HERITAGE SIGNERS: BIMODAL BILINGUAL CHILDREN FROM DEAF FAMILIES

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Abstract

Researchers have argued that being a bilingual learner necessarily entails a reduction in input space [1], which may result in exposure to some structures falling below the threshold for optimal acquisition. This pattern is particularly common for heritage language bilinguals who are acquiring a minority home language, with reduced exposure compared to other bilinguals**.** As a result, these heritage speakers display highly variable proficiency in their heritage language [2]. The discussion of heritage language users has focused almost exclusively on spoken language bilinguals, but it may be equally applicable to bimodal bilinguals who are learning a sign language as their heritage home language [3, 4]. Our project tracks the development of American Sign Language (ASL) or Brazilian Sign Language (Libras) by young children growing up in deaf signing families. Because these children can hear, they also simultaneously learn English, the majority spoken language. Here we discuss aspects of their grammatical development, proposing that observed divergences from Deaf child comparisons are most appropriately discussed within a framework of heritage language development.

1. Background: Heritage Speakers

Heritage languages (HLs) are minority languages in a specific socio-cultural context in which there is a different dominant language in the community. Benmamoun et al. (2013, 132) define the term 'heritage speaker' as typically referring to second generation immigrants who live in bilingual contexts. Such children are generally exposed first to their family's home language (their heritage language) and have strong cultural connections with the language (Fishman 2001) that often persist into adulthood. Then in early childhood, these children begin to receive increased input in the majority language of the greater community. Under these circumstances they may experience a switch in their language dominance, especially once they enter formal education, which is typically delivered in the majority language. Due to the language input patterns just described, heritage speakers acquire their heritage language naturalistically and look similar to monolingual native-speaker comparison peers in some aspects of their language, but they diverge in others (Rothman 2009, 156). In some domains, the HL may not be completely acquired because of the dominance shift (Polinsky et al. 2007, 369). In still other cases, it is possible that some feature of the HL had once been acquired, but due to insufficient use and/or the influence of the more dominant language, there is attrition or degradation in the HL (Polinsky 2011). As is typical in most cases of bilingual acquisition, heritage speakers display wide variation in proficiency due to complex interactions of input factors such as parents' language background, contexts of use, attitude towards the heritage language in the local community, etc. Relatively restricted input, compared to that received by non-heritage speakers, may have significant effects on the acquisition and maintenance of heritage languages (see Benmamoun et al. 2013 and Scontras et al. 2015).

Heritage language effects can be noted in different linguistic domains. In this paper, we summarize evidence for HL characteristics in bimodal bilingual children in the domains of phonology, syntax, and discourse. For evidence of HL effects in the lexicon and morphology of bimodal bilingual adults from the US and Brazil, see Quadros et al. (2016, in prep). First, we set the stage by summarizing research on HL effects in these domains for spoken language bilinguals.

Heritage speakers may seem most comparable to monolingual native speaker peers in the domain of phonology. In both production and perception, they significantly outperform second language learners (e.g., Lukyanchenko et al. 2011), for whom phonological abilities pose a notable difficulty. Heritage speakers may also maintain native-like phoneme discrimination (Oh et al. 2003). Nevertheless, in phonological production heritage speakers may differ from monolingual peers (Au et al. 2002, Godson 2004), for example by producing vowels more similar in quality to their second language.

There have been numerous studies of HL effects in syntax, finding a degree of proficiency but some overall simplification patterns such as a reliance on basic word order (Scontras et al. 2015), and some difficulties with more complex structures such as relative clauses (Polinsky 2011) and long-distance dependencies in binding (Kim et al. 2009).

Other syntactic effects are found in relation to the strong tendency for morphology to be affected; for example, case marking (Montrul et al. 2012; Polinsky 1997) and gender (Polinsky 2008).

At the discourse level, many issues are observed for heritage speakers, with some characterizing the syntax-discourse interface as one of the most vulnerable domains (along with morphology) (e.g., Benmamoun et al. 2013). One area in which this vulnerability appears concerns the expression of referents across a discourse, including the use of overt versus null pronominals (Sorace 2004, 2011). Perhaps surprisingly, researchers have observed that speakers use *fewer* null subjects in their HL, across a wide range of languages. Perhaps this is an effect of processing demands of using and interpreting null pronouns. Discourse-pragmatic features are also commonly affected in HL, including aspects of scope interpretation and implicatures (Benmamoun et al. 2013, Scontras et al. 2015).

This overview of HL effects demonstrates that although there is great variation in language development, interaction and use among heritage speakers, researchers have identified a number of characteristic patterns that apply to bilinguals speaking a wide variety of heritage languages. Presumably, these patterns might also apply in contexts where the heritage language is not a spoken language, but a sign language. With this in mind, we introduce our research on sign+speech bilinguals, also known as bimodal bilinguals.

2. Bimodal Bilinguals: Codas and DDCI

Broadly speaking, the term *bimodal bilingual* applies to any individual who uses both a signed language and a spoken[i] language. Most commonly, this term includes hearing individuals who are raised in signing Deaf[ii] families, known as *Codas* (for *Child of Deaf Adults;* or sometimes *Kodas*, for children younger than 12 or 13, although in this paper we will use *Codas* to designate either adults or children), Deaf signers who access a spoken language through a visual form, hearing L2 signers, children (Deaf or hearing) whose hearing parents use a sign language, and Deaf children of Deaf parents who access spoken language through cochlear implants (henceforth abbreviated DDCI). This chapter will focus only on Codas/Kodas and DDCIs, (see Chen Pichler et al. 2015 for an overview of L2 sign language research).

The proportion of signed vs. spoken language input that bimodal bilingual children receive varies according to several factors, such as whether one or both parents are Deaf and whether they have regular contact with other sign language users, such as Deaf siblings or extended family members. The same factors also lead to variation in age of exposure to the majority spoken language; children who have a hearing parent and/or hearing older siblings may be exposed to regular spoken language input from birth, while others (less commonly today than in the past) may have only minimal contact with the spoken language until they enter hearing (pre-)schools. For DDCI children, age of implantation (and activation) as well as unilateral vs. bilateral implantation are also important factors affecting children's language input. Setting aside for the moment variations in language input and corresponding language proficiency, we will assume the following broad definitions of Codas and DDCI:

(1) Codas: Audiologically hearing individuals with at least one Deaf parent and regular exposure to a sign language and a spoken language within the first 6 years of life

(2) DDCI: Deaf individuals with at least one Deaf parent and regular exposure to a sign language and a spoken language (through at least one cochlear implant) within the first 6 years of life.

Demographically, the frequencies with which Codas and DDCI occur across Deaf families differ dramatically. Researchers estimate that between 80-90% of the children born to Deaf, signing families are Codas (Mitchell et al. 2006; Singleton et al. 2000). In contrast, only an estimated 5% of deaf children born in the US are born into Deaf, signing families (Mitchell et al. 2004), and of those children, only a small (but growing) percentage receive cochlear implants (Paludneviciene et al. 2011, Mitchiner 2015). Codas and DDCI also typically differ in age of exposure to spoken language and explicit training in that language. Whereas Codas are born with normal hearing and are thus able to access spoken language from birth, the U.S. FDA has approved cochlear implantation for children as young as 12 months of age, and after the surgery the recipient must wait another two to four weeks for the device to be activated and calibrated before they can begin to access speech. DDCI children also receive intensive and explicit training in speaking and listening as part of the services supporting their cochlear implant, much more than Coda children typically receive (although see Chen Pichler et al. 2014 for a discussion on the frequent misdiagnosis of Codas as language delayed, on the assumption that their Deaf parents do not provide adequate spoken language input for normal development). Due to these differences in early speech input, we consider Codas and DDCI to be potentially distinct sub-populations within the category of bimodal bilinguals. This distinction also reflects the prevalent view in the Deaf community that even DDCI with excellent spoken language development are still fundamentally deaf, while Codas are hearing.

Although there are important differences between the groups, in terms of their bilingual development, Coda and DDCI children often pattern together. In a series of longitudinal and experimental studies conducted as part of our research project, *Development of Bimodal Bilingualism*, we have documented numerous similarities in the spoken language and

sign language development of Coda and DDCI children in the US and Brazil. Both groups emerge as successful spoken language users, by a variety of measures. Davidson et al. (2014) report similarly high scores for American Codas and DDCI on standardized tests of English expressive vocabulary, articulation, phonological awareness, productive syntax and general linguistic development. With respect to sign language development there is more variation across children, among both Codas and DDCI, a point to which we will return below. However, in a test of receptive ASL skills (Enns et al. 2011), most American Codas and DDCI between the ages of 4;0 and 7;0 scored within or above the range reported for native signing Deaf children without cochlear implants (Davidson et al. 2014; Palmer 2015), broadly confirming that like their (unimplanted) Deaf counterparts, both Codas and DDCI are acquiring ASL as an L1. However, detailed analysis of specific aspects of Coda and DDCI sign language development reveals notable divergences from previously reported developmental patterns for native signing Deaf children. We turn to these divergences next, focusing in particular on code-mixing, phonology, word order and referent cohesion. These developmental patterns, along with sociolinguistic and cultural aspects of Coda and DDCI relationships with their native sign language, support the proposal that bimodal bilingual children are heritage signers, comparable in many ways to heritage speakers.

3. Bimodal bilingual children as heritage signers

3.1 Identity, input, and variation

Heritage speakers are characterized by particular linguistic features, as well as unusual patterns of language input, great variation in proficiency in the heritage language, and a strong familial or cultural connection to that language. Compton (2014), arguing that ASL qualifies as a heritage language for many child signers, highlights strong familial ties to ASL as the primary hallmark of heritage signers, whatever their signing competence (p. 275). Similarly, Pizer (2008) notes that many of the adult Codas whom she interviewed feel strong emotional connections to ASL, even if ASL is not necessarily their dominant language, as illustrated by the following quote from one of Pizer's interviewees, reprinted in (3).

(3) "...even though, when I speak English I don't have to think, it's still something that I have to *do.* ASL is just something that I am." (Pizer 2008, 35).

In terms of language input, Coda and DDCI children also resemble heritage speakers in that their heritage language is a minority language used in restricted contexts, mainly centered around their home and Deaf community (e.g. Deaf churches and other social gatherings). With the exception of a small segment of Coda and DDCI children living in areas with large Deaf populations who may enroll for part of their educational careers in daycare programs, preschools or schools established for signing children, where sign language is used as a language of instruction, school-aged bimodal bilingual children spend the vast majority of their waking hours in a spoken language environment. This dramatic imbalance in the levels of input they receive in their sign language and their spoken language is a key factor underlying wide variations in signing proficiency across Coda and DDCI signers, another hallmark of heritage speakers (Benmamoun et al. 2013).

In contrast, native (unimplanted) Deaf signers, especially those attending schools for the Deaf or specialized programs for Deaf students in hearing schools, typically receive more sign language input throughout the day than their Coda and DDCI counterparts. They also socialize regularly with other signing Deaf children; socialization with in-group peers sharing a common ethnic language has been identified as a factor correlating with increased heritage language proficiency (Phinney et al. 2001). Indeed, in studies of L1 sign language acquisition, native-signing Deaf children raised in Deaf families and attending Deaf schools are presented as a homogenous group, acquiring their sign language fully and consistently. In the following subsections, we detail several studies comparing Coda and DDCI sign language patterns with those of native Deaf signers. In several of the studies, the native-signing Deaf participants cluster as a group, while the bimodal bilingual participants display more individual variation. In many cases, the sign language production of the bimodal bilingual children diverges from what has been reported for native-signing Deaf children at comparable ages. Taken together, the results from these studies support the view that the term "heritage language" applies equally well to spoken languages and sign languages.

3.2 Code-blending

As bilinguals, Codas and DDCI are prone to code-mixing, a common occurrence among spoken language bilinguals. However code-mixing among bimodal bilinguals rarely manifests as code-switching, although it is physically possible to switch from signing to speech and back again. Bimodal bilinguals are much more likely to code-blend,

simultaneously producing elements of their sign language and spoken language (Emmorey et al. 2008; Lillo-Martin et al. to appear). Frequent and sustained code-blending, often involving whispering rather than full phonation (Petroj et al. 2013), is regarded by many as a hallmark of bimodal bilingual production, constituting a striking and immediately noticeable contrast with signing by Deaf individuals who access the dominant language of the surrounding hearing community through print rather than speech. Although many Deaf signers also code-blend in certain contexts (e.g. Deaf parents at home with their hearing children), many of them choose not to use speech for personal or cultural reasons. Deaf code-blending has thus received far less attention to date in the literature than bimodal bilingual code-blending.

Combining two languages in a way that respects the distinct grammatical and lexical properties of both languages requires fairly sophisticated bilingual knowledge (Baker et al. 2009). Quadros et al. (in preparation) and Quadros (in preparation) report that balanced adult bimodal bilinguals can use their two languages interchangeably, depending on the context, as the primary or the secondary language. The primary language provides more of the grammatical structures in evidence, although aspects of each language can appear in the same sentence. According to this approach, the derivation of a sentence starts with grammatical features from one or both languages, with lexical and morphological output from either or both simultaneously (Lillo-Martin et al. 2010; Koulidobrova 2012; Lillo-Martin et al. 2012; Lillo-Martin et al. to appear). Bimodal bilinguals can also switch from using one language as the primary language to the other, or they may use both languages as primary languages simultaneously, which requires special skill to select grammatical structures from each language that do not violate the grammar of the other.

Preference for code-blending over code-switching is a robust bimodal bilingual pattern that has been repeatedly documented for Codas, from toddlers (Petitto et al. 2001) to adults (Emmorey et al. 2008), and in a variety of sign languages (e.g. Kanto et al. to appear for Finnish Sign Language, Fung 2011 for Hong Kong Sign Language, Petitto et al. 2001 for Langue des Signes Québecoise). Longitudinal recordings of young bimodal bilinguals collected by our research group in the US and Brazil reveal that the children generally match their language choices to those of their interlocutors, producing more signed utterances when interacting with Deaf interlocutors, and more spoken utterances when interacting with hearing interlocutors (Lillo-Martin et al. 2014; see also Petitto et al. 2001, and Kanto to appear). However, they show differential code-blending patterns, producing the most code-blends when interacting with Deaf interlocutors who can not hear speech. We propose that code-blending in these cases occurs for the benefit of the bimodal bilingual children, perhaps as a mechanism for easing the cognitive costs of suppressing their dominant language (spoken English or Portuguese) while signing (Lillo-Martin et al. 2014; Petroj et al. 2013; Emmorey et al. 2008). Experimental studies show that bimodal bilinguals make faster semantic judgements with code-blends than they do with ASL or English alone, providing additional evidence that code-blending is actually facilitative (Emmorey et al. 2012). While language suppression and switch costs are common among speech bilinguals, the ability to mitigate these costs by producing both of one's languages at the same time is unique to bimodal bilinguals, and underscores the importance of studying this population for a comprehensive understanding of bilingual language development.

3.3 Phonology

Sign language phonological development among Coda and DDCI signers is still a very understudied area. An early study by Kantor (1978) reports that native adult Deaf signers asked to view video samples of anonymous signers and identify them as native Deaf, L2 Deaf, Coda or L2 hearing, had more difficulty identifying Coda signers than native Deaf or hearing L2 signers. Although Kantor's study does not include any systematic comparison of the phonological features of her Coda or native Deaf signers, the relative difficulty of native Deaf ASL users in identifying Coda signers on the basis of their sign production is in line with general assumptions that heritage language users are relatively successful in their phonological development.

More recently, we have compared phonological accuracy of Coda, DDCI and native-signing Deaf children between 4;0 and 8;0 in their reproduction of invented nonce signs consistent with phonological constraints in ASL or Libras (depending on the sign language of the children we test). Children watched short videos of a Deaf adult modeling each pseudosign, then were required to repeat the sign they had just seen. Responses are coded as target-like if they match the target form in handshape, movement, location and palm orientation; errors in one or more of these phonological parameters results in the response being coded as non target-like. Kozak (in preparation) and Kozak et al. (2013) report that Coda and DDCI children performed at lower accuracy that native Deaf controls in pseudosign repetition (Figure 1), although not by much. Parallel testing in Brazil comparing accuracy of pseudosign reproduction across Brazilian Codas, Deaf cochlear implant users (mostly with hearing parents in Brazil) and native Deaf controls reveals similar patterns, with the control group scoring highest, followed closely behind by Coda signers and Deaf cochlear implanted signers (Kozak et al. 2013; Cruz et al. 2014). Across all groups, signs with marked features were reproduced with higher error rates than those with less marked features. Signs involving a combination of a marked handshape and a complex movement (path + internal) were universally the hardest for the children to reproduce in target-like fashion. Analysis is currently underway to

characterize detailed differences in bimodal bilingual vs. native-signing Deaf phonological production and determine whether these differences are statistically significant.

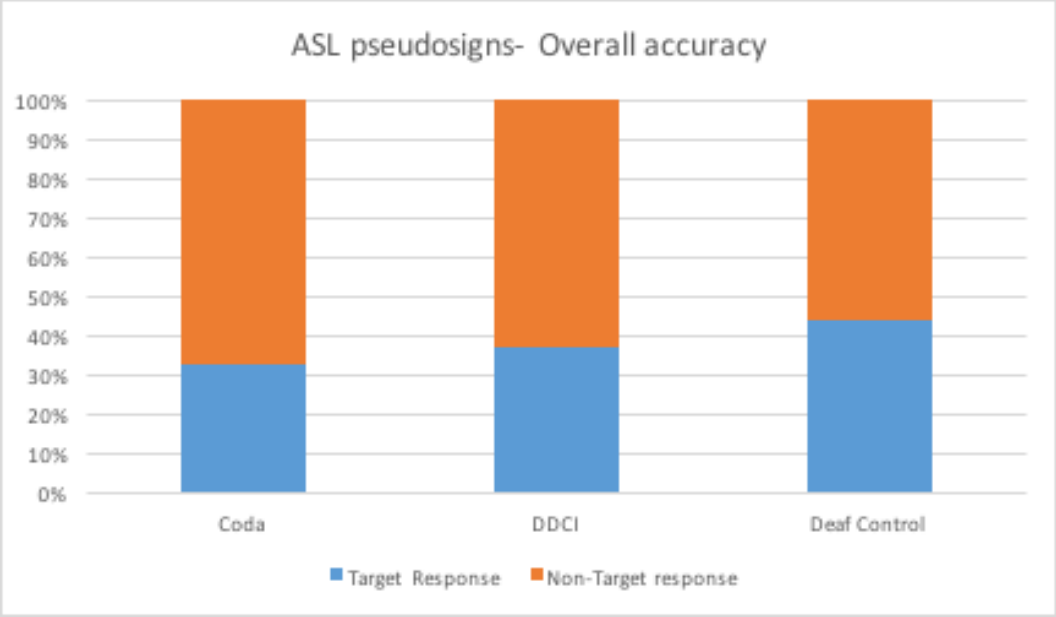

Figure 1: Comparison of overall phonological accuracy of Codas, native Deaf controls, and DDCI for pseudosign repetition

Due to the small percentage difference across all groups, it appears that despite anecdotal differences between Coda and DDCI phonology and that of the native-signing Deaf comparisons, all three groups of children in our study performed similarly, consistent with current characterization of heritage speaker phonology.

3.3 Syntax: Canonical and noncanonical word order

Our analyses to date on syntactic development of Coda and DDCI children focus mostly on word order patterns. Palmer (2015) analyzed the early word orders produced by four bimodal bilingual children (two Codas and two DDCI) during longitudinal spontaneous production. The goal of his study was to determine how frequently each child used canonical versus noncanonical word order and to determine when each child satisfied a *repeated-use* criterion (Stromswold 1996) as a measure of mastery. The results were compared with word order patterns produced by native signing Deaf children, as reported by Chen Picher (2001). ASL is a variable word order language; canonical SVO word order occurs in pragmatically neutral contexts, typically with verbs without complex morphology, but noncanonical orders also frequently occur. Noncanonical VS word order is permissible when the post-verbal subject is a pronoun and most frequently used for emphasis or confirmation (Coulter 1979, Padden 1983). Object-verb (OV) order is permitted with a host of verbs bearing complex morphology (Liddell 1980, Chen Pichler 2001) encoding spatial, aspect, instrumental or handling information, among others. Finally, certain lexical verbs (e.g. WANT and HAVE) seem to permit post-verbal objects as well (Chen Pichler 2001, Lillo-Martin et al. 2003). Noncanonical orders with preverbal objects and postverbal subjects are quite common in adult signing.

Palmer (2015) analyzed all two-word utterances with a verb (including partially and fully bimodal utterances) and at least one overt argument from 34 hours of video recordings spanning the ages of 20 and 40 months for his four bimodal bilingual participants, following criteria for identifying canonical and grammatically acceptable noncanonical word orders from Chen Pichler (2001). For canonical word orders (SV and VO), the bimodal bilingual children met the repeated-use criterion at 23 months, the same age reported by Chen Pichler (2001) for native signing Deaf children. A mixed effects two-way linear regression reveals that over time there is no difference between the production of canonical SV ($\beta = 0.271$; s.e. = 0.440, $t = 0.616$) and canonical VO: ($\beta = -0.272$; s.e. = 0.313, $t = -0.868$) between the two groups. This suggests that similarly to native signing Deaf children, bimodal bilingual children exhibit control and acquisition of canonical word orders and have set their spec-head and head-complement parameters early as expected.

For noncanonical word orders (VS and OV), the native signing Deaf children satisfy the repeated-use criterion at 23 months, confirming Chen Pichler's reports that these children use both canonical and grammatical noncanonical orders from their earliest multi-sign combinations. Noncanonical word orders constitute a large portion of the overall utterances produced by the native signing Deaf children: 54% of the utterances containing a verb and an object appear in OV order, and 37% of the utterances containing a subject and verb appear in VS word order. The bimodal bilinguals, however, display a radically different acquisition pattern for noncanonical word orders. For VS word order, two of the participants never reached criterion while the other two participants only did so at 36 months, more than a year after the Deaf controls. As for OV word order, none of the participants met the repeated-use criterion by 40 months of age. In general, noncanonical word orders represent a very small percentage (less than 1%) of the bimodal bilinguals' total utterances. Linear regression shows that the native signing Deaf children produce significantly more noncanonical OV utterances (β = -6.81; s.e. = 1.35; t = 5.03) and noncanonical VS utterances (β = 5.32; s.e. = 1.35; t = 3.93) than the bimodal bilingual children. This suggests that the bilingual bimodal children are developing quite differently from the deaf controls with respect to noncanonical word order. Figure 2 illustrates this difference graphically. The right panel shows that native Deaf children appear to be developing both canonical (SV and VO) and noncanonical (VS and OV) word orders at a steady rate. Although the development of canonical orders (SV and VO) appears typical for the bimodal bilingualism (left panel of Figure 2), the trend lines representing noncanonical VS and OV utterances for the bimodal bilinguals remain flat, indicating there was not much change during the time period study.

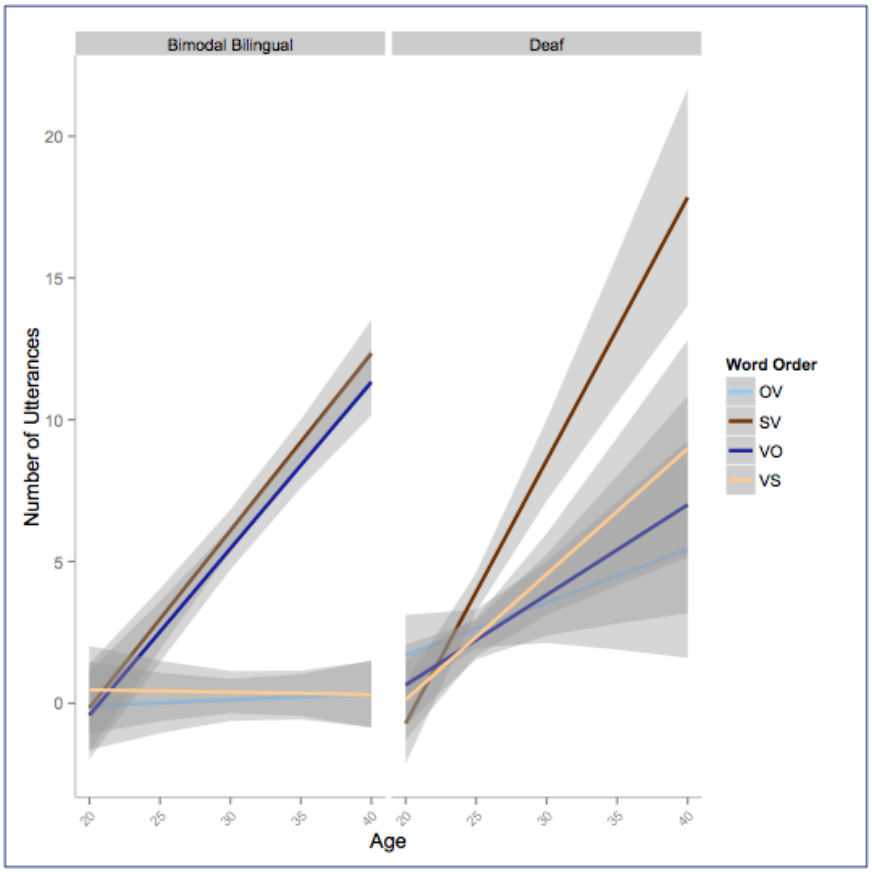

Figure 2: Word Order trend lines for native Deaf (control) and bimodal bilingual (Coda and DDCI) children

Although Palmer (2015) does not explicitly track development of ASL morphology in the signing of his Coda and DDCI participants, he notes a conspicuous absence of the complex morphological forms that license OV word order in ASL and proposes that these bimodal bilinguals diverge in their developmental path from Deaf controls for this aspect of ASL grammar. This proposal is consistent with observations from spoken language research that morphology is a particularly vulnerable feature of heritage grammars.

3.4 Syntax: Wh-questions

Word order for Wh-questions in both ASL and Libras is more variable than in English or Brazilian Portuguese, which both place the Wh-element in sentence-initial position. This word order option is grammatical in ASL and Libras, but those languages additionally allow Wh-elements to appear sentence-finally, or both sentence-initially and sentence-finally. This variation is illustrated for ASL in Table 1. In both American and Brazilian contexts, the possible word orders for Wh-questions in the spoken language are a subset of the possible word orders in the sign language.

English	ASL
What did John buy?	WHAT JOHN BUY?
	JOHN BUY WHAT?
	WHAT JOHN BUY WHAT?

Table 1: Word orders for Wh-questions in English and ASL.

Previous research eliciting Wh-questions from native Deaf signing children (ages 4;0- 6;0) by Lillo-Martin (2000) reported that even the youngest participants produced all three possible ASL word orders, with 5- and 6-year olds producing proportionally more Wh-questions in final and doubled positions than the 4-year olds. In contrast, the same elicitation methodology administered to American Coda and DDCI children reveals a strong preference for sentence-initial Wh-questions, especially for object Wh-questions; Brazilian Coda and cochlear implanted children (including mixed DDCI and DHCI children) behaved similarly to their American counterparts (Lillo-Martin et al. 2012, Quadros et al. 2013), as illustrated in Figure 3 (due to restrictions in space, results for only ASL object Wh-questions are shown here).

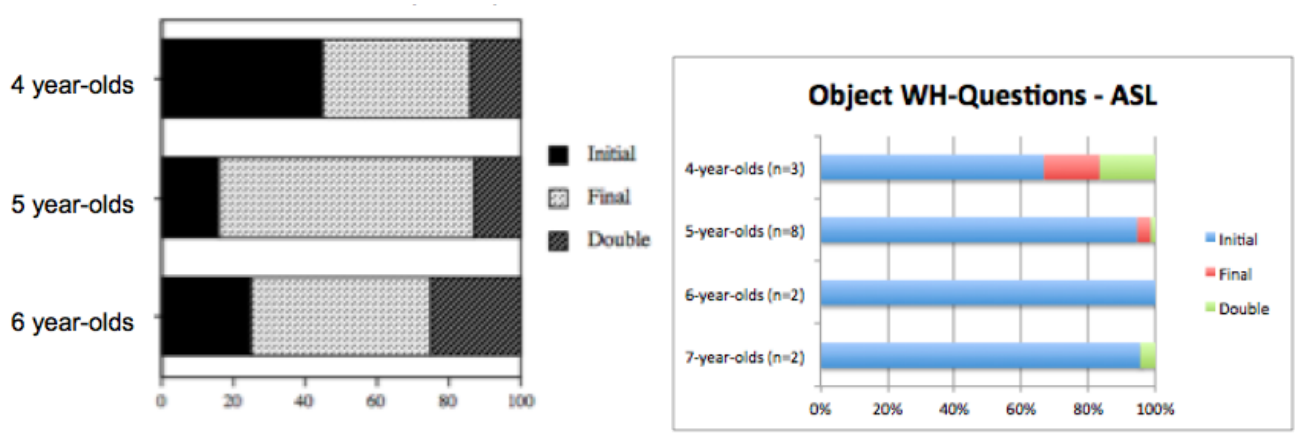

Figure 3: Word orders for object Wh-questions elicited from native Deaf controls (left) and Coda and DDCI children (right) in the US.

For Wh-questions, as was the case for the word order phenomena investigated by Palmer (2015), the preferred word order for bimodal bilingual children's spoken language is a subset of the possible word orders for their signed language. In both cases, Coda and DDCI children seem to follow the basic pattern of selecting structures that will be acceptable in both grammars. The strong tendency for bimodal bilingual children to code-blend, mentioned earlier, may lead to choosing matching syntactic structures in the children's simultaneously activated signed and spoken languages.

3.5 Discourse

Differential developmental patterns at the discourse-pragmatic level have been observed for heritage speakers of null subject languages, as noted earlier. Heritage speakers frequently produce overt forms in contexts where null forms are used by monolinguals (Montrul 2004, Polinsky et al. 2007, Silva-Corvalan 1994), such as in contexts when a previously-mentioned referent is maintained in discourse. This tendency for bilinguals to be "overly overt" surfaces even when both languages allow null subjects, as illustrated by the finding that child Spanish-Italian bilinguals still overproduce overt forms in their non-dominant (presumably heritage) language (Sorace et al. 2009). Some preliminary support for our initial

prediction of over-reliance on overt forms by bimodal bilingual children comes from adult L2 learners of sign language, who demonstrate an over-reliance on overt subjects in their signed narratives (Bel et al. 2014 for L2 Catalan Sign Language signers; Frederiksen et al. 2014 for L2 ASL signers).

Reynolds (in preparation) elicited ASL narratives at two points in time (Time 1 from 5;2-6;9; Time 2 from from 6;8-8;2) for six bimodal bilingual children (three Codas and three DDCI) and compared them to six native-signing Deaf children of roughly similar ages (from 5;5-7;10). ASL allows a variety of null elements, including both *pro* and Chinese-style null topics (Lillo-Martin 1986). Also, sign language narratives frequently involve depicting verbs, sign-specific forms that show actions or events in a highly iconic fashion (Liddell 2003), often in conjunction with null arguments. All the children produced signed narratives displaying some degree of depiction and null arguments, but the five- to eight-year-old bimodal bilinguals used increasingly fewer null arguments between Time 1 and Time 2 for reference maintenance and reintroduction than their age-matched Deaf controls (Figures 4 and 5). Instead of null forms, the bimodal bilingual children used full noun phrases and a variety of reduced nominal forms including pronouns and fingerspelled entities.

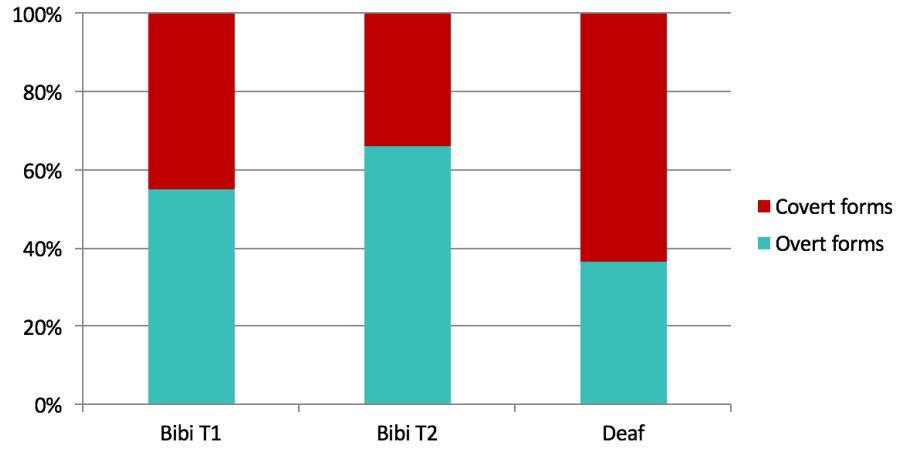

Figure 4: Distribution of narrative referent overt and covert forms in ASL narratives by bimodal bilingual (Bibi) children showing significantly different proportion of overt vs. null forms compared to native-signing Deaf controls (Bibi T1 vs. Deaf, overt vs. null, χ^2 8.999, p<.003; Bibi T2 vs. Deaf overt vs. null, χ^2 22.650, p<.000)

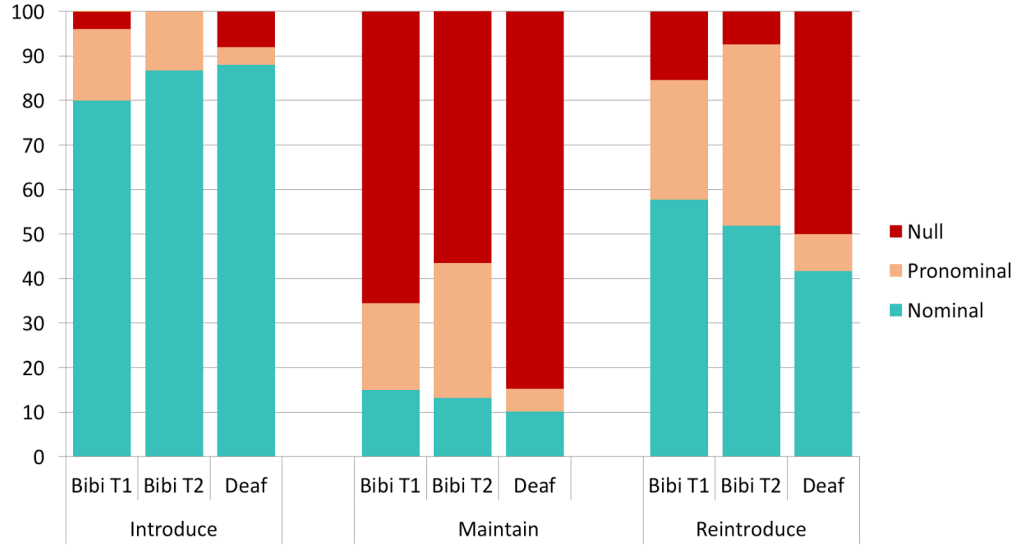

Figure 5: Distribution of referent forms by function in ASL narratives by bimodal bilingual (Bibi) children at Time 1 (T1) and Time 2 (T1), compared to native-signing Deaf controls

The Coda and DDCI children studied by Reynolds (in preparation) thus pattern more like heritage speakers than their native-signing Deaf peers in their use of null arguments for reference cohesion in their signed narratives. At the same

time, Coda and DDCI narratives feature innovative and skillful use of depiction and other grammatical devices associated with successful ASL narratives, all of which are reportedly difficult for L2 learners of sign language to master. The spontaneity and ease with which young bimodal bilinguals employ these aspects of ASL grammar in their signed narratives highlights their status as native signers, even if their use of null arguments diverges from expected patterns.

4. Conclusions and implications

The developmental patterns reported for Coda and DDCI signers in the studies discussed above echo general patterns observed for heritage speakers of a variety of languages in minority contexts. Like their native-signing Deaf counterparts, Codas and DDCI receive early exposure to a natural sign language from Deaf parents and develop strong emotional ties to that language. Their receptive skills and phonological production are both quite good, resembling those of native-signing Deaf children. Coda and DDCI also control many other aspects of their sign language grammar with much greater facility than is typically observed for hearing L2 learners. Yet unlike their native-signing Deaf counterparts, Coda and DDCI are typically dominant in their non-sign language and display notable language synthesis effects (transfer) from that language into their sign language. At the syntactic level, we have observed decreased use of word orders that are normally licensed by verbal morphology or discourse factors, both domains that are reported to be difficult for heritage speakers. At the discourse level, Coda and DDCI narratives are characterized by over-reliance on overt forms, mirroring similar patterns in heritage speakers of null argument languages. Taken collectively, the results of the preliminary studies reported here suggest very strongly that the same types of heritage language effects observed for spoken languages exist for sign languages, and that Coda and DDCI children can be viewed as *heritage signers*.

Compton (2014) points out that given the unusual intergenerational language transmission patterns for sign languages, "the majority of native signers are not deaf but rather hearing," (276). Accordingly, a comprehensive research program on the grammar and development of sign language must consider data not only from deaf signers, but from Codas (and DDCI) as well. Research on heritage signer development is still in its infancy, but already, discussions about the implications and applications of these studies are occurring throughout the Deaf community. For instance, there is increased interest in the idea of developing ASL courses or sign language interpreter training programs tailored to adult ASL heritage *learners* whose needs and experiences differ from those of typical L2 sign language learners (cf. Williamson 2015, Isakson 2016). Language maintenance is another topic of interest in the Deaf community, as Deaf parents struggle to help their children continue developing their heritage sign language once they become dominant in their spoken language. Researchers are also interested in studying heritage signer populations for new insights on how languages in different modalities develop, attrite and interact; some linguistic phenomena, such as code-blending, are unique to bimodal bilingualism and offer insights that would not be available from the study of spoken language bilingualism.

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[i] The extent to which language development/attainment/processing across these populations is parallel remains to be more fully investigated.

[ii] Following convention, "Deaf" written with a capital D differs from "deaf" in that the former term designates individuals who identify as culturally Deaf and use ASL as their primary mode of communication, while the latter refers to an audiological status. Deaf individuals vary widely in their level of hearing and use of spoken language; what unifies them as a group is their perception of themselves as members of a Deaf community, rejecting a pathological view of deafness associated with disability that needs to be "fixed."