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10 Language Development in ASL–English Bimodal Bilinguals

Deborah Chen Pichler, James Lee and Diane Lillo-Martin

Introduction

Recently, simultaneous bilingualism has enjoyed a surge in public interest, as researchers uncover unsuspected cognitive benefits associated with knowledge of two languages (Bialystock *et al.*, 2009). At the same time, bilingualism continues to be regarded with suspicion by many, as a perturbation of 'normal' language development that leads to 'language handicap' and delays, particularly for school-aged children (Darcy, 1953; Rossell & Baker, 1996). This is particularly true with respect to the simultaneous acquisition of one sign language and one spoken language, which we will refer to as *bimodal bilingualism* (Emmorey *et al.*, 2008). In this chapter, we will focus our discussion on hearing children of deaf parents, also known as *codas* or *kodas* (the latter term used specifically for young coda children). These children have often been diagnosed as language delayed or disordered, due to deviations in their development of spoken English with respect to their monolingual hearing peers. At the same time, there is a widespread view that kodas' ASL development is often weak compared to that of Deaf children. Yet we argue that, as bilinguals, kodas can be expected to display different developmental patterns from those of their typical comparison groups, due to influence from their other language. This is the usual situation for bilinguals, whether children or adults – both languages are mentally active and interactions between the languages are to be expected. Such interactions are more a sign of language skill than language problems (e.g. Poplack, 1980). Deviations from monolingual English norms, then, should not automatically be considered evidence of language disorder. Neither should deviations from

Deaf sign language norms be automatically interpreted as poor sign language skills. In this sense, the koda development patterns discussed in this chapter are typical, in that they do not seem to indicate any language disorder. At the same time, studies of koda development are still few and too new for us to claim that the patterns observed so far are typical of koda populations in general.

This chapter begins with an overview of a research project currently being conducted by co-authors Chen Pichler and Lillo-Martin, investigating koda language development in the US. This project targets specific aspects of phonological, morphological and syntactic development in kodas' spoken English and signed ASL, and investigates divergences from monolingual[1] patterns as possible bilingual effects. The general finding that has emerged so far from our early analyses of koda participants is that they have productive use of both English and ASL, but with some cross-linguistic influence, or language synthesis effects. For the youngest kodas, from two to four years old, these effects tend to be from ASL to English, while the older koda children, who have entered school, display influence from English to ASL. Not surprisingly, a major factor affecting ASL development is the quantity and quality of input that children receive in that language (see the previous chapter for discussion of input effects among Dutch codas). It is not surprising that we should see an increase in cross-linguistic effects from English to ASL once kodas enter school and begin to speak English all day. For Deaf families, this raises the practical concern of whether ASL exposure limited to one's parents is sufficient for kodas to continue developing their ASL grammar beyond early childhood. We make several suggestions for maintenance and continued development of the home language, based on reports from the spoken bilingual literature.

Many of these same suggestions for the maintenance and continued development of ASL were integrated by the second author of this chapter (Lee) into the services provided to kodas by the Hearing and Speech Center (HSC) at Gallaudet University, in response to concerns from Deaf parents that their children's ASL development was stagnating. Charged with the task of assessing the English development of koda clients, but recognizing the insufficiency of using static English tests to evaluate ASL–English bilinguals, the Gallaudet HSC developed dynamic assessment techniques taking into consideration the effects of bimodal bilingualism. These techniques, discussed in more detail below, were designed to provide as comprehensive a picture as possible of a child's developing bilingual competency, with the goal of distinguishing true language *disorder* from language *difference* caused by ASL–English bilingualism. Lee draws on observations from his 20-plus years of interaction with kodas and their parents as a speech pathologist, noting that although kodas vary widely in their English development, they display a number of 'typical differences' in early koda English that indicate important areas to investigate through targeted linguistic research.

Varying Levels of Input for Bilinguals

Speech language pathologists (SLPs) not familiar with Deaf culture and ASL may find the notion of evaluating kodas to be daunting. SLPs in the mainstream often have limited professional experience with bilingualism and even fewer have experience with ASL. A demographic profile of American Speech Language Hearing Association (ASHA) member and non-member Certificate holders who self-identified as bilingual service providers from 1 January through 31 December 2009 revealed that out of 6248 providers, only 5.1% identified themselves as bilingual. This very low percentage of bilingualism among SLPs, combined with their unfamiliarity with ASL and Deaf culture, often leads to the mistaken belief that kodas are inherently input deprived in terms of language, which can lead to unwarranted diagnoses of language disorder. For instance, non-target use of pronoun gender, number and/or case has been anecdotally observed for many koda children. While such errors are also common among monolingual English learners and unimodal bilinguals, they are more likely to be interpreted as signs of disorder for koda children, on the assumption that Deaf parents provide insufficient English input to their children (see Sachs *et al.*, 1981; Schiff & Ventry, 1976, for some early research articles supporting this view). Language professionals may also see ASL as an obstacle to English development, dismissing the importance of a strong early ASL foundation for koda spoken English development. As a result, well-meaning SLPs err on the side of paternalism and automatically assume that kodas are language deprived.

Indeed, characterizing typical development for bilingual children is always challenging, given the wide variation in exposure that children receive in their two languages. This variation is due to many factors, including the context of bilingualism, and the quality and quantity of language input that the child receives. For instance, our research project on koda bilingual development includes children with the varied profiles listed in Table 10.1. These profiles trigger very different concerns for both 'lay professionals,' or language specialists who are unfamiliar with ASL, and the children's Deaf parents.

All of these children are considered ASL–English bilinguals, yet they can display very different developmental patterns. Furthermore, comparisons with 'baseline' early ASL patterns observed for Deaf children exposed primarily to ASL (before entering school) may not be appropriate for children whose ASL input falls below some threshold level, although it is difficult at this time to determine where that threshold lies. With so many factors potentially affecting koda children's language acquisition, we cannot currently define the limits of what is 'normal' for bilingual ASL and English development. This is especially true given the small number of children under investigation. Nevertheless, we feel that it is still useful to report the

Table 10.1 Koda input profiles, expectations and typical reactions from professionals and parents

Koda input profile	*Typical expectations*	*Typical reactions*
Receive substantial ASL exposure from parents and other sources, e.g. at a bilingual ASL–English school with koda and Deaf classmates and teachers; English input from other relatives and friends.	Have strong ASL skills, comparable to that of Deaf children, and may even be ASL-dominant early on; English development may appear somewhat delayed.	• Professionals: concerns that dominant ASL and relatively lower input in English will lead to delays in English development.
Are immersed in English at a hearing daycare or school, but are also part of a larger Deaf community and have regular contact with signing children and adults.	Have strong ASL skills, as well as strong English skills.	• Professionals: less concern about delayed English development than for the group described above.
Use not only ASL, but also a foreign spoken language and/or a foreign sign language at home and in their community.	Have weak skills in both ASL and English.	• Professionals: serious concerns about language delays in English; • Parents: concerns that child's home languages are not developing well.
Immersed in English at a hearing daycare or school, and do not have regular contact with ASL signers other than their parents.	Have strong English skills, but weak ASL skills.	• Professionals: less concern about delayed English; • Parents: concerns that child's ASL is not developing well.

patterns that we are seeing, particularly non-target patterns that are potentially effects of bimodal bilingualism, to demonstrate the range of structures that we note in our data. Since none of the children in our current study has any identified language disorder, this information should be helpful for professionals charged with the task of evaluating koda children for bona fide language disorders.

Throughout, it must be kept in mind that knowledge of two languages does not imply equal control of both. Bilingual adults and children are rarely *balanced bilinguals*; they are more likely to be dominant in one language, and

weaker in the other (Grosjean, 2010). More importantly, bilinguals are not simply two monolinguals in a single body; the grammars of their two languages influence each other, and as such can diverge quite noticeably from that of monolingual speakers of either language (De Houwer, 2009; Grosjean, 2010; Romaine, 1999). With respect to child bilinguals, this divergence can manifest in a number of ways. Some are striking and immediately noticeable. For instance, bilingual children often engage in *code mixing* of their two languages, either *code switching* from one language to the other, or inserting words from one language into the grammatical structures of the other. Bimodal bilinguals also make frequent use of *code blending*,[2] or bimodal production of overlapping sign and speech, a unique type of code mixing not observed in spoken language bilinguals (Emmorey *et al.*, 2008). Other divergences from monolingual development are more subtle. For example, acquisition of specific structures may be protracted for bilingual children compared to their monolingual counterparts, or certain error patterns may persist longer than usual, due to reinforcement from the other language (Hulk & Müller, 2000). Identifying developmental patterns that result specifically from bilingualism is of major interest to acquisition researchers: how does the development of a bilingual child's grammar of a given language diverge from developmental patterns that have been established for monolingual learners of that language? Are there recognizable patterns for bilingual development for particular pairs of languages that could eventually constitute 'baseline' norms specific to bilingual ASL–English acquisition?

Research on the Development of Bimodal Bilingualism

Beyond the clinical applications to be discussed in this chapter, bimodal bilingual research offers insight on a number of interesting research questions regarding bilingualism and language acquisition in general. These questions include (but are by no means limited to) the following:

- What are the typical developmental milestones for bimodal-bilingual development, and how do they compare with those of unimodal bilingual development?
- How is bimodal bilingual acquisition different for hearing children who are born with access to both speech and sign (kodas) and Deaf children who access speech through a cochlear implant?
- Are there 'critical' ages when exposure to a spoken language is more important than at other ages?
- How much exposure to a language does a child need to achieve 'typical' phonological, morphological, syntactic and pragmatic competence? Do these thresholds vary depending on the modality of the target language(s)?

- Do bimodal bilinguals exhibit phonological transfer between their two languages and, if so, do they exhibit less than unimodal bilinguals due to the modality differences of their two phonological systems?
- What unique insights to bilingual development do code blending behaviors offer that cannot be learned from observing unimodal bilingualism?

Our research project focuses on the first two items in the list above, studying ASL–English kodas as part of a larger, binational project comparing bimodal bilingual development by kodas and Deaf children with cochlear implants in the US and Brazil. All of the koda children in this study (currently 30 in the US) are acquiring sign language from signing families where one or both parents are Deaf. The data for the project are collected using a combination of longitudinal and experimental methodologies (Chen Pichler *et al.*, 2010a; Quadros *et al.*, in press). A select few participants are filmed on a weekly-to-biweekly basis in naturalistic play with experimenters and family members, beginning around age 1;06 and continuing for two or more years. This practice has generated a large corpus of naturalistic data that offers us a picture of the overall linguistic development of bimodal bilinguals. We have also assembled a battery of language tests for both signed and spoken language, targeting kodas between 4;0 and 8;0 years. These tests focus on specific aspects of language development, such as early phonology, WH-questions and word order.

Although we have collected a substantial amount of data, particularly from the longitudinal participants, the transcription process is slow and painstaking, so only a subset of our videotaped data is fully transcribed and available to us for analysis. We have, however, made some preliminary findings, which we summarize in the following section.

Preliminary Findings

At the early ages, we find that the children are quite productive in both sign and speech. They distinguish between the languages, although they do sometimes show a preference for the spoken language, even when conversing with their Deaf parents or Deaf researchers whom they know are Deaf (cf. Petitto *et al.*, 2001; Pizer, 2008). We see clear development of lexicon, phonology and syntax in both languages (Chen Pichler *et al.*, 2010b; Lillo-Martin *et al.*, 2010, 2012). As mentioned earlier, we also see several examples of bimodal bilingualism effects, including code blending and language synthesis, or the use of structures from the sign language in their speech. We expand on each of these below. Because the focus of this chapter is koda children, we restrict our discussion to the data from our koda subjects only, and report on our data for Deaf children with cochlear implants only very briefly at the end of this subsection.

Code blending

Overall, in the data we have coded so far, the children use code blending anywhere from a very small portion to 50% of the time during filmed sessions (Quadros *et al.*, 2010; Lillo-Martin *et al.*, 2010). Previous studies of adult codas in the US (Emmorey *et al.*, 2008) and child codas in the Netherlands (van den Bogaerde, this volume) and Canada (Petitto *et al.*, 2001) have all noted the prevalence of code blended utterances in coda production, so this should be considered a common and normal feature of bimodal bilingualism. Van den Bogaerde (2000) reported that overall rates of koda code blending by young (under 3;0) Dutch kodas closely mirror the rates of code blending in the input from their Deaf parents. These rates diverge as the same koda children grow older (between 3;0 and 6;0) and increase their use of code blending, while their Deaf mothers' use of code blending decreases. The use of voiced English by Deaf parents (with or without accompanying signing) with their hearing children has been documented among American families (Mallorey *et al.*, 1993; Pizer, 2008) and is an important factor to consider when studying the use of koda code blending. However, we have anecdotally noted an interesting generational shift in the use of spoken English reported by Deaf parents at the Gallaudet University HSC over the last 20 years. In the early 1990s most families reported that at least one of the Deaf parents used code blending or spoken English with their koda children. In more recent years, parents have explicitly stated that they do not use their voices when signing with their children, so as to maintain a 'purer' form of ASL than would result from mixing with voiced English. It is not clear at this time how widely this perception is shared among Deaf families outside Gallaudet and the greater Washington, DC area.

In terms of koda production, we have not yet carried out any analysis of the factors that trigger specific instances of code blending in our data, but we have observed many varied contexts that are potential factors affecting language choice. These include whether or not the koda's interlocutor is also bimodal bilingual, whether the filming location is a place where code blending frequently occurs (such as Gallaudet University), the type of discourse the child is producing (e.g. narratives frequently lend themselves to depiction and code blending), and even the topic of conversation (e.g. shifting a speech-only discussion to a topic related to the child's Deaf parent may trigger code blending).

The form of code blended utterances also varies, including those in which the complete utterance is expressed in both sign and speech, those which are primarily spoken utterances with some signs included, and those which are primarily signed utterances with some speech included. Finally, code blended utterances vary in the level of phonation of the spoken language. Our use of the term code blending includes utterances in which the spoken language is fully voiced or whispered (Guerrera *et al.*, 2013), but not signed utterances

with mouthed English only (in contrast to van den Bogaerde & Baker (2005), who count signing and mouthing as instances of code blending).

One important observation we have made about the code-blended utterances is that it is always the case that the spoken portion and the signed portion contribute to a single proposition (Quadros *et al.*, 2010). The children do not produce one proposition on the hands while a different proposition is produced vocally, and in this they are like bimodal bilingual adults (Emmorey *et al.*, 2008). The children's code blends differ from adults in one respect, however. We found numerous cases where the children attempt to produce a sign together with a spoken element, but the timing of their utterances is not coincident. As an example, consider the diagram in Figure 10.1.

The diagram shows a portion of the coding screen using ELAN software (Crasborn & Sloetjes, 2008) developed at the Max Planck Institute for Psycholinguistics in Nijmegen, The Netherlands (http://www.lat-mpi.eu/tools/elan/). The top line is the tier on which the child's ASL utterances are transcribed, while the second line shows the tier on which the child's English utterances are transcribed. Annotations in ELAN reflect the timing and duration of the child's utterances. As the figure demonstrates, the child BEN (age 2;01) produces the spoken word 'snake' before the signed utterance, then again after the signed utterance has started. During this part of the utterance, the speech and sign are not coordinated. BEN then repeats the signed/spoken pair, and this time the coordination is accurate (the sign annotation starts just before the speech annotation, taking into consideration the transition time needed to move the hand into position for the sign; the lexical movement of the sign and the spoken word are completely coordinated). Thus, children seem to still be developing their ability to coordinate the timing of code-blended utterances, but the structure and nature of these utterances appear adult-like.

Language synthesis effects

In addition to code blending, our koda data feature language mixing in the form of language synthesis, or the interaction of the vocabulary and grammatical rules for ASL and English. Although it is widely agreed that bilingual children develop two autonomous grammars from the very beginning of language development (Genessee, 1989), language synthesis effects are widely documented in the production of bilingual children (and adults).

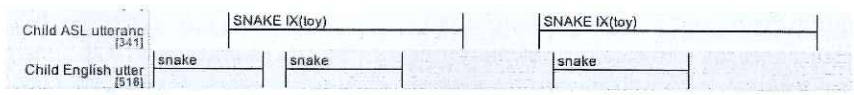

Figure 10.1 Code-blended utterance with timing mismatch

Like other children developing in two languages – and in fact, like adult bimodal bilinguals (Bishop & Hicks, 2005) – bimodal bilingual children sometimes produce utterances which appear to be composed of words from one language, using a grammatical structure from the other. We have found numerous examples of such cross-linguistic influence, including the ones illustrated below (Koulidobrova, 2012; Lillo-Martin *et al.*, 2010). In all of these examples, the English word order is non-standard (a preverbal object in (1); doubled verb in (2); post-verbal subject (Padden, 1988 [1983]) in (3); and WH-question word in final position in (4)), and appears ungrammatical. However, closer examination reveals that these are all word order variations that are permitted in ASL. Such ASL-to-English effects are most common in the longitudinal data from our youngest koda participants, at a time in their lives when they tend to have relatively strong input in ASL compared to English.

(1) O-V order
Ben (2;01) Eng: chocolate eat
ASL: HOT CHOCOLATE IX EAT
'He's eating hot chocolate.'

(2) Doubling
Ben (2;01) Eng: sleeping mouse sleeping
'The mouse is sleeping.'

(3) Subject Pronoun Copy (a subject pronoun appears sentence-finally)
Ben (2;03) Eng: stuck it
'It's stuck.'

(4) WH *in situ* (WH element fails to raise to sentence-initial position)
Tom (2;04) Eng: bug go where
'Where did the bug go?'

Other researchers have also noticed cross-linguistic influence in coda production (e.g. Johnson *et al.*, 1992; Todd, 1971) and we regard it as a normal aspect of bilingual development, parallel to what is documented for unimodal bilingual children (Cantone, 2007). Quinn (2004) argued that English–ASL code mixing in koda production is frequently misinterpreted by SLPs as language deviance according to monolingual English standards, leading to unwarranted diagnoses of language disorder among kodas. In her examination of naturalistic ASL and English production by four koda subjects, Quinn documented recurring patterns of code mixing at all levels (syntax, semantics, morphology, phonology and pragmatics) of her koda subjects' English production, accounting for 27% of their non-target-like English constructions. Her thesis highlighted the most common types of code mixes she observed and pursued the hypothesis that some of these mixing behaviors were potentially attributable to natural mixing in the input (cf. a similar discussion in the previous chapter), rather than linguistic insufficiency or disorder. Overall,

Quinn concluded that most of her subjects' non-target English production was best characterized as bilingual difference, not disorder. Parents, teachers and therapists need to recognize that such structures emerge naturally in bilingual children and are not necessarily signs of language disorder, despite the fact that they may diverge from standard English word order.

Turning now to the older koda participants in our project (ages four to seven), we have noticed two other general patterns. First, the spoken language skills of these older kodas are largely age-equivalent in comparison to monolingual English speakers, based on results from our test battery (Davidson *et al.*, in press). Second, their ASL skills, while still fluent, display noticeable influence from their spoken language. We will address each of these general patterns in turn.

We administered several standard spoken English tests to the participants in our experimental studies, including the Preschool Language Scales (PLS; an overall language measure) and the Goldman–Fristoe Test of Articulation. On these tests, the koda children in our study all scored at or above the age-equivalent level. We also administered a number of tests designed by our research group targeting specific morphosyntactic structures, such as verbal morphology, adjective-noun word order, and WH-questions. On all of these tests, the children produced target-like structures for English (e.g. WH-questions with the WH-word in the initial position, and Adjective + Noun combinations), as well as non-target structures that are also observed in monolingual English-speaking children (e.g. failure to invert the subject and auxiliary verb in 'why' questions; see Quadros *et al.*, 2013; Lillo-Martin *et al.*, 2012, for details.)

Standardized tests for sign languages are far less common than for spoken languages, so most of the tests we used for assessing aspects of koda children's phonology, morphology and syntax were adapted from spoken language tests or created by our research team specifically for our project. The results from these tests indicate that the children's signing is fluent, but on some of the tests their signing is notably influenced by English. For example, although ASL permits WH-elements to appear in initial position or final position or both, the 5–6-year-old kodas in our study overwhelmingly preferred to use sentence-initial WH-questions, the order that is also used in English (Lillo-Martin *et al.*, 2012), as shown in Figure 10.2. This contrasts with results from Deaf signing children on a similar experimental task, for whom sentence-initial WH-structures were only one of a variety of ASL question structures that they produced (Lillo-Martin, 2000), as shown in Figure 10.3.

The contrast between Deaf and koda WH-questions in our experimental data is so striking that the Deaf experimenters administering the test expressed concern that some koda participants were essentially performing the WH-task 'in signed English'. The WH-task is cognitively more demanding than the other tests in our battery, and the experimenters' assessment was that some children were simply unable to perform it in ASL. Alternatively,

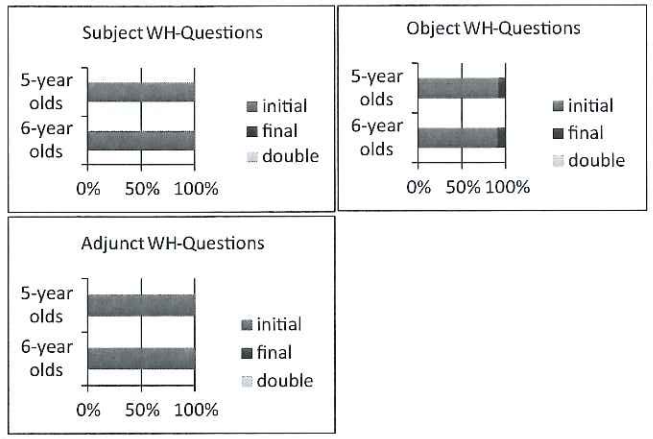

Figure 10.2 American kodas overwhelmingly favor WH-initial order for all types of WH-questions in ASL

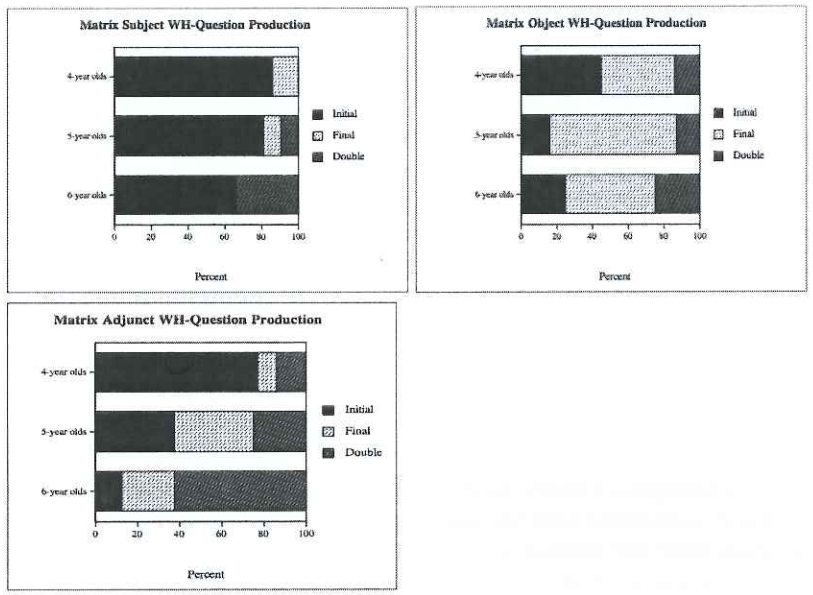

Figure 10.3 Varied order for WH-questions in ASL produced by Deaf 4–6-year-olds
Source: Reproduced with permission from Lillo-Martin (2000)

these children might have been quite capable of varied WH-question forms in ASL, but assumed that language tests are always for English, and therefore the WH-task we gave them must be targeting their English grammar (koda children are not typically tested on their ASL skills). In such a case, signed English could be a compensation strategy, offering a signed response to what

the child assumes is an English task. Either way, from the perspective of language synthesis, signed English can be viewed as one extreme on the bilingual spectrum between ASL and English; simultaneous activation of the structures and vocabularies of both languages offers kodas the option of producing a variety of WH-question forms, including those consisting of ASL signs in an English word order. This explanation is compatible with the fact that several of the kodas in question also participated in our longitudinal studies as toddlers, and we know from our extended observations of them that they developed strong foundations in ASL, employing word order variety beyond what is available in English. Further analysis of our longitudinal and experimental WH-data is necessary to determine which of the above explanations of the WH-test results is correct, but either way, we again note the importance of considering kodas' knowledge of *both* ASL and English when analyzing their language production.

In addition to differences in word order choices, degree of exposure to ASL also appears to affect children's use of morphologically complex 'classifier constructions' and depictive structures in their elicited narratives. Depiction is a common linguistic strategy in ASL and other signed languages used to visually represent or 'show' an action or appearance rather than simply 'telling' it (Dudis, 2007; Liddell, 2003). For example, in Figure 10.4 a Deaf mother creates an ASL narrative about Elmo approaching Cookie Monster and giving him a kiss. Although it is possible in ASL to 'tell' this event through a sequence of lexical signs, parallel to what one would say in English (5), the mother instead depicts the event using 'classifier' handshapes that represent Elmo approaching Cookie Monster (frames a–b) then kissing him (frames c–e). The use of space and facial expressions effectively convey the relative position of the two entities, the size of the kiss and other additional information that is absent in (5).

(5) ELMO KISS COOKIE-MONSTER
'Elmo kissed Cookie Monster.'

Sign languages are particularly rich in depictive structures. They are widely considered hallmarks of skilled signing, so many Deaf parents are concerned when they note the limited use of depiction in their koda children's signing.

Figure 10.4 Depiction in ASL showing one upright figure approaching another and giving it a kiss.

Likewise, shifts in word order of the type described earlier for WH-questions may also be interpreted as an indication that their children's ASL competence is stagnating or even deteriorating as their English proficiency increases. These concerns have led to discussions with parents in our project on the importance of maintaining the home language, with the goal of maximizing their children's bilingualism (see section on Maximalizing Bilingualism below).

Multi-generation Deaf children with cochlear implants

Although the overwhelming majority of children with cochlear implants are born to hearing, non-signing parents, a small number of Deaf parents have opted for cochlear implants for their Deaf children. Cochlear implants are a very sensitive topic in the Deaf community, which traditionally views them as a major threat to its future existence. In our experience, the Deaf families who choose implants for their children do so for various, personal reasons, but they are similar in one important respect: they are culturally Deaf, and are thus committed to signing ASL with their children, in the hope that they will develop as bimodal bilinguals. Multi-generational Deaf children with cochlear implants thus differ from other implanted children by being exposed to a fully accessible natural language (in this case, ASL) from birth and throughout their childhood.

Given the well-documented importance of L1 exposure in the first year of life (see Morford & Mayberry, 2002 for an overview), the early and unfettered access to language that multi-generational Deaf children receive throughout the pre-implantation, activation and adjustment periods is a highly desirable benefit that is rarely available to implanted children. Indeed, recent research on this unusual group has demonstrated the important advantages of early sign language exposure in areas such as sign and speech perception (Giezen, 2011), speech intelligibility and comprehension (Hassanzadeh, 2012) and phonological memory (Quadros *et al.*, 2012). These results stand in stark contrast to the comparatively large body of research reporting negative effects of signing on speech development among cochlear implanted children (e.g. Geers *et al.*, 2002; Kirk *et al.*, 2003; Svirsky *et al.*, 2000). These studies define 'signing' children as those who are enrolled in 'total communication' (TC) school programs and/or use signed supported speech at home with their hearing parents. Such limited use of signs cannot be equated with a full and natural sign language such as ASL. Multi-generation Deaf children are thus a critical group for clarifying the role of early and sustained exposure to a full sign language in the acquisition of speech through a cochlear implant.

At the same time, multi-generation implanted Deaf children are also a logical comparison group for kodas in the study of bimodal development, offering unique insights into the effects of cochlear implantation on simultaneous development of spoken and signed languages. We have therefore included both groups in our research project. We have just recently begun

analysis of the longitudinal and experimental data from our cochlear implanted participants, and so far they appear very similar to their koda counterparts in many respects. Both groups show English development that is within monolingual English norms, according to the results of our test battery (Davidson *et al.*, in press); both make frequent use of code blending, and are proficient in ASL, but with identifiable cross-linguistic influence from English in their word order choices once they reach school age (e.g. predominant use of WH-initial structures in our WH-test, as described earlier), triggering concerns among Deaf parents that their children's ASL development is lagging behind that of English. These are all very general preliminary patterns, of course, and much more analysis of the data is necessary before we can determine the true extent of similarities between bimodal bilingual development for kodas and implanted multi-generational Deaf children.

Maximizing Bilingualism

Parents who wish to raise their children bilingually face two competing demands. On the one hand, they want their children to fully function in the majority, surrounding language. In the case under discussion here, Deaf parents want their hearing children to speak, comprehend, read and write English. Achieving this goal means that the children need to interact with English speakers for a significant length of time. On the other hand, in order to develop and maintain competence in the home language, in our case ASL, sufficient input is also required, including opportunities to interact with a variety of ASL users at an increasingly sophisticated level.

Researchers studying bilingual language development have noted the role of input factors in each language for appropriate development and maintenance. We do not know of any such research specifically addressing these issues for bimodal bilinguals. For this reason, we will summarize some of the major points based on research with unimodal bilinguals, and then offer some speculations and ideas on how that research might translate for bimodal bilinguals.

It has been often been reasoned that, on average, children who are exposed to two languages will experience less input in each language as compared to monolingual children (Paradis & Genessee, 1996). Although this much input must be 'enough' for acquisition – indeed, children in many parts of the world manage to acquire three or more languages, indicating that even less input per language is sufficient for acquisition – there is evidence that the relative amount of exposure in each language is a strong predictor of *rate* of development (Gathercole & Thomas, 2009; Pearson *et al.*, 1997; and many others). Some of these studies find that these effects are greatest in early stages of acquisition, with groups tending to equalize at later ages, at least in areas where there is a high degree of bilingualism (e.g. grade 5; Oller & Eilers, 2002).

Unsworth (2013) reports that a more fine-grained measure of input quantity is a better predictor for certain linguistic characteristics. She estimated *cumulative* language exposure by having parents complete a detailed questionnaire about the language used by various input providers (parents, other adults at home, daycare providers, adults at school, etc.) currently and retrospectively for each year of the child's life. This measure was a significant predictor of the participant's appropriate use of gender in Dutch determiners for simultaneous Dutch/English bilinguals, ages 3–17.

Researchers have also looked further into the input factors affecting bilingual development. Place and Hoff (2011) studied the early development of Spanish and English by children living in southern Florida, a strongly bilingual community. Parents were asked to complete a diary recording the child's language environment for every 30-minute block of the day, over the course of seven days. Parents also reported their children's language development using the MacArthur–Bates Communicative Development Inventory (CDI) in both English and Spanish. The study found that three input properties were positive predictors of the children's English skills: 'the number of conversational partners with whom the child spoke only English, the number of different speakers from whom the child heard English, and percent of the child's English exposure that was provided by native speakers' (Place & Hoff, 2011: 1845).

Gathercole and Thomas's (2009) study arrived at some conclusions that may be particularly applicable for the case of bimodal bilinguals in the US. They examined bilingualism in Welsh and English in stable bilingual areas of Wales, including both children and adults. For Welsh, the minority language, they found a strong relationship to input factors at all stages, for measures including the development of vocabulary, grammatical gender and the identification of grammatical subjects. The strongest effects correlated with the language used in the home (Welsh only, English only, or both Welsh and English). A smaller effect was found for language used in school. In contrast, for English, the dominant language, input factors were relevant to early periods of language development, but differences across groups attenuated by mid-school years.

Given these results, as well as our own observations, we make the following suggestions regarding maximizing bilingualism for families with koda children. First, because of the dominance of English as the primary language of the larger community, koda children are highly likely to develop English fully and to consider themselves dominant in English as adults (Bishop *et al.*, 2006). Second, during development, bilingual children should be compared not with monolingual English speakers but with other bilinguals (Cantone *et al.*, 2008). There may be some areas in which bilingual English development progresses more slowly than for monolinguals, and some types of language mixing or language synthesis may be observed (as noted earlier in the chapter), but the children can be expected to display essentially age-appropriate English development by school age.

With regard to ASL, on the other hand, extra effort may be needed to promote and maintain the home language. Below is a list of input factors that have been noted in previous research regarding home language maintenance.

- *Quantity of input, particularly cumulative exposure.* Certain areas of the language may be dependent on the child's exposure to a threshold of quantity over a period of years. In the case of the Unsworth (2013) study, this was found for a morphological phenomenon with a high degree of idiosyncrasy.
- *Number of different speakers who use ASL with the child.* Psycholinguistic studies indicate that word recognition and word production benefit from experiencing multiple speakers, to aid recognition of phonetic variation (Singh, 2008). Sign language researchers also propose that word order variation within a single signer's production can aid Deaf children in 'exploration of linguistic possibilities' of the target sign language (Hoiting & Slobin, 2002: 3).
- *Number of conversational partners with whom the child uses only ASL.* Since koda children frequently switch to spoken language with hearing interlocutors, it may be important to expose the child to a wider range of Deaf signers beyond the immediate family.
- *Language used at school.* There is some evidence to suggest that use of the minority language at school aids in the child's development of this language. Although there are few opportunities for most koda children to use ASL at daycare or school, some programs and special schools provide a bilingual environment in both signed and spoken languages. Such bilingual school environments have been identified as a strong predictor of lexical competence in sign language for Deaf children (Tomasuolo *et al.*, 2010). Certainly, for parents of kodas hoping to maintain their children's use of ASL, programs at which children may use ASL with their peers may be highly valuable.

Based on our observations so far, certain linguistic areas may be more susceptible to effects of input factors than others. For example, the use of ASL-specific word orders that are different from corresponding orders of English, such as the WH-final and WH-doubled structures in ASL discussed earlier, may be particularly sensitive to the amount and variation of ASL input that the children receive. This is an area in which further empirical investigation is needed.

Integration into Clinical Practice

Given the traditional tendency for bilingual effects of koda language development to be mistaken for language disorders, the incidence of true

language disorders in the koda population is probably much lower than currently assumed. We can look to studies of language disorders within the Deaf population for possible insight. Sign language researchers in the UK have developed and normed a battery of standardized tests of British Sign Language (BSL) that can now be used to identify Deaf children with potential specific language impairment (SLI) in that country. These children show significant language delays relative to their Deaf peers, despite having normal cognitive, social and motor abilities, and despite the fact that they come from signing, Deaf families that have provided them with high levels of BSL input. Using these tests, Mason *et al.* (2010) conclude that true cases of SLI within the British Deaf population occur with the same relatively low frequency as they do in the monolingual population (about 7%). Parallel investigations on SLI within Deaf populations in the US are currently being carried out by Quinto-Pozos *et al.* (see this volume).

Similarly, there is no evidence to suggest that the incidence of true language disorder among kodas should be any higher than it is in the general hearing population. Yet Lee (the second author of this chapter) notes that during his 20 years of professional service in the Washington, DC area, every Deaf family he encountered that engaged the DC public schools and some of the neighboring public school systems received special educational SLP services for their koda children. Such universal provision of services is unheard of for unimodal spoken language bilinguals, indicating again that SLPs and school officials perceive koda children as different from spoken bilinguals and inherently at higher risk for language delays.

It is essential that parents, teachers and clinicians take bilingualism into consideration before concluding that koda children are language disordered. Intervention should only be carried out on the basis of consistent evaluation of a koda child's English and ASL that shows marked delay in *both* languages, such as difficulty acquiring new language concepts, even with explicit and repeated exposure. In the following section, we discuss practices followed at the Gallaudet University HSC to ensure that koda children receive accurate diagnoses with regard to language delay or disorder.

Dynamic assessment of koda clients

For more than a generation, kodas have been served at the Gallaudet University HSC through speech and language evaluations assessing their spoken English. Deaf parents unable or uncertain of their ability to monitor the spoken English development of their koda children bring them for evaluation after someone has expressed concerns about language delays or more serious disorders. This prompting may come from hearing family members and/or school officials who notice aspects of koda language (discussed earlier) that appear to deviate from monolingual English development. Concerns about koda delay or disorder may also be prompted by koda behaviors reflecting Deaf

cultural practices that are viewed as unacceptable in the mainstream hearing culture. For example, important attention-getting strategies for ASL that are acquired early by kodas involve a variety of visual (e.g. hand-waving in the addressee's line of vision), tactile (e.g. touching or tapping the addressee) and vibratory (e.g. stomping on the floor) techniques to draw the attention of a potential communication partner. These practices are cultural conventions observed across Deaf cultures, and many koda children continue to use them when they transition into hearing-dominant contexts such as public school. This often leads to conflicts and misunderstanding with public school staff, who follow a strict no-touching policy. Persistent use of attention-getting strategies that are viewed as inappropriate in hearing schools often leads to punitive measures against koda students, who may also be labeled as having behavioral or cognitive problems.

In general, while understanding of bilingual acquisition has improved in the US, this improvement has not extended to koda bilingual development, due to the fact that there has been little documentation of developmental patterns that are typical for koda children. From a clinical point of view, koda children are unique among bilinguals in that they must acquire language in two different modalities, visual/gestural and aural/oral. This dynamic presents diagnostic challenges for determining the presence or absence of a speech-language disorder, particularly with respect to phonology. The bimodal nature of koda language development, combined with parents who do not model a spoken language at home, plus the general unavailability of tools for assessing koda children's proficiency in their home language (ASL) and its effects on the child's English, make it challenging to accurately determine whether koda production patterns deviating from monolingual English norms indicate a language disorder or simply a bilingual difference. New norms specifically for koda English phonological development need to be developed through careful observation and documentation of koda language development that is informed by linguistic and cultural awareness on the part of the evaluator.

Lee (2008) discussed the development of more culturally and linguistic sensitive practices for assessing koda language, based on the following definition of dynamic assessment from ASHA:

> A method of conducting a language assessment which seeks to identify the skills that an individual child possesses as well as their learning potential. The dynamic assessment procedure emphasizes the learning process and accounts for the amount and nature of examiner investment. It is highly interactive and process-oriented. (http://www.asha.org/practice/multicultural/issues/Dynamic-Assessment.htm)

Dynamic assessment varies from traditional static testing by actively engaging the family, increasing the participation of the examiner, promoting

modification in administration of test items and interpretation of scores, and being more fluid and responsive to the child/family. Techniques used at the Gallaudet University HSC include extensive interviews to precisely ascertain the age at which the koda was first exposed to ASL and English, parents' perceptions of the koda's ASL and English development compared to that of siblings and other peers, the language(s) used at home and at school/work, the amount and integrity of exposure to each language, the koda's preferred language with siblings, peers, parents, etc., progress made as an English Language Learner, if relevant, and a report of academic performance. Trial teaching has also been used to determine the koda's ability to acquire new linguistic information in a highly stimulating environment. More formally, the Response to Intervention (RTI) model (Haywood & Lidz, 2007) was utilized during the multi-year assessment journey to assess the language disorder of a koda child presented as a case study at ASHA (Lee, 2010). RTI is a process of establishing non-IEP interventions and measuring impact over time to assist in determining if a true language disorder exists and if more formal IEP-based services are required. These dynamic assessment techniques can be augmented with commercially available criterion- and norm-referenced tests, such as the PLS, the Clinical Evaluation of Language Fundamentals (CELF), the Rossetti Infant-Toddler Language scale (Rossetti, 2006, etc.), and the MacArthur–Bates CDI for English (Fenson *et al.*, 1993) and ASL (Anderson & Reilly, 2002), provided the examiner performs the evaluation in accordance with the ASHA Code of Ethics and the guidelines for evaluating English language learners:

> It should be noted that test scores would be invalid for testing a client who is not reflected in the normative group for the test's standardization sample, even if the test were administered as instructed. However, these tests can provide valuable descriptive information about a client's abilities and limitations in the language of the test. (http:/www.asha.org)

Accordingly, the Gallaudet HSC employs static testing for future comparative purposes only, and test scores are interpreted with extreme caution. Working closely with the families of koda clients ensures that the assessment process takes into consideration relevant cultural and linguistic aspects of ASL and the Deaf community. It also helps minimize the historically contentious relationship between Deaf families and speech therapy professionals and increases the family's willingness to share their perceptions of their child's language development. Additionally, the Gallaudet HSC recognizes the importance of ASL proficiency among speech and language professionals for effective communication with Deaf families, as well as for a more comprehensive understanding of koda children's language abilities (some of which may have developed for ASL, but not yet for English).

Language stimulation groups

In addition to providing diagnostic services, the Gallaudet HSC has for many years provided spoken language stimulation groups for koda children, focused on developing English vocabulary, syntax and phonological awareness. These group sessions also provide important language-related feedback that Deaf families may not typically provide, such as feedback on koda children's speech intelligibility and explicit training in cultural practices that differ across Deaf and hearing communities (such as the attention-getting strategies mentioned earlier). Language stimulation occurs twice a week for approximately 50 minutes each session, in small groups of three to five children. A variety of discussion themes, age-appropriate books and table and motor activities encourage children to develop new English skills in experiential and natural ways. In particular, nursery rhymes, songs and rhyming books are incorporated to provide auditory experience for fostering phonological awareness skills.

Paul (2010) evaluated the effect on one koda child who attended the Gallaudet HSC English language stimulation groups described above between the ages of 2;4 and 2;8 (with a final data collection session at 3;0). She found that spoken English intervention had a positive impact on English development, reporting increases in the child's Mean Length of Utterance (MLU) (as measured by Brown, 1973 & Retherford, 1993), phonemic inventory and intelligibility. She also emphasized the crucial importance of ASL competence for clinicians working with koda children, noting the frequency with which she depended on her subject's use of ASL to understand otherwise unintelligible English utterances. Also, her subject displayed numerous lexical gaps in English, but was able to express these words in ASL, giving a more accurate picture of his vocabulary development than would be possible if the clinician assessing his language skills attended only to his English production.

As koda children's exposure to spoken language increases, many Deaf parents express concern that their koda children's ASL development begins to lag behind their English development. Additionally, some parents report with distress that their koda children begin communicating with them solely in spoken English, seriously hindering parent–child communication. These parental observations are consistent with reports by researchers at the annual ASHA conventions between 2009 and 2010 that although unimodal bilingual children respond positively to intervention in their second language, their first language (home language) tends to plateau or diminish in use and sophistication (personal communication at ASHA conventions). In response to these concerns, the Gallaudet HSC developed a pilot project involving two 50-minute sessions of ASL stimulation in addition to existing English stimulation sessions. Four children (three girls and one boy) between the ages of 18 and 24 months participated in the pilot project. The purpose of these ASL sessions was to increase the perceived value of ASL use among young kodas

and enhance their ASL input by exposing them to a greater variety of signing adults. Whereas the English stimulation groups are traditionally facilitated by two hearing, SLP graduate students, the facilitators of the ASL group needed to be native or near-native users of ASL, with an understanding of language development in general and ASL development specifically. An understanding of child development, behavior management and practical experience working with young children was also important. Ultimately, two graduate students (in linguistics and Deaf education) and an undergraduate education student were selected to facilitate the ASL pilot sessions. All three were native or near-native ASL users; two were Deaf and one was a coda.

In terms of content, the ASL and English stimulation sessions often shared themes but did not attempt to mirror one another, reflecting the opinion that trying to force acquisition of the same linguistic concepts in both ASL and English at the same time would be artificial and unnecessary. To promote the expectation of ASL use and to ensure that the Deaf adults in the room (as well as Deaf parents, who often observed the sessions from an adjacent chamber) had direct access to communication, it was decided that facilitators would only use ASL during the ASL sessions. The hearing student in the room would not respond to spoken utterances by the koda children. Similarly, in the spoken language groups, emphasis was placed on spoken English to promote the children's use of that language. Kodas' ASL utterances were acknowledged by the clinicians but reflected back to the children in spoken English.

From the beginning of the pilot program, there were significant differences in spoken English use across the four children. The boy and the youngest girl were the least willing to use spoken English, while the two older girls used much more spoken English. Over the one-semester course of the project, facilitators expanded short utterances produced by the older, more verbal girls and modeled target forms for the their non-target utterances containing syntactic or morphological errors. These techniques evidenced a positive effect as judged by increased MLU and overall sophistication of utterances across sessions. The two younger children, who had started the semester very reluctant to speak, evidenced progress in the increased use of their voices and engagement in spoken English activities.

As for the ASL stimulation groups, these also appear to have been successful, as Deaf families reported an increase in their children's use and sophistication of ASL at home. Through observation of the ASL sessions, Deaf parents were exposed to a variety of explicit language stimulation techniques, and became familiar with themes and activities that they could reinforce with their children throughout the week. Additionally, the ASL facilitators documented the types of signs and sign combinations each child was using, and shared this information with parents. This helped parents see more clearly where their children's ASL seemed on target and where they

might need additional stimulation. As mentioned earlier, variety in input is a key factor for supporting a vulnerable home language, and the ASL stimulation groups not only exposed koda participants to new signers beyond their parents, they also provided parents with techniques for increasing variety in the input at home. Overall, the Deaf families had a very positive reaction to the new paradigm for language stimulation that included both English and ASL sessions.

Concluding Remarks and Future Directions

The present volume focuses on disorder in the signed modality, making this (and the previous) chapter a bit of an exception to the overall theme of the other chapters. The koda children described in here are not, to our knowledge, language disordered in any way. While koda English (as well as koda ASL) displays non-target features in comparison to monolingual counterparts, we argue that these differences are an outcome of bimodal bilingualism rather than a language disorder. Studies of bimodal bilinguals are still relatively rare compared to those of more traditionally studied unimodal bilinguals, so it is still too early to define the developmental characteristics that are typical of koda children. Nevertheless, projects like the one described in this chapter, which track selected aspects of ASL and English development for multiple koda subjects, are already finding general patterns that could turn out to be widespread across koda populations, within the US and abroad. Chief among these patterns is the observation that young kodas from strong signing homes develop fluency in both English and ASL, but display cross-linguistic influence from ASL to English (particularly under 4;0 years) and English to ASL (particularly once children have entered school). While much more research is needed to clarify the nature and distribution of the cross-linguistic effects in our data, it is already abundantly clear that such effects occur in koda production, and must be taken seriously into consideration during clinical assessments of koda language development and disorder.

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Notes

(1) We acknowledge that 'monolingual' is not an appropriate label for the Deaf signing children who form the comparison group for our koda participants' ASL production. Although Deaf signing children in the US have varying exposure to and proficiency in English, they are most appropriately characterized as bilingual (Grosjean, 1992). However, their access to English is largely visual only, whereas kodas have unrestricted access to English, both visual and auditory. Our selection of Deaf children as the control group for koda ASL reflects a reasonable hypothesis that unrestricted access to English may lead to a higher degree of cross-linguistic influence from English to ASL than is typical for Deaf children.

(2) We consider code blending to be distinct from simultaneous communication or SimCom in that the former occurs spontaneously in mixed Deaf-hearing households, is generally accessible to all parties, and is used in low-stake, informal contexts, while the latter is essentially sign-supported English, and is noted for being inaccessible to Deaf addressees, particularly in high-stake contexts such as classroom lectures, meetings, etc. (Emmorey *et al.*, 2008).

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