

Bimodal bilingual language development in a hearing child of deaf parents

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ABSTRACT

This study examined the spoken English development of a hearing child of deaf parents who used American Sign Language (ASL). The child first learned ASL in interactions with his parents and later developed spoken English outside the home environment. It was hypothesized that the child's acquisition of spoken English would systematically reflect both expected monolingual developmental patterns and interlinguistic transfer. Four areas of mismatch between ASL and spoken English were identified. Language sample data from ages 2;9-5;2 were examined for evidence to evaluate the hypotheses. Features that reflected the simultaneous versus sequential mismatch between ASL and English, undifferentiated versus differentiated aspects, free versus bound morpheme mechanisms, and word-order differences provided evidence of ASL influence on spoken English acquisition. Although not extensive, ASL appears to have exerted consistent influence on several areas of the child's spoken English development.

Simultaneous acquisition of spoken English and American Sign Language (ASL) in hearing children of deaf parents (HCDP) is a common phenomenon, yet documentation of the course of bilingual development for these languages has been limited. Quigley and Paul (1984) estimated that more than 90% of the children born to deaf parents are hearing, while numerous researchers have documented predominant use of ASL as the language of the deaf community. Despite the frequency of occurrence, little is known about this bimodal language acquisition process.

Concurrent development of ASL and spoken English is of particular interest for several reasons. First, because the languages differ in linguistic features, like many spoken languages, the instances of possible transfer

or interaction can be identified. Second, because the two languages are transmitted in different modalities demanding, perhaps, a different combination of skills than usually seen in bilingual development, the universal principles of such development can be examined. The sociolinguistic rules for switching from ASL to English are more obvious than with two spoken languages. For example, shifting from spoken communication to use of the hands in ASL is more clearly marked than changes from one spoken language to another. The types of transfer would not include phonological influences, but should include aspects of morphology and syntax. Third, ASL has only recently been recognized as a natural language by linguists (e.g., Klima & Bellugi, 1979; Siple, 1978; Stokoe, 1960; Wilbur, 1979). Past research on HCDP may not have fully considered the possibility that communication development in these children is frequently a special case of sequential bilingualism in which ASL serves as the child's first language and spoken English as the child's second. As such, differences in patterns of spoken English acquisition would be anticipated. In contrast, however, many researchers have attributed the spoken English delays and differences in the HCDP who were studied to impoverished spoken language input.

This study emerged from the opportunity to observe the English language development of a hearing child of deaf parents, hereafter referred to as Becos. Until the age of 2;3, this child was immersed in an ASL linguistic environment with limited exposure to spoken English. From that age on, spoken English was required in natural contexts outside the home, such as daycare and preschool, and ASL continued to be used in the home. Given these circumstances, we elected to term this condition "bimodal, bilingual" development (Bernstein, Maxwell, & Matthews, 1985; Kessler, 1984; McLaughlin, 1984). In Becos's case, intense exposure to a second language occurred after the age of 2;3. Prior to that time, his spoken English models consisted of maternal input, which was marginally intelligible and abbreviated, and television. Once he began attending preschool, he was actively exposed to spoken English in numerous naturalistic contexts requiring English competence. Thus, Becos's language acquisition could be described as that of sequential bilingualism.

There is no consensus in the area of bilingual or second language (L2) acquisition on the issue of what has been termed "interference" or "transfer" between languages; a continuing debate exists regarding the nature and extent of influence of one language on the other (Dulay & Burt, 1974a; Dulay, Burt, & Krashen, 1982; Garcia, 1983; Hakuta, 1986). In a series of studies on L2 acquisition, Dulay and Burt (1974a) challenged the long-standing assumption of contrastive analysis theory (Lado, 1957) that most errors in L2 result from linguistic differences or interference from the first language (L1). Dulay and Burt found that less than 5% of children's errors were related to L1-to-L2 transfer. Dulay, Burt, and Krashen (1982) found that less than 20% of adult errors in L2 were related to transfer from L1. Generally, most of the errors in L2 were said to be predicted by normal developmental sequences in L2 for such aspects as morphology.

In contrast, Garcia (1983) contended that the developmental order of

morpheme acquisition in L2 was not as predictably reliant on L2 as Dulay and Burt (1974a, 1974b) suggested. Studies by Hakuta (1974) and Rosansky (1976) found different orders of English morpheme acquisition for Japanese and Spanish children learning English as an L2. This suggests that interlinguistic transfer, as well as normal developmental processes, should be considered in bilingual language acquisition. Further, it should be noted that errors or differences in L2 patterns of acquisition may stem from a number of potential sources. First, there is the possibility of true interference of the L1 grammatical system on L2. Second, production overload problems, created by the tension of dealing with two or more language systems, may generate an influence of one language on another. Third, sociolinguistic processes may promote the creation and use of certain interlingual constructions. These three factors, and others not yet identified, may all contribute to the influence of an L1 on the L2 and appear as transfer phenomena from L1 to L2. Precisely identifying the specific source of an individual, observed error may not be possible.

Many researchers accept transfer phenomena and note that they vary according to environmental and situational factors (Garcia, 1983; Kessler, 1984). The degree of bilingualism, the rate of acquisition of two distinct systems, and the extent of influence are all affected by input factors that must be documented. Wode (1981) argued that the reliance on L1 for L2 learning is an integrated part of the linguo-cognitive system and should not be considered unusual. Hakuta (1986) concurred, stating that transfer is compatible with theories of cognitive development. He cited Werner and Kaplan (1963), who proposed that novel functions are first executed through old forms. When new forms serve the functions better, they are substituted. Simply, Hakuta stated, "Who, when faced with an unfamiliar language, would not make the most of an already familiar language?" (p. 123). He advocated continued investigation of possible instances of transfer such that investigators can better understand the conditions under which it occurs.

PREDICTING AREAS OF MISMATCH: FOUR HYPOTHESES

According to the principles of contrastive analysis, potential areas of interlingual influence can be pinpointed by looking for mismatches between two target languages (Dulay, Burt, & Krashen, 1982). If we are to consider both developmental and transfer processes as influences in the acquisition process, as Wode (1981) suggested, existing errors in Becos's language should be predictable. If error patterns are not developmental in nature, then ASL influences must be examined.

Predicting errors due to mismatches between ASL and spoken English requires consideration of the unique aspects of each language. Such consideration reveals four principled ways in which ASL influence may be manifest in spoken English acquisition. First, Siple (1978) pointed out that the availability of three-dimensional space in ASL provides opportunity for syntactic mechanisms that could not be used in spoken languages. Numer-

ous researchers (e.g., Baker & Padden, 1978; Bellugi & Klima, 1980, cited in Wilbur, 1987; Liddell, 1980) confirm the fact that ASL makes elaborate use of this spatial medium as evidenced by the simultaneous yet distinct use of facial expressions, movement during sign formation, head postures, and body orientation to serve the grammatical functions of marking question forms, negation, verb aspect, and relativization, for instance. An uninflected lexical stem can be inflected in ASL by dynamic changes in co-occurring movement of various parts of the body.

Given this simultaneous dimension, it can be hypothesized that interlinguistic influence might be evident in those grammatical aspects that are produced simultaneously in one language and sequentially in the other. For the purposes of this study, negatives and question forms, which are early developing aspects for both languages, provide test cases. Negatives are marked early in the development of ASL by the addition of the sign NO or by a simultaneous or linearly occurring headshake. In spoken English acquisition, the word *no* is usually the first negative form, followed by *not*, *don't*, and *can't* (Bellugi, 1967, cited in Lund & Duchan, 1988). Question forms in ASL are marked by furrowing the eyebrows for *wh*- questions and raising the eyebrows and widening the eyes for yes/no questions. Jones and Quigley (1979) documented the early development of the *wh*- question posture and the early use of a generalized *wh*- question sign in an HCDP. This is similar to the early use of a rising vocal intonation for yes/no questions in the development of spoken English; however, children quickly begin to use *what*, *where*, and *why* by the time the mean length of utterance (MLU) is between 2.25 and 2.75 (Klima & Bellugi, 1966). If developmental expectations for English can be ruled out, and if an HCDP has considerable difficulty learning the English rules for more sophisticated, developmentally appropriate forms of negatives and questions, it will be possible to identify the influence of ASL on spoken English.

A second case in which the influence of ASL could be traced include instances when a concept is undifferentiated in one language and differentiated in the other (Lehiste, 1988). For example, ASL does not differentiate between definite and indefinite articles as does English, using adjective classes and word order instead. Similarly, personal pronouns are undifferentiated in ASL. The INDEX sign, used for *he*, *she*, and *it*, is distinguished by preassigned spatial referents in front of the speaker. Each spatial referent may vary in the pronoun assigned to it.

A third case in which ASL and English differ is in the use of bound versus free morphemes to mark particular concepts. Regular plural, present progressive verb tense, and regular past tense are instances in which English uses an obligatory bound morpheme, while ASL uses free morphemes. For example, in ASL, plurality can be signified by adding number adjectives, such as MANY or TWO, or by repeating the noun using different spatial end points (Wilbur, 1987). Although English may use adjectives, a bound morpheme is obligatory for marking regular plurals. Similarly, the present progressive verb tense in English is marked with an obligatory *-ing*, and the regular past tense, with *-ed*. In ASL, tense is marked at the beginning of a

discourse segment and is presumed to be the same until the speaker changes it. Present verb tense is assumed unless otherwise designated in ASL or marked by the sign NOW (Liddell, 1980). Because these are relatively early developing morphemes in English and concepts in ASL, they provide test cases for examining interlingual influence.

A fourth case in which the influence of ASL on spoken English might be hypothesized to be evident is in word-ordering patterns. ASL generally follows the predominant subject-verb-object (SVO) pattern of English. However, ASL also allows for S,VO; O,SV; and VO,S orders (e.g., Liddell, 1980; Wilbur, 1987). In these instances, the sentential topic is stated first, and then modifiers or comments are added (Klima & Bellugi, 1979; Liddell, 1980). Additionally, important aspects of the proposition can be restated in ASL at the end of the utterance. This has been referred to as "bracing" (Kegl, cited in Wilbur, 1987) or "bracketing" (Todd, 1975) when the same sign is repeated, or "doubling" (Todd & Aitchison, 1980) when a synonym is used instead of exact repetition. In spoken English development, the placement of S, V, O, varies in two-word utterances, but becomes more conventional prior to the emergence of the first bound morphemes (Owens, 1988). Sentential topic is often marked by the use of vocal stress. Word order variations from S-V-O are unusual in the development of spoken English (Maratsos, 1982). The strongest case for influence of ASL on spoken English, then, would involve spoken word-order deviations from typical English patterns that mirror those seen in ASL and do not follow developmental patterns for English.

PAST STUDIES ON HEARING CHILDREN OF DEAF PARENTS

Existing research on the spoken language acquisition of HCDP has reported either similar development of English to that seen in hearing children of hearing parents (HCHP) or delayed or unusual developmental patterns. As mentioned previously, the majority of these studies have focused on the limited early exposure to spoken language and have viewed language learning differences from the perspective of language delay resulting from environmental input deficiencies. These investigations have not generally focused on ASL acquisition, which may or may not have been the L1 learned by the HCDP studied.

To some extent, the findings of typical versus delayed/deviant development in research reports may have resulted from the aspect of language studied, the variation in hearing status of parents, and varying ages of the participating children. For example, several studies of semantic relations in relatively young HCDP have reported developmental patterns similar to those seen in HCHP. In a study of five 2-year-old HCDP, Schiff (1979) found that the order of semantic relation acquisition was consistent with expectations for monolingual English development; however, the proportion of various semantic relations used differed from that seen in typical English language development. These results were consistent with Slobin's (1978) suggestion that semantic categories constitute a common feature of

all languages. Further, both Holmes and Holmes (1980) and Prinz and Prinz (1979a, 1979b) reported the presence of the same semantic relations in the development of ASL as those seen in English. However, although the children involved in both studies were acquiring both ASL and spoken English, they were not HC DP in the traditional sense because they heard spoken language used by either one or both hearing parents.

In contrast to semantic relations, grammatical morphemes and syntax are more specific to particular languages and provide grounds for determining the existence of influence of ASL on spoken English. The evidence from studies on HC DP is unclear. Schiff (1979) looked at the order of emergence of grammatical morphemes in English and found that it was the same for five HC DP as for HC HP. Rate of acquisition was not explicitly examined. Schiff did note a small percentage of utterances (3%) that were not in the S-V-O order expected in English, although these were not detailed. In another study, Jones and Quigley (1979) examined question-form development in two hearing children of deaf parents and found parallel development in both ASL and spoken English without evidence of transfer between languages.

Additional studies of syntactic acquisition in HC DP, however, report delayed or deviant development of spoken English and provide some indication of possible influence between languages (cf. Schiff & Ventry, 1976). Critchley (1967) reported an instance of delayed development of verb tense in an HC DP. Sachs, Bard, and Johnson (1981) studied two hearing brothers of deaf parents. The older child (age 3;9) demonstrated severe articulation problems, low MLU, low receptive language skills, and delayed and atypical acquisition of grammatical morphemes. Semantic relations were not delayed. The younger sibling (age 1;8) demonstrated initial speech and language delays, but gained linguistic skills quickly following intervention. The authors did not examine the specific influence that ASL may have had in these language acquisition differences.

Murphy and Slorach (1983) analyzed the English skills of six preschool-aged HC DP. They documented delays in the children's comprehension and production of language and the presence of relatively high percentages (13-25%) of syntactically deviant utterances. Murphy and Slorach tagged these syntactically deviant utterances as those that were "never found in normal child language" (p. 121). The influence of sign language on spoken English was mentioned as a possible factor in the character of these utterances.

Todd (1975) and Todd and Aitchison (1980) provided one of the most detailed case investigations of an HC DP with delayed and deviant spoken English development in one of the few studies to consider the potential role of ASL influence. Evidence was provided for the influence of ASL beyond expectations for normal development of spoken English. The instances of influence included *reduplication* (immediate repetition of the last word of the utterance), *copying around* (repetition of the subject at the end of the utterance), *doubling* (repeating synonyms of words within the utterance), and *afterthought* (tagged material to the end of the utterance after a pause).

To describe these constructions, the authors formulated a rule structure that emphasized the predictability of the form of the utterances. The rule structure formulated was similar to that seen in ASL, not English.

The purpose of this case study was to examine Becos's spoken English language development in light of the four identified areas of mismatch between Becos's two target languages – spoken English and ASL. The perspective of this article is not to provide evidence for or against the predominance of transfer phenomena. Rather, the emphasis is on delineating the nature and extent of such interaction when it seems the most likely explanation for the linguistic patterns noted.

METHOD

Subject

The subject of this study was Becos, a male growing up as the only child in the home of deaf parents who used ASL as their primary language. Becos's age ranged from 2;9 to 5;2 during this longitudinal study. Audiological assessment indicated that Becos's hearing was within normal limits.

Although ASL was the primary language of Becos's home, his mother reported using paired presentation of oral and sign language when communicating with him. Researchers (Johnson & Rash, 1990), who viewed videotapes and listened to taperecorded samples of interactions between Becos and his mother, confirmed this pattern and noted limited intelligibility of the mother's speech. Becos's father was not observed to use any spoken communication, relying on ASL alone. Becos's early exposure to spoken language centered on limited interactions with hearing relatives and listening to television programs (primarily cartoons presented at a very loud volume). Becos was enrolled in part-time daycare when he was 2;3 and, following the recommendation of a speech-language pathologist, began attending daycare on a full-time basis at 2;7. Starting with his first visit to the preschool, Becos showed clear instances of code switching, based on the hearing status of the speaker. He refused to use ASL when speaking to hearing signers, even when his mother was present. In addition to the more traditional daycare placement, at 4;2, Becos was enrolled in language-enrichment preschool 4½ days per week, where he participated in classroom activities. He did not receive individual language therapy sessions.

Basic measures of Becos's spoken English language acquisition are available from 16 samples collected between 3;0 and 4;6. These measures, chiefly MLU in morphemes and associated Brown's linguistic stage, are reported in Table 1. In these samples, Becos's MLU was either within or slightly below monolingual expectations for age given the normative data provided by Miller and Chapman (1985): $\pm 1 SD =$ normal range. Further, in the final sample collected at 4;6, Becos's MLU of 4.00 (linguistic stage V) was within the monolingual normal range.

Table 1. *General measures of Becos's language development (16-sample subset)*

Age	MLU-Morphemes	Associated Brown's stage
3;0 (36 months)	2.10	II
3;1 (37)	2.66	III
3;3 (39)	2.02	II
3;3 (39)	2.30	II
3;5 (41)	2.84	III
3;7 (43)	2.44	II
3;8 (44)	2.33	II
3;8 (44)	2.74	III
3;9 (45)	3.16	Early IV
3;9 (45)	3.41	Early IV
3;9 (45)	3.09	Early IV
3;10 (46)	2.72	III
4;2 (50)	3.38	Early IV
4;3 (51)	3.55	Late IV
4;4 (52)	3.12	Early IV
4;6 (54)	4.00	V

Procedure

Spoken language samples. Across the span of this study, videotaped samples of Becos's spoken English were collected once or twice per month in a quiet room at either Becos's daycare facility or the language-enrichment preschool center. During each 20-30-minute videotaped recording, a graduate student elicited spoken language samples from Becos by using one or more of the following five targeted activities: (a) administration of formal language assessments, such as the Peabody Picture Vocabulary Test-Revised (PPVT-R) (Dunn & Dunn, 1981); (b) informal vocabulary elicitation games, e.g., looking at pictures and selected objects and naming them; (c) book reading, which consisted of looking at the pictures in a book and constructing a narrative about the actions depicted; (d) free play with toys; and (e) peer interaction, which involved Becos and one peer playing and talking together.

Each spoken English sample was transcribed orthographically by two independent reviewers. A third judge compared the two initial transcripts, while reviewing the videotaped language sample, settled any discrepancies, and prepared a final "master" transcript. All master transcripts were then entered in computer files for analysis via the Systematic Analysis of Language Transcripts (SALT) computer program (Miller & Chapman, 1985).

Two overlapping data sets of spoken English were derived from these videotapes. The complete data set involved all the samples of Becos's spoken English gathered outside the home across the span of this study (a total of 30 samples). This data set included all the targeted activities for elicit-

tion of Becos's language (PPVT-R, free play, book reading, and peer interaction) and was analyzed primarily for the purpose of charting Becos's acquisition of Brown's (1973) grammatical morphemes. Becos's utterances were coded for the presence or absence of Brown's grammatical morphemes in obligatory contexts; obligatory contexts were determined with reference to acceptable conversational ellipsis. A morpheme was considered mastered when 90% or greater accuracy in obligatory contexts was achieved across two consecutive sessions. A minimum of five obligatory contexts was considered necessary to calculate percentage of accuracy.

The second data set used involved a more restricted subset of Becos's spoken English samples. This data set included 16 samples of Becos's language. Becos's age ranged from 3;0-4;6 at the time of these samples. The samples were selected from the larger corpus of total samples according to the following criteria: (a) only language interactions between Becos and one adult were included; (b) only samples with an MLU of 2.0 or greater were considered; and (c) the portions of the samples that included formal testing (e.g., PPVT-R) were removed. These criteria were employed to enhance consistency across samples, to ensure that Becos produced enough language to allow data analysis, and to remove the influence of formal test settings - primarily to control for variables that may have artificially influenced the occurrence of language errors. The 16 samples included 3,133 Becos utterances.

For the purpose of data analysis, the basic convention followed was that the complete data set was used for analysis of grammatical morpheme acquisition, while the subset was used to analyze other linguistic features. Again, these conventions were adopted to limit the potential effects of varied contexts and activities on the language analyzed.

Samples of ASL. To supplement the transcripts of Becos's spoken English, samples of his ASL were also analyzed. Three unstructured home videotapes were available showing Becos interacting using ASL with both parents and spoken language with his mother. The investigators left videotaping equipment at the home after instructing the parents in the operation of the equipment. The parents were asked to record any interactions they wished. Most of the videotapes showed the mother and Becos reading books, naming and describing pictures in both ASL and spoken English. These types yielded 347 intelligible signed utterances for Becos. Short segments of conversational dialogue were also included. These tapes spanned ages 2;7-3;0.

The home videotapes were transcribed using a method developed by Johnson and Rash (1990) in which the simultaneous aspects of ASL and spoken communication were recorded. Three investigators transcribed 20-minute segments from each of the three videotapes to obtain reliability. Two investigators transcribed the remaining intelligible portions of videotape.

Comparison of ASL and spoken English. A descriptive taxonomy was used to compare the observable surface features of Becos's two language systems (Dulay, Burt, & Krashen, 1982). As Wode (1981) suggested, one method of

analysis for errors in bilingual development is to search for parallel syntactic or morphemic surface structures that are used appropriately in one language and inappropriately in the other. This analysis is made stronger if it can be shown that the "error" is not developmental in nature for the target language. Given this perspective, Becos's spoken language samples were analyzed for linguistic features within the four areas that were hypothesized to be possible sources of mismatch with ASL. To evaluate developmental considerations, two sources of information were available. First, Becos's acquisition of particular grammatical features of interest was compared to monolingual development norms, in light of Becos's age-of-exposure to spoken English. Second, Becos's acquisition of particular grammatical features was compared to his general language level, as presented in Table 1.

RESULTS

The results of this study will be discussed by reviewing each of the hypotheses proposed regarding ASL influence on spoken English development. Specific language data for ASL will be presented and available comparison data for monolingual English language acquisition will be provided.

Hypothesis 1: Simultaneous dimension

ASL influence will be apparent on those early developing grammatical features coded simultaneously in ASL and sequentially in English. The features of Becos's language data that were pertinent to this hypothesis were question forms and negatives.

In the home videotapes of ASL, 42 of 347 utterances were determined to be questions. Becos used raised eyebrows for yes/no questions simultaneous with the formation of nucleus signs and furrowed eyebrows as he was signing WHAT + nucleus, WHERE + nucleus, or nucleus words consisting of nouns or verbs. The use of either eyebrow posture with a nucleus sign to mark questions occurred approximately twice as often as the simultaneous use with specific *wh*- question signs. It was predicted that Becos would predominantly use vocal inflection to mark questions in spoken English, with less reliance on auxiliary inversion required for *wh*- questions and yes/no questions. The subset of spoken English data (16 transcripts; Becos's age 3;0-4;6) was used to address this question.

Table 2 displays the number and percent of Becos's questions in each of the 16 transcripts that were formed by rising vocal intonation only, incomplete/incorrect questions (auxiliary omitted or not inverted), and complete and correct *wh*- and yes/no questions. Data were not recorded for accompanying eyebrow postures. In the last four transcripts, from ages 4;2-4;6, Becos used inflection alone to express 50-60% of his questions (yes/no) and used complete and correct yes/no and *wh*- questions to express 30-40% of his questions. Given his age of exposure to consistent models of English, Becos had up to 2 years, 3 months experience with these forms. In

Table 2. *Number and percent of Becos's question forms*

Becos's age	Inflection only	Incomplete <i>wh</i> ^a	<i>wh</i> ^b	Total
3;0 (36)	1 (100%)	0	0	1
3;1 (37)	3 (27%)	0	8 (73%)*	11
3;3 (39)	1 (50%)	1 (50%)	0	2
3;3 (39)	7 (44%)	1 (6%)	8 (50%)	16
3;5 (41)	10 (48%)	1 (5%)	10 (48%)*	21
3;7 (43)	1 (25%)	1 (25%)	2 (50%)*	4
3;8 (44)	3 (38%)	1 (13%)	4 (50%)*	8
3;8 (44)	0	0	1 (100%)*	1
3;9 (45)	2 (67%)	0	1 (33%)*	3
3;9 (45)	7 (24%)	6 (21%)	16 (55%)	29
3;9 (45)	3 (60%)	1 (20%)	1 (20%)	5
3;10 (46)	5 (45%)	2 (18%)	4 (36%)	11
4;2 (50)	18 (58%)	2 (6%)	11 (35%)	31
4;3 (51)	14 (48%)	4 (14%)	11 (38%)	29
4;4 (52)	16 (52%)	5 (16%)	10 (32%)	31
4;6 (54)	17 (61%)	3 (11%)	8 (29%)	28

^aNo inversion of noun and verb form or omission of auxiliary in *wh*-questions.

^bYes/no questions.

comparison, Berninger and Garvey (1982) reported that children aged 2;10-3;3 who are learning English as L1 express 15% of their questions via intonation alone and 74% of their questions in *wh*- and yes/no forms. Further, Berninger and Garvey reported that children aged 4;7-5;7 express 8% of their questions by intonation alone and 66% of their questions in *wh*- and yes/no forms. The predominance of Becos's reliance on intonation seems to be an atypical pattern of English language development.

The second aspect of Becos's language data pertinent to the simultaneous dimension was Becos's acquisition of negative constructions. The home videotapes revealed the following for negative utterances: Becos used head shakes alone for *no* or *don't* in 4 of 13 utterances, overlaid the use of head shakes plus a nucleus sign (indicating rejection or denial) in 3 of 13 utterances, used the sign NO or NOT combined with head shakes in 4 of 13 utterances, and used a headshake plus spoken *no* or just spoken *no* in 2 of 13 utterances. This mirrors the expected developmental sequence in ASL for deaf children of deaf parents (DCDP), as noted by Hoffmeister and Wilbur (1980). It was anticipated that negative constructions in spoken English would be acquired late or would be marked in an atypical manner due to the fact that negation can be indicated in ASL via negative head shake in conjunction with the formation of nucleus signs.

The subset (16 samples) of spoken English transcripts was used for this analysis. Table 3 displays the negative forms used by Becos in each of the

Table 3. *Becos's use of negative forms*

Becos's age	Negative constructions used
3;0 (36)	<i>don't</i> nonproductive
3;1 (37)	<i>can't</i> productive ^a
3;3 (39)	<i>can't</i> productive
3;3 (39)	<i>don't</i> nonproductive
3;5 (41)	<i>don't</i> nonproductive
3;7 (43)	<i>don't, can't</i> productive
3;8 (44)	<i>can't, don't</i> productive
3;8 (44)	<i>can't, don't</i> productive
3;8 (44)	<i>can't, don't</i> productive
3;9 (45)	<i>can't, don't</i> productive
3;9 (45) ^b	<i>no, don't</i> nonproductive
3;9 (45)	<i>don't</i> productive, first use of <i>didn't</i> (1 instance)
3;10 (46)	<i>don't, can't</i> productive
4;2 (50)	<i>is not, don't, 're not, didn't</i> (1 instance)
4;4 (52)	<i>don't, can't, doesn't</i>
4;6 (54)	<i>don't, can't, isn't</i>

^a"Productive" indicates that forms were used in more than one utterance and in combination with more than one utterance frame.

^bVery restricted number of negative forms in sample.

16 transcripts analyzed. Until the sample at 3;9, Becos's use of negative forms was limited to *no, don't, and can't*. From 3;9 to 4;6, Becos demonstrated limited use of a few additional negative constructions: *didn't, isn't, and doesn't*. Data from English development (Brown, 1973; de Villiers & de Villiers, 1979; Owens, 1988) suggest that by stages IV-V, children use *isn't, aren't, doesn't, didn't, wasn't, wouldn't, couldn't, and shouldn't*. Becos's means of expressing negation in spoken English appeared limited in comparison to age peers. In comparison to age-of-exposure peers, however, he was following monolingual developmental sequences for English. No atypical or deviant negative forms were noted. The use of head shakes alone to signify negatives was not documented in the spoken language transcripts and cannot be addressed.

An additional comparison of interest can be made by considering Becos's use of negative forms relative to his general language level, as measured by MLU. At 4;6, Becos's MLU was 4.00 (stage V), within monolingual normal limits. With this MLU, expanded use of negative forms is expected. Thus, Becos's acquisition of negative constructions appears to lag behind general measures of his overall language development.

Hypothesis 2: Undifferentiated versus differentiated aspects

The influence of ASL would be apparent in those linguistic concepts that are undifferentiated in ASL and differentiated in English. Two aspects of Becos's language acquisition were addressed in conjunction with this

Table 4. *Becos's use of articles*

Becos's age	No. articles omitted	No. articles used ^a	Omission index (%) ^b
3;0 (36)	24	31	44
3;1 (37)	5	27	16
3;3 (39)	20	28	42
3;3 (39)	26	41	39
3;5 (41)	22	38	37
3;7 (43)	11	15	42
3;8 (44)	8	15	35
3;8 (44)	14	37	27
3;8 (44)	11	50	18
3;9 (45)	13	46	22
3;9 (45)	2	18	10
3;9 (45)	18	69	21
3;10 (46)	5	34	13
4;2 (50)	3	36	8
4;4 (52)	11	42	21
4;6 (54)	6	33	15

^aThe number of articles used is a rough number; all uses were included, accuracy of use was not considered.

^bOmission index $\frac{\# \text{ Omissions}}{\# \text{ Omissions} + \# \text{ Uses}}$, for example, for sample 3;0 (36), omission index = $24/24 + 31$.

hypothesis. The first feature of interest for this hypothesis was Becos's use of articles. It was hypothesized that Becos would frequently omit or use definite and indefinite articles interchangeably. Errors in the use of definite versus indefinite articles were not considered due to difficulty in distinguishing whether a definite or indefinite article was appropriate to the context and in determining which article Becos used (because HCHP have difficulty with this distinction into the school-aged years).

The subset of spoken English was used to chart Becos's omission of articles in obligatory contexts across the 16 samples. Table 4 presents the number of articles omitted, the number used, and an omission index, which indicates the percentage of articles omitted. Becos's omission index ranged from 44% at 3;0 years to 15% at 4;6 years. Although no directly comparable data exist for percent of article omission for English acquisition in HCHP, several researchers have investigated 2- to 5-year-old children's use of definite and indefinite articles (Garton, 1983; Maratsos, 1976; Power & Dal Martello, 1986). By 4 to 5 years, articles are basically in place, including definite/indefinite distinctions. Article omission does not appear to be a significant phenomena in normally developing monolingual English speaking preschool children.

On an age-of-exposure basis, with 2 years, 3 months of exposure to

English, Becos's acquisition of articles does not appear particularly delayed. However, in terms of Becos's general-level language, as measured by MLU at 4;6 (MLU = 4.00; Table 1), articles do appear to lag behind developmental expectations. Data on grammatical morpheme acquisition suggest mastery in monolingual children between ages 2;4 and 3;10 in linguistic stage IV, as compared to Becos's continued omission of articles at 4;6 when MLU placed his general development in stage V (Brown, 1973; Owens, 1988).

The second aspect of English that was predicted to be more difficult according to the undifferentiated versus differentiated hypothesis was the use of pronouns. In ASL, this is a complex morphological system (Loew, 1983, cited in Wilbur, 1987) that may not be developed until age 4;9 (Petitto, 1980, cited in Wilbur, 1987). As mentioned, words such as *he*, *she*, and *it* are undifferentiated in terms of the formation of the INDEX sign, but are distinguished by preassigned spatial referents. In the home videotapes, Becos was observed to use the INDEX sign profusely (in about 42% of his utterances) as demonstrative pronouns or gender pronouns with concrete referents such as pictures, people, and objects. It was predicted that because the ASL sign formation is undifferentiated, gender pronouns would be used interchangeably late into the development of English.

The subset of 16 spoken English transcripts was used to examine Becos's use of pronouns. Several spontaneous *he/she* confusion errors were present. However, interpreting the accuracy of *he/she* use in spontaneous conversation with toys and play materials was difficult because the referent for an utterance was not always immediately apparent, and because many toy materials can correctly be labeled either *he* or *she*. For this reason, additional information was needed.

Data from an additional study on Becos's language was used to examine this hypothesis (Mueller & Rice, 1987). In brief, this study used a multiple baseline design with generalization probes to train Becos (and a second child) in the use of feminine pronouns, both subjective and objective case. Generalization did not occur, with final results indicating that Becos continued to use *he* for *she* in conversation even after training (Becos's age was 4;3-4;4 during study, which followed 2 years of exposure to English). However, Becos did demonstrate correct performance in the training setting and was able to correctly state the rule for pronoun use. Other morphemes that were expected based on chronological age, not age of exposure, were present (see Table 5). Data for English (Owens, 1988) indicate that *he* and *she* generally emerge in Brown's stage III (approximately 2;7-2;10 years), although mastery of these pronouns can continue across the preschool years. Thus, it appears that the use of pronouns was particularly weak for Becos given his pattern of development for other morphemes.

Hypothesis 3: Bound versus free morphemes

The influence of ASL on English acquisition would be evident in cases where an obligatory bound morpheme is required for English and a free morpheme is used in ASL. Two aspects of English were hypothesized to be test cases for the influence of ASL: verb tenses and plurals.

Table 5. *Becos's acquisition of grammatical morphemes^a*

Morpheme	Age at mastery ^b	Monolingual mastery
In	3;1	2;3-2;6 II
Present progressive	4;3	1;7-2;4 II
Modal verbs/auxiliaries	4;9	
Copula	4;10	2;3-4;1 III-V
On	4;10	2;3-2;6 II
Regular plural	5;0	2;0-2;9 II
Regular third person	5;1	2;2-3;10 IV
Auxiliary	5;1	2;5-4;2 V
Articles	5;2	2;4-3;10 IV
Regular past tense	Not within sample	2;2-4;0 IV
Irregular past tense	Not within sample	2;1-3;10 III
Possessive	Not within sample	2;2-3;4 III
Irregular third person	Not within sample	2;4-4;2 V

^aMorphemes of particular interest in boldface.

^bThese data are from transcripts of all samples taken during the period (ages 3;0-5;3). A total of 30 transcripts were included in the analysis. The criteria for mastery are: (a) 90% use in obligatory contexts for two consecutive samples; and (b) five or more contexts for and/or instances of the target morpheme.

Source: For monolingual data: Owens, R. E. (1989). *Language development: An introduction* (2nd ed.). Columbus, OH: Merrill.

In ASL, present verb tense is assumed unless otherwise designated or is marked by the sign NOW (Liddell, 1980). An adverb or adverbial phrase is used at the beginning of a discourse segment to signify past or future tense for the ensuing segment of talk. This aspect of verb inflection has not been addressed in the ASL developmental literature. Fischer (1973), for example, looked at the development of directional and locational verb inflections, but did not address tense. The home videotapes of Becos using ASL showed no tense marking, although his parents modeled this aspect in 15% of their utterances. It was anticipated that the present progressive and past tense English verb markings, which develop relatively early in monolingual children, would be acquired late and/or out of sequence.

The complete data set was used to chart Becos's acquisition of these morphemes in English. Table 5 indicates mastery of the present progressive at 4;3; developmental standards for monolinguals indicate mastery in stage II between ages 2;3-2;6 (Brown, 1973; Owens, 1988). Considering his length of exposure to spoken English (2;3 years), this appears to be earlier than would be expected for an HCHP. Mastery of third person singular verb tense occurred at 5;1 years after 2;10 years of exposure. Monolinguals master this tense between 2;2-3;10 years. It is of interest, however, that Becos showed mastery of other morphemes that are later developing for monolingual English speakers, such as auxiliary and copula verbs, prior to mastering third person singular. Further, on the basis of general language level as measured by MLU and Brown's linguistic stage (see Table 1), both present progressive and third person singular verb inflections were mastered at a later time than would be predicted by Becos's general developmental level.

Further, Becos did not demonstrate mastery of regular and irregular past tense forms within the sampling period after at least 3 years of intense exposure to English. These forms were used inconsistently and infrequently. Brown (1973) reported that monolingual children master regular and irregular past tense forms by stage V between ages 3;5-3;10. Note also that other morphemes that are usually acquired after regular and irregular past tense were in evidence (see Table 5). Again, given Becos's general language level, particularly at 4;6 (MLU = 4.00, stage V), the acquisition of past tense regular and irregular inflections would be predicted. This atypical order of development is felt to be evidence of interlingual influence, as it was in the cases reported by Hakuta (1974) and Rosansky (1976).

The second aspect of Becos's language data that is relevant to the bound versus free morpheme hypothesis was Becos's acquisition of the plural marking. Plurality can be signified in ASL by adding number adjectives, such as MANY or TWO, or by repeating the noun using different spatial end points (Wilbur, 1987). In the home videotapes, Becos was observed to use both the numerical adjective (5 of 15 plural utterances) and repetition of nouns or INDEX (signifying "this" or "that") with different end points to indicate plurality (10 of 15 utterances). Hoffmeister and Wilbur (1980) commented that DCDP use pointing or indexing to indicate plurality in the immediate environment as a first indicator of plural pronouns; however, specific percentages of usage are not known. It was predicted that plural English morphemes would be acquired late or in atypical order.

The complete data set was used to chart Becos's acquisition of the regular plural form. Table 5 indicates that mastery of the regular plural form occurred at 5;0, after 2;8 years of exposure to English. Data for English (Brown, 1973; Owens, 1988) indicate that monolingual children master the regular plural form in stage II between ages 2;3-2;6. Plurals were mastered after auxiliary and copula verbs, an order not usually seen in spoken English (see Table 5). Becos's acquisition of plural inflection occurred well beyond the time that would be predicted on the basis of his general language level (given MLU of 4.00, stage V, at 4;6).

Table 6. *Becos's non-English word-order patterns*

Type	Age	Utterance
<i>Subject repetition</i>	3;0	That one pink in it, one.
	3;1	It close, it.
	3;5	He can push it, he.
	3;8	This is one, it. He's gonna take it off, Daddy. No, this right, that.
	3;9	It work, it.
<i>Initial position</i>		
Verb repetition	3;9	Wash, you got wash?
Object repetition	3;5	Bear, hurt the bear.
Adverb repetition	3;5	Down, it go whoa down.
<i>Predicate object</i>		
Repetition	3;0	I get one, one.
	3;8	He gonna look it, it.
	3;9	I get this close, this.
<i>Repetition of synonym</i>	3;0	I wanna do that, read.
	3;3	I want another one, horse. I see other one sink.
	3;8	He put in the shoes, in it.
	3;9	I wanna do it, the airplane. I need another one, boy.
<i>Imperatives</i>	3;5	Put the back, it.
	3;8	Put it on, it.
	3;9	Look that dress, that. Put it in, it

Hypothesis 4: Syntactic constructions

Influence of ASL on spoken English would be evident in variable word-order patterns. This hypothesis proposed that because ASL allows more flexible word order than spoken English, ASL surface-ordering patterns might be noted in certain English utterances. Table 6 displays the total number of spoken English utterances taken from the second data set that resemble ASL ordering patterns and are atypical for English.

One example of ASL ordering that does not occur in English development is the repetition of the subject at the end of the utterance (Humphries, Padden, & O'Rourke, 1980). The same word or a synonym is repeated to give emphasis to that portion of the proposition. Todd (1975) and Todd and Aitchison (1980) noted a similar pattern of "copying around" in their HCDP. The videotape of ASL usage revealed several instances of this type of structure (e.g., INDEX-car BROKEN INDEX-car). Several of Becos's spoken utterances showed this pattern, as in *He can push it, he*. Similarly, Becos emphasized either verb or object in the utterance *Wash, you got wash?*, the object in *Bear, hurt the bear*, and the particle in *Down, it go*

whoa down. His ASL sample showed examples of these constructions as well (e.g., PAINT HOUSE PAINT and OUT DOG GO OUT). Only one example that might be repetition of synonym was found in the ASL sample: THROW AWAY INDEX, ORANGE. The INDEX sign may have stood for a demonstrative; however, there was a clear pause after its formation, suggesting a VO,O order. As shown in Table 6, several samples of this construction in Becos's spoken English were found. The literature on English language development has not addressed this phenomenon.

Becos's pattern of spoken imperative structures (Table 6) seems to consist of cases of repetition of the object pronoun. This is an allowable structure in ASL (Humphries, Padden, & O'Rourke, 1980) and an unusual structure in spoken English. For Becos, these utterances seemed to serve the function of revision, clarification, or added emphasis. This ASL-like word-order pattern did not occur with high frequency; Becos demonstrated predominant use of SVO word order, while drawing on an optional alternative from ASL for emphasis and/or clarification.

DISCUSSION

In general, Becos's pattern of spoken English development can be described by both expected developmental sequences for English and predictable patterns of influence from ASL. The data reflect instances of influence or transfer for the four hypotheses proposed regarding simultaneity of expression, undifferentiated versus differentiated features, bound versus free morpheme mechanisms, and word order. It is acknowledged that the overall frequency of occurrence for transfer was low in relation to the corpus of transcripts. Nonetheless, the predictable nature of many of Becos's English language errors and difficulties suggest a systematic rather than spurious influence.

In relation to the simultaneous dimension, evidence for ASL influence is strongest for question forms. Becos relied on intonation alone to mark questions with a much higher frequency rate than is seen for children acquiring English at even earlier ages. This finding follows the hypothesized prediction; a form marked simultaneously in ASL and sequentially in English was mastered later than expected and out of the typical developmental sequence.

The development of negatives was not as clearly indicative of ASL influence due to the simultaneous-sequential mismatch. The fact that the number of negative forms was limited provides only weak evidence because no additional atypical forms were seen. In this study, videotaped language samples were not analyzed for an overlaid head shake accompanying spoken negative forms. However, Becos's lack of diversity in mastering negative forms was striking relative to his general language abilities, as estimated by MLU and the associated linguistic stages.

The evidence for the undifferentiated versus differentiated hypothesis provides stronger support for ASL influence. The omission of articles persisted past the age expected for monolingual children exposed to English

for a similar amount of time. Other bound morphemes expected for monolinguals were present, providing evidence of the specific influence of ASL. Personal pronouns in English were not mastered during the course of the study despite the mastery of morphemes that usually develop later in Brown's sequence. Because these errors are not developmental, and because they reflect areas of mismatch between ASL and spoken English, it is hypothesized that ASL background influenced Becos's learning of these morphemes (cf. Dulay & Burt, 1974a).

The hypothesis regarding the mismatch between the use of free or bound morphemes to mark verb tense and plurals also provides support for ASL influence. The present progressive and third person singular verb tenses were acquired at ages 4;3 and 5;1, respectively. Given Becos's age of active exposure to English (2;3), this indicates a developmental trend similar to monolingual English-speaking children. That is, he had been exposed to present progressive tense for 2 years; monolingual English-speaking children acquire this morpheme between 1;7 and 2;4 years. He had been exposed to the third person singular form for 2;10 years; monolingual children acquire this morpheme between 2;2 and 3;10 years. However, regular and irregular past tenses were not mastered within the time period sampled for this study. Other developmentally expected morphemes were present; the verb tense markers were acquired in the expected order for monolingual children. Further support is provided by the fact that on the basis of general language level, acquisition of these morphemes would be expected. These instances point to ASL influence.

Additional support for the ASL influence hypothesis can be found in the word-order patterns noted. From age 3;0-3;9, instances of repetition of some part of the utterance were noted. Becos's transcripts reveal a large variety of repetitions that follow ASL word-order rules. Since these patterns do not appear to be developmental and are predictable from ASL syntax, the influence of ASL seems to be a tenable hypothesis, even though the frequency of such utterances in the corpus of transcripts was low.

To summarize, evidence to support ASL influence on Becos's spoken English development was found, at varying levels, across the hypotheses examined. Although not extensive, ASL influence appeared to be exerted consistently within several areas of spoken English development. These results suggest that the conclusions of several scholars (Garcia, 1983; Hakuta, 1986; Kessler, 1984; Wode, 1981) regarding bilingual development are pertinent for bimodal, bilingual language acquisition. That is, the acquisition process for bilingual learners may include a degree of reliance on the earliest learned language regardless of the modality of transmission.

The results of this study have additional implications regarding the spoken English language development of HCDP. Many of Becos's utterances and syntactic constructions appeared strikingly similar to those observed in the child studied by Todd (1975) and Todd and Aitchison (1981) and to the children studied by Murphy and Slorach (1983) and Sachs et al. (1981). The addition of this study to preceding studies strengthens the case for the possibility of ASL influence on the development of aspects of spoken En-

lish syntax in HCDP. Furthermore, the findings from this group of studies may lend support to the notion of resilient versus vulnerable aspects of language, as addressed by Goldin-Meadow (1982; Goldin-Meadow & Mylander, 1986). Goldin-Meadow suggested that certain features of language may be resilient to variations in the quantity and quality of the language model, while other linguistic properties may be vulnerable to such variation. Thus, some aspects of language acquisition would be expected to appear delayed or different under conditions of unusual linguistic input, while others would be predicted to develop intact. As studies converge, the nature and extent of language interaction are clarified.

The results of this study also highlight the need for future research. One area for future investigation is the potential influence of spoken English on ASL acquisition and use. To understand fully the characteristics of language transfer in Becos's case, the study of English influence on ASL use in the home setting is necessary. Unfortunately, available data on Becos's language acquisition do not allow the exploration of this issue. A second area for future research is the general acquisition process of ASL for both DCDP and HCDP. Broader understanding of characteristics and parameters of ASL acquisition would facilitate the identification of atypical developmental patterns.

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REFERENCES

- Baker, C., & Padden, C. (1978). Focusing on the nonmanual components of American Sign Language. In P. Siple (Ed.), *Understanding language through sign language research* (pp. 27-58). New York: Academic.
- Berninger, G., & Garvey, C. (1982). Tag constructions: Structure and function in child discourse. *Journal of Child Language*, 9(1), 151-168.
- Bernstein, M., Maxwell, M., & Matthews, K. (1985). Bimodal or bilingual communication? *Sign Language Studies*, 47, 127-140.
- Brown, R. (1973). *A first language: The early stages*. Cambridge: Harvard University Press.
- Critchley, E. (1967). Language development of hearing children in a deaf environment. *Journal of Developmental Medicine and Child Neurology*, 9, 274-280.
- De Villiers, P., & de Villiers, J. (1979). *Early language*. Cambridge: Harvard University Press.
- Dulay, H. C., & Burt, M. K. (1974a). Errors and strategies in child second language acquisition. *TESOL Quarterly*, 8(2), 129-136.
- (1974b). Natural sequences in child second language acquisition. *Language Learning*, 24, 37-53.

- Dulay, H. C., Burt, M., & Krashen, S. (1982). *Language two*. Oxford: Oxford University Press.
- Dunn, L. M., & Dunn, L. M. (1981). *Peabody Picture Vocabulary Test-Revised*. Circle Pines, MN: American Guidance Service.
- Fischer, S. (1973). *The deaf child's acquisition of verb inflections in ASL*. Paper presented to the Linguistic Society of America Annual Meeting, San Diego, CA.
- Garcia, E. (1983). *Early childhood bilingualism*. Albuquerque: University of New Mexico Press.
- Garton, A. F. (1983). An approach to the study of determiners in early language development. *Journal of Psycholinguistic Research*, 12, 513-526.
- Goldin-Meadow, S. (1982). The resilience of recursion: A study of a communication system developed without a conventional language model. In L. R. Gleitman & E. Wanner (Eds.), *Language acquisition: The state of the art*. New York: Cambridge University Press.
- Goldin-Meadow, S., & Mylander, C. (1986, October). *The development of morphology without a conventional language model: The resilience of levels of structure*. Paper presented at the 11th Annual Boston University Conference on Language Development, Boston, MA.
- Hakuta, K. (1974). Prefabricated patterns & the emergence of structure in second language acquisition. *Language Learning*, 24, 287-297.
- (1986). *Mirror of language*. New York: Basic Books.
- Hoffmeister, R., & Wilbur, R. (1980). The acquisition of sign language. In H. Lane & F. Grosjean (Eds.), *Recent perspectives on American Sign Language* (pp. 61-78). Hillsdale, NJ: Erlbaum.
- Holmes, K., & Holmes, D. (1980). Signed and spoken language development in a hearing child of hearing parents. *Sign Language Studies*, 28, 239-254.
- Humphries, T., Padden, C., & O'Rourke, T. J. (1980). *A basic course in American Sign Language*. Silver Spring, MD: T. J. Publishers.
- Johnson, J. M., & Rash, S. J. (1990). A method for transcribing signed and spoken language. *American Annals of the Deaf*, 135(5), 343-349.
- Jones, M. L., & Quigley, S. P. (1979). The acquisition of question formation in spoken English and ASL by two hearing children of deaf parents. *Journal of Speech and Hearing Disorders*, 44, 196-208.
- Kessler, C. (1984). *Language acquisition processes in bilingual children* (Bilingual Education Paper Series, 7[6]). California State University at Los Angeles, Evaluation, Dissemination and Assessment Center.
- Klima, E., & Bellugi, U. (1966). Syntactic regularities in the speech of children. In J. Lyons & R. J. Wales (Eds.), *Psycholinguistic papers* (pp. 183-208). Edinburgh: Edinburgh University Press.
- (1979). *The signs of language*. Cambridge, MA: Harvard University Press.
- Lado, R. (1957). *Linguistics across cultures*. Ann Arbor: University of Michigan Press.
- Lehiste, I. (1988). *Lectures on language contact*. Cambridge, MA: MIT Press.
- Liddell, S. (1980). *American Sign Language syntax*. The Hague: Mouton.
- Lund, N., & Duchan, J. (1988). *Assessing children's language in naturalistic contexts*. Englewood Cliffs, NJ: Prentice-Hall.
- Maratsos, M. (1976). *The use of definite and indefinite reference in young children*. Cambridge: Cambridge University Press.
- (1982). Children's construction of grammatical categories. In E. Wanner & L. Gleitman (Eds.), *Language acquisition: The state of the art* (pp. 240-266). Cambridge: Cambridge University Press.
- McLaughlin, B. (1984). *Second language acquisition in childhood: Volume 1. Preschool children* (2nd ed.). New York: Erlbaum.
- Miller, J., & Chapman, R. (1985). *Systematic analysis of language transcripts* [computer program]. University of Wisconsin, Madison.
- Mueller, K. A., & Rice, M. L. (1987, November). *He's a she: The persistence of idiosyncratic lexical performance after training*. Paper presented at the annual convention of the American Speech-Language-Hearing Association, New Orleans, LA.

- Murphy, J., & Slorach, N. (1983). The language development of pre-preschool hearing children of deaf parents. *British Journal of Disorders of Communication*, 18, 118-126.
- Owens, R. E. (1988). *Language development: An introduction*. Columbus, OH: Merrill.
- Power, R. J. D., & Dal Martello, M. F. (1986). The use of definite and indefinite articles by Italian preschool children. *Journal of Child Language*, 13, 145-154.
- Prinz, P., & Prinz, E. (1979a). Acquisition of ASL and spoken English in a hearing child of a deaf mother and hearing father: Phase I - Early lexical development. *Papers and Reports on Child Language Development*, 17, 139-146.
- (1979b). Simultaneous acquisition of ASL and spoken English in a hearing child of a deaf mother and hearing father. *Sign Language Studies*, 25, 283-296.
- Quigley, S., & Paul, P. (1984). *Language and deafness*. San Diego, CA: College Hill.
- Rosansky, E. J. (1976). Methods and morphemes in second language acquisition research. *Language Learning*, 26, 409-426.
- Sachs, J., Bard, B., & Johnson, M. (1981). Language learning with restricted input: Case studies of two hearing children of deaf parents. *Applied Psycholinguistics*, 2, 33-54.
- Schiff, N. (1979). The influence of deviant maternal input on the development of language during the preschool years. *Journal of Speech and Hearing Research*, 22, 581-603.
- Schiff, N. B., & Ventry, I. M. (1976). Communication problems in hearing children of deaf parents. *Journal of Speech and Hearing Disorders*, 41, 348-358.
- Siple, P. (1978). Linguistic and psychological properties of ASL: An overview. In I. M. Schlesinger (Ed.), *Sign language of the deaf: Psychological, linguistic, and sociological perspectives*. New York: Academic.
- Slobin, D. (1978). Cognitive prerequisites for the development of grammar. In L. Bloom & M. Lahey (Eds.), *Readings in language development* (pp. 407-432). New York: Wiley.
- Stokoe, W. (1960). Sign language structure: An outline of the visual communication system of the American deaf. *Studies in Linguistics Occasional Papers No. 8*.
- Todd, P., & Aitchison, J. (1980). Learning language the hard way. *First Language*, 1, 122-140.
- Todd, P. H. (1975). A case of structural interference across sensory modalities in second language learning. *Word*, 27, 102-118.
- Werner, H., & Kaplan, B. (1963). *Symbol formation: An organismic developmental approach to language and the expression of thought*. New York: Wiley.
- Wilbur, R. (1979). *American Sign Language and sign systems: Research and applications*. Baltimore: University Park Press.
- (1987). *American Sign Language: Linguistic and applied dimensions*. Boston: College Hill.
- Wode, H. (1981). *Learning a second language: I. An integrated view of language acquisition*. Philadelphia: Benjamin's, North America.