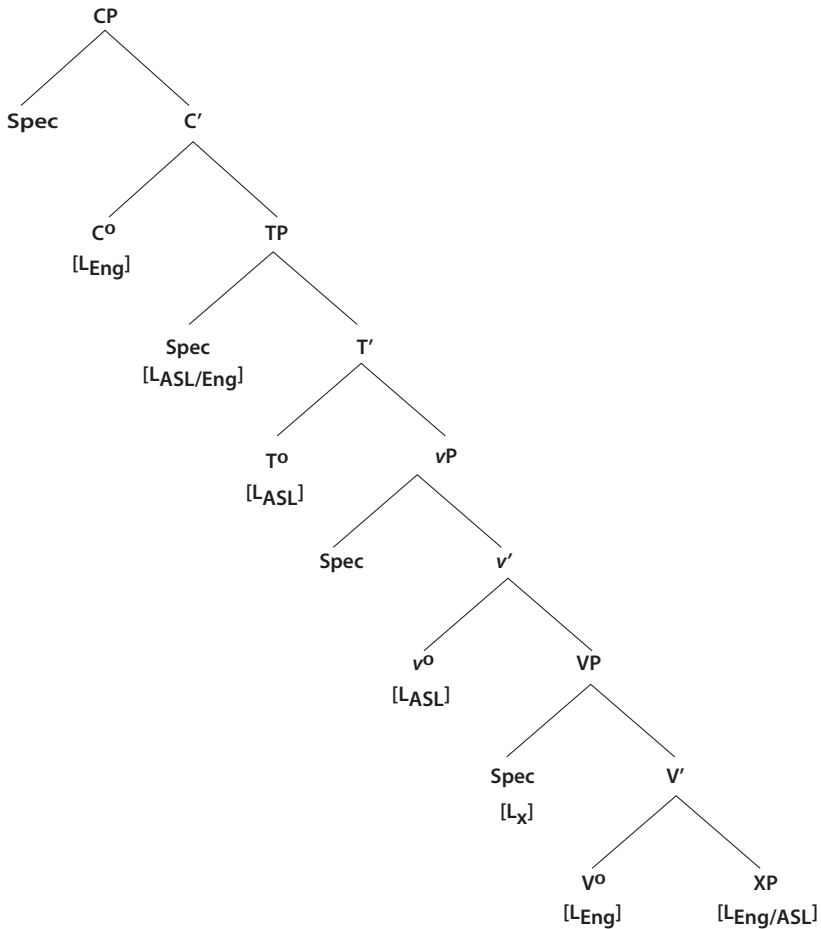


Figure 9. A possible ASL-English CP (Koulidobrova, 2012)

The aforementioned offers an appealing account of language interaction effects that might otherwise be labeled ‘transfer’/‘CLI’: the presence of the ASL T° and v° in the otherwise English clause will result in the possibility of argument omission — i.e. the clause that may appear language uniform may, in fact, contain phonologically null elements (e.g. functional heads) from another language (see Koulidobrova, 2012 for an extensive discussion). Note that the aforementioned is entirely divorced from the knowledge (or lack thereof) of the morpho-syntactic processes in both of the languages of the bilingual or their misanalysis (Müller, 1998), as it is from the rates of code-blending. Instead, what is at stake is accessing the appropriate set of lexical items for the Lexical Array — i.e. as he approaches sentence production/comprehension, what the bilingual child needs to learn is which language to ‘pull from’ (or, rather, which language to leave uninhibited).

Arguably, this constitutes a separate type of learning.⁶ This stance further suggests that in the context where such code-switching is particularly appropriate — such as during an interaction with other bilinguals with the same/similar language combination — the rates of phenomena of this sort will be elevated. Translating this into a general description of bilingual language production: in an environment that naturally lends itself to code-switching, ‘cross-linguistic influence’ will be observable at higher rates.

In other words, the theory of language interaction can be described in terms of a theory of language choice. Adding to this observation the fact that bimodal (e.g. ASL-English) bilinguals are much less practiced in inhibiting one of their languages than their unimodal (e.g. Italian-English) counterparts results in a potential possibility that bimodal bilinguals may exhibit effects of language synthesis to a higher degree, in more domains, and for longer than unimodal bilinguals. This view seems to be supported by study reported here and requires re-examining the data in the previously published bimodal bilingual research (see section 1). Finally, this line of reasoning predicts that a bilingual child acquiring two Sign languages will behave much like unimodal bilinguals (e.g. Carlo) and not like TOM and LEX.

6. Conclusion

This paper examined argument omission in spontaneous production of ASL-English bilinguals: both in ASL and English. The study was chiefly guided by the question whether ASL-English bilinguals would exhibit cross-linguistic effects in argument omission in each of their languages — arguably, the consequence of the influence of their other language. We have seen that ASL-English bilinguals exhibit not only elevated/protracted rates of argument omission in their English typically unobserved in monolinguals or unimodal bilinguals, argument omission occurs in contexts unattested in the literature. It is, of course, conceivable that TOM and LEX are not the norm. The concern then is this: unimodal bilingual literature has strongly suggested that it is all but impossible (cf. Tsimpli, 2011) for children acquiring a similar pair of languages to omit arguments in their non-null argument language. However, TOM and LEX, while being potential outliers, show that such ‘impossibility’ does not extend to bimodal bilinguals. Nor is it the case that the kudas simply ‘voice’ ASL in lieu of English, and that is why their English

6. Den Dikken (2011) argues that functional elements from multiple languages actually compete in the linguistic mind of the bilingual. On this view, the linguistic mind of a bilingual is affected by the knowledge of more than one language in a non-trivial manner: language-synthesis becomes obligatory and interesting predictions arise.

appears starkly different from that has been documented in the literature: the children clearly differentiate between their two languages, since the rates of argument omission in English differ from that in ASL. Further examination of monolingual and unimodal bilingual signers promises to shed further light on how different koda ASL actually is.

Emmorey et al. (2008), Casey and Emmorey (2009), and others have argued that bimodal bilinguals tend to use both languages simultaneously, perhaps simply because they can. Thus, the cognitive demand associated with constant inhibition of one of the languages may be reduced. On the approach to bilingual language production in Sorace (2011, i.a.), a prediction arises that in experimental anaphora resolution tasks, bimodal bilinguals will behave differently from unimodal bilinguals as well (see Koulidobrova, 2013a, for confirmation). We also expect that re-analysis of previously reported data on other similar bimodal language combinations (e.g. BSL-English in Morgan, 2000) will look similar to the findings reported here. Note that if what passes for language interaction effects between the languages of a bilingual results from a forced language choice, then an ability to bypass this choice (at least to some degree) may result in linguistic patterns of bimodal bilingual children being labeled somehow 'atypical.' In reality, these patterns are the typical case of two languages being used to create an utterance; the additional effects of unimodality further constrain this typicality. This line of reasoning points to the direction of approaching the atypical bilingual patterns from the point of view of code-switching (or, as it has been termed in the recent literature, *language synthesis*), and not dominance or cross-linguistic influence. Many more questions remain, however.

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