

Connected Speech Development in a Child with Limited Language Production Experience

Le développement du discours continu chez l'enfant ayant une expérience limitée de la production des actes de langage

by • par

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ABSTRACT

Some children with severe speech and physical impairment (SSPI) needing augmentative and alternative communication (AAC) systems may develop connected speech later in childhood, beyond the period when rapid linguistic growth typically takes place (i.e., between the ages of approximately two and six years). During the normal developmental period, therefore, they may rely primarily on language comprehension experiences in order to learn the grammar of the spoken language of the environment. The purpose of this study was to investigate the expressive syntax of a child (CB) with SSPI who developed connected speech after the age of five years. Analysis of spoken utterances reported and observed in clinical records and formal evaluation of expressive syntax at age 8;6 years (i.e., 3;6 years following the onset of connected speech) revealed progress in syntactic development that equalled or exceeded the rate typically achieved under normal developmental circumstances. The results tend to support comprehension-based views of acquisition of grammatical knowledge rather than those that emphasize language production.

ABRÉGÉ

Certains enfants souffrant de graves handicaps de la parole ou physiques (SSPI) et ayant recours à un système de communication suppléante (CS) peuvent développer le discours continu tardivement durant leur enfance, au-delà de la période typique de croissance linguistique rapide (c.-à-d. entre l'âge de deux et six ans, environ). Donc, pendant la période de développement normal, ces enfants peuvent se fier surtout sur leurs expériences de compréhension langagières pour apprendre la grammaire du langage parlé dans leur milieu. Cette étude avait pour objectif d'examiner la syntaxe expressive d'un enfant (CB) atteint de SSPI qui a développé le discours continu après l'âge de cinq ans. L'analyse des énoncés parlés signalés et notés dans les dossiers cliniques et une évaluation formelle de la syntaxe expressive à 8;6 ans (c.-à-d. 3;6 ans suivant l'avènement du discours continu) a permis de constater le progrès du développement syntaxique équivalent ou supérieur au taux typique de circonstances de développement normales. Les résultats tendent à appuyer les théories d'acquisition des connaissances grammaticales fondées sur la compréhension plutôt que celles mettant l'accent sur la production des actes de langage.

KEY WORDS

augmentative and alternative communication (AAC) • expressive syntax • grammatical knowledge

For children with severe speech and physical impairments (SSPI) who are unable to produce functional speech, language production experiences are significantly reduced when compared to typical developmental circumstances. In particular, their production of connected syntactic structures during early childhood is very limited, even when augmentative and alternative communication (AAC) systems are provided. In addition to the significant clinical challenges that children needing AAC present, this situation is interesting theoretically because theories of acquisition of grammatical knowledge differ in the importance they attribute to language production. Some theories view language production as a critical or facilitatory variable in the normal process of acquisition of grammar. Other theories place primary emphasis on language comprehension and thus consider production to play a minor role.

Within strong versions of production-based theories, language production is thought to be a central mechanism which serves to consolidate emerging grammatical knowledge (e.g., Clark, Hutcheson, & Van Buren, 1974). Children learn grammar to match the intents they wish to express in their sentences (Ninio & Snow, 1988). Weaker production-based views suggest that language production facilitates acquisition of grammar by providing opportunities for practice and feedback (e.g., Bloom & Lahey, 1978; Bohannon & Stanowicz, 1988; Hirsh-Pasek, Treiman, & Schneiderman, 1984). Social experiences gained through contingent interaction using language production motivate further linguistic development (e.g., Berko-Gleason, Hay, & Cain, 1989; Bruner, 1975; Ochs & Schieffelin, 1995). Thus language production is highlighted although the weight and nature of its influence vary among these theories.

Within comprehension-based theories, in contrast, the importance of language production is reduced, because it is held that language acquisition is based primarily on the language children hear and comprehend in the environment. Strong versions of this view contend that exposure to linguistic input and innate syntactic principles are sufficient to ensure acquisition of grammatical knowledge (e.g., Chomsky, 1986; Crain, 1987; Crain & Fodor, 1993; Meisel, 1995). Weaker positions suggest that comprehended utterances form the input to further learning of grammatical rules (Braine, 1988), or combine with children's internal mental models to refine both grammatical knowledge and understanding of the world (Golinkoff & Hirsh-Pasek, 1995). Thus these theories focus on comprehension rather than production in the acquisition of grammatical knowledge.

For children who speak, evaluation of grammatical knowledge is commonly based on the grammatical structures observed in their language productions. For children with SSPI who use AAC systems, in contrast, language production cannot be used to evaluate grammatical knowledge in a similar manner. It is frequently noted in the literature that individuals using AAC tend to produce limited syntactic structures (e.g., Beukelman & Mirenda, 1992; Bruno, 1989; Harris, 1978; Light, Collier, & Parnes, 1985b; Smith, 1996; Sutton, 1989; Sutton & Gallagher, 1995; Udwin & Yule, 1990). However, this observation cannot be interpreted as reduced underlying knowledge of syntactic structures because differences between AAC communication and spoken communication obscure the relationship between grammatical knowledge and utterance forms.

The global impact of AAC/spoken language differences on communication interaction has been well studied (e.g., Beukelman & Mirenda, 1992; Gerber & Kraat, 1992; Kraat, 1985; Light, Collier, & Parnes, 1985a; Nelson, 1992; Udwin & Yule, 1991). Differences may relate to a variety of variables, including AAC system factors, visual modality factors, and intrinsic user factors (see Smith, 1996, for a discussion). Factors related to use of an AAC system include system features (e.g., reduced vocabulary and grammatical elements that are difficult or impossible to mark), and atypical communication patterns (e.g., reduced encoding rate, partner involvement in message construction). The use of the visual modality (e.g., picture sets, graphic symbols, or printed words) rather than the auditory modality alone as in spoken communication, may influence AAC utterance forms (Sutton & Morford, in press; Smith, 1996). Alternatively, reduced syntactic constructions observed in AAC utterances may be related to intrinsic linguistic limitations of individuals who use AAC (i.e., variations in underlying knowledge of syntax, mor-

phology, and vocabulary). However, given the uncertainty in the current literature about how extrinsic and modality variables may influence AAC utterance forms, clinicians and researchers are careful not to base assessments of grammatical knowledge primarily on AAC language production, as they may do for spoken language production.

Although the need for AAC is typically a lifelong issue, some children with SSPI begin to produce connected speech in later childhood, after the age normally associated with rapid and significant linguistic growth (approximately age two to five or six years). During the typical developmental period, therefore, children with late-developing spoken language production relied primarily on their language comprehension experiences in acquiring the grammar of the language of the environment, because they were unable to produce connected syntactic structures (using voice and/or AAC systems). In normal developmental circumstances, children's expressive syntax typically includes two-word structures by two years of age, and some five-word, simple, and complex structures by the age of four years (e.g., Bloom, Lahey, Hood, Lifter, & Fiess, 1980; Bowerman, 1979; Gard, Gilman, & Gorman, 1993; Scott, 1988; Wells, 1985).

Syntactic structures produced by children with late-developing connected speech may provide insight into the grammatical knowledge that can be acquired from their early comprehension experiences, and thus would shed light on the importance of language production in the acquisition of grammatical knowledge. If production is as important as some theories suggest, then children without that experience in the developmental period would be expected to demonstrate significant expressive syntactic difficulties when their connected speech emerges. If acquisition of grammar is primarily based on comprehension of linguistic input, as proposed by other theories, then children with late-developing connected speech would be expected to demonstrate expressive syntax similar to that of children who acquired spoken language production during the normal developmental period. Further, once connected speech emerges in these children their expressive syntax would be predicted to develop rapidly. The purpose of this study, therefore, was to investigate the expressive syntactic abilities of a child with SSPI who began to produce connected speech after the period when most syntactic growth takes place in normally developing children.

Method

Participant

The participant was a boy (CB) aged eight years, six

months (8;6), with mixed cerebral palsy resulting in severe motor speech impairment and severe physical impairment. At the time of the study, CB was dependent for mobility on a manual wheelchair and was receiving powered mobility training. His hearing acuity and corrected visual acuity were normal, but he experienced significant visual-perceptual difficulties, according to his clinical records.

CB is the only child of English-speaking parents who have consistently been responsive to his communicative initiations and actively involved in his therapies. They carried out activities and techniques at home as recommended by CB's therapists and had attended a Hanen parent training course.

CB received regular speech-language pathology intervention from the age of 2;6 years on an individual basis (once to twice a week) and in group sessions. The goals noted in his records were to develop speech production abilities, comprehension, and use of AAC systems. From the age of about two years to 4;5 years he attended a half-day playgroup program for children with disabilities three times a week. At the age of 4;7 years he began attending a full-day preschool program at a rehabilitation centre in a class that included children with and without disabilities (reverse integration). He continued to receive regular individual and group sessions, as well as in-class activities in which AAC techniques were used. At the time of the study, he was following the first grade curriculum (i.e., one grade behind that expected for his age) in a reverse integration class at the rehabilitation centre. He used two head switches, with Morse code for access to written communication.

CB had been exposed to a variety of AAC techniques from the age of 2;6 years. These included real-object and picture choices, presented in arrays of two or three; live-voice presentation of auditory scanning of toy/activity choices; single-switch activation of adapted toys and household appliances (e.g., blender); and, single-switch scanning access to computer activities. However during this time CB's visual-perceptual difficulties and motor movement patterns had hindered his use of graphic AAC systems. Use of eye gaze for communication was not reliable because it was difficult to determine the direction of his gaze. Hand-pointing and head-pointing were not feasible because his motor disability precluded independent arm/hand/head movement. As a consequence, auditory scanning and Yes/No responses were frequently used. In addition to these techniques, vocal responses, even when minimally intelligible, could sometimes be utilized to differentiate choices that were maximally distinct within CB's vocal repertoire. For example, when presented with the choice of a *green* toy or a *blue* toy and a verbal model that

emphasized the /i/ and /u/ vowel sounds, CB's vocal response could be identified as one of the options presented.

CB did not produce connected speech during the period usually associated with significant growth of expressive grammar. His vocal communication improved in very small increments between the ages of approximately two years and five years. After the age of approximately five years, he began to produce sequences of intelligible words and subsequently communicated primarily using speech. Although his speech remained severely dysarthric, it gave the impression of underlying intact grammatical competence. Formal structured language comprehension testing was not possible due to CB's motor response difficulties. However, his language comprehension was judged by his speech-language pathologist and teachers to be within normal limits.

Procedure

A detailed review of CB's communication history was made by examining his clinical records. Developments in communication preceding the onset of connected speech were noted. Samples of spoken utterances were collected from clinical notes and records of informal testing. In addition, videotapes of periodic assessment sessions were reviewed and all examples of spontaneous speech were transcribed, which yielded a sample of 80 utterances, collected between the ages of 7;3 and 7;6 years. Because this sample was collected informally and over a period of time, descriptive analysis and comparison with a variety of developmental reference charts (e.g., Crystal, Fletcher, & Garman, 1989; Gard et al., 1993; Menyuk, 1969; Miller, 1981; Nelson, 1993; Owens, 1995; Retherford Stickler, 1987; Scott, 1988) rather than formal language analysis procedures were used.

At the age of 8;6 years, CB's expressive language was evaluated more systematically by a certified speech-language pathologist with AAC experience. The Patterned Elicitation Syntax Screening Test (PEST; Young & Perachio, 1983), which is a delayed imitation task, and the Expressive One-Word Picture Vocabulary Test (EOWPVT; Gardner, 1981) were administered. A 30-minute conversational language sample was collected. The language sample was analyzed using the Developmental Sentence Scoring (DSS; Lee, 1974) and the Language Assessment, Remediation, and Screening Procedure (LARSP; Crystal et al., 1989). Expressive language measures typically used with older children (e.g., Clinical Evaluation of Language Functions-Revised; Semel, Wiig, & Secord, 1987) were not used, despite CB's age, because they tend not to focus on emerging syntactic features, and therefore were not appropriate for the purposes of this study.

Testing sessions with CB were videotaped in their entirety, with audio input from a microphone around CB's neck. Three certified speech-language pathologists were involved in the data collection, transcription, scoring, and assessment of reliability. They were conservative in giving credit for use of grammatical structures when scoring the tests, to avoid over-interpreting CB's dysarthric speech as grammatical skill. It was clear that CB's articulation was still interfering with his production of some grammatical elements (e.g., suffixes, unstressed morphemes).

All data (tests and language sample) were collected by SLP One, who was experienced in AAC. She scored the PEST and EOWPVT responses at the time of administration, and subsequently checked them using the videotape. She also transcribed the connected speech sample orthographically from the videotape. SLP Two, also a certified speech-language pathologist experienced in AAC and language sample analysis, performed the DSS and LARSP procedures.

All data were transcribed and scored by one other judge for reliability purposes. SLP Two retranscribed and scored responses on the PEST and the EOWPVT-R, and retranscribed the entire language sample. SLP One repeated the LARSP analysis and SLP Three, a certified speech-language pathologist experienced in language analysis, repeated the DSS procedure. Point-to-point reliability measures were calculated for words transcribed (including morphological elements) on tests and in the connected speech sample, for test scores, and for language sample analysis codes. Inter-observer agreement for transcription, scoring, and coding ranged from 90% to 98%.

Results

The review of CB's clinical records revealed a pattern of very limited speech production prior to the age of 5;0 years (see Table 1). He progressed from communication by behaviour (whining, crying), to single words and short phrases in context, to spontaneous short phrases. Once he began to produce connected speech, CB seemed to progress rapidly in expressive spoken communication. At 5;6 years (i.e., six months following the onset of connected speech), CB produced a variety of structures in delayed imitation that suggested considerable gains in expressive syntax (see Table 2). The error productions noted (e.g., inconsistent interrogative reversal) resembled normal developmental error patterns (e.g., Retherford Stickler, 1987).

At age 7;3 to 7;6 years (approximately two and a half years following the onset of connected speech), the phrases and sentences that CB produced in spontaneous speech were essentially error-free. He used several structures and grammatical elements typically acquired within 2;6 years follow-

Table 1. CB's progress in communication and spoken language development between the ages of two years and five years (from records).

Age	Behaviour
Early Communication	
2;3	Mother reported no words, communication by whining and crying
2;5	First spoken words reported: "hi" and "daddy"
2;8	"Yes" and "No" verbal responses clear but not reliable
2;10	Understood "red", "green", "blue", "orange"
3;1	Understood "big/little", some prepositions
4;5	18 words intelligible out of context, many others intelligible with context
Onset of Connected Speech	
4;6	Produced a few 2- to 3-word routine phrases in structured contexts with familiar listeners
5;0	2- to 4-word phrases produced spontaneously

ing the onset of connected speech (see Table 2). However, he also demonstrated consistently correct use of Yes/No and WH question structures: almost a quarter of the utterances in the sample were questions (19/80), and these were all syntactically correct. This consistently correct question formation contrasts with reversal errors noted among children developing spoken language up to four to five years following the onset of connected speech (Nelson, 1993). Thus although the data is limited at this stage, it indicates a rapid rate of progress in expressive syntax (see Table 2).

Test results at 8;6 years suggested that CB's expressive syntax skills were reliably at a level that exceeded what would be expected based on language production experience age alone (i.e., three years, six months following the onset of connected speech), although still reduced relative to his chronological age. On the PEST, CB obtained a score of 38/44. This was above the 50th percentile for the 5;6-5;11 year age group, and above the 25th percentile for the 6;0-6;5 year age group in the standardization sample (see Table 3). Although CB's score fell below his age level, it is important to note that this score approached the ceiling level of the test. Further, his responses scored as errors were not ungrammatical structures. For example, following the model "A cowboy rides a horse", CB produced "A cowboy is riding a horse". Further, these test results indicate that he maintained the gains made earlier and continued to progress in development of expressive syntax beyond the initial growth noted above.

CB's DSS score of 9.22 fell at the 50th percentile for

Table 2. CB's progress in communication and spoken language development between the ages of five years and eight years (from records). Typical time post onset of connected speech is shown in parentheses below the structure types.

Connected Speech Development (5;0 to 7;6 years)		
Age	Structures Correctly Produced	Examples
5;0	2- to 4-word phrases produced spontaneously	
5;6 (six months)	(delayed imitation) Sentences of up to seven words Conjunctions Variable interrogative reversal in "Yes/No" and "Wh" questions Variable copula and auxiliary Some past tense forms (within two years of onset of connected speech)	because, which is, are, will, can
6;7	(spontaneous speech) Syntactically correct, 7-word sentence	I want to go to the bathroom
7;3 to 7;6 (2;3-2;6)	(spontaneous speech) Reversal of subject and auxiliary In "Yes/No" (6/6) and "Wh" questions (13/13) (Inconsistent reversal typically still frequently noted 5 years after onset of connected speech)	What were they doing? Did you watch any TV? Can I see the video? What did you see? What else are we gonna do?
(4 to 5)	Noun + verb + particle	you touch somebody... and they put their hand up
(at least 2;6)	Empty "it" and "there" Contracted negative forms (2/2) Correctly placed "not" negative (1/1) (double negatives typically still noted 2 to 4 years after the onset of connected speech)	There's a little girl and a little cat It's finished I can't see you, I don't He's not playing in the playoffs
(6 months to 2;6)	Variety of question words	who, what, where, how many, what else, what about, what kind, why, how
(at least 2;0)	Indefinite pronouns	somebody, nobody
(2)	Clause-initial conjunction "because"	Because I win
(2)	Two-clause conjunction "and"	There's a little girl and a little cat
(1 to 1;6)	Variety of personal pronouns (usually all acquired by about 1;6 to 2;0 years after onset of connected speech) Expanded adjectives and adverbs	I, my, me, you, your, they, their, we a long time ago funny feet a little girl I am doing fine first place, last night really really quickly
(1 to 1;6)	Post modified nouns	one that you gave me that's what I got what kind of salad?
(1)	Adverbial phrases	The Canadians win this time I saw the eclipse today

Note. Typical age of acquisition equivalents have been obtained from several sources, including Crystal et al. (1989), Gard et al. (1993), Menyuk (1969), Miller (1981), Nelson (1992), Owens (1995), Retherford-Sticker (1987), Scott (1988).

age 5;6 years or at the 25th percentile for age 6;4 years. The LARSP profile characterized CB's expressive syntax as the late stage of syntactic development (see Table 3). These findings were comparable to the PEST results noted above. The range of structures CB produced, essentially without errors, in spontaneous speech was further evidence of continued progress in expressive syntactic development. For example, he produced coordination, subordination (adverbial, complement), complex verb phrases, and late developing grammatical morphemes (negatives, auxiliaries, comparatives, and derivational adverbs). A portion of the language sample transcript is found in the Appendix.

On the EOWPVT, CB obtained a raw score of 62 (Standard Score 77; Language Age 6;4 years; see Table 3). This score is below what would be expected for his chronological age, but must be considered a minimum level because of CB's known visual-perceptual difficulties. It is likely that some of his errors were related to misperception of the target picture rather than lack of vocabulary knowledge. For example, CB said "pencil" for the target picture "rocket", and "typewriter" for the target picture "cash register". The score CB obtained suggests that his expressive vocabulary was at a level at least as advanced as his grade level (first grade), although it was somewhat reduced for his chronological age.

CB's test results at 8;6 years should be considered as a minimum estimation of his expressive syntactic skills. The tests were used as measures of emerging syntactic abilities, which are typically standardized on children younger than CB. Although his scores ap-

Table 3. CB's performance on measures of expressive language at 8;6 years.

Evaluation of Expressive Syntax and Vocabulary				
Test	Score	Normal Age Comparison	Ceiling Age of Test	Gain from Onset of Connected Speech
Patterned Elicitation Syntax Test	38/44	> 25 %ile for 6;0 to 6;5 years	7;6 years	4 years
Developmental Sentence Scoring	9.22	50 %ile for 5;6 years 25 %ile for 6;4 years	6;11 years	3;6 to 4 years
Language Assessment and Remediation Procedure		late stage of syntactic development	4;6 years+	
Expressive One-word Picture Vocabulary Test	62 (raw) 77 (standard)	6;4 years age equivalent	11;11 years	4;4 years

proached a six-year-old level overall, it is not clear that his performance would actually be below the normal range for his age.

Discussion

The findings suggest that CB's expressive grammatical development had advanced at a rate that was at least equivalent to normal developmental progress following the onset of connected speech at five years of age, even though it was apparently delayed in relationship to his chronological age. Although expressive syntax was not formally evaluated until the age of 8;6 years, the test results and descriptive analysis provided evidence of expressive syntactic skills. The findings are consistent with other reports of rapid expressive syntactic development following late onset of connected speech in children with SSPI (e.g., Kraat, 1991). In addition, based on the available data, CB's progress seemed to resemble normal developmental patterns in terms of emergence of structures and types of errors (e.g., early inconsistent interrogative reversal prior to consistent reversal).

The findings of this study suggest that CB's experience with English language structure through comprehension of spoken language in the environment during early childhood prepared him adequately for the development of expressive syntax, despite its late onset. His lack of experience producing English language structures during this period did not appear to hinder significantly his subsequent development of expressive syntax. Rather, his development of grammatical knowledge seemed well supported by his language comprehension experiences.

In general, the findings of this study tend to support comprehension-based views of acquisition of syntax (e.g., Braine, 1988; Chomsky, 1986; Crain & Fodor, 1993; Golinkoff & Hirsh-Pasek, 1995) and are not consistent

with theories that attribute a strong central role to language production (e.g., Clark et al., 1974; Ninio & Snow, 1988). CB demonstrated expressive syntactic development that exceeded the progress that would be expected based on his language production experience alone. No evidence of significant syntactic difficulties were observed once connected speech emerged despite his prior limited spoken or AAC production.

The findings could also be interpreted as consistent with weaker versions of the production-based view (e.g., Bloom & Lahey, 1978; Bruner, 1975; Ochs & Schieffelin, 1995).

CB had many opportunities to produce communicative behaviours that were interpreted as utterances by his communication partners, even though his independent production of connected speech did not begin until after the age of five years. The fact that CB received intervention from an early age directed towards development of language and communication skills may also have aided his grammatical development when production experience was severely limited.

Further research is needed to investigate which aspects of the early language development experiences of children with SSPI may facilitate grammatical development. Additional systematic studies of the emergence of expressive syntax in children with limited language production experience will advance our understanding of the roles of language production and comprehension in the development of grammatical knowledge.

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References

- Berko-Gleason, J., Hay, D., & Cain, L. (1989). Social and affective determinants of language acquisition. In M. Rice & R. Schiefelbusch (Eds.), *The teachability of language* (pp. 171-186). Baltimore, MD: Paul H. Brookes.
- Beukelman, D., & Mirinda, P. (1992). *Augmentative and alternative communication*. Baltimore, MD: Paul H. Brookes.
- Bloom, L., & Lahey, M. (1978). *Language development and language disorders*. New York: Wiley and Sons.
- Bloom, L., Lahey, M., Hood, L., Lifter, K., & Fiess, K. (1980). Complex sentences: Acquisition of syntactic connectives and the semantic relations they encode. *Journal of Child Language*, 7, 235-261.
- Bohannon, J., & Stanowicz, L. (1988). The issue of negative evidence: Adult responses to children's language errors. *Developmental Psychology*, 24, 684-689.
- Bowerman, M. (1979). The acquisition of complex sentences. In P. Fletcher & M. Garman (Eds.), *Language acquisition* (pp. 285-306). Cambridge: Cambridge University Press.
- Braine, M. (1988). Modelling the acquisition of linguistic structure. In Y. Levy, I. Schlesinger, & M. Braine (Eds.), *Categories and processes in language acquisition* (pp. 217-260). Hillsdale, NJ: Erlbaum.
- Bruner, J. (1975). From communication to language: A psychological perspective. *Cognition*, 3, 255-288.
- Bruno, J. (1989). Customizing a Minspeak™ system for a preliterate child: A case example. *Augmentative and Alternative Communication*, 5, 89-100.
- Chomsky, N. (1986). *Knowledge of language*. New York: Praeger.
- Clark, R., Hutcheson, S., & Van Buren, P. (1974). Comprehension and production in language acquisition. *Journal of Linguistics*, 10, 39-54.
- Crain, S. (1987). On performability: Structure and process in language understanding. *Clinical Linguistics and Phonetics*, 1, 127-145.
- Crain, S., & Fodor, J. (1993). Competence and performance in child language. In E. Dromi (Ed.), *Language and cognition: A developmental perspective* (pp. 141-171). Norwood, NJ: Ablex.
- Crystal, D., Fletcher, P., & Garman, M. (1989). *Grammatical analysis of language disability*. London: Whurr.
- Gard, A., Gilman, L., & Gorman, J. (1993). *Speech and language development chart*. Austin, TX: Pro-Ed.
- Gardner, M. (1981). *Expressive One-Word Vocabulary Test*. Novato, CA: Academic Therapy Publications.
- Gerber, S., & Kraat, A. (1992). Use of a developmental model of language acquisition: Applications to children using AAC systems. *Augmentative and Alternative Communication*, 8, 19-32.
- Golinkoff, R., & Hirsh-Pasek, K. (1995). Reinterpreting children's sentence comprehension: Toward a new framework. In P. Fletcher & B. MacWhinney (Eds.), *Handbook of child language* (pp. 430-461). Cambridge, MA: Blackwell.
- Harris, D. (1978). Communicative interaction processes involving nonvocal physically handicapped children. *Topics in Language Disorders*, 2, 21-37.
- Hirsh-Pasek, K., Treiman, R., & Schneiderman, M. (1984). Brown and Hanlon revisited: Mothers' sensitivity to ungrammatical forms. *Journal of Child Language*, 11, 81-88.
- Kraat, A. (1985). *Communication interaction between aided and natural speakers: A state of the art report*. Toronto: Canadian Rehabilitation Council for the Disabled.
- Kraat, A. (1991). Methodological issues in the study of language development among children using aided language. In J. Brodin & E. Bjordk-Akesson (Eds.), *Methodological issues in research in augmentative and alternative communication* (pp. 118-123). Stockholm: Swedish Handicap Institute.
- Lee, L. (1974). *Developmental sentence analysis*. Evanston, IL: Northwestern University.
- Light, J., Collier, B., & Parnes, P. (1985a). Communicative interaction between young nonspeaking physically disabled children and their primary caregivers: Part I - Discourse patterns. *Augmentative and Alternative Communication*, 1, 74-83.
- Light, J., Collier, B., & Parnes, P. (1985b). Communicative interaction between young nonspeaking physically disabled children and their primary caregivers: Part III - Modes of communication. *Augmentative and Alternative Communication*, 1, 125-133.
- Meisel, J. (1995). Parameters in acquisition. In P. Fletcher & B. MacWhinney (Eds.), *Handbook of child language* (pp. 10-35). Cambridge, MA: Blackwell.
- Menyuk, P. (1969). *Sentences children use*. Cambridge, MA: MIT Press.
- Miller, J. (1981). *Assessing language production in children: Experimental procedures*. Needham Heights, MA: Allyn and Bacon.
- Nelson, N. (1992). Performance is the prize: Language competence and performance among AAC users. *Augmentative and Alternative Communication*, 8, 3-18.
- Nelson, N. (1993). *Childhood language disorders in context*. Toronto: Merrill.
- Ninio, A., & Snow, C. (1988). Language acquisition through language use: The functional sources of children's early utterances. In I. Schlesinger & M. Braine (Eds.), *Categories and processes in language acquisition* (pp. 1-30). Hillsdale, NJ: Erlbaum.
- Ochs, E., & Schieffelin, B. (1995). The impact of language socialization on grammatical development. In P. Fletcher & B. MacWhinney (Eds.), *Handbook of child language* (pp. 73-94). Cambridge, MA: Blackwell.
- Owens, R. (1995). *Language disorders: A functional approach to assessment and intervention* (2nd ed.). Boston: Allyn and Bacon.
- Retherford Stickler, K. (1987). *Guide to analysis of language transcripts*. Eau Claire, WI: Thinking Publications.
- Scott, C. (1988). Producing complex sentences. *Topics in Language Disorders*, 8 (2), 42-62.
- Semel, E., Wiig, E., & Secord, W. (1987). *Clinical Evaluation of Language Fundamentals - Revised*. Allen, TX: DLM.
- Smith, M. (1996). The medium or the message: A study of speaking children using communication boards. In S. von Tetzchner & M. Jensen (Eds.), *Augmentative and alternative communication: European perspectives* (pp. 119-136). London: Whurr.
- Sutton, A. (1989). The social-verbal competence of AAC users. *Augmentative and Alternative Communication*, 5, 150-164.

Sutton, A., & Gallagher, T. (1995). Comprehension assessment of a child using an AAC system: A comparison of two techniques. *American Journal of Speech-Language Pathology*, 4, 60-67.

Sutton, A., & Morford, J. (in press). Constituent order in picture pointing sequences produced by speaking children using AAC. *Applied Psycholinguistics*.

Udwin, O., & Yule, W. (1990). Augmentative communication systems taught to cerebral palsied children-a longitudinal study. I. The acquisition of signs and symbols and syntactic aspects of their use over time. *British Journal of Disorders of Communication*, 25, 295-309.

Udwin, O., & Yule, W. (1991). Augmentative communication systems taught to cerebral palsied children-a longitudinal study. II. Pragmatic features of sign and symbol use. *British Journal of Disorders of Communication*, 26, 137-148.

Wells, G. (1985). *Language development in the preschool years*. Cambridge, England: Cambridge University Press.

Young, E., & Perachio, J. (1983) *Patterned Elicitation Syntax Screening Test*. Tucson, AZ: Communication Skill Builders.

APPENDIX

A portion of language samples collected at age 8;6 years.

Account of an operation that CB had had a year prior to the conversation:

- Well, how it started I went to the (name of local hospital)
- And I went in the car
- And I got there
- And I went into the waiting room and my mom told me a story
- And XXXX and I went to my operation
- I was crying
- Because I missed my mom
- I went to sleep and dreamed about (name of family member)
- I went to sleep dreaming about (family member)
- And then I went to another hospital
- And then they invited my whole class to come
- And they brought me a pizza
- And the next day I went down to my school
- And they gave me this award
- For doing hard work at school
- And then the next day I went back home for the weekend
- Because it was Friday
- And this is what I said to my mom
- Isn't it nice to have this award? and she said yes
- Do you have to say something to me?
- I think we should continue with this the next time.

Other examples of sentences:

- We went under water and I was trying to catch the fish (about a movie experience)
- The baseball game is fun and the maze was fun
- I went with my mom and my cousins and they played it
- But they won't have any friends to play with
- And (occupational therapist) can come one day to see me