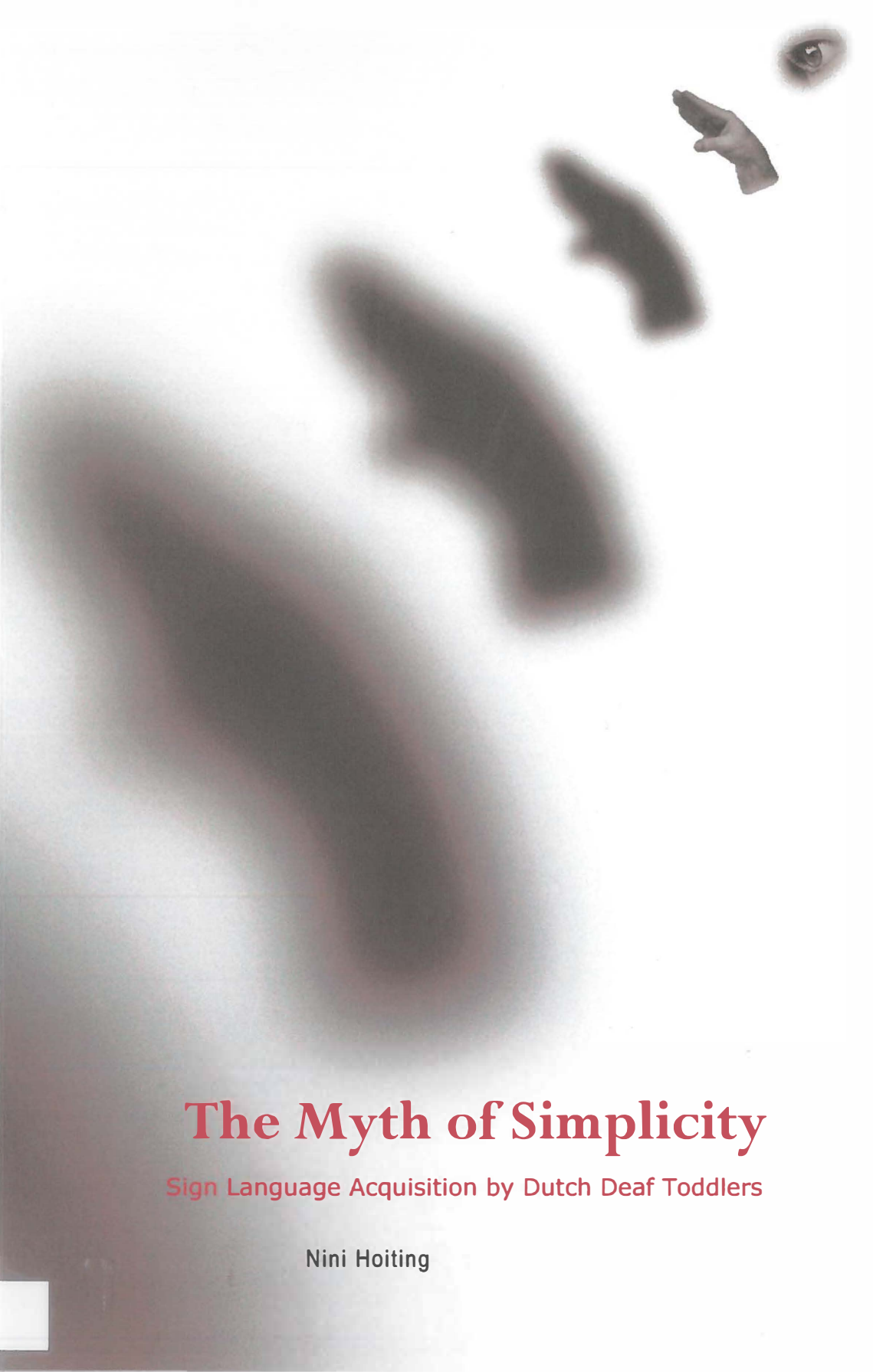

The Myth of Simplicity

Sign Language Acquisition by Dutch Deaf Toddlers

Nini Hoiting

The Myth of Simplicity:

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Stellingen behorende bij het proefschrift

The Myth of Simplicity:
Sign Language Acquisition by Dutch Deaf Toddlers

van

Nini Hoiting

1. Alleen Gebarentalen beschikken over de rijkdom van twee articulatoren die twee verschillende betekenissen kunnen representeren.

2. Het slinken van taaluniversalia lijkt omgekeerd evenredig aan de toename van kennis van talen.

3. Linguisten hebben weinig 'agreement' over "Agreement".

4. Onderscheid en schikking van taaldelen vooronderstelt kennis van hun functies.

5. De term "visueel taalonderwijs" suggereert ten onrechte dat gegrammaticaliseerde oog - en hand bewegingen in NGT herkend worden.

6. Het ontgaat velen dat gebaren van dove en horende mensen fundamenteel verschillende uitdrukkingstaken hebben terwijl het onderscheid gestures voor 'horende' en gebaren voor dove taalgebruikers zou volstaan.

7. Veel taaltherapeuten verwarren taalproductie met taalproductiviteit.

8. Integratie van doven en slechthorenden in de horende wereld wordt ten onrechte gereduceerd tot een audiologische snelweg.

9. NmG is als een TOMTOM: je komt ergens zonder te weten waar je bent .

10. Een halftalige dove kost op termijn meer dan een tweetalige Dove.

11. Linker - en rechter hemisferen worden verdacht weinig vergeleken met linker - en rechterwielen van auto's.

Skia: Ben je Eratosthenes vergeten? Die stelde vragen aan een piepklein schaduwtje op de bodem van een kom, en dat verklapte hem de afmetingen van de aarde!

Roberto Casati , 2000. De Ontdekking van de Schaduw
(vertaling Jan Gunning 2000, Bezige Bij, Amsterdam).

Cover design: Frans Gort & Nini Hoiting
(variant op de discussie tussen Plato en Skia, waarbij Skia refereert aan
geograaf Eratosthenes (276 – 196) die een piepkleine schaduw vragen stelde
en op grond daarvan de afmetingen van de aarde kon berekenen. Casati, 2000- p. 284.

RIJKSUNIVERSITEIT GRONINGEN

The Myth of Simplicity:

Sign Language Acquisition by Dutch Deaf Toddlers

Proefschrift
ter verkrijging van het doctoraat in de
Medische Wetenschappen
Aan de Rijksuniversiteit Groningen
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in het openbaar te verdedigen op
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om 16.15 uur

door

Jantien Frederika Albertine Hoiting

geboren op 20 december 1944
te Groningen

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Acknowledgments

Unlike most doctoral studies, this book is not the product of a beginning career in research. It is written near the end of a professional career as a clinical linguist and researcher. It is the product of my clinical work along with linguistic and developmental psycholinguistic research. The parents and children, as well as deaf colleagues that I have been working with for more than 25 years, have been my enduring inspiration and source of never ending *vade mecum*—that is, a living reference manual. I want to thank all these individuals for being such rich and patient sources for my never-ending questions. If this book, as a result of all our questions, helps coming generations to a deeper understanding of this beautiful and challenging language it will have achieved its goal.

My sign language studies were awakened by a book handed to me by Frans Zwarts, lector at the Rijksuniversiteit Groningen back then, now my Promotor. The book was *The Signs of Language* by Edward Klima and Ursula Bellugi (1979). I received that seminal book in July 1981, and only when I finished the book in August, did I notice that the Dutch summer had gone by and my direction in linguistics had changed forever. Frans, I thank you for conveying your unprejudiced attitude in linguistics, for the opportunities of opening up the world of sign linguistics to me, and—when I came back after so many years with this dissertation—for being as enthusiastic as decades ago.

From the time of reading the book that shaped my linguistic directions, until the time in 1983 that I succeeded in obtaining a job in a project at the Royal Institute for the Deaf "H. D. Guyot", and up until today, in 2009, I have had the rare opportunity of sculpturing my linguistic passions in many ways, in research as well as in innovating projects to (re-)introduce the use of the Sign Language of the Netherlands (SLN) in deaf education. It is in my work with deaf colleagues, that I have learned—and I am still learning—the most about sign language, and unexpectedly much more about linguistic prejudices. My deep admiration for many of my bilingual deaf and hearing colleagues comes not only from the fact that they have shared their beautiful language with me, but especially from their amazing patience with the linguistic prejudices of so many people in the hearing world. I owe many thanks to all of you, beginning with A. Oostra, whose trust guided me for so many years; A. Woest, who has been such a good collaborator in many of our innovative projects; Johan Wezeman for being a never ending inspiration; Martha Luining, Diny Visch, Arie and Anne Marie Terpstra, whose enduring cooperation has opened up new projects to develop courses for improving signing skills in parents, colleagues, and teachers—and last but not least, to all of you for being such beautiful SLN models. My thanks go also to Frans Gort, whose qualities as cameraman, as video developer and moviemaker, and fun-sharing partner have been essential to this endeavor. I'm grateful for all of your long-lasting collegiality and friendship, and for the changes that we have managed to bring about.

In the department of the family Support Program I found my "Stiel". The earliest interaction between parents and children won my neverending interest from the start in 1986 with the "Pioniers". Thanks to all of you over so many years for opening up your homes and family lives to me. May the insights hereafter express my deep gratitude to all of you and your hospitality.

I am indebted to the United States, whose National Science Foundation funded a research proposal that Professor Dan I. Slobin and I designed. The NSF support gave me the means to carry out my research on SLN acquisition in the company of a wonderful group of graduate students at the University of California at Berkeley. The Institute of Human Development

(IHD) at Berkeley provided us with research and meeting space, along with efficient grant administration. In our lab in Tolman Hall we discussed ongoing research on the acquisition and linguistic structures of SLN and ASL, with Dan Slobin's experienced guidance in child language development and typological linguistics, and occasional participation by sign language researchers such as Professors Jeffrey Bettger, Robert Hoffmeister, and Philip Prinz. We wrote and published papers together, developed a new system for transcribing sign languages, and all of the members of the group completed doctoral dissertations in the field. Dissertations on the acquisition of American Sign Language (ASL) were written by Michelle Anthony, Amy Lieberman, and Reyna Lindert; on the role of ASL in deaf children's cognitive development by Jennie Pyers; on adult ASL literacy by Helen Thumann; on acquisition of English literacy by deaf children in the United States by Marlon Kuntze (Stanford University) and in New Zealand by Yael Biederman; and on developmental assessment by Wolfgang Mann. The current dissertation—the only one on SLN—completes the series spawned at Berkeley. My deepest gratitude goes to IHD for providing me with four years of great hospitality, with openness and friendship.

The Max Planck Institute for Psycholinguistics in Nijmegen, The Netherlands, provided additional invaluable research support, thanks to Director Stephen Levinson. The Max Planck Institute provided not only skilled technical support, but also a place to work, in an atmosphere of friendship and stimulating discussions at the "Plank." Thank all of you so much: Melissa Bowerman, Penny Brown, Eve and Herb Clark, Wolfgang Klein, Pim Levelt, Steve Levinson, David Wilkins, and the Technical Group. It is a pleasure to express my gratitude to all of these institutions and fellow travelers, and especially to my continuing research collaborator and co-author, Dan Slobin.

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Professor Bencie Woll, whom I met at the same early sign language congress as Engberg Pedersen, struck me at once with a sense of humor and sincerity, supported by a striking breadth of knowledge and research skills, ranging from aphasia in deaf adults to early child languages analysis. This breadth is embodied in her admirable research institute that brings together an international group of deaf and hearing researchers in London today. Thanks, Bencie, for finding a hole in your many schedules to provide me your challenging questions.

Professor John Nerbonne never stops to surprise me with unexpected and hard-to-answer questions, but valuable methodological advice. Some time I hope to answer more of the issues later. So, amongst others, thank you John for keeping me on track.

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Soulmates and their friendship are my surviving tools. All of them, the earliest and the latest, and on either side of the Atlantic, have never given up their friendship, although I spent years away from them: Eye †, Peek † and de Freule †, Menno, Barbara, Wytze, Iet, Mariette, Thea †, Liny, Hanny and her BoBo's, Dan, Bill and Leah, Mark and Greta, Gladys—and, my stars Elis, Roos, and Susan.

Nini Hoiting

Table of contents

Chapter 1
Introduction to the Study

"Our understanding of what constitutes a language has been much too narrow."
Scott Liddell (2003, p. 362)

This is a study of deaf children's acquisition of Sign Language of the Netherlands (SLN) as a first language and their hearing parents' use of SLN as a second language.[1] It is an impressive fact that deaf children succeed in finding linguistic patterns when exposed from early on to a sign language. However, if they do not have early experience with sign language—either because their hearing parents cannot sign, or because pedagogical practice is based on an oral language—deaf children create a rudimentary gesture system known as "homesign" (Goldin-Meadow, 2003). Homesign systems provide for only limited communication with the hearing world, and these children do not have direct access to the surrounding spoken language of the home and community. Such children face serious communicative and linguistic difficulties if they receive no signed input and are forced to try to create meaning from a spoken language. Because the vast majority of deaf children (90% or more: Quigley & Paul, 1984) are born to hearing parents, research on the language-learning capacities of deaf children is urgent.[2] If a deaf child born to hearing parents is to acquire first-language competence in a sign language, the parents must quickly learn that language as well. The current investigation began with a pressing question: "Can a deaf child learn to sign from hearing parents?" The findings presented here give a positive answer—provided that parents and child are taught a natural sign language, such as SLN. The study thus deals both with children's first-language acquisition and their parents' second-language acquisition of signing. In addition, a comparison is made of a natural sign language, SLN, and a hybrid system of speech and signs, Sign-Supported Dutch (SSD).

Whatever cognitive potentials a deaf child may possess, these skills have to be adapted to a language that uses the manual/visual modality, rather than the vocal/auditory.
In order for the child to make use of skills in informational processing, intention-reading, memory, and attention, those skills must be applied to information from adults that is presented in formats that the deaf child can process. In other words, the meaning of any adult communicative act has to be phrased in a way that allows it to be a communicative tool for the child. In order to frame these issues, this introductory chapter first describes the data sample, situating the endeavor in the fields of child language acquisition; the chapter then goes on to document the language under investigation, SLN. Having laid this groundwork, the chapter concludes with the questions and hypotheses that guide the analysis presented in Chapters 2 (lexicon), 4 (morphosyntax), and 5 (input). Chapter 3 (transcription) presents a

[1] This dissertation uses the English names for Dutch sign languages, following most of the international literature. SLN (Sign Language of the Netherlands) is equivalent to NGT (Nederlandse Gebarentaal); SSD (Sign-Supported Dutch) is equivalent to NmG (Nederlands met Gebaren).
[2] The research reported here was completed in 2006, before the widespread introduction of cochlear implantation for deaf children in the Netherlands. Data were gathered during a period when it became broadly accepted that initial competence in some sort of signed communication would facilitate acquisition of literacy in the spoken/written language of the community, as well as normal cognitive and social development.

system of transcribing sign language at the level of meaning components; that system is applied to the data of Chapter 4.

Sign Language of the Netherlands: History and current state

Historical roots of Sign Language of the Netherlands[3]

In the period of the Enlightenment, sign languages were a topic of intense discussion and debate. At issue was the question: If the Lord created humans, and gave them a (spoken) language, what will His acceptance be of the human use of signed languages? This debate was decided in 1784 at the famous religious Zurich Convention, which favored *La Méthode des Signes,* as presented by the French Abbé de l'Epée, in preference to the Oral Method, presented by the German pastor Samuel Heinicke as a linguistic tool to introduce the deaf to the Bible.
The history of SLN begins in 1785 when Henri Daniel Guyot returned to Holland from Paris, bringing the insights from Paris of Abbé l'Epée. Along with other European pioneers, Guyot followed l'Epée's advice to build on what we now call local "homesign" systems, adding structural concepts developed for French Sign Language. By 1790 he had established a school in Groningen with about half a dozen deaf children. Guyot, being a student of l'Epée, preferred the bilingual approach *avant la lettre*, and indeed, deaf teachers were part of the educational system back then. Guyot and his colleagues pragmatically designed the "mixed method" as a language tool for those who were able to speak, possibly hard-of-hearing in times when audiologists did not yet exist. Central to his language teaching method was a pragmatic approach not to bother pupils with visualized Dutch grammar. Instead, early educators used SLN to explain spoken and written Dutch, so as not to *lose pupils in the translation*. This "Old Dutch Method" as a teaching model underlies the present-day Sign Supported Dutch (SSD) as a flexible system following Dutch word order using a borrowed SLN lexicon, primarily adding fingerspelling for Dutch grammar excursions and proper names. SLN itself went underground—unfortunately—from the middle of the nineteenth century until the seventies of the twentieth century. The structure and lexicon of SLN indicate that the language is strongly related to Old French Sign Language, and—like all sign languages—functions as a living, natural language, displaying semantic and grammatical complexity and organizational principles of its own.

As far as can be ascertained from study of existing documents, Guyot's method was eclectic, using sign-supported Dutch (now known as SSD) to aid literacy, while also allowing for the elaboration of existing systems of gestural communication used by the deaf. The Groningen school was notable in Europe for its early employment of deaf teachers. In the middle of the nineteenth century, oralism took over, again with a hot debate with the "new" Oralists, who partly supported their arguments by recourse to the hope that galvanic electricity might aid the hearing of deaf people (just as the current new oralists base their arguments on hopes for cochlear implants).

In the middle of the nineteenth century, the Oral Method took over and in 1864 the school in Groningen officially designated oralism as the only method of instruction; and after the Milan Convention of 1880, which established oralism as the standard for the world, this philosophy

[3] The historical overview presented here is based on work in the archives of the Koninklijk Instituut voor Doven "H. D. Guyot"—first in Groningen and later in Haren (see Hoiting, 1983, 1990; Hoiting et al., 1990).

dominated in the Netherlands for the following 100 years. However, documentation in the archives of the school suggests that teachers continued to use some sign-supported Dutch throughout the period (Guyot archives, 1983).
There were four schools of the deaf in the nineteenth century, each of them providing a nucleus for a Deaf[4] community that must have continued to elaborate a natural sign language—that is, the language that is currently referred to as SLN. The first Deaf communities in the Netherlands were formed around the schools, and until the rise of oralism, the schools and the communities formed a single entity. However, when the educational establishment turned its back on the use of sign language, independent Deaf Associations arose outside of these schools. The first formal Deaf Association was founded in Amsterdam in 1878, and other cities followed. Those were the places where SLN continued as an active language until its formal reacceptance in recent times.

These facts, along with the absence of detailed records of the use and the structure of SLN and SSD in earlier years, make it impossible to determine the historical and sociolinguistic circumstances of the influence of Dutch on modern SLN. Consequently, in searching for the roots of borrowings from Dutch into SLN, we can only examine the role of Dutch as reflected in modern SLN. In attempting to reconstruct the situations in which Dutch elements entered SLN, a number of factors must have played a role. We know that fingerspelled Dutch names and words were in use from the beginning of Guyot's school. And, of course, many deaf pupils became literate in Dutch, thereby providing possibilities of borrowing through their own bilingualism. In addition, schools for the Deaf have always included pupils who were deafened after having acquired the spoken language. It should also be noted that until the middle of the twentieth century Deaf and hard-of-hearing pupils attended the same schools; an official split in these populations took place in the 1950s. It is also evident from an examination of didactic materials that teachers must have introduced various elements of Dutch grammar and lexicon into their ad-hoc instructions, using some type of gestural communication. The use of various kinds of manually coded Dutch (sign systems) played a role both in introducing Dutch into the manual modality, and in giving rise to contact languages such as those described for ASL and English by Lucas and Valli (1992). All of these avenues were open for the movement of Dutch into SLN, although we cannot document the point of entry of any specific element.[5] In addition, SLN as know it nowadays was shaped by fingerspelling (for proper names, some grammatical functions), adaptation of sign orders from Dutch, and mouthing of Dutch words with corresponding signs (see Schermer, 1992).

The following is a brief historical overview of Dutch language policy over the past two centuries:

1785-1790:	first private lessons of H. D. Guyot to five deaf pupils at home
1790:	start of Dutch deaf education in Groningen
1866-1968:	formal adaptation of the oral approach, banishing sign language completely
1968-1995:	formal adaptation of Total Communication as a philosophy and a sign system (SSD) as the "language" of education and acquisition

[4] Following widespread international practice, Deaf with a capital letter refers to a group with a language and culture; deaf with a lower-case letter indicates individuals who are biologically unable to hear sounds according to a certain criterion.
[5] Bos (1994) and Hoiting and Slobin (2001) discuss the adaptation of Dutch lexical items into SLN, demonstrating that borrowed prepositions can come to serve as verbal elements (auxiliary, aspect marker) in sign language grammar.

1995:	formal adaptation of Sign Language of the Netherlands in the schools as the language of acquisition and language of instruction within a bilingual curriculum
2003:	with the rise of early cochlear implantation, re-introduction of SSD as an option for parent and child training

Acquisition

Early acquisition in SLN has received attention in several studies. Van den Bogaerde (2000) and Van den Bogaerde and Baker (2001) studied language input provided by four deaf mothers along with the language production of three deaf and three hearing children in the age range of 1;0–3;0, raised bilingually in deaf–hearing mixed families. Their main conclusion is that the use of speech and sign in a system of "simultaneous communication" leads primarily to the use of SLN by the deaf children, whereas the hearing children pick up SLN, Dutch, and a third, mixed form of sign and speech.

These results confirm an earlier study by Rooijmans (1995) on the developmental aspects of SLN from the same corpus. Rooijmans found a considerable amount of individual variation in Mean Length of Utterance (MLU), Type-Token Ratio (TTR), and verb inflection, as well as the use of nonmanual markers[6]. The considerable individual differences in the Rooijmans study were explained by the methodology used: The type of activities that were videotaped were responsible for a high amount of pointing and the consequent TTR scores. Productivity in the type of interaction appeared to be highly influenced by different types of questioning, i.e.,. open versus yes-no questioning. Striking is the statement in this study that MLU for SLN and Dutch are not quite comparable. The lexical study presented in Chapter 2 of this dissertation deals with this assessment issue in particular by explaining differences in MLU on the basis of the modality and linguistic typology of SLN.

A detailed study of a single bilingual deaf child was reported by Hoiting (1997, 2001). The current study, however, is the first large-scale investigation of the acquisition of sign language by deaf children in the Netherlands, and perhaps the only detailed investigation anywhere on the acquisition of a sign language by deaf children with early primary sign input from hearing parents. (For recent work on acquisition of various sign languages see papers in Morgan and Woll 2002 and Schick, Marschark, and Spencer 2005.)

Input

Characteristics of parental communication to children are divided by features that are common to all language learning situations, such as children's cognitive abilities and relations to nonverbal context, whereas uses of particular lexical items and constructions are claimed to be more language specific (e.g., Camaioni & Longobardi, 2001; Slobin crosslinguistic volumes [1985a, 1985b, 1992, 1997a, 1997b; Snow, 1977). Comparing deaf and hearing mothers, Spencer and Harris (2006) found that hearing mothers may unknowingly produce ungrammatical forms, unstable phonetic forms, and variability in the lexical input to their deaf children. Summarizing the differences between hearing and deaf mothers as found by these British authors, deaf mothers tend to provide more facial expressions and playful imitations, use more multimodal forms, are more rhythmic, and adapt their signing by prolonging, enlarging, and/or slowing down production rate, and sometimes relocate signs

[6] Note that at the time of this 1995 study Dutch schools were formally providing SSD as "the language of education and acquisition," as discussed above.

near to the eyes of their toddlers. Importantly, although early on there is a lower rate of signed communications as compared to spoken utterances, mothers' rates of signing increases when deaf children become more adept in shifting visual attention. Although statistical evidence could not be provided, the authors indicated that the "stability" feature (slower production in early stages), along with simplified models of sign grammar, may support children's identification of stable sign forms. Spencer and Harris (2006) discuss the different outcomes of two studies using a vocabulary checklist, the MacArthur Communicative Development Inventory (MCDI): Anderson and Reilly (2005) for ASL, as compared to Hoiting (2005) for SLN. Spencer and Harris suggest that a probably greater emphasis on increasing verb input for the deaf mothers might explain the SLN outcomes. This possibility is examined in detail in Chapter 2 of this dissertation, adding a typological perspective on sign languages. However, confirmation of the proposed input factors can only be obtained from future studies using large scale data.

Sign Systems and Implications for Acquisition

There have been many possible variants of simultaneous speaking and signing, as discussed by numerous researchers (e.g., Lucas & Valli [1992] and Woodward [1973] for ASL; Deuchar [1984] for BSL). Attention has been paid to a range of factors, including hearing loss, starting age of acquisition of a particular sign language, and conversational parameters such as participants and topic. Often a dominant role is assigned to formal grammatical features—in particular on the level of morphosyntax—for both signed and spoken languages. In a comprehensive overview, Wilbur (1979) presented an overview of a range of sign systems, concluding that generalizations based on the grammar of a spoken language are not transportable to the design of a sign system. She concluded that young children cannot make generalizations from sign systems—even for the most simple rules such as pluralization or past-tense verb inflections. By the time children are able to metalinguistically reflect on such rules, precious time has been lost for generalizations in early developmental stages. Problems inherent to all varieties of sign systems—such as overload in memory capacity and mixing of auditory and visual systems (e.g., Wilbur, 1979, p. 253)—eventually gave rise to programs of bilingual education of the deaf.

Because deaf toddlers lack auditory perception, they can't make use of patterning capacities, such as those proposed by Tomasello (2003; see below), to structure speech input. For deaf infants the starting point of language learning begins with visual perception of language, and it is the visual and motor modalities that provide the basis for getting and giving meaning in communicative settings. Such information may be partially present in sign systems via the use of some lexical items drawn from a natural sign language, but the relations of such signs to one another in a system of linguistic levels (phonology, morphosyntax, semantics, pragmatics) are not perceivable and thus are not accessible to young children exposed to a sign system such as SSD, as discussed in portions of this dissertation.

Other claims have been suggested by an array of education-related issues, such as Van der Lem et al. (1987, 1994), who presented an overview of research concerning literacy and the use of SSD in education. In an insightful and attractively designed book on SLN aimed at a broader reading audience, Koenen and Bloem (1993) call deaf people's use of the hand, as executed in ongoing signing, the "chameleon hand," thereby referring to its quickly moving and changing shapes and directions throughout the signing space. They paid attention in that book to sign order, time-lines, operators, nonmanual elements, and scope.

Data Collection

The data presented here were collected within the procedures of the Family Support Program introduced in 1989 at the Royal Institute of the Deaf "H. D. Guyot" (now the Royal Effatha Guyot Group, or KEGG) in Haren, in the northeast part of the Netherlands. This program provides weekly preschool experience for young deaf children, parental meetings along with social services, a testing program for psychological development, and five years of sign languages courses for parents—initially in their homes, and subsequently at the Institute. The Institute's starting program for language development combined three goals: to design diagnostic instruments for evaluating language development of deaf toddlers, to set up an intervention model for deaf and hearing parents, and to conduct research in the field of sign language acquisition. These goals were combined in a program of twice-yearly visits to family homes for gathering as well as providing information, videotaping family interaction, discussing parental reports of vocabulary development, and reviewing the child's performance.

The videotapes were not designed for a research project; they were simply my regular observations of the progress of the children and their families over the years 1989-2000. When it became evident that they also constituted a unique and rich source of data for studying a number of theoretical and practical issues, I sought and received permission from the Institute to use the home and video recordings, along with parental vocabulary checklists, for longitudinal psycholinguistic research[7]. The parents had given permission for use of the data, with the constraint that the children and their families not be identified, and that the filmed material not be presented in public or in publications.

From a sample of 350 diagnostic cases, I selected a core group of 30 for study, consisting of children considered profoundly deaf (hearing loss of at least 90 db) and with no other known handicaps. The core group includes children with Deaf parents acquiring SLN, and children with hearing parents who were either acquiring SSD in the earlier period or SLN thereafter. The three groups are designated as SLN-D (children learning SLN from deaf parents), SLN-H (from hearing parents), and SSD-H (children learning SSD from hearing parents). The age range is from 15 to 36 months of age. The samples chosen for vocabulary study are described in Chapter 2, and those chosen for morphosyntactic analysis in Chapter 4; detailed summaries are given in Appendices A.1, A.2, A.3, and A.4.

Theoretical issues

Approaches to child language acquisition over the past several decades have raised important new questions that are also relevant to the acquisition of sign languages. The general approach followed in this dissertation is broadly functional and cognitive, as exemplified by such linguists as Bybee, Givón, and Talmy, psychologists such as Bowerman, Slobin, and Tomasello, and anthropological linguists such as Levinson and Wilkins.

The child language literature has been enriched by detailed crosslinguistic comparative studies (see Slobin's five volumes on crosslinguistic research, including one sign language—

[7] The investigations reported here received three main sources of support: (1) the Royal Effatha Guyot Group, (2) the U. S. National Science Foundation (grant SBR-97-27050 to D. I. Slobin, Institute of Human Development, University of California, Berkeley), and (3) the Max Planck Institute for Psycholinguistics, Nijmegen, Netherlands. To all of these institutions I express my deep thanks.

American Sign Language) (Slobin, 1985a, 1985b, 1992, 1997a, 1997b). The comparative approach has made it clear that the child's conceptual space is shaped by the particular input language. As Bowerman (1985, p. 1313) has stated: "...the way in which languages organize meaning ...is an integral part of their structure." That proposal has been supported by evidence from typologically very different languages, such as Korean and English (Choi & Bowerman, 1991), Tzeltal Mayan (P. Brown, 2001), and others. Once the child has cracked some word meanings, the semantic patterns of the specific language begin to reveal themselves, allowing for the continuing accumulation of instances which reinforce language-specific mapping solutions (Levinson, 2001, p. 582). Furthermore, as Levinson has emphasized, children become sensitive to the pragmatic principles which frame the structure of fields of vocabulary, especially the power of individual expressions to contrast with one another in communicative contexts.

Tomasello (2003) pays specific attention to the pragmatic domain and its relation to the child's discovery of both semantic and morphosyntactic structures. The title of his 2003 book clearly sets forth the constructivist approach taken by this dissertation: *Constructing a language*; and the subtitle underlines the role of language use in the processes of acquisition: *A usage-based theory of language acquisition*. Tomasello pays systematic attention to the functional dimensions of attention sharing, based on the child's necessary abilities to discern the communicative intentions of interlocutors. Together with a set of pattern-finding skills, children are sufficiently equipped to detect the patterns underlying adults' uses of linguistic symbols across different utterances and contexts, and so to construct the specific linguistic forms and mappings of the exposure language. The pattern-finding skills listed by Tomasello (2003, p. 4) apply equally to deaf children exposed to a sign language and hearing children exposed to a spoken language:

- "the ability to form perceptual and conceptual categories of 'similar' objects and events";
- "the ability to form sensory-motor schemas from recurrent patterns of perception and action";
- "the ability to perform statistically based distributional analyses on various kinds of perceptual and behavioral sequences";
- "the ability to create analogies (structure mappings) across two or more complex wholes, based on the similar functional roles of some elements in these different wholes."

His studies add to earlier philosophical and cognitive considerations—going back, for example, to Peirce, Piaget, and others—in claiming that the symbolic dimension of language is explicitly based in the expression and comprehension of communicative intentions, which Tomasello refers to as the "intention reading" capacity. This unique human capacity is at the heart of his approach. In this theory: "...grammar emerges as language users create linguistic constructions out of these symbols from which children in return pick up patterns and 'construct their language'" (p. 4). From this perspective, the many years of daily interaction with adult language models provide the child, finally, with an adult language. This approach thus champions what one might call "the wealth of the stimulus"—a theoretical position 180 degrees opposite from the earlier generativist "poverty of the stimulus" argument (Chomsky, 1988). In that approach Chomsky and his colleagues proposed an innate universal grammar containing a number of abstract principles that guide the acquisition process, due to a supposed insufficiency of the information available to the child. More than fifty years of academic research in this direction has led to a growing host of short-lived principles and theoretical reformulations, that—in the opinion of functional and cognitive linguists—have

not greatly illuminated our understanding of the nature of language or its acquisition. The issues are, of course, still hotly debated. Since this is a dissertation on a particular investigation within a functional/cognitive framework, I will leave the debate to be continued beyond the pages of this chapter.

Sign language linguistics

Sign language research in the Lowlands did not start until the early 1980s. The results of several studies are briefly reviewed below, providing a sketch of structural characteristics of the language aimed at academic readers who not familiar with SLN or signed languages. (Various references to American Sign Language—ASL—which has been more widely investigated, appear throughout the dissertation.)

All known sign languages have a compositional structure like known spoken languages, in which smaller units (handshapes, movements, locations, and others) are combined to create higher level structures (complex words, phrases, clauses, sentences). The familiar levels of phonetics/phonology, morphemics/morphology, syntax, semantics, and pragmatics can be readily identified in sign languages, though there is great and continuing debate—as in linguistics generally—about how to define and delimit these levels and how to describe their interactions
(see, e.g., Emmorey, 2003; Engberg-Pedersen 1993; Liddell, 2003; Meier, Cormier, & Quinto-Pozos, 2002; Pizzuto, Pietrandrea, & Simone, 2007; Taub, 2001). SLN has received scientific linguistic attention on all of the levels of linguistic analysis.

Phonology and the Lexicon

Borrowing from the tools of spoken language research, sign language researchers separate out the basic compositional structures of sign phonology by the use of four basic categories: handshape, movement, location, and orientation. These are the building blocks of sign languages, parallel to the functions of sound and sound combinations in spoken languages. Unlike speech sounds, which make up words, a handshape can travel through the signing space, starting to move at a particular place, where it begins to change its path and/or internal movement. Handshapes tend to be as meaningless as consonants and vowels are in spoken languages, or for that matter in written mode, as written letters are in alphabetical writing systems. However, physical aspects of referents—particularly size and shape—are often realized by handshapes that suggest those aspects.

Bos, Harder, and Schermer (1986), as the first SLN researchers in the Netherlands, presented an inventory of phonological handshapes in SLN, primarily based on analogy with ASL phonology. They noted that SLN shows a good deal of regional variation, related to the history of educational institutions in the country.

Crasborn (2001) proposed a Functional Phonology model (Boersma, 1998) and claimed a distinction between perceptual features and articulatory representations at the interface between phonetics and phonology. He proposes a set of perceptual features for SLN and provides evidence for the inclusion of nonmanual aspects of signs in a phonological model.

Schermer (1990) has studied the use of mouth patterns in SLN. She concluded that there are two basic types of mouth use accompanying manual signing. One type, the "oral component," presents supporting dynamic information, comparable to the use of ideophones in a spoken language. For example, a sign meaning 'be located/present'—produced by a 5-hand with spread fingers, located at a relevant location in signing space—is accompanied by a

hissing, voiceless sound like "ssshhh," produced by a tight, open mouth showing clenched teeth. She notes that this is not borrowed from Dutch. A second type of mouthing, the "spoken component," is based on an Dutch word that is (or was) relevant to the meaning of the sign. For example, a manual sign meaning either 'man' or 'boy' is discriminated only by the simultaneous mouth pattern of the Dutch words *man* or *jongen* 'boy'. Here the influence of Dutch is critical, because the signs cannot be distinguished in any other way. The use of mouthing is relevant to sign language acquisition because it requires the child to pay attention to the mouth in order to disambiguate particular manual signs.

Morphology

Sign formation—that is the creation, inflection, and derivation of lexical items—is a crucial level of analysis, as it is in any language, because it shows the interface of phonological features of a particular language and its syntactic rules. Morphological analysis of ASL had its origin in pathbreaking work by Klima and Bellugi (1979), who described a number of grammatical processes in ASL within the borders of available linguistic models and tools. They analyzed the structured use of space and handshapes, describing such morphological processes as inflectional and derivational mechanisms. This was the beginning of a continuously increasing linguistic exploration of not only ASL, but a range of European-based sign languages, and eventually a worldwide range of sign languages, in the frameworks of the dominant linguistic models. (The University of Hamburg maintains an online International Bibliography of Sign Language which, in July 2008, contains 44,000 titles: http://www.sign-lang.uni-hamburg.de/Bibweb/Bibliography.html.)

Sign languages, existing in a different modality than spoken languages, confront us with particular means of packaging linguistic information. It is necessary to treat sign languages as typologically distinct from the languages that have dominated nineteenth and twentieth century linguistic formalization—particularly Indo-European languages, but also Finno-Ugric, Turkic, Japanese, and Chinese, since these language groups also do not share basic typological features with signed languages. To justify this proposal, I will first pave the linguistic road to the discovery of sign languages as authentic languages in the seventies of the last century, providing a brief overview of the structure of these languages as they have been described thus far.

Sign languages provide highly structured bundles of information, just like spoken languages. However since these languages are visual/manual rather than spoken/written, the type of linguistic packaging differs remarkably from the ones most people are so familiar with. Signed information is a literal bundle, that is, organized as simultaneously occurring information structures. For example, a handshape moving through space can represent both the type of moving entity (e.g., a car versus a person) and the direction of movement, along with possible representation of rate and manner of motion; at the same time, the face can indicate the speech act status of a signed utterance (e.g., assertion, question) as well as the sort of affective information conveyed by prosody in a spoken language. Consequently the way these languages have organized their grammars has been proven to be beyond the imagination of many people, including linguists. Generally they have been treated as collections of gestures and pantomime (e.g., Furth, 1973, who treated deaf children as lacking language). Only since video technology started to provide the means to investigate the phenomenon in depth, could linguists start to rethink their linguistic judgments on the nature of sign languages. Actually, American cultural anthropologists (Kroeber, 1958; West 1960) started to describe signed languages of the Plains Indians, but had great trouble in framing the most salient parameters. Stokoe was the first to put a sign language (ASL) into a linguistic framework, presenting the first formal representation of a signed language in 1965.

Klima and Bellugi (1979) took up the delicate task of pulling these sign bundles apart, and succeeded with a pioneering group of ASL researchers in providing the first linguistic analysis of how these languages are structured. These early analyses turned out to provide a groundbreaking insight into the human capacity to turn gestural and bodily information into a structured language, perceived by the eyes and produced by closely interconnected articulators—hands, eyes, face, and torso. This should not only make us rethink the nature of human cognitive capacities, but it should also lead to a reconsideration of issues of the social impact on sign language and its users. Indeed, as has often been suggested, sign language started to come alive due to the first historical attempts at the education of "the poor subjects," as Guyot described them in the seventeenth century. By now we clearly know that education in itself is not sufficient to raise the level of linguistic competence of deaf children. An important social dimension comes from the knowledge gathered by sociolinguists and cultural anthropologists, from whom we know that group formation as a social phenomenon requires information exchanges. Schools for the deaf provide the necessary social group that is lacking for isolated homesigning children. Recent studies of new sign languages that emerge in new schools for the deaf, such as the well-documented Nicaraguan situation (e.g., Senghas & Coppola, 2001), have shown how quickly linguistic structures can emerge in the give-and-take of ordinary conversation.

Sign language linguists have not yet fully succeeded in describing how simultaneity really works as part of linguistic structure. For quite some time, such important nonmanual features as facial expressions, eye-gaze, and posture were overlooked and/or simplified with regard to their contribution to the grammatical structures of signed languages. Apart from the transcription issues involved in sign language research (see Chapter 3), glossed translations have functioned as explanations, often without the realization that another linguistic modality had crept in, resulting in watered-down and misleading linguistic descriptions. The danger is that, for example, a Dutch gloss of an SLN utterance suggests aspects of Dutch grammar and semantics that are not in the SLN original. This often led many researchers astray in taking for granted a one-to-one meaning correspondence between a sign language and a written language. Unfortunately the facile use of glossing led educators/layman into thinking that such translations sufficed, and could even be used in equating counts of linguistic units. This has had negative consequences in applying the standard measure of child language, MLU (Mean Length of Utterance) to sign language productions of deaf children. As an example of problems of transcription and glossing, consider one transcription line of a signed utterance which means something like: "Firmly she threw the ball over the net into the right corner: GOAL!" The following are only four of many possible ways in which one might represent the meaning of this utterance using the conventional system of words in capital letters (drawn from the language of the surrounding speaking community) plus several added annotations:

- BALL FIELD NET PNT_ 3a THROW- from loc x to loc y. *or:*
- PNT_3a WOMAN FIRM THROW BALL NET OVER: GOAL. *or:*
- FIELD NET BALL OVER_net PNT_3a WOMAN. *or:*
- GOAL! WOMAN TENNIS-throwing-with-power.

In fact, none of these possibilities can reflect the semantic and morphosyntactic structure of the signed utterance. These issues are discussed at length in Chapter 3, which presents a new means of transcribing sign language at the level of meaning components. And the issue is raised again, acutely, in Chapter 5, where it is demonstrated that any system of speech supported by signing—that is, attempting to speak and sign simultaneously—is doomed to failure, given the vastly differing typologies of signed and spoken languages. The typological differences are given more detailed linguistic description in Chapter 2, with regard to the deaf

child's acquisition of a lexicon that is grounded on typologically specified dimensions. At this point, it is relevant to examine another typological issue, one that does not receive detailed attention in other chapters—namely, the debated existence of "classifiers" in sign languages.

From early on, sign languages have been considered from a typological view. Frishberg (1975), as one of the first sign language researchers, compared ASL verb structure to the particular structures of Athapaskan Languages, using the term "classifier" for the compact linguistic clusters that include information about the entity that is referenced in the verb. The term "classifier" used by Frishberg referred to a referential component of a verb of motion as expressed by a particular handshape that "classifies" that referent according to some physical characteristic. For example, in SLN a flat hand with palm down, moving forward, indicates the forward motion of a vehicle such as a car, whereas the same movement with a vertical hand (rotated 90 degrees clockwise) refers to a vehicle such as a bicycle. That is, handshapes are components of verbs of motion, location, and transfer that indicate the category that a referent belongs to. This comparison led later researchers to study classificatory verb stems in various languages, Navajo in particular, and from then on such structures were observed in all of the known sign languages at the time. The term has become established in sign language research and teaching practice, but it is now undergoing serious linguistic re-examination, as reflected in a collection of papers resulting from an international conference on classifiers in sign languages (Emmorey, 2003).

Morphosyntax: Problems of satisfactory linguistic description of elements

The hand that articulates a sign language verb can move in signing space from one point to another, indicating both spatial changes in location and thematic relations between agents, patients, and recipients. In early classification of verbs, Gee and Kegl (1982) characterized all forms of spatial modification in ASL as "agreement," taking a traditional term from structural linguistics. But, as Engberg-Pedersen (1993) and others have pointed out, sign language "describe agreement in localist terms." That is, the verb moves in space from source to goal, from agent to patient, from giver to recipient, etc. Padden (1988) proposed a classification of verbs in ASL based on their morphological use of space, identifying three types of verbs: inflecting, spatial, and plain (stationary) verbs. The first two move in space from source to goal, though it is not clear why they should be distinguished on the basis of the linguistics of English and similar spoken languages, rather than on the basis of sign language linguistics. For example, verbs with the meanings 'give' and 'put' move from source to goal, regardless of whether the goal is a person or a location. It is not obvious the a distinction is marked between 'transfer to position' (agreement) and 'change of location' (space). Using terms like "agreement" to describe a sign language such as ASL or SLN reflects a widespread implicit assumption that in order for sign languages to be "legitimate" human languages, they must show the same collection of linguistic categories and structures as spoken languages. Liddell (2003) argues strongly against this presupposition.

Early morphological analysis of SLN offered careful observations of particular groups of "classifiers" and other morphological processes and mechanisms, but many comparisons based on analogies to ASL structures (e.g., Fortgens, 1993) have not yet been confirmed by detailed analysis. Zwitserlood (2003) proposed a functional approach to "classifiers," using the Marantz generative framework in an analysis of a restricted group of manual classifiers. This model proposes to make no distinction between morphology and syntax, but instead focuses on the interface between grammar and phonetic form. Zwitserlood claimed that SLN classifiers unite two functions, phonological and syntactic, i.e., hand configurations function in referential affixing processes to serve "agreement." However, the acquisition research

reported in this dissertation is based on a more radical understanding of the structure and functions of hand configurations that function as parts of verbs.

Engberg-Pedersen (1993) took seriously the task of taking grammatical descriptions of ASL and applying them to Danish Sign Language (DSL). This early effort in comparative and contrastive linguistics of sign languages led Engberg-Pedersen to make new proposals. She found that DSL locative verbs can also take modifications in ways that are not possible in ASL. An examination of such differences led Engberg-Pedersen to make an important distinction between *nonpolymorphemic* and *polymorphemic* verbs on the basis of morphological and semantic criteria. In so doing, she developed a more thorough analysis of the various components that play a role in the structure of "classifier verbs." Her reformulation is central to the proposals for transcribing child sign language presented in Chapter 3.

Verbs that incorporate meaningful handshapes are polymorphemic for several reasons: they move in space and they indicate referents. As Engberg-Pedersen points out (1993, p. 235): "polymorphemic verbs can take two or more consecutive or simultaneous morphemes denoting path and motion or location, and the handshape by which some of the stems are expressed can change in a morphologically relevant ways." These morphologically relevant ways reflect the referents that are indicated by those handshapes. Supported by this more functional/semantic approach, Engberg-Pedersen provides an overview of classifier systems in spoken languages and discussions of apparently similar systems in sign languages. She suggests that referentially meaningful handshapes could be analyzed as classificatory elements integrated into verb complexes. It is clear from this approach that handshapes in verbs of location, motion, and transfer play a role that is critically semantic, referential, and discourse-oriented. This analysis played a significant role in motivating the morphosyntactic approach taken in the current investigation of SLN acquisition.

Schembri (2003), in an important paper in Emmorey's conference volume, reviews terminological issues and findings in the field of classifiers. His overview makes it clear—in tune with Engberg-Pedersen's careful judgments—that the project of equating classifiers across spoken and signed languages really does not work. Schembri concludes that particular handshapes cannot have a classificatory function only; instead, such handshapes incorporated in verbs represent a morphosyntactic subsystem primarily motivated by semantic properties. On the terminological level, Schembri prefers the term "polycomponential verb" for this category of signs, but the term "classifier" has not been replaced, since no consensus has occurred, as Emmorey pointed out in her preface.

The important outcomes of the 2003 conference concerned three issues:

1. The use of polycomponential verbs and handshapes appears to be very similar in all documented signed languages.
2. Close links between form and meaning (iconicity, depictive and analogue capacities of handshapes and movement patterns) account for the crosslinguistic similarities between these verb forms (as well as the communicative use of handshapes by nonsigners).
3. In spoken languages, classifiers appear to be secondary grammatical phenomena that have evolved through a process of grammaticization of more primary lexical categories.

It is clear, then, that the linguistic status of classifier systems in sign languages thus far has not been adequately solved along traditional lines. The approach of our research group at the

conference—reflected in the transcription system presented in Chapter 3 and the morphosyntactic analysis in Chapter 4—is best conveyed by quoting our conference paper. We propose the term *polycomponential sign*, to include all parts of speech that include handshapes that reference an argument in terms of some physical characteristic of that referent; and we label such elements as *property markers*. We explain that (Slobin, Hoiting et al., 2003, p. 273):

> Like Elisabeth Engberg-Pedersen (1993), Adam Schembri (2003), and others, we seek to represent the range of meaning components, both manual and nonmanual, that co-occur in complex signs. Our motivation is to devise a systematic approach toward citing each meaning component in complex signs. We have chosen to use ***polycomponential***, rather than Engberg-Pedersen's ***polymorphemic***, because we are not ready to determine the linguistic status of each of the components, manual and nonmanual, in complex signs. And we have replaced Engberg-Pedersen's *verbs* and Schembri's *predicates*, with ***signs***, because the handshape expressions under study are used in verbal, adjectival, and nominal constructions.
>
> While various categories of polycomponential signs can be proposed, our work has focused on alternative conceptualizations of "classifiers." Rather than emphasize classification as the central feature of "classifier" handshapes in polycomponential signs, it seems more useful to treat them as marking a relevant property of a referent. The major function of such a handshape is to evoke a relevant referent in discourse, indexing a particular referent according to properties that are appropriate for the current discourse. That is, the "classifier" handshape designates, or specifies, or indicates a referent with a particular property (e.g., two-legged, horizontal plane, etc.). In the Berkeley Transcription System [see Chapter 3] such handshapes are designated as ***property markers (pm)***.

These new approaches to linguistic analysis and description sign language provide the basis for observations in the following chapters, in particular Chapter 2, where patterns of lexical acquisition in SLN are best explained in terms of the typology of the language as *head-marking* as opposed to the *dependent-marking* typology of the spoken languages that surround sign languages in Europe, Asia, and the Americas (see Chapter 2), and Chapter 4, where the emergence of complex forms of both points and signs is described in terms of the building blocks of simultaneous semantic components that make up the basic structure of polycomponential signs. Chapter 5, on input and communication, deals both with pragmatic issues and the impact of typological differences between Dutch and SLN.

Leading questions and hypotheses

Having briefly situated the study in its historical and linguistic context, we turn now to the guiding hypotheses of the study. These constitute clusters of expectations based on preliminary analyses of the SLN data, as well as ongoing and published work on children's acquisition of ASL (Casey, 2003; Lindert, 2001; Newport & Meier, 1985), British Sign Language (BSL) (Morgan, Barriere, & Woll, 2006; Morgan, Herman, Barriere, & Woll; 2008; Morgan, Herman, & Woll, 2002; Morgan, Smith, Tsimpli, & Woll, 2007), and Australian Sign Language (Auslan) (de Beuzeville, 2006). To provide an overview, I reformulate the overarching question, leading to a chapter-by-chapter presentation of questions and hypotheses.

The umbrella question, "Can deaf children learn SLN from hearing parents?" can be translated into linguistic terms: *What sorts of lexical and morphosyntactic development are demonstrated by deaf children exposed to three types of language?* Namely:

1. SLN as first language of Deaf parents and deaf children: L1 situation for both input and development.
2. SLN as foreign language of hearing parents and first language of deaf children: L2 or L+ for parents, L1 for children.
3. SSD as language system of hearing parents and basis of first language of deaf children: bimodal, primarily monolingual input (spoken Dutch supported by SLN signs, following primarily Dutch grammar).

This overarching question is broken down into questions (indicated by Q) and guiding hypotheses (H) for each chapter.

Chapter 2: Questions and hypotheses with regard to the lexical development of deaf children

- Q2.1: What similarities and differences can be found between the development of a lexicon in signs or spoken words?
- Q2.2: Is the MCDI (MacArthur Communicative Development Index) an adequate diagnostic instrument for this population? If not, how should it be adapted?
- Q2.3: Are standard linguistic part-of-speech categories such as noun, verb, adjective, etc., applicable to sign languages and their acquisition?
- Q2.4: Are there similarities between noun and verb learning in a signed language?
- Q2.5: Is there a clear distinction between signs and gestures?

Gesture and Sign

For deaf children, as well as hearing children, gestures play a significant role in the emergence of the first single element utterances. For hearing children, gesture+word combinations provide a bridge into longer, structured utterances consisting only of words. For deaf children, gestures play this role as well, in transitions from gesture+sign to sign+sign utterances. However, at the same time, a gesture itself can carry the seeds of a sign—that is, gestures become both lexical items and grammatical elements (Hoiting & Slobin, 2007), as has been attested in the historical development of sign languages (Supalla, 1991). The same developmental path from gesture to sign is to be expected of children acquiring a sign language as a first language. We also know, from studies of the "homesign" systems of deaf children deprived of sign language input, that handshapes are productively modified to indicate objects and people in terms of physical attributes of shape, size, and extent (Goldin-Meadow, 2003; Goldin-Meadow, Mylander, & Butcher, 1995). Thus both deaf and hearing children use handshapes and movement to indicate types of moving entities. These considerations underlie several hypotheses:

- H2.1: There will be a preponderance of verbs in early vocabularies, due to children's tendency to represent events in terms of the movement and manipulation of entities that can readily be depicted by meaningfully moving handshapes.
- H2.2: There will be early evidence for polycomponential signs that include elements that designate both objects and directed motion, especially goal-oriented motion.
- H2.3: Acceleration of noun acquisition will be seen after the productive use of a number of verbs.

Chapter 4: Questions and hypotheses with regard to the morphosyntactic development of deaf children

- Q4.1: What is the early course of development of meaningful hand motion in signing space?
- Q4.2: How are referents introduced in the early language use of young deaf children? Is reference mainly communicated by pointing?
- Q4.3: What linguistic operators are found before age 3?
- Q4.4: How are these operators used?
- Q4.5: How do the three language-input groups differ in morphosyntactic development?

Morphology

Internal complexity of signs will reflect the tendencies discussed above: meaningful use of movement in space and incorporation of property markers ("classifiers") for reference-making (introduction, maintenance, reintroduction of referents). At the same time, components of signs are also used for utterance-level operators and discourse markers.

- H4.1: A pointing gesture can be modified in ways that are also appropriate to a sign, in order to indicate relative distance and size of the entity under attention. Points, therefore, are not simple gestures, but provide a working space for the child to elaborate dimensions of signing without the additional task of referent specification in terms of property markers. Early uses of what might be termed "protomorphology" will be found in some uses of pointing, which provide a bridge to the systematic and conventional use of signing space in SLN.
- H4.2: Early complex signs will tend to include a handshape referencing a moving, goal-directed figure. More complex signs will include source as well as goal orientation, and specification of figure as well as ground. (This expectation comes from general attentional tendencies in toddlers.) Accordingly, one source of increasing complexity will be found in inclusion of property markers referencing grounds and paths that are anchored in source locations.
- H4.3: Signs will also grow in complexity by the addition of various sorts of modification. A particularly salient modification is the aspectual difference between comparable signs that refer to an action (e.g. combing) and an object involved in the action (e.g. a comb). Other salient modifications include augmentation, affect markers, and discourse markers. (There is no clear boundary that delineates "strictly linguistic" modifications in sign language, nor is such a boundary to be expected in early acquisition.)
- H4.4: Operators that have scope over a sign or a series of signs are produced simultaneously to manual movement by the use of various facial markers (head nod, head shake, mouth movement, eyebrow movement, and the like). As Reilly (2003) has noted for ASL acquisition, the timing of simultaneous production of manual and nonmanual components poses difficulty for the child, and such difficulties are also expected in our data.
- H4.5: It is expected that some operators will be produced in vague simultaneity with signing, particularly indicators of affirmation and negation. These operators will occur simultaneously with points as well as signs. Lexically-conditioned formation and timing of mouth movements, however, will show a long developmental course and may not appear in the early data of this study.

Eye gaze

The directed use of the eyes has received insufficient attention in sign language linguistics and in studies of child signing. Our data, using a single camera, often lack precise information about gaze direction and joint visual attention. The emergence of systematic uses of gaze therefore remains a question to be explored, to the extent possible, in the data.

- H4.6: It is expected only in later phases of development will gaze direction be used to successfully shift attention between signing space and interlocutor.

Cognition

Deaf children who are otherwise unimpaired (the only group of children considered in this study) follow a normal course of cognitive development, though undoubtedly with a slower course of social cognitive development due to limited opportunities to interact linguistically with other children and adults. Various aspects of cognitive development will be reflected in our data.

- H4.7: The semantic fields expressed in children's early and growing vocabulary will parallel those attested for the development of various spoken languages (proper names; verbs of feeding, dressing, movement; labels for everyday objects), though with more early emphasis on verbs than nouns, as discussed above.
- H4.8: Reference to absent objects and events will develop slowly. Coherent discussions of past and future events will depend heavily on the signing skills of the parents. However, early reference to the not-here and not-now is to be expected—as a consequence of normal development of memory and communicative needs. Lacking linguistic means of expressing temporal relations, however, such references will often supplemented by miming of past events and pointing to relevant locations, as has been demonstrated for homesign children (Goldin-Meadow, 2003). The establishment of loci in signing space to refer to absent entities or entities in a narrative will be slow to develop and may not appear in our early sample (similar to pronoun difficulties faced by children learning a spoken language).
- H4.9: In the time period under study (under age 3) many operators will be absent, particularly those that require understanding of discourse organization and the state of knowledge of the other (theory of mind, topic markers), conditionals and hypotheticals, and systematic indicators of role shift.

Chapter 5: Questions and hypotheses with regard to language input to deaf children

The data allow for several important comparisons of the sorts of input that deaf children in the period under study received from adults: deaf versus hearing, parent versus teacher, user of SLN versus SSD. All of these contrasts are explored in Chapter 5. Given what has already been observed about these dimensions of contrasts, several questions and hypotheses can be put forward.

- Q5.1: Is the term "impoverished language input" applicable to the input provided by all hearing parents and teachers of deaf children?
- Q5.2: Are there differences in utterance length in input provided in SSD versus SLN?
- Q5.3: Are there differences in utterance length provided in SLN by deaf and hearing signers (parents, teachers)?

These questions lead to the following hypotheses:

- H5.1: Children with deaf parents will make the most progress on all of the dimensions under study.
- H5.2: Utterance length in SSD input will be shorter than SLN input.
- H5.3: Utterance length in SLN input will be longer when provided by deaf parents, in comparison with hearing parents.
- H5.4: The linguistic development of children with hearing parents using SLN will surpass that of children raised with SSD.
- H5.5: On the most basic dimensions of sign language (pointing, meaningful use of space and handshape, attention to verbs) the three child groups will show similarities.
- H5.6: Children learning SSD are exposed primarily to the citation forms of verbs—that is, verbs without meaningful contrasts of directionality and handshapes (property markers). These children will be slower to develop the internal morphology of signs. However, they may attempt to modify the input, as has been attested for American children learning a form of Manually Coded English (MCE) that bears similarities to structural and lexical principles of SSD (Davidson et al., 1996; Stack, 1996; Supalla, 1991).
- H5.6: Parents using SSD will be less successful in establishing and maintaining their child's attention and in building conversational interchanges over several turns, due to the limitations of SSD as a means of communication, as discussed in Chapter 5.

Plan of the dissertation

The following three data chapters, Chapters 2, 4, and 5, are all based on samples drawn from the three groups, SLN-D, SLN-H, and SSD-H. Chapter 3 provides a linguistic analysis of sign language morphology in terms of property markers and the other components that make up polycomponential signs. This analysis is the basis of an innovative system for transcription, the Berkeley Transcription System (BTS), which is used for representation of examples in Chapters 4 and 5.

Chapter 2 is based on parental checklists of vocabulary, without attention to the internal morphology of lexical items. However, a strong morphological argument is presented for the classification of SLN, and perhaps all signed languages, as *head-marking*, as opposed to the *dependent-marking* type of the surrounding spoken languages in Europe, Asia, and the Americas. The chapter concludes with supporting lexical data from the transcripts and from parallel studies of the development of spoken English, a dependent-marking language similar to Dutch.

Chapter 4 is devoted to morphosyntactic analysis of the transcribed data of the children's interactions with parents and teachers. It applies the componential categories of BTS to the internal structure of both points and signs, demonstrating the application of some grammatical principles to children's pointing behavior.

Chapter 5 turns to the input that the children receive from deaf and hearing parents and teachers, and the consequences of various sorts of input patterns for sign acquisition. Data and argumentation are presented to demonstrate the inadequacy of SSD as a source of primary linguistic and sociocommunicative data for children. The chapter introduces a new concept, *variation set*, to describe patterns of adult-child interaction that may foster linguistic growth.

Chapter 6 brings the dissertation to a summarizing and interpretive conclusion.

Chapter 7 gives a short overview of the study in Dutch, intended for a broad public of colleagues and clients with whom I have worked in clinical settings.

References and appendices follow.

Chapter 2
Early Lexical Development: Vocabulary Studies[8]

Introduction

Learning how to map meanings to lexical signs is, for the deaf child, a task that differs from the hearing child's lexical task in a number of ways. Because of this, special assessment measures must be designed for this population. In the present chapter, the domain of lexical development is explored; Chapter 4 turns to morphosyntactic development. The following are some of the facts that are critical in attempting to document language development in deaf children.

Because only a small proportion (c. 5%) acquire SLN from fluent signers, the majority, with hearing parents, are in danger of not being introduced at all to any linguistic community, or at best (too) late. Those hearing parents who do undertake instruction in SLN are novices in sign language. They are not able to provide their children with rich and complex input (see further discussion in Chapter 5). In addition, hearing parents often fail to recognize the child's meaningful communicative acts. As a consequence, potential conversational interchanges do not occur, further limiting the child's linguistic input.

Even in the best of circumstances—with fluent, Deaf parents—the sheer quantity of exposure to language is, of necessity, less for deaf than hearing children. Signed interaction is only possible when the hands are free and the interlocutors have eye contact. By contrast, hearing children receive streams of spoken language without these constraints. The deaf child also receives limited sign language input from the outside world (rarity of signed television and video materials, few or no deaf relatives, moving in a world of hearing and speaking people outside of the home, etc.) There are therefore fewer opportunities to learn new lexical items and constructions. That is, the deaf child, in contrast to the hearing child, has limited opportunities to take part in or "overhear" discussions that provide contexts for the meanings of lexical items and the discourse uses of constructions.

For all deaf children, interacting in the visual/manual modality, it is generally not necessary to label physically present objects, except for special activities, such as book reading and picture identification, or acts of categorization. Lexical items are critical in discussions outside of the here-and-now, but this is relatively infrequent for children in the early stages of learning. As a consequence, deaf children often refer to the presence of objects, people, animals in the physical context by a gaze direction, by pointing, or even by showing or holding up an object for attention.

Comparisons with language development of hearing children is difficult, due to the lack of fully comparable measures. Normative studies of lexical development of deaf children often measure along norms of a spoken language, which is not necessarily appropriate according to the type of language to which sign languages seem to belong.
In addition, they are often biased by the vocabulary and structure of the surrounding speaking community, rather than being based on the sign language itself.

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[8] This chapter is based, in part, on N. Hoiting (2006). Deaf children are verb attenders: Early sign vocabulary development in Dutch toddlers. In B. Schick, M. Marschark, & P. E. Spencer (Eds.), *Advances in the sign language development by deaf children* (pp. 161-188). Oxford: Oxford University Press.

In sum, deaf children receive less input, for various reasons. The input is often not of the highest quality. And the instruments for measuring their linguistic skills are not adapted to sign language. The problem of how to overcome these shortcomings is not easy to solve, but the study presented in this chapter is an attempt to systematically assess the vocabulary development of deaf children, taking account of the linguistics of SLN.

Measuring Sign Vocabulary

The most widely-used tool for assessing early vocabulary growth is the MacArthur Communicative Development Inventory (MCDI, sometimes referred to as the CDI or, more recently, as the MacArthur-Bates Communicative Development Inventory, in honor of its designer, the late Ellizabeth Bates). It has proven itself in many spoken languages (Fenson et al., 1993, 1994); however, it needs to be refined for use with children learning a sign language. In this chapter I explain how the MCDI has been adapted for use in SLN, with applications to the diagnostic process as well as the selection and categorization of lexical items in research carried out by clinicians and psychologists working with deaf children. In the process of applying this instrument of early language assessment, it became clear that important theoretical issues were involved. The age of detection of deafness, ranging from 6 to 30 months, indicates later onset of learning then comparable samples of hearing children learning spoken languages. In addition, as noted above, deaf babies with hearing parents seem to be exposed to "imperfect input" from parents who are, themselves, early second language learners of SLN. This later onset of language learning is indeed revealed in vocabulary size and rate of growth—but not to the extent one would expect. The data of this chapter document considerable early vocabulary growth in such children, especially those with hearing parents using SLN.

In interpreting the data, one is confronted with categories that divide nouns and verbs but are these traditional linguistic categorizations for words of spoken languages comparable to lexical categories of a sign language? I will illustrate how these issues add new dimensions to what may be called the "the noun-verb controversy" in child language research. The growth curves of the sign vocabularies from a sample of 30 Dutch deaf children—of both Deaf and hearing parents, in the age range of 16–36 months—clearly demonstrate that sign acquisition, as assessed by the MCDI, is qualitatively and quantitatively different from patterns of acquisition of spoken languages by hearing children. As I will argue, these differences are not simply due to later onset and diminished language exposure; rather, they reflect deep-seated differences in language *typology*. Using the MCDI for the purpose of sign assessment is clearly an important tool for discovering many aspects of acquisition, as has proven to be to be the case for spoken languages; in addition, the tool proves to be useful in comparative linguistic analysis.

Data collection

Participants

The sample of 30 children (see Table 2.1; Appendix A.a gives grouped MCDI scores and Appendix A.b gives child-by-child data), selected from a diagnostic pool of about 350 children, includes deaf children with both Deaf (SLN-D) and hearing parents; those with hearing parents are divided into two groups: those who were exposed to SSD (Sign-Supported

Dutch) in the earlier years of parent training (SSD-H), and those who were exposed to SLN in more recent years (SLN-H).[9]

Table 2.1. Research sample[10]

Language	Parents	Age Range	N
SLN (SLN-D)	Deaf	1;3–3;0	4
SLN (SLN-H)	Hearing	1;4–3;0	13
SSD (SSD-H)	Hearing	1;5–3;0	13

As noted in Chapter 1, after the formal introduction of bilingual education in 1995, SSD has no longer been used in programs of early language training, but the rise of the use of cochlear implantation has brought SSD back into attention.[11] In the last part of the analysis provided here, the results of the SSD group are compared with the data of both SLN groups.

As discussed in Chapter 1, SLN was the natural language of the Dutch Deaf, dating back to 1790, when Guyot started to teach deaf children in the North of Holland. (See Hoiting, 1983; Hoiting, Menke, & Kuik, 1990, for a history of deaf education in the Netherlands.) SLN made its public comeback around 1980. Because it became evident in the early 1990s that SSD was failing for natural discourse and language learning, bilingual education was formally re-introduced at the Royal Institute for the Deaf in Haren in 1995, and from then on SLN flourished in the schools, fed by intense SLN training for hearing parents and teachers, including the contributions of many Deaf teachers. In this growing bilingual context, the demand for teaching and testing materials—in particular for assessment of the language acquisition of young deaf children—led to endeavors to develop an SLN version of the MCDI. This task became a true linguistic journey of discovery, as I will now start to elucidate.

Adaptation of the MCDI for SLN

The MCDI is a systematic checklist of vocabulary items that can be used by a parent to indicate forms used by the child, including preverbal communication and symbolic skills, lexical items, morphology, and syntax. Anderson (2006) presents an ASL adaptation of the MCDI.

In order to modify the MCDI for use as a diagnostic tool in SLN, I began with a list of possible words. An initial list of 250 glosses, serving as a preliminary inventory, was based on three sources: (1) signs taken from the *Groninger Gebaren Woordenboek* (1979), (2) a

[9] The total group of 350 was reduced to about 100 with no additional handicaps; however some of them demonstrated later handicaps and were excluded from the vocabulary comparisons. The final sample of 30 was determined on the basis of average or higher scores on tests of intelligence (BOS2, K-som), social competence (VPPSI-R), and for those with hearing parents, only those parents who followed a full schedule of sign training. In addition, these 30 all came from families above an SES cutoff.

[10] Chapter 4 presents a morphosyntactic study of a subset of 19 these 30 children, selected on the basis of sufficient videotaped data of spontaneous signing in home and preschool settings.

[11] Deaf schools in the Netherlands require a loss of 90 dB or more for selecting a child for deaf education, whereas less than 90 dB selects for Schools for the Hard of Hearing, provided there are no additional handicaps at the time. Future placement of children with cochlear implants will depend on the level of remaining hearing loss after implantation.

collection of preschool signs and expressions collected by Deaf and hearing preschool teachers, and (3) signs and communicative gestures used in sign language courses for parents. This list was then compared to the Kohnstamm list of frequent Dutch words in the vocabularies of hearing preschool children (Kohnstamm et al., 1981). The resulting inventory provided a useful preparation for the first MCDI version, which I designed in 1990and adapted in 1991, adding topic groupings and additional sections for the use of voice/sound and the use of hand configurations. An English summary of the current inventory is shown in Appendix B. Unlike the early ASL version of Reilly (1992), the Dutch MCDI did not contain written questions for parents concerning their child's grammatical constructions, since the Dutch parents were personally interviewed . The interviews made it possible to maintain the section on comprehension in the original ASL–MCDI adaptation, later excluded for practical reasons in research on ASL vocabulary acquisition with a larger population of deaf children of Deaf parents (Anderson, 2006; Anderson & Reilly, 2002). The parental answers concerning the child's productivity were recorded by the clinician and compared to analyses of the video materials in home and preschool settings, as well as to the parents' checklists. For clinical purposes, the division of the English MCDI into separate infant and a toddler versions was kept in the Dutch sign language variant, but without mentioning particular age-related factors. The second SLN list applies only to advanced signers and can be used when it is clear that a particular child can manage basic signing. The initial version consists of 150 lexical items in 20 conceptual categories, and the advanced version contains 560 lexical items in 23 additional conceptual categories. The starter's version of the SLN–MCDI does not contain the category of "connecting signs" or "helping signs" that are in the ASL version. This starter's list is currently being used for all incoming deaf children, whether they have hearing or deaf parents. The advanced version contains the starter categories but with additional words; for example, the category "toys" is expanded to include "vacation" and "play"; the category "family" is expanded to include "pronouns" and "professions." Both versions contain a category of idiomatic expressions in SLN and some signs reflecting particular Deaf culture and experiences. Signs that Anderson and Reilly label in the ASL version as having "virtually the same form" (2002, p. 86), such as EAT and FOOD, SIT and CHAIR, are kept as separate signs in the SLN version, precisely because SLN acquisition shows considerable changes in the verbal forms between the ages of 2 and 3 years—whether deaf children have deaf or hearing parents, provided they are SLN language models. In addition, in both SLN–MCDI versions, the comprehension/production distinction was kept for all lexical items in the parental forms. (This chapter is based only on production data.) Because of this, it was possible to keep the category "body parts," because it turned out that comprehension of this particular category often appeared early and some of these signs were produced like the actual SLN signs for body parts of people or animals. To summarize, the ASL and the SLN versions of the MCDI differ on the following dimensions:

- administration of the SLN–MCDI to Deaf and hearing parents via personal contact;
- the use of two lists in SLN: a "starter's" version and an "advanced" version;
- preservation of the comprehension/production distinction in the SLN adaptation;
- replacing the written "grammar" questions of the ASL version by personal interview of the parents in the SLN version on sign production, supported by video analysis;
- addition of questions about handshape configuration in the starter's list;
- addition of questions concerning the use of sound, speech, or mouthing in the starter's list;
- addition of an advanced list of 560 lexical items in 23 semantic categories;
- deletion of the category of "early understanding" in the advanced list.

It should be noted that replacing the written questions from the ASL version on grammar with the SLN video materials allowed me to see how the items were being used by the children in real conversations and compare these to the parental checklist . Thus, although the MCDI requires a decision as to the appropriate linguistic category, the child's actual signing provided the answer of how to categorize an item. A more thorough approach of how these items are used by the different language groups for verbs of transfer, ingestion, and the like, can be found in the morphosyntactic analysis in Chapter 4.

Criteria for sign comprehension and production

For hearing parents—generally learning sign language at the same time as their child—it is not an easy job to recognize the child's phonologically "incorrect" signing as conventional signs. For the SLN–MCDI, parents are asked to fill the circles for comprehension only if their child responded at least three times in different contexts to the signing of a parent by responding to a question or request, following an instruction, or acting with or on objects. For the child's sign production, again the parent had to be sure of having observed the same gesture or sign at least three times on different occasions with a stable referent—with or without pointing—and a stable, but not necessarily correct phonological form. Distinctions as to whether a production appeared to be an action, a gesture, or a sign were not part of the parental task. This criterion for observational frequency may seem to be fairly strict, but it helped the parent to be alert and to distinguish between productive and purely imitated forms.

Categorization of lexical items

Categorization of lexical items in many spoken languages is often a battlefield of acquisitional linguistics. An early noun dominance has been claimed for spoken languages by Gentner (1982), whereas Merriman and Tomasello (1995) and others hypothesize that early language use centralizes the role of verbs. A mini-literature has sprung up in this debate, presenting evidence for both noun and verb dominance, depending on language and methodology (see, for example, Choi, 1998; Choi & Gopnik, 1995; Gelman & Tardif, 1997; Tardif, 1996; Tardif, Shatz, & Naigles, 1997).

In applying traditional form classes such noun, verb, adverb, and the like to sign languages, one is faced with several challenges. For many conceptual categories, nouns and verb forms use the same handshape, but differ in movement patterns. The noun form is restricted in movement and comes to a noticeable stop, whereas the verb form shows a continuous sweeping or repetitive movement. The noun/verb distinction appeared to be difficult to distinguish for hearing parents, but also for Deaf parents who struggled, for example, with the minimal perceptual distinctions between for such items as 'to comb' and 'a comb'.[12] The SLN verb 'to comb' is a downward movement of the fist from the top of the head to the neck, repeated two or three times, whereas the noun 'a comb', referring to the object, has the same movement, however with an abrupt hold after one downward movement. Such pairs might differ in SLN in repetition of the hand movement versus a hold after one movement or direction; sometimes just a minimal change in orientation occurs. The videotapes of the children in home and preschool settings were decisive in this respect. Without exception, all children, whatever, their input, showed a predominant initial use of the verb form for these

[12] In fact, I would argue that, for such lexical pairs, "noun" and "verb" are not separate parts of speech. Rather, there is a root form, as in Semitic languages, with two aspectual modulations: a short, single movement and hold for forms that make reference to objects, and a repeated movement of 2-3 cycles for forms that make reference to actions.

types of lexical items. I will come back to this discussion later, but these observations clearly made it necessary to distinguish related noun and verb forms in the SLN checklist. Preliminary knowledge of children's linguistic performance clearly plays an essential role in the design of a vocabulary checklist.

Another challenging issue was posed by the special verbal construction type in sign languages, traditionally known as "classifiers," here referred to as "polycomponential signs" (following Slobin, Hoiting et al., 2003; see discussion in Chapter 3). In this type of construction, meaning elements co-occur neatly packed into what seem to be single units with compositional structure. Contrary to earlier research claims (Newport & Meier, 1985; Schick, 1990), some of these forms do appear early in signing children; and again, these early constructions seem to be best looked upon as verbs with incorporated information about nominal arguments (as discussed in Chapter 4). For example, in (1), the child is simultaneously providing information about an object—a balloon—and its movement (Slobin, Hoiting et al., 2003, p. 283). (For the sake of the reader, a reduced transcription is presented here; more elaborated decomposition of polycomponential verbs can be found in Chapters 3 and 4.)

(1) Situation: child describes hot-air balloon seen on earlier occasion.
Utterance: two curved vertical upward moving hands (fingers spread apart), palms facing each other, arms extended wide and drifting about, puffed mouth and pursed lips
Translation: 'A very big balloon (was) floating about in the air.'
(Reduced) Transcription: (float) – spherical object(2H) – wander(movement) – augmented modification

If a parent reported that the child used such a construction, it would be coded on the MCDI as a verb ('float') with an incorporated object ('balloon'). Such complex items were noted for grammatical analysis, as discussed in diagnostic reports on sign grammar (see Chapter 4).

Input factors

The data presented here must be considered in the light of Dutch practices with regard to deaf infants (during the period of data gathering). With regard to age of detection, note the tiny time window of the children in the sample: 14–36 months of age. Age of detection of the child's deafness for children of hearing parents is within this time frame in the Netherlands. Second, I used computations based on both chronological age and "adjusted age," the latter varying with the age of detection of deafness. And last but not least, the hearing parents of these children are divided into two different "input groups" (SSD and SLN), whereas the deaf children of deaf parents form a group apart (native SLN input), allowing for three-way comparisons (as illustrated in table 2.1, above):

- children of SLN-using Deaf parents (SLN-D), who shared their SLN as a native language with their deaf child;
- children of SLN-using hearing parents, (SLN-H) who were taught SLN, rather than speech-driven sign systems, and consequently provided their child with SLN;
- children of SSD-using hearing parents (SSD-H), who were taught a speech-driven sign system, offering their child speech and sign simultaneously.

As noted in the Introduction to this chapter, the quality of SLN input provided by the hearing parents does not equal that of native SLN-using parents. Due to age of detection and consequent delayed input of a perceivable language for deaf children of hearing parents, authors have suggested "impoverished language exposure" (Livingstone, 1983) or "atypical

language exposure" (Goodheart, 1984). In reality, hearing parents may be only months ahead of their child's sign language skills. However, in this respect it is important to stress that it is not necessarily the case that all deaf parents can provide fully native sign language input language to their children. Many deaf adults were, themselves, raised by hearing parents and were surrounded by many hearing people who cannot sign well. In addition, as Maxwell, Bernstein, and Mear (1991, p. 190) have pointed out with regard to ASL, "the sign language used in the United States is not a single homogeneous language code" and "it is worthwhile to open our minds and direct our attention to the varieties of sign language and the combinations of speech and sign modes that we can see around us." According to Anderson and Reilly (2002, p. 86), we should define all hearing parents as late learners of a sign language *simply because* they are hearing. However, in an earlier study of sign complexity in the Dutch 2–3-year-olds (Hoiting & Slobin, 2002), the deaf children with hearing parents who were learning SLN were not delayed as much in their language development as the deaf children with hearing parents who were learning SSD. Thus the parental group exposing their children to SSD was closer to the label of "impoverished input," since none of the SSD children or their parents showed early growth in complexity of verbal constructions (as discussed in Chapter 4). The MCDI allows us to ask whether this situation is different with regard to vocabulary, since counts of signs as lexical items alone may not show the same deficits as seen in language production in situated use. According to expectations based on claims of "imperfect" or "impoverished input," I expected that the SLN-D children would present the highest vocabulary counts, followed by both groups of children of hearing parents, SLN-H and SSD-H. However, the SSD group proved to be considerably behind both SLN groups.

When does signing begin: babbling sequence, gesture, or sign?

Another issue related to assessing the onset of signing is when to call the early movement of the hands a sign. Deaf babies have been repeatedly observed to produce their first signs at around 8 months of age (e.g., Anderson & Reilly, 2002; Bonvillian & Folven, 1987; Conlin, Mirus, Mauk, & Meier, 2000; Newport & Meier, 1985). Is this precocity due to the relative ease of motor production by the hand as compared to the more difficult task of fine motor control in the speech channel? Other explanations of these early productions consider them "communicative gestures" that are similar to gestural precursors to spoken language, as defined by Bates and her colleagues (Bates et al., 1979). Accordingly, the suggestion for acquisition of a signed language would be that conventional signs spring from these early gestures, allowing the deaf infant to profit from the iconic features of gestures. Indeed, in sign language research this topic is even more complex than it is in spoken languages, since there are convincing similarities in the form of early gestures when compared to conventional signs (see Casey, 2003, for extensive literature review and discussion; Hoiting & Slobin, 2007; and discussion in Chapter 4). Anderson and Reilly (2002, p. 89) raise a doubt with regard to early onset in their data, suggesting that "it is quite possible that both hearing and deaf children produce communicative gestures at young ages, but that only deaf children are given credit for having produced a lexical item" when they gesture. It is interesting to note in this regard that two of the Dutch Deaf parents claimed, literally, that their babies were communicating and "trying to sign"; however they concluded that …"real signs did not come until several months later…" (personal communication). An intriguing aspect of the data of the current project is that all deaf children of hearing parents, after being exposed to signs—at whatever age—started using "communicative gestures," and indeed before their parents could identify their gestures as conventional SLN forms. That is, the children were using the manual modality for communicative purposes.

It remains an open question whether children profit from potentially iconic features of early gesture (see Schick, 2006). Research on homesign by Goldin-Meadow and her colleagues seems to suggest an affirmative answer, since the children they have observed make use of dimensions of sublexical information, such as movement and hand configuration, for systematic referential contrasts (Goldin-Meadow, 2003; Goldin-Meadow, Mylander, & Butcher, 1995).

Early signs as lexical types

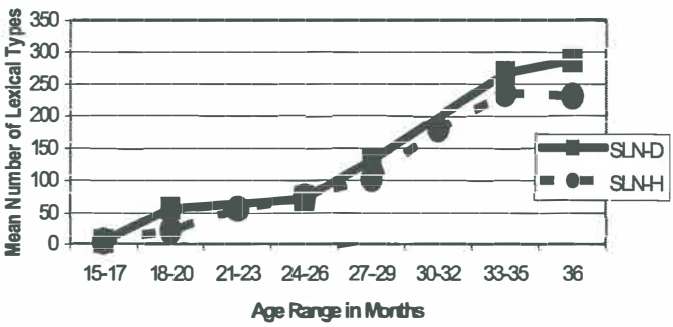
The topic of gesture and iconicity brings us back to the issue of categorizing the vocabulary data. Videos of spontaneous signing by the children clearly show that many early signs are realized as action signs, even when referring to an entity, as CUT (opening and closing of index and middle fingers while moving the hand forward) instead of SCISSORS (opening and closing of index and middle fingers in place). Surprisingly, the ASL data come close to the vocabulary data reported for the English MCDI, even in terms of distribution of the categories (however, Anderson and Reilly, 2002, point to some changes in the ASL adaptation, as well as cautioning about interpretations of their ASL categorization). The ASL and English patterns, however, are unlike the SLN and SSD vocabularies, as described below. The young Dutch signers seem to be extremely attentive to movement and produce their early signs as if they are overextending this phonetic feature across lexical items. This is particularly true of early verbs such as DRINK, CUT, COMB, GLUE. All of the children, whatever their input group, express these first signs first as verb forms—that is, with an extended movement component—and only later as nouns. Note that in most cases the phonetic realization of these verb signs is easier to produce than the noun versions, which require either an abrupt hold or some more limited and less perceptible feature. According to principles of both ease of production and perceptual saliency, the verb form of these paired lexical items seems to be more accessible to the beginning signer. In addition, for some items in this group of paired signs one might claim a more transparent and/or iconic meaning as part of the explanation. For example, some of the verb signs depict components of actual movements involved in their referent situations, such as EAT, HAMMER, COMB, CUT.

SLN Vocabulary Growth

Development by Chronological Age

To begin with, consider what the growth curves tell us about the development of sign vocabulary in the two SLN groups. Figure 2.1 presents vocabulary growth by chronological age

Figure 2.1. SLN Vocabulary Growth by Birth Age



("birth age") for SLN-D and SLN-H children. The mean number of signs refers to the average number of different signs on the vocabulary checklist. The vocabulary growth by birth age for both groups is remarkably parallel. But, in addition, the SLN-D curve is marginally but consistently higher than the SLN-H curve, with increasing divergence after about 33 months. This is what we might expect: deaf children of Deaf parents have an overall advantage, because they have been seeing a great deal of signing from the very start, and their parents are fluent signers. So it is reasonable that these children tend to have bigger vocabularies than their peers with hearing parents. However, this gap may be illusory, as discussed below, when children are compared with regard to their starting ages for attending to sign language. (Note, however, that comparisons between these two groups can only be suggestive, because they are based on 4 SLN-D children contrasted with 13 SLN-H children. Furthermore, as shown in Appendix A.b, there are individual differences, as well as sampling at different age points and intervals, due to exigencies of clinical work and family schedules. In addition to these sorts of variability, the sample populations are also too small for serious statistical analysis.)

When we compare the SLN results to the published data from native ASL-learning children (Anderson & Reilly, 2002), we see a considerable difference in total numbers. The ASL vocabularies reach 550 signs at 36 months, whereas the SLN-D group shows an average of about 300 items at the age of 35 months. This difference (in total numbers) can at least partly be explained by criteria used in the SLN adaptation of the MCDI, as discussed above. Note that the current SLN analysis excludes early communicative gestures, proper names, body parts, most prepositions and locatives, as well as any fingerspelling for words, numbers, or letters. This is unlike the counting of the ASL–MCDI, where most of these categories were included in the counts, where there has not been a check by the researcher from video data and parental word checks, and where there has not been a restrictive note to the parents to only circle an item after having seen the sign at least three times, without imitation. The strict criteria used in the SLN–MCDI , along with the video comparison checks, clearly influence the SLN totals reported here.

Turning back to Figure 2.1, one is struck by a relatively high and rapid growth curve in the SLN-H group; this is remarkable, given that these children are supposedly dependent on "impoverished" input. Maybe the growth curve is only a matter of vocabulary, but, in addition, as laid out in Chapter 4, the Dutch data show that most of the children in this group also use SLN grammatical structures in their early signing. The biggest difference in

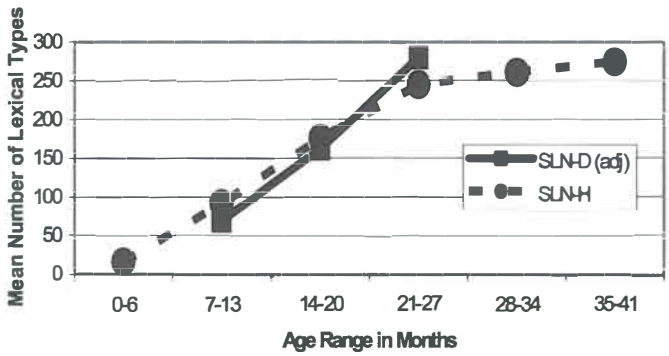
comparison with the SLN-D group seems to lie in speed and fluency of signing, rather than in early acquisition of lexicon and grammar (see Figure 5.5, p. 86).

Development by Adjusted Age

However, with regard to developmental patterns, it is necessary to take account of the age of detection of deafness. Deaf children with Deaf parents are exposed to signing from the start, whereas those with hearing parents do not begin to receive sign input until deafness is detected. Therefore, it is helpful to control for this factor, grouping children by "adjusted age" rather than "birth age" or "chronological age," thereby giving all of the children roughly comparable starting points. The SLN-D children represented in Figure 2.1 have received sign input from early infancy; by contrast, SLN-H children at a particular age point on the graph vary in the age at which they were exposed to sign. Figure 2.2 attempts to make the two groups comparable. The "adjusted age" for children with hearing parents can be taken as the point at which these children begin to be exposed to signs—in this case, because it is the first time they were presented with signs (generally later than 10 months or so of age). Although SLN-D children were born into signing environments, one cannot assume that they initially differentiate signed communication from gestural and affective movement. Because deaf-of-deaf infants begin to use sign-like gestures communicatively at about age 10 months, an arbitrary—but not unreasonable decision was made to set the starting point of "adjusted age" for SLN-D children at 10 months.[13] This adjustment is indicated in Figure 2.2 as SLN-D (adj). For example, an SLN-H infant whose parents began to sign when the infant was 15 months old is equated with an SLN-D child of 10 months. (Note that some of the curves start at late ages, due to late detection). Using this correction, the growth curves of the two SLN groups are virtually identical for each starting age at which comparable data are available.

[13] I am grateful to the late Elizabeth Bates (e-mail, April 7, 2003) for advice in devising this procedure for defining a comparable starting point for deaf-of-deaf and deaf-of-hearing infants. Her experience and authority in the field of child language research were a strong support for this innovative technique of making diverse populations roughly comparable. The use of "adjusted age" is also compatible with a suggestion made by Baker, van den Bogaerde, and Woll (2005, p. 17), who use the term "linguistic age" to compare the development of children with differing language experience: "Matching on linguistic age may be important when exposure to a sign language has been extremely variable within a group." All calibrations of this sort give some disadvantage to children with Deaf parents who have probably been learning something about sign language in the first ten months of life. However, what is gained is some reassurance that data from children with hearing parents are compatible with each other; such compatibility is lost when making use only of birth ages for children with quite different ages of first exposure to signing. Furthermore, if deaf-of-deaf children show advantages even with this adjustment, we can be more confident that those advantages are not due simply to lack of calibration of age of exposure between deaf-of-deaf and deaf-of-hearing children.

Figure 2.2.
SLN Vocabulary Growth by Adjusted Age



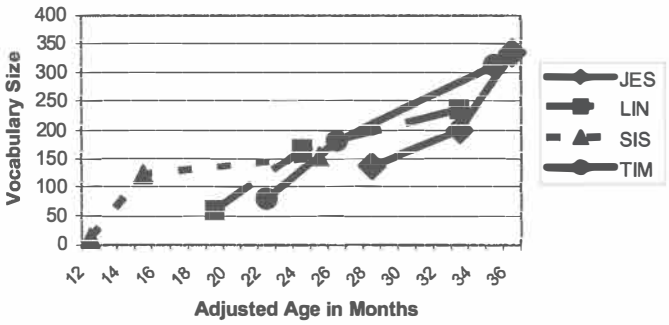
Looking back at Figure 2.1, both the "birth age" and "adjusted age" curves suggest some advantage for the SLN-D group towards the end of the period under study, but the striking parallels in the second graph indicate that children with hearing parents have the potential of catching up—at least if the input is SLN.

Individual growth curves

Figure 2.3 presents individual growth curves for four SLN-D children: the three children of the existing sample, and a fourth child, TIM[14]. The growth curves show that when children have fluent signers as their models, they demonstrate continuous growth in vocabulary, comparable to statistics for hearing children learning a range of spoken languages. These data are valuable for underlining the fact that acquisition of a natural sign language, under natural circumstances, parallels development of other languages. I have not tabulated growth curves for individual children with hearing parents, but an overview of their data indicates similar patterns of growth.

[14] Although there are MCDI scores for TIM, his home and preschool videos have not yet been transcribed; therefore he is absent from the analyses in Chapter 4. An overview of the videos indicates that he is a bright child, with rapid development.

Figure 2.3.
Vocabulary Growth in Four SLN-D Children



Children exposed to SSD show rather different patterns—slower in rate, but similar with regard to the types lexical items acquired. Therefore, before considering the SSD-H group, it will be useful to analyze vocabulary development in terms of *categories* of lexical items, particularly with regard to verb-like signs.

Development of Predicate Forms

Lexical items in the SLN–MCDI have been grouped into categories of terms that designate *entities* (roughly, nouns), *predicates* (including verbal and adjectival notions), and *operators* (elements such as question words, negation, temporal expressions—that is, forms that have scope over part of a proposition or an entire proposition). The full list of predicates, in English translation, is given in Table 2.2.

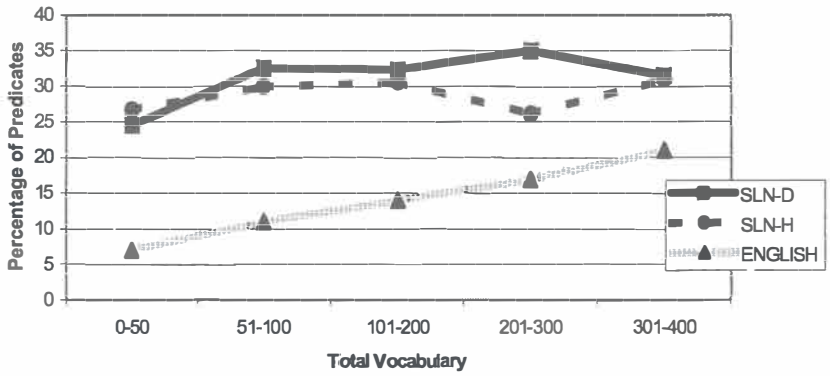
Table 2.2.

Predicate Items in the MCDI for SLN

able, be able	do	look	show
a lot	draw	loose	sign
agree	dream	love	sleep
allow, permit	dress, get dress	make	slide
always	drink	mean, nasty	soft
angry	dumb	more	stand, stand up
attach	eat	must	start
away	fall	need	steal
awful, terrible	feel (emotions)	nice	stuff, cram
big	find	no	surprised
bite	found	not yet	swing
blow	friendly	now	take
blue	funny	OK	talk, communicate
borrow, lend	get up	open	tap
bother, disturb	get, obtain	orange	tell
brave	give	out	think, believe
break	go	paint, color	throw
bring	glue	pity, too bad	tired
broken	good	play	together
brown	good-looking	pleased	try
build	grab	polite	understand
bump	gray	practice	undress
buy	green	present, here	urinate
call up	help	pretty	use
calm	happy	proud	wait
careful	hard	pull	walk
caress	have	purple	wander, walk about
carry	hear	push	want
choose	hit	quick	warm
clay	hold on, hold tight	quiet	warn
clean, make clean	how	read	wash
clever	hunger, be hungry	ready	wear
click	in	red	wet
climb	jealous	remember	what
close, shut	jump	return, back	when
cold	keep off, stay away	ride	where
complain	kind	right away	which
cook	kiss	rip	who
crawl	know certainly	rise	why
comb	know not	run	write
cry	laugh	sad	wrong, mistake
curious	lay down, set down	same	yellow
cut (with scissors/knife)	lead	satisfied	yes
dance	learn	scared	yummy
dear, sweet	lick	scoop up	
defecate	lie, lie down	scream	
dig	little	shame, embarrassed	

Counts of the proportions of predicates make it possible to address the "noun/verb" issue in vocabulary acquisition. Using MCDI data for English presented by Bates et al. (1994, p. 95), Figure 2.4 presents the percentage of predicates out of total vocabulary for successive stages of vocabulary growth for the SLN groups compared with English-speaking children. (Detailed data can be found in Appendices A.1 and A.2.) Plotting predicates against vocabulary size makes it possible to relate lexicon and grammar in development, as well as providing a precise comparison with a spoken language—English. The typical pattern for English is a slow but steady increase in proportion of predicates, indicating changes in the organization of grammar as lexical items are accumulated. The SLN development is strikingly different. The percentage of predicates is consistently higher in SLN than in English: five times as large at the start and still twice as large at end of the period. Clearly, there are significant differences in the organization of SLN and English, probably reflecting general differences between types of languages, as discussed below.

Figure 2.4.
Percentage of Predicates out of Total Vocabulary:
SLN-D, SLN-H, English



The two groups of SLN children are comparable except for a slight decline later in development. For the SLN-H group the decline occurs after reaching a vocabulary of 100 items, and for the SLN-D group at the 200-item level. (However, as shown in Appendix A.1, the numbers of children at these levels are very small.) These later declines may reflect encounters with more demanding complex utterances that may temporarily slow down the ongoing intake of new verbs, and/or it may indicate an acceleration of noun acquisition. This issue calls for a more detailed discussion of linguistic issues, which will be addressed before returning to a comparison of the role of predicates in signed and spoken versions of the MCDI.

Deaf children as Verb Attenders

The manual-visual modality of sign languages differs considerably from the vocal-auditory modality of spoken languages—in perception as well as production. In spite of similarities in strategies and stages in language acquisition in the two modalities, most research exhibits consensus in recognizing sign languages as representing special typological characteristics. In the early research stages they were grouped with American Indian languages, such as Navajo, due to the use of something like sign language "classifiers" as grammatical markers

(Frishberg, 1972). More recently, this particular salient property of sign languages has been reconsidered, starting with Engberg-Pedersen's (1993) innovative analyses of "polymorphemic verbs," and, most recently, insightfully debated in a series of papers edited by Emmorey (2003) in *Perspectives on Classifier Constructions in Sign Languages*. Those papers discuss many classifier phenomena in both spoken and signed languages, resulting in the view that many of the classifier phenomena described for spoken languages are rather different from those in sign languages. Slobin, Hoiting et al. (2003) propose a polycomponential analysis (see Chapter 3) of the development of verbs in young deaf children acquiring SLN and ASL, demonstrating increasing conventionalization of integrated verbal–referential forms. That is, signed predicates contain more explicit referential information than verbs in the standard spoken comparison languages. (However, comparable patterns of early verb richness have been reported for children acquiring spoken languages such as Inuktitut (Allen, 1996, 2000) and Tzeltal (P. Brown, 2001). These are all languages in which verbs carry information about their arguments, as in signed languages, as discussed below.)

These considerations return us to the "noun/verb controversy" in the child language literature. Clearly, the Dutch deaf children are far ahead from the very beginning in predicate acquisition compared to English-speaking children. Furthermore, as discussed below, the same is true of the SSD-H children. Why should this be the case? The most simple explanation would be to refer to some lexical items in SLN that do have a very slight phonological difference between noun and verb forms, such as COMB (noun) – COMB (verb), SWING (noun) – SWING (verb), and SCISSORS – CUT-WITH-SCISSORS. The "verb" forms may well be more salient in perception, as well as more active in production. We have already noted that sign languages have rich verbs that are full of information about entities in combination with movement of various sorts. Deaf children are very focused on movement, and this is apparently a linguistic place where they can determine the referential intent of parental signing. (Consider, for example, verbs of handling , in which the combination of handshape and movement indicates both action and type of object.) However this would still not explain the considerable quantitative differences reflected in Figure 2.4. In fact, only nine of the MCDI items listed as predicates in Table 2.2 could conceivably be items that were intended as object rather than action designations: call-up (telephone), carry (heavy object), clay (substance), comb (object), cut (scissors), drink (cup), play (toy), swing (object), write (pen/pencil). I suggest, rather, that the answer lies in a basic typological difference between languages like English and Dutch on the one hand, and sign languages on the other.

A fundamental revision in typology

In all of the languages spoken by the surrounding communities where sign languages have been studied in depth—Indo-European as well as Japanese, Turkish, and Chinese—the basic verb argument structure of the clause locates information about argument roles *outside of the verb*. That is, one must look to the nouns—either their word-order arrangement in relation to the verb, and/or their casemarking—in order to determine their roles with regard to the verb. Nominal arguments are dependents of the verb, and these are all *dependent-marking* languages. By contrast, a large group of spoken languages provide information about the roles of nominal arguments in elements located as part of the verb—that is, on the head of the clause. These are *head-marking languages* (Nichols, 1986, 1992). Examples are found, for example, in the Americas (Blackfoot, Cree, Inuktitut, Lakhota, Nootka, Tzeltal, and others) and in the Caucasus (Abkhaz and others). Such languages have generally not provided the point of comparison for sign language syntax, but it is apparent that all of the sign languages

that have been described are head-marking, rather than dependent-marking languages (Hoiting & Slobin, 2003; Slobin, 2006).

Consider the following two examples provided by Nichols (1986, p. 61). Japanese is a dependent-marking language. The role of each noun argument is marked by a particle following the noun, and the verb is bare, as shown in (2):

(2)	*boku*	*ga*	*tomodati*	*ni*	*hana*	*o*	*ageta*
	1st PERSON	SUBJECT	friend	DATIVE	flowers	OBJECT	gave

'I gave flowers to (my) friend'

We are familiar with such arrangements in the casemarked suffixes of Latin or Russian or Turkish, the casemarked articles of German, and the casemarked pronouns of Indo-European languages like Dutch, English, and Spanish, which also rely on fixed word-order patterns of dependents to identify their roles when casemarking is not available. By contrast, (3) is an example from Abkhaz, a head-marking language of the Caucasus. The verb is underlined.

(3)	*a-*	*xàc'a*	*a-*	*pħ°əs*	*a-*	*š°'ə*	*Ø-*	*l ə-*	*y-*	*te-*	*yt'*
	the-	man	the-	woman	the-	book	it-	to.her-	he-	gave-	FINITE

'The man gave the woman the book'

Note that in (3) there are no markings on any of the dependent nouns: the-man, the-woman, the-book. All of the relations between the nouns are marked by affixes of the verb.

It will be evident to readers familiar with SLN or other sign languages that (3) is parallel in structure to sign languages, although relying on spoken phonetic material to indicate argument roles on the verb, whereas sign languages do the same by means of movement between loci, often associated with gaze direction and body shift as well. Because of this, it is incorrect to treat loci in signing space as dependents whose roles are marked independent of the directional movement of the verb. Rather, the verb's movement, in itself, identifies the argument roles of loci which, in themselves, are only referential indices. In other words, sign languages are head-marking, using spatio-temporal means to mark the argument roles of dependents. The widespread use of terms such as "pronoun" and "agreement" mask the obvious deep typological difference between head-marking languages and the dependent-marking languages from which the prevailing grammatical descriptions are drawn.[15] Once we recognize this essential typological characteristic of sign languages, it is evident why children pay more attention to verbs in acquiring such languages. The nouns are simply much less frequent, and much less salient, in signed utterances, and the verbs are informationally rich with regard to both predicates and their argument relations. (Consider also, as pointed out in the Introduction, that much of signed communication needs no nouns, because they are physically present or have been established as spatial loci; but verbs are an essential element of almost all utterances.)

When w``e consider the lexicon as the starting point for the child to derive morphological and syntactic structure, then it seems that verbs serve as heavy loaded informational "carriers" for deaf children. In order to know how to "package" an event for encoding, deaf children have to learn where types of *carriers* (verbs – 'float, drive') *move* (adverbs – 'to, in, from around') *particular* types (adjectives – big/round, thin, long) of *nominals* (nouns – balloon, car, pencil).

[15] In the Berkeley Transcription System (BTS), presented in Chapter 3, verbs have meaning components that mark movement from source to goal, thus removing the need to postulate "agreement" or a distinction between "spatial verbs" and "agreeing verbs."

Indeed the predicates in the "adult" language—the input—carry most nouns, adverbs, adjectives, to locations/goals. This is unlike Dutch or English, because those languages take all these linguistic categories apart to put them in strict sequential order, but the predicate expressions of SLN are convergent with structures that have been documented for head-marking languages (e.g., Bohnemeyer, 1998; Nichols, 1986, 2001; Pye, 1992). (Note that this reanalysis of the typology of sign languages casts doubt on formal analyses derived from generative grammars of dependent-marking languages.)

Thus natural sign languages guide deaf children into a type of language, with typologically specific constructions, from the earliest stages. The child must not only select the appropriate meaningful elements, but those elements must also be categorized and constructed according to the typological grammar of the exposure language. As a consequence, the typological characteristics of the language come into focus. This of course makes one wonder what one will see in the process of lexical acquisition when SSD serves as the input language.

Acquiring vocabulary with SSD as the input language

The structure of SSD

In the historical overview presented in Chapter 1, I characterized SSD as a flexible system that follows Dutch word order and a borrowed SLN lexicon, primarily adding fingerspelling for Dutch grammatical elements and proper names. This sort of hybrid sign system qualitatively approaches the designation of "impoverished input." In the pre-1995 clinical setting, SSD functioned in the Dutch educational system as a system comparable to Manually Coded English (MCE) in the United States—that is, a speech-driven system, in which signs are used in citation form with speech accompanying most of the signing. In a number of European schools for the deaf, sign systems are still the norm as the educational and communicative tool for language teaching and learning of deaf children. The recent medical technique of improving hearing by means of cochlear implantation has brought SSD back into attention in the Netherlands, challenging the prevailing bilingual approaches. Although hearing parents are encouraged to use SLN as the visual language for young implanted children, many parents understand the bilingual educational policies, but respond by signing and speaking at the same time to their implanted children. (At the time of writing, in 2006, implantation begins as early as age 6 months). As a consequence, the picture may be changing back to the use of a speech-driven sign system, which may not be the optimal linguistic answer for all deaf children. At any rate, the current situation suggests a potential return of SSD, making our earlier assessment data on SSD relevant at this time.

A brief discussion of predicate expression in SSD is necessary to set the stage for the analysis. Verbs are produced as citation forms in SSD—that is, they are not directed in space to indicate their arguments. Rather, the arguments are established by the use of nouns and points to present entities. For example, a child might be presented with a simultaneous Dutch and signed utterance as in (4a), meaning 'I go to school': A point-to-self is followed by the citation form of GO-TO, followed by a noun labeling the goal, using Dutch word order. The verb is a generic pointing forward gesture equivalent to GO-TO, and SCHOOL is signed on the forehead, regardless of the path of motion.

(4a)	spoken Dutch:	Ik	ga	naar	school
	simultaneous SSD:	POINT-TO-SELF		GO	SCHOOL

By contrast, (4b) presents the SLN equivalent of the same proposition:

(4b) SLN: SCHOOL POINT-TO-LOCATION POINT-TO-SELF $_{me}$MOVE-TO$_{school\text{-}locus}$

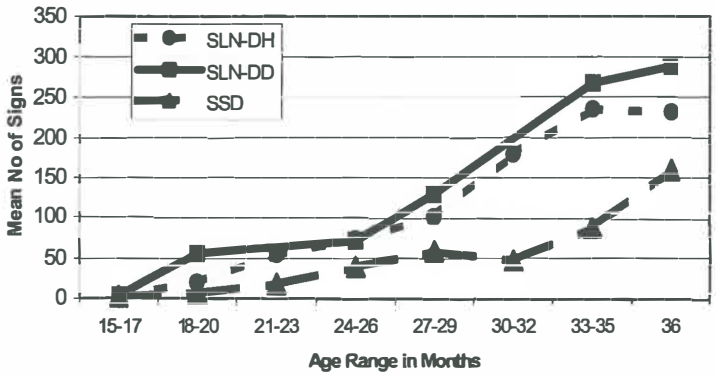
Note that in the SLN version, SCHOOL is signed as the first lexical item and is then located, allowing the directional sign MOVE-TO to move from the signer's body—identifying the actor—to a locus that has already been identified as the school. (It could be further argued that SCHOOL, POINT-TO-LOCATION, and POINT-TO-SELF set up the referential topics and that the entire predicate-argument structure is contained in the verb. On this analysis, SLN is a *topic-prominent* language, in contrast to Dutch, which is a *subject-prominent language*, in which the subject is a syntactic component of the proposition.) In brief, (4b) is a typical head-marking construction, in contrast to the dependent-marking construction in (4a), where a preposition associated with a noun indicates the noun's role as goal. Note, too, the difference in sign order between (4a) and (4b), along with the different status of the pointing gesture. In the SSD examples in (4a) the points identify source and goal, but do not explicitly encode the motion component of the event as part of a sign that moves from source to goal. By contrast, in (4b) the points in SLN identify the arguments that then serve as source and goal when the verb is anchored by those two points.

In this regard, it is significant that the video analyses of the SSD children's utterances at around the age of 3 years start to show remarkable changes. Some of the children sign the citation form first and then start to trace the directional path with their index finger towards the located sign SCHOOL. That is, they are in the process of creating a "dynamic auxiliary" for SSD, such as has been documented as a support for "plain verbs" in SLN (Bos, 1994; Hoiting & Slobin, 2001) and Taiwan Sign Language (Smith, 1990). It seems that the naturalness of movement for the manual/visual modality cannot be avoided, resulting in the use of directional pointing as a kind of "auxiliary" to identify the relevant arguments of the verb. These findings are comparable to spontaneous uses of directionality that have been documented at length by Casey (2003) for children's early productions in both ASL and homesign, echoing findings by S. Supalla (1991) that children learning MCE begin to move verbs through space to indicate source and goal, actor and recipient, etc.)

Vocabulary growth in SSD

Children acquiring SSD do acquire a lexicon, although at a much slower rate than children exposed to SLN. Figure 2.5 presents vocabulary growth by birth age for the three groups. The SSD children have smaller vocabulary than both groups of SLN children and show a much longer period before they begin to acquire vocabulary more rapidly. This salient starting delay is unlike both SLN curves, with the SLN-H group continuing to grow steadily in vocabulary size, comparable to the SLN-D group. Although the SSD group increases the rate of acquisition after the age of 30-32 months, it does not reach the SLN levels by the end of the age range under study.

Figure 2.5.
SLN and SSD Vocabulary Growth by Birth Age



The SSD developmental pattern is quite likely due to factors involved in the use of simultaneous streams of speech and sign. (See Chapter 5, and Hoiting & Slobin, 2002, for an analysis of SSD as a non-natural sign system, with negative implications for communication and acquisition.) The child receiving SSD input has to divide visual attention between the hand and the mouth, and as a consequence misses parts of the signed input[16]. In addition, parents often repeat the same signs without any variation in form or order, often demanding vocalization from the child. Because SSD is modeled on Dutch, the parents do not have recourse to the normal use of sign order variation in a natural sign language such as SLN. Consequently, there is limited variety in the input, often resulting in loss of interest from the child's side. Note, too, that lack of variation deprives the child of essential cues to meaning. As discussed in Chapter 5, young language learners benefit from receiving different versions of utterances conveying the same essential meaning. Such "variation sets" (Küntay & Slobin, 1996; Slobin, Hoiting, & Küntay, 2000) allow the learner to focus both on lexical items and the constructions in which they can occur. A natural language, such as SLN, facilitates parental use of variation sets, whereas a speech-supported system, such as SSD, predisposes parents to repeat stereotyped patterns. This is due to at least two factors: (1) Parents desire to focus on vocalization and lip-reading, and so put more attention on exact utterance repetition. (2) Variation sets in spoken Dutch often rely on a range of discourse particles that have no signed equivalents. It may be that the resulting stereotypy is the most serious obstacle for the SSD-learning child, since this causes difficulty in inferring meanings of new lexical items.

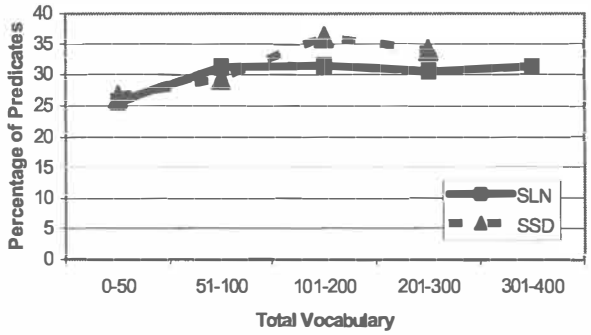
Development of predicate forms in SSD

Figure 2.6 combines the two SLN curves of Figure 2.4 (see Appendix A.1), adding the percentage of predicates out of total vocabulary for the SSD group. In light of the features of SSD discussed above, it is remarkable that the lower vocabulary growth of the SSD group in comparison with the SLN groups does not alter the preponderance of predicates. Video analyses of the SSD children show that they realize many early signs as verbs, as do the SLN children. Their accuracy in discriminating nouns and verbs generally also seems to rise after

[16] To be sure, lexical information presented on the mouth can also be relevant in SLN. But such information is generally redundant, reinforcing information conveyed by the hands; by contrast, some lexical information in SSD is conveyed only by the mouth, due to the parent's vocalizations, which cannot be perceived by the child.

the age of 3 years. Both the MCDI and video data indicate that action signs are more salient to deaf children than are verbs for hearing learners of English.

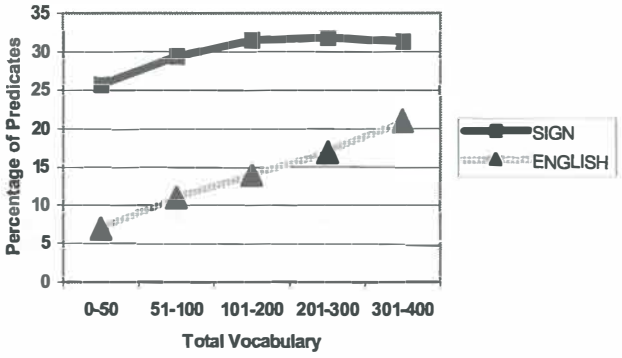
Figure 2.6.
Percentage of Predicates out of Total Vocabulary:
SLN (D+H) and SSD



Predicate use in Dutch deaf and English hearing children

The SLN and SSD predicate curves are close enough to be combined, as shown in Figure 2.7, which collapses the data from the three Dutch deaf groups into a single curve that can be compared with published English data on the MCDI. The graph shows the percent of predicates in relationship to vocabulary size, in order to make the sign and speech data comparable. We are now confronted with a considerable and remarkable difference: The deaf as a group, including those acquiring SSD, are far ahead in predicate acquisition at every age, with no apparent change in development after reaching a vocabulary level of 100 words. By contrast, the English group shows a steady and linear growth trend, ending the sample period with 20% in comparison to 30% for the deaf children. The fact that the pattern for the deaf children is essentially similar whether they have deaf or hearing parents, and whether they are exposed to SLN or SSD, indicates that the quality of input may not be important as far as predicate acquisition is concerned. What counts is the salient role of predicates in sign language, that is, language in the visual/manual modality—even if supported by speech. SLN and SSD children are all verb attenders. Verb attending is clearly a deaf child's job, since it is primarily verbs that satisfy the child's demand for meaning in a sign language.

Figure 2.7.
Percentage of Predicates out of Total Vocabulary:
Comparing Dutch Sign (SLN+SSD) and English

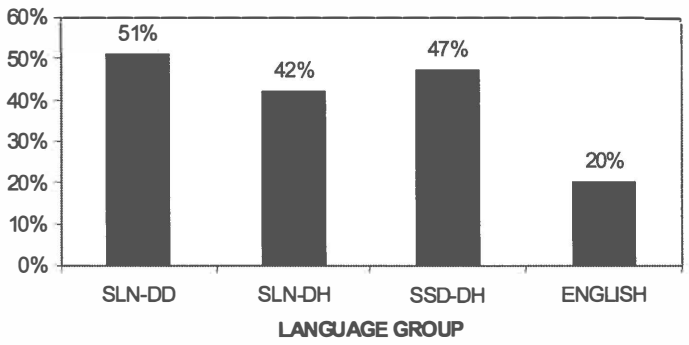


Predicate use in spontaneous signing

Morphosyntactic dimensions of spontaneous signing are dealt with in Chapter 4; here it is relevant to include a predicate measure from the spontaneous data. Those data provide another check on the role of predicates in early signing, complementing the findings of the vocabulary checklist reported here. Figure 2.8 is based on the data in Appendix C, which lists all of the lexical items used by all of the children in spontaneous signing. The data are based on the 19 children whose morphosyntactic structures are studied in Chapter 4 (see Table 4.1: 3 SLN-D, 8 SLN-H, 8 SSD-H). These 19 children are a subset of the 30 children represented in the MCDI study, selected on the basis of sufficient video data to allow for morphosyntactic analysis (see Chapter 4). Figure 2.8, like Figure 2.7, presents percentages of predicate use in children learning a sign language and children learning English. Separate data are given for each of the three Dutch groups. The data presented here confirm the patterns revealed by the MCDI, thereby offering some measure of validity of the checklist. And the data also underline the thesis of this chapter that deaf children are "verb attenders."[17]

[17] These data, since they are based on quite different numbers of children and vocabulary items. Nevertheless, it should be clear to inspection of Figure 2.8 that the range of 42%–52% for the deaf children surpasses by a wide margin the 20% reported for hearing, English-speaking children.

Figure 2.8
Percent Predicate Tokens in Productive Lexicon,
by Language Group[18]



[a] (χ^2=14.35, *df*=3, p<.01)

With regard to the data presented in Figure 2.6 and 2.8, it is also important to note that the SSD children are learning and using *citation forms* of verbs, whereas the SLN children are learning to vary verbs according to the semantic categories of their participants ("classifiers," "property markers"). For example, an SSD-learning child may have a single verb meaning 'give', whereas an SLN-learning child learns to adjust this verb according to the object given and the source and goal of the transfer. Therefore the vocabulary data may not be fully comparable, and improvements of the vocabulary test are called for , as discussed at the end of this chapter. It cannot be assumed that the mastery of a citation form such as 'give' is the end of the acquisition for that particular concept .This brings us to another neglected topic in studies of sign language vocabulary—namely, the degree of granularity of verbs in this type of language.

The overall differences between the four groups are significant. In pair wise comparisons there are no differences between any of the three deaf groups. Each of the deaf groups differs significantly from the English group (SLN-DD vs. ENGLISH: χ^2=13.54, *df*=1, p<.001; SLN-DH vs. ENGLISH: χ^2=7.81, *df*=1, p<.01; SSD-DH vs. ENGLISH: χ^2=10.89, *df*=1, p<.01).

Verb specificity

Verbs of motion, transfer, and manipulation in sign languages tend to incorporate information about the type of figure involved. So-called "classifiers" or "property markers" (see Chapter 3) indicate a salient feature of the referenced entity: size, shape, substance, etc. For example, although SLN has citation forms of verbs meaning 'eat' and 'drink' (though no general verb meaning 'ingest'), it also has a range of verbs in which the hand or hands move towards the mouth, designating the type of ingestion. Consider verbs that would simply be glossed as

[18] The figures for the three deaf groups represent all of the lexical items in the transcripts. Predicates are defined as verbs and other signs that refer to states or attributes (e.g., colors, emotions). The English data come from published MCDI data (Bates et al., 1994), where 20% is the highest reported percentage of predicates, in the vocabulary range 301-400 (the maximum vocabulary size of the most advanced signers in the current study).

DRINK in traditional linguistic analyses[19]: drinking from a cup requires a cupped C-hand; from a bottle, a flattened-O; a flattened-T for drinking tea; flattened-F for drinking through a straw; open-5 closing away from the mouth for an animal drinking; etc. This range of handshapes that specify different kinds of drinking are used by parents and teachers and readily acquired by toddlers. Note that these verbs of drinking incorporate information about the type of container used (for human drinking), as well as the type of drinking activity (for both humans and animals). Although the related nouns (cup, bottle, etc.) are indicated by the handshape incorporated in the verb, the child may not yet know the noun forms. What is characteristic about sign languages of this sort is the diversity of verb forms in a domain, indicating specific types of nominal arguments by handshape and movement. Yet uses of the MCDI that rely only on written equivalents of signed verbs in a spoken language do not distinguish between citation forms and more specialized forms of lexical items, thereby underestimating vocabulary size and lacking full information about children's linguistic competence.

Granularity of semantic analysis of domains is found in many spoken languages as well. A useful example comes from Tzeltal Mayan, a language in which P. Brown (2001) has studied children's acquisition of verbs of motion, handling, and ingestion. Similar to SLN, the Tzeltal language favors a high degree of granularity, what Brown calls "verb specificity." For example, 2-year-olds use the following set of verbs of ingestion: *bik* (things that are swallowed whole), *k'ux* (crunchy solids, beans), *lo'* (soft solids, fruits), *ti'* (meat), *we'* (tortillas, bread), *uch'* (liquids), *nuk' sigarro* (smoke), and more. Similarly, with regard to verbs of holding/carrying: 2-year-olds make distinctions such as *pet* (in both arms), *kuch* (weight on head/back), *k'ech* (weight across shoulders), *lik* (in hand, supported from top), *tuch'* (vertically extending from hand), *lut* (in mouth), and several more. Brown proposes that semantic specificity in the verb lexicon is a typological feature of Mayan languages and that children easily become sensitive to this characteristic in acquiring new verbs. She proposes a "verb specificity hypothesis" that might well apply to the acquisition of SLN and other sign languages:

The proposal developed here is that the language Tzeltal children hear provides many different verb labels for a given domain of activity, and thereby affects the hypotheses they bring to bear on what new verbs can mean" (P. Brown, 2001, p. 536).

Conclusions

The data gathered by means of both the MCDI–SLN and video analyses of natural interaction demonstrate that deaf children with hearing parents can have normal early vocabulary growth, when parents are trained to use a natural sign language such as SLN. The comparison of the three groups of learners according to their input makes it clear that the notion of "impoverished input" has to be specified more carefully. Although the SSD learners show the expected relatively high proportion of predicates, they lag behind in overall vocabulary size and rate of growth. Sign systems—as has been known for so long—do not empower all the linguistic capacities that these children potentially possess.

With regard to the acquisition of predicates, I have proposed that the modality of sign languages makes action and motion salient, drawing attention to verbs. This is also true for

[19] See Chapter 3 for alternatives to glossing; pictures of handshapes can be found in the English BTS manual in Appendix D and the Dutch BTS manual in Appendix E.

SSD, where even the use of citation forms of SLN verbs often display action components, and where points that move towards goals or away from sources come to serve as analogues for the grammaticized use of motion in SLN predicates. Accordingly, early sign vocabularies show relatively high proportions of predicates in comparison with spoken languages like English.

Treating sign languages as head-marking in typology underlines the salience of verbs, since nominal arguments do not need separate expression once their identities have been established. This is clear in the videos of SLN discourse—with both Deaf and hearing parents. The verb-oriented patterns of early vocabulary reported here are similar to those found in the acquisition of spoken head-marking languages, such as Mayan (de León, 1999, for Tzotzil; Pye, 1992, for K'iche') and Inuktitut (Allen, 1996; Fortescue & Lennert Olsen, 1992). In a paper appropriately titled "Why Tzotzil (Mayan) children prefer verbs over nouns," de León points out that "the patterns of verb semantics orient the learner to refer both to objects and actions by a single semantic packet contained in the verb root" (de León, 1999, p. 3). She presents data for two children "beyond the 50-word level": verbs made up 52% of the vocabulary for a child of 1;8, and 58% for a child of 1;9. A K'iche' Mayan child studied by Pye (1992) had a vocabulary made up of 45% predicates at age 2;1. Predicate statistics derived from MCDI vocabulary assessments have been useful in drawing attention to this major typological issue, leading to the need for more in-depth linguistic and discourse analysis.

Last but not least, the MCDI has proven to be a fruitful tool to fit this less familiar language type. The process of adapting the measure for SLN made clear that the instrument must attend to language-specific lexical categories. The division into entity designations, predicates, and operators has been a useful first pass, but more finegrained and typologically sensitive analyses will be necessary. A major problem with all current versions of the MCDI for use with sign languages is the fact that the actual lexical items are presented to the parents in the written form of their spoken language. This inevitably distorts the data. For example, if a Dutch-speaking parent reports that a child uses a sign meaning *eten* (eat), we do not know precisely what SLN form is used by the child. Indeed, the child may actually use several different signs, with handshapes indicating the type of object being eaten, and/or mouth movement indicating the manner of eating. That is, the Dutch verb does not match the level of specificity preferred by SLN verbs. By simply checking off "eat," therefore, we miss information about possible lexical diversity. Similarly, checking off the verb "give" fails to provide information about possible variability in handshape for different types of object transfer, as well as the range of source-goal relations commanded by the child. In this instance, we not only lose verb specificity, but also the distinctly head-marking characteristic of marking role relations within the verb. Indeed, in a language of this type, one cannot fully assess the lexicon without also assessing morphosyntax. The fact that the MCDI was designed for a dependent-marking and minimally inflecting language—English—has thus obscured issues of lexical development that are critical to other types of languages. Future versions of the MCDI should present parents with *videoclips* of signs rather than written words in the spoken language. To make an analogy with spoken languages, it would be unacceptable to assess the vocabulary of Turkish-speaking children in the Netherlands by presenting their parents with checklists of Dutch words, asking them to indicate which words their children used in Turkish. The same attention to the actual language being assessed should now be turned to the assessment of sign language competence, using easily-available video technology.

Nonetheless, the present endeavor to assess the vocabularies of Dutch deaf children using an adaptation of the MCDI has yielded valuable data, with suggestions for theory, methodology, and application. And modeling the measure after versions of the MCDI for spoken languages allows for crosslinguistic and cross-typological comparisons of the sort carried out here. In conclusion, then, this study has aimed at fulfilling the ideal that Elizabeth Bates presented in designing the MCDI as an assessment tool for all types of languages. There is no better way to thank her—in memoriam—for her model, and for her advice and efforts in the last spring of her life (April 2003) to contribute to this same but different MCDI endeavor.

Chapter 3
Transcription at the Level of Meaning Components:
The Berkeley Transcription System (BTS)[20]

"What is on a transcript will influence and constrain what generalizations emerge."
Elinor Ochs (1979, p. 45)

Introduction

Transcription is the very start of a linguistic analysis of a corpus. In this respect, the transcribing of sign language data is not different from transcribing data from any other language, although systematic linguistic research on sign language is less than half a century old. Stokoe's "cherology" (sign phonetic/notational system) appeared in 1960. This means that there is hardly any notational tradition to build on. Although Miller (1994) has provided the field with family trees of notational systems, including more recent technologically based ones, the basic problem is that there is hardly agreement on what constitutes a linguistic unit in sign languages. The innovative system of transcription used in this research is based on the need for developmental analysis of signing, with attention to units of meaning and conversational interaction. The system is the product of the Berkeley Sign Language Acquisition Project, developed in research meetings from 1998 to 2001, under the direction of Nini Hoiting and Dan Slobin.[21] The raw data for designing BTS consist of about 400 hours of

[20] This chapter is based, in part, on Hoiting, N., & Slobin, D. I. (2002). Transcription as a tool for understanding: The Berkeley Transcription System for sign language research (BTS). In G. Morgan & B. Woll (Eds.), *Directions in sign language acquisition* (pp. 55-75). Amsterdam/Philadelphia: John Benjamins.

[21] The Berkeley Transcription System (BTS) represents the collective work of Michelle Anthony, Yael Biederman, Nini Hoiting, Marlon Kuntze, Reyna Lindert, Jennie Pyers, Dan I. Slobin, Helen Thumann, and Amy Weinberg. The work was carried out in the Child Language Research Laboratory, Institute of Human Development, University of California, Berkeley (UCB). Support was provided by the Linguistics Program of the National Science Foundation under grant SBR-97-27050, "Can a Deaf Child Learn to Sign from Hearing Parents?" to Dan I. Slobin, PI, and Nini Hoiting, co-PI. Additional support has been provided by the Institute of Human Development and the Institute of Cognitive and Brain Sciences, UCB; by the Royal Institute for the Deaf "H. D. Guyot", Haren, The Netherlands, and by the Max Planck Institute for Psycholinguistics, Nijmegen, The Netherlands. The system has been developed on the basis of parent-child videotapes in Sign Language of the Netherlands (SLN), collected by Nini Hoiting, and American Sign Language (ASL), collected by Reyna Lindert. The current version reflects the consensus of a workshop held in Berkeley, April 12-13, 2000, based on examples from American Sign Language, Danish Sign Language, Sign Language of the Netherlands, and Nicaraguan Sign Language. In addition to the investigators listed above, the workshop included Paul Dudis, Elisabeth Engberg-Pedersen, Philip Prinz, Brenda Schick, Ann Senghas, Richard Senghas, Eve Sweetser, David Wilkins, and Alyssa Wulf. We have been especially helped by the four native ASL-signers in our group, Marlon Kuntze and Paul Dudis (Deaf), and Jennie Pyers and Helen Thumann (hearing). A Dutch version was prepared by Nini Hoiting and Baukje Bosma. It is equivalent to the English version in all respects, except for the language of notation and glossing. Appendices D and E contain the full English and Dutch versions of BTS, with sample transcripts; Appendix F provides item-by-item equivalences for the two versions. BTS is currently also being applied to the study of British Sign Language, German Sign Language, and Spanish Sign Language.

videotapes of signing deaf children and their Deaf and hearing interlocutors in home and preschool settings in the Netherlands and the United States. (The data presented in this dissertation are a subset of the SLN materials used in designing BTS; ASL data came from the dissertation research of Lindert, 2001.)[22]

The basic research goal is to document the ways in which children and parents construct shared meaning in their communicative patterns, and the ways in which sign language competence develops—across sign languages, and for both first- and second-language learners. Given these goals, transcription at the level of basic elements of handshape, movement, and location would be too fine-grained. The widespread practice of "glossing" would also be inappropriate, since this would bias the analysis to issues of translation into a spoken language. (The inadequacy of glossing was made immediately obvious to the designers when existing transcriptions presented problems of comparing English glosses of American Sign Language with Dutch glosses of the Sign Language of the Netherlands. It was clear that the glosses reflected the grammar and semantics of the surrounding spoken languages, rather than revealing the structures of the sign languages.) The theoretical interest of this developmental investigation lies at *the level of meaning components*—that is, the ways in which semantic elements are combined into lexical items and utterances. The fact that we are dealing with a type of language that uses simultaneous and successive manual and nonmanual means to structure signed messages, sets the task of how to devise a transcription system that can capture the full array of meaning components in sign languages. It is therefore essential to capture these components—manual and nonmanual, conventional and gestural—*without prejudging their formal linguistic status*. In my opinion, we must first have a full documentation of linguistic behavior before we can ascertain whether particular types of components are standardized signs or gestural accompaniments, and whether particular forms are productive in the use of an individual signer. (See discussion of these issues in Chapter 4.)

Transcription as theory and as technology

Elinor Ochs (1979), in an important paper written a quarter-century ago, brought the issue of transcription to the attention of child language researchers. She underlined the facts that "the transcriptions are the researcher's data" and "transcription is a selective process reflecting theoretical goals and definitions" (p. 44). These points are especially relevant to sign

[22] The original impetus to the design of BTS was to describe and compare early acquisition in SLN and ASL. In confronting this challenge, I stressed to the group the importance of attending to meaning rather than form alone. This became immediately evident when we confronted Dutch glosses of SLN with English glosses of ASL and realized that we were comparing Dutch and English rather than the two sign languages. What was called for was a new sort of transcription at the level of meaning components. In about a year of intense discussions and repeated viewing of videotapes, the group as a whole developed the system presented here as BTS. Being the only representative of SLN among a group of ASL-users, I had a central role in guaranteeing that all transcription solutions would be crosslinguistically applicable. Decisions based on my second-language competence in SLN were then discussed with my group of Deaf SLN-users in the Netherlands, with much back-and-forth as the system was refined. Later I was responsible for translating the entire system into Dutch (see Appendices E and F) and carrying out the entire set of BTS transcriptions of the SLN data represented here. In this work I was assisted by Baukje Bosma. We divided the task of SLN transcription and I also transcribed the SSD tapes, having had earlier experience with SSD. All transcriptions were checked and extensively discussed by the two of us. And all transcriptions were checked, line-by-line, with members of the Berkeley team. Uncertain cases were discussed with a group of Deaf consultants (Martha Luining, Bottie Reitsma, Anne-Marie Terpstra, Dini Visch) and one hearing Dutch-SLN childhood bilingual (Arie Terpstra). As a result of these discussions, BTS was refined further.

language research today. The sign languages used by Deaf people gained recognition as languages when a notation system was made available. Within the anthropological attempts to transcribe the sign languages used by Plains Indians of the United States, LaMont West (1960) laid the notational foundation that Stokoe (Stokoe et al., 1976) used and improved to represent the combinatorial structure of the signs used by the American Deaf population, hereby claiming the linguistic status of American Sign Language (ASL). Stokoe's notational efforts were supported by the use of film and photo, providing detailed depictions of the systematically structured sublexical components that seemed to be the building blocks of the lexical signs of ASL. This early stage of notation clearly shows the theoretical impact of transcription, in that it made a clear claim for a formational, "phonological" level in sign languages. That is, signs are systematically put together from component elements of handshape, location, and movement, in the same way that words are systematically composed of articulatory/acoustic elements. The support of the notations by still photographs of handshapes provided precise documentation of the proposed units of analysis. With the rapid developments in video technology—now digitized and accessible to computer processing—we have fully adequate documentation of the physical and temporal parameters of sign languages.

Nevertheless, although there are dozens of lexicons of various sign languages from around the world, and a few partial sign grammars, in the year 2006 there are still basic linguistic problems to solve in this field. One of the remaining puzzles is to determine the components that construct form-meaning relationships in space and time. On the lexical level, comparable to the word level in spoken languages, we do know something about the units of many sign languages. However the morphemic level is still a hotly debated issue, and it is this level in particular—in acquisition—that we want to know about in more detail. The goal of this research is to gain insights into the learner's mental processes of analyzing events and signed utterances into components, with the aim of producing and comprehending utterances in communicative contexts.

Sharing the Data

The goal of all transcription is to produce a permanent written record of communicative events, allowing for analysis and re-analysis. In the field of sign language research, many researchers have had to work in isolation from other projects, due to a lack of standard transcription formats and an internationally accessible database, such as has been available for many years in the field of acquisition of spoken languages (MacWhinney, 2000). At the start of the BTS project we made a clear decision: We wanted our data to be archived and publicly accessible for sharing, discussing, and other types of scientific analysis or re-analysis. That is, a major goal of BTS is to provide resources for other researchers, now and in the future. Therefore, the aim is to provide a standard means of representing the data of sign language acquisition, across research projects and sign languages. Furthermore, given the expectation of new developments in the field, as well as varying research goals, BTS was created as a system that is open to revision and applicable to a range of analyses and theoretical approaches.

The inspiration was the worldwide CHILDES system (Child Language Data Exchange System) established a quarter-century ago for transcribing and archiving data of the development of spoken languages. That system has provided child language researchers with a common format for transcription and analysis of data, along with a large and growing

archive of materials from a large number of spoken languages.[23] The system describes itself in the following terms (CHILDES url, 2001):

"The CHILDES system provides tools for studying conversational interactions. These tools include a database of transcripts, programs for computer analysis of transcripts, methods for linguistic coding, and systems for linking transcripts to digitized audio and video."

BTS has joined CHILDES, where it is available as Chapter 11 of the online CHAT manual, as well as in the published version (MacWhinney, 2000), available at http://childes.psy.cmu.edu/manuals/bts.pdf . The full English and Dutch versions of the manual can be found in Appendices D and E; Appendix F gives equivalences of BTS codes in the two languages. Appendix G provides guidelines for automated searches of transcripts, allowing for quantitative analysis. The rationale for BTS can be found in Slobin, Hoiting et al. (2001). The eventual goal is to contribute sign language transcriptions, in BTS, to the CHILDES archive. For this reason, BTS adheres to the established CHAT format, allowing the international community to access and search sign language data using the CLAN software tools provided by CHILDES.

Challenges of Transcription

Every publication on sign language has to decide on the appropriate level of analysis and means of representing handshapes, locations, movements, and information conveyed by face and posture. Representations of signs range from detailed notation of physical elements, through pictures and diagrams, to glosses in the written language of one country or another. In most instances, such representations cannot be reduced to the ASCII keyboard—a prerequisite to international data-sharing on the CHILDES model.

Stokoe began the modern era of sign language linguistics by developing a sort of "phonological" transcription[24], though his terminology is in some ways more appropriate: "Analogous with the *phoneme* is the sign language *chereme* (CARE-eem, the first syllable from a Homeric Greek word meaning 'handy')" (Stokoe et al., 1976, p. xxix). His system requires a large collection of idiosyncratic symbols, although Mandel has reduced them to an ASCII version (http://world.std.com/~mam/ASL.html).[25] Another phonological transcription system, using only ASCII characters, is SignPhon (http://www.leidenuniv.nl/hil/sign-lang/signphon2.html). There are several modern attempts to represent signed languages on the level of formational components such as those first isolated by Stokoe. These systems make use of sets of iconic symbols for handshapes, locations, movements, and nonmanual elements, and provide special keyboards and related computer facilities:

[23] CHILDES is available on a North American website organized by Brian MacWhinney (http://childes.psy.cmu.edu/), on a European mirroring site organized by Steven Gillis (http://atila-www.uia.ac.be/childes/), and on a Japanese mirroring site organized by Hidetosi Sirai (http://jchat.sccs.chukyo-u.ac.jp/CHILDES/).

[24] In the analysis of both spoken and signed languages, linguists distinguish a *phonetic* level, which is concerned with the basic articulatory units of production, and a *phonological* level, which is concerned with the combinatorial patterns of such basic units according to the rules of a given language.

[25] Details of these systems are not relevant to the current research; the reader is referred to online facilities that represent each of the notation systems mentioned.

- HamNoSys: http://www.sign-lang.uni-hamburg.de/Projekte/HamNoSys/default.html
- Sign Writing: www.SignWriting.org
- SignFont: http://members.home.net/dnewkirk/signfont/

All of these are useful for various purposes, including detailed linguistic analysis as well as first-language literacy for Deaf children. However, none of them is at the level of analysis required by our sort of research, and most of them cannot function without special fonts. In any case, this level of transcription is too fine-grained for the purpose of transcription and analysis of children's acquisition of lexicon, morphology, and syntax. Stokoe's system and its derivatives correspond most closely to the International Phonetic Alphabet (IPA), while child language transcriptions in the CHILDES database tend to be at the morphological level or in ASCII versions of the available orthographies used by the various spoken languages represented in the archive. Although study of the acquisition of sign language phonology is clearly of great importance, BTS—and the current research project—is concerned with morphosyntactic, semantic, and pragmatic dimensions of language.

The first detailed sign language study by Klima and Bellugi (1979), and many others since, have used line drawings that are free drawings or modifications of tracings taken from videotapes. For the grammatical uses of the basic handshapes involved in a signed utterance, little diagrams of the signing space are frequently added. This is, however a quite inefficient technique, both in terms of time and expense. Also, different perspectives on the execution of ongoing signing hands requires techniques such as strobe-like drawings and arrows—again time consuming and expensive. Abstracted drawing, as shown in Zeshan's (2000) concise study of Indo-Pakistan Sign Language, is a creative solution, solving the perspective issue by using a computer program for graphic presentations of signs. However, all such "picture" versions (including actual photographs and digitized video clips), are useless for computer-aided searching, sorting, and summarizing of data.

The most popular and traditional way of transcribing sign language is the use of glosses in capital letters, supplemented by various diacritics and discursive notes. This sort of transcription may seem to have the advantage of being a shared system, although every individual researcher seems to bring in new diacritics, given their research questions and the language they are dealing with. And, again, a mixed system of glosses and diacritics is inaccessible to computer programs of the sort used in child language research. More seriously, the glosses represent the nearest translation equivalent in the *spoken* language of the particular community, making it impossible to carry out serious linguistic analysis of the sign language itself. For example, when the research group in Berkeley began to compare acquisition of SLN and ASL, the participants were immediately struck by the fact that similar signs expressing desire in the two languages were glossed as an adverb in Dutch (GRAAG) and as a verb in English (WANT). Clearly, neither of these words is a lexical element of SLN or ASL. Just as no linguistic analysis of a spoken language relies solely on glosses in the language of the investigator, linguistic analysis of a sign language requires representation at the level of the meaning components of that particular language.

Transcription at the level of meaning components

An examination of verbs in any sign language makes it evident that we are dealing with a sort of "polysynthetic" language that is quite different from the spoken languages of the surrounding communities. Those languages—be they as different from one another as English or Finnish or Chinese—do not demonstrate the morphological complexity of verbs that is found in such languages as SLN or ASL. To find somewhat comparable examples in spoken languages it is useful to turn to indigenous languages of North America. Consider, for

example, Leonard Talmy's (1985) work on Atsugewi, a Hokan language of northern California. The verb roots in this type of language designate figures of particular shapes, postures, and consistencies, e.g.:

lup- 'small shiny spherical object'
caq- 'slimy lumpish object'

The roots take locative/directional suffixes, such as:

-ak 'on the ground'
-mic̀ 'down onto the ground'

Polymorphemic combinations are similar to those of verbs of motion and object transfer in sign languages. Consider, for example, the Atsugewi construction: *s-ʹ-w-itᵘ-mic̀*. The first three morphemes indicate a first-person subject in factual mood. The last two identify the postural figure and movement:

itᵘ	*-mic̀*
'linear_object_in_lying_posture'	'-move_down_onto_ground'

Glossing at this level of analysis is sufficient to indicate the morphological components of the verb. BTS, as demonstrated below, takes a similar approach to components of signs. In addition, following linguist practice, Talmy provides a discursive translation in English:

s-w-ʹ-itᵘ-mic̀
'I lay down onto the ground'

BTS is not concerned with this sort of paraphrase, except as a possible additional comment for clarification. Nor does BTS present simple glosses in Dutch (or English, or whatever) for signs that are clearly polycomponential. Rather, the goal is to represent those *components of complex signs that can be productively used to create meaningful complex signs* in the particular sign language under investigation. That is, BTS is intended to be the equivalent of a morpheme-by-morpheme analysis, with a collection of abbreviations designed for signed languages. (Signs that cannot be analyzed into evident meaning components are transcribed in traditional upper-case format, such as BOOK in SLN.)

Polycomponential verbs in BTS

The following paragraphs present one extended example of the level of analysis that has been developed in BTS. Verbs of motion (self-movement, caused-movement, object transfer) are polycomponential, including handshapes or body parts that indicate the figure and/or ground involved in the motion event. These verbs have traditionally been designated as "classifier predicates" (e.g., papers in Emmorey, 2003; Valli & Lucas, 1992). That is, the handshapes for figure and ground are components that specify, or "classify" a relevant semantic property of the corresponding referential entities. BTS treats "classifiers" as *property markers*—that is, handshapes that identify a referent by indicating a relevant property of that referent (for justification, see Slobin, Hoiting et al., 2003).[26] For example, an "inverted V" handshape is

[26] "While various categories of polycomponential signs can be proposed, our work has focused on alternative conceptualizations of "classifiers." Rather than emphasize classification as the central feature of "classifier" handshapes in polycomponential signs, it seems more useful to treat them as marking a relevant *property* of a referent. The major function of such a handshape is to evoke a relevant referent in discourse, indexing a particular referent according to properties that are appropriate

transcribed as **pm'TL** (two-legged animate being), and never as "V-CL," "inverted V," or the like. If both figure and ground are part of a verb, the order of notation is always *ground* before *figure*, following the logic of manual representation of such events.

In essence, verbs of motion in signed languages (at least in SLN and ASL, the languages for which BTS was constructed), consist of components of ground, figure, path, and various additional movement elements indicating features such as aspect and manner. Such verbs cannot be directly glossed in Dutch, or the other Indo-European languages that are characteristic of the surrounding speech communities that have been most extensively studied. Consider, for example, a verb that is used in both SLN and ASL: The verb has the following components, with BTS conventions in parentheses: the non-dominant hand is held vertically, with flat palm, fingers extended forward (**pm'PL_VL** 'plane showing vertical length'); the dominant hand is in an inverted-V position (**pm'TL** 'two-legged animate being') and it moves to a goal at the top of the non-dominant hand (**gol'PL_VL_TOP** 'move to top of vertical plane') to straddle the hand (**pst'STR** 'posture straddle'). This verb could refer to a range of events, such as a cowboy mounting a horse or a boy sitting up on a fence. It can be represented as a verb with four meaning components ("morphemes"), as indicated by four hyphens[27].

-pm'PL_VL-pm'TL-gol'PL_VL_TOP-pst'STR

Note that the linguistic status of each meaning component is given in lower-case letters (**pm, gol, pst**), while upper-case letters indicate the semantic content of each component. (As mentioned above, upper-case letters are also used for unanalyzed signs, allowing for separate automatic searches for morphological and lexical elements combined.)

This is, in fact, a sufficient transcription linguistically, but it lacks legibility—at least for hearing readers. We would like to be reminded of a comparable Dutch or English verb, *but we do not want such a gloss to influence our transcription or analysis.* To solve this problem, BTS allows the transcriber to begin a verb with a parenthetical, lower-case possible equivalent. Thus one might type:

(mount)-pm'PL_VL-pm'TL-gol'PL_VL_TOP-pst'STR

The parenthetical gloss is not a conventional part of the system, and each transcriber can provide a suitable equivalent. For example, this verb could also be glossed as (get_up_on_horse) or (mount_straddling), or whatever seems useful to the transcriber. The parenthetical glosses stand outside of the analyses, and function only to facilitate reading. They play no role in searching, counting, or analyzing data from transcripts.

If more contextual detail is needed, it can be provided on a dependent tier, under the utterance line. For example, one could add a "gloss" tier (**%gls**). Following CHILDES format, the utterance line begins with an asterisk and an identifying code for the speaker in three upper-case letters, while dependent tiers begin with a percent sign and lower-case ID.

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for the current discourse. That is, the "classifier" handshape designates, or specifies, or indicates a referent with a particular property (e.g., two-legged, horizontal plane, etc.). In the Berkeley Transcription System such handshapes are designated as ***property markers (pm)"*** (Slobin, Hoiting et al., 2001).

[27] See BTS Manual in Appendices D and E.

By convention, MOT and FAT are used for mother and father; a trigram is invented for each child in the sample.

***MOT: COWBOY (mount)-pm'PL_VL-pm'TL-gol'PL_VL_TOP-pst'STR .**
%gls: the cowboy got up on the horse's back

The transcription is thus based on linguistic analysis, often resulting in initially non-obvious decomposition of complex signs. Note that this work cannot be done without the active participation of native signers. At almost every point in the development of BTS, the native signers in our group have helped us to discover contrasts, nuances, and possibilities that may not have been evident to second-language signers.[28]

Segmentation of a sign into meaning components depends on the availability of contrasts in the language. For example, this analysis of 'mount' is based on the possibilities of substituting the *ground* component (e.g., by use of a horizontal plane to indicate movement onto a different sort of ground), the *figure* component (e.g., by reference to an animal, such as a cat, mounting a horse), and the *posture* component (e.g., by contrast with a person standing on a horse's back). The search for contrasts is essential to the analysis, and contrasts are not always obvious without careful examination of a range of potential scenarios and their signed descriptions.

To continue the demonstration of this method, note that 'mount' is part of a collection of verbs that have a derivational relationship with one another, as revealed by the addition or removal of a meaning component:

- If the path component (**-gol-**) is replaced by a static component (**-loc-**) the result is a verb describing a static configuration:

  (be_mounted)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR

  Again, the parenthetical gloss is not part of the analysis. This verb could describe a man seated on a horse, a boy seated astraddle on a fence, etc.

- If a movement pattern (**-mvt-**) is added to 'be_mounted' the resulting verb is dynamic: 'ride'. BTS is not concerned with a phonological description of this particular movement pattern, because it does not contrast with other movement patterns using this configuration of property markers: Its only function is to indicate that this configuration has the meaning of 'ride'. Therefore the forward rotational movement of this verb is simply represented as **mvt'LEX**, where **LEX** refers to the movement pattern that identifies this particular verb. That pattern is pointed to parenthetically: **mvt'LEX(ride)**. (This is similar to spoken language transcriptions, such as transcriptions of English verbs as 'walk-PAST' or 'run-PAST', where the reader can provide *walked* or *ran* on the basis of knowledge of the language.) With regard to the parenthetical gloss, note that SLN and ASL each has a different verb for

[28] In the Berkeley group there were three native ASL signers: Marlon Kuntze, who is Deaf, and Jennie Pyers and Helen Thumann, who are CoDAs (hearing offspring of Deaf parents: "Child of Deaf Adult"). In the Netherlands, I worked with several native SLN-signing Deaf colleagues at Koninklijk Instituut voor Doven "H. D. Guyot" in Haren: Bottie Reitsma, Annemarie Terpstra, and Diny Visch, who are Deaf, and Ari Terpstra, who is a CoDA. We are grateful for the linguistic insights and expert advice of all of these collaborators.

riding in a vehicle, so the verb transcribed here is parenthetically indicated as 'ride_mounted':

(ride_mounted)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR-mvt'LEX(ride)

- Once we have a dynamic verb of motion, we can then add further components of *manner* and *aspect*. For example, the following extended notation indicates that the referent event was rapid (**-mod'RAP**) and that it came to a stop (**-asp'CES** 'cessive'):

(ride_mounted)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR-mvt'LEX(ride)-mod'RAP-asp'CES

It is important to note that these relationships are not evident in the standard English glosses for each of the verbs discussed above. That is, if one relied on glosses as the central element of transcription, there would be no reason to see the regular relationships that hold between three verbs that describe a human being mounting, straddling, and riding a horse: GET_ON, BE_LOCATED, and RIDE. Liddell (2003) discusses this type of predicate—and manner-of-motion verbs in general—as providing gestural resources embodied in signs. However, he emphasizes that sign sequences with internal movement patterns are not necessarily completely analyzable into separate "morphemes," although such components are clearly meaningful. Cogill-Koez (2000), in fact, argues for a primarily analogue or depictive approach to meaningful visual/motoric representation in signs, emphasizing the role of schematic visual representation. BTS takes a neutral ground in providing means for analyzing complex signs into various sorts of meaning "components," without making formal linguistic distinctions at this point in our understanding of the structures of complex signs. Note, too, that polycomponential signs that contain directional components such as *src* (source) and *gol* (goal) implicitly allow for analogue representation—e.g., the hand moves from source to goal—without explicit specification of the shape of the path. BTS, thus, sees signed languages as an amalgam of discrete and continuous components.

Sign language researchers with experience in typological linguistics will not be surprised by the elaborateness of BTS transcriptions of polycomponential verbs. Such relatively opaque morpheme-by-morpheme glosses are familiar in papers dealing with a wide range of agglutinative and polysynthetic languages, as discussed with regard to Atsugewi, above. Polycomponential verbs are quite accessible to children learning spoken languages of this type. Consider the following example from Inuktitut, spoken by an Eskimo child of 2;6. Here we have an entire sentence in one polycomponential utterance (Allen, 2000, p. 495).

ma -una -aq -si -junga
here -VIALIS -go -PROSPECTIVE.ASPECT -PARTICIPIAL.1SG
'I'm going through here.'

Note that the morpheme-by-morpheme gloss is uninterpretable without knowledge of Inuktitut, just as BTS utterance-line transcriptions are uninterpretable without knowledge of the particular sign language. Because BTS is designed for investigators who know the sign language, however, the utterance line should generally be sufficient. The use of a **%gls** line, like the line in single quotes above, is always available for clarification.

Nonmanual components of signs

A defining feature of signed languages is the use of the face and/or body to add meaning to signed utterances. BTS transcribes four distinct types of nonmanual components. These can

occur simultaneously with a single sign, or can have duration (scope) over several signs. In many transcription systems, a horizontal line drawn above glosses of signs indicates the temporal scope of a nonmanual component. BTS restricts itself to a series of ASCII characters, using the carat (^) to indicate temporal onset and offset of a nonmanual component that has scope. The four types of nonmanual components are *operators, modification, affect,* and *discourse markers*:

- A grammatical *operator* has scope over a phrase or clause (negation, interrogation, topic, relative clause, conditional, etc.). The notation is **^opr'X ...** ^ . For example, the following transcription format indicates negation of a proposition in BTS (CHI is the default trigram for child):

  ***CHI: ^opr'NEG WANT BOOK ^ .**

- *Modification* can add a dimension to the referential meaning of a lexical item or proposition by means of noncanonical articulation of the sign and/or accompanying facial expression, such as augmented or diminished size, rate, or intensity. The notation is **^mod'X ...** ^ . For example, an SLN-signing 2-year-old wanted her mother to draw a big house. She greatly extended the sign HOUSE (**AUG** = augmented):

  ***CHI: HOUSE-^mod'AUG .**

  In this example, the nonmanual component is part of a single sign. There is no offset carat because such a nonmanual ends with the end of the sign. Of course, modification can also extend over sequences of signs.

- *Affective* accompaniment to signing is provided by use of mouth, face, and body, indicating the signer's attitudinal stance towards the situation being communicated (e.g., disgust, surprise, excitement). The notation is **^aff'X ...** ^ . For example, an SLN-signing teacher asks a child to do something and the child agrees, though with some worried concern (**PNT_1** = point to self):

  ***CHI: ^aff'WORRIED CAN PNT_1 ^ .**

  Note that affective information can be provided in spoken languages by prosody, as well as by affective particles and inflections. The designers of BTS consider it appropriate to include all meaning components in transcription, without prejudging their "linguistic" status.

- *Discourse* markers regulate the flow of interpersonal exchange, such as checking if the addressee has comprehended, has agreed, and so forth. These sorts of nonmanual components correspond to discourse particles and intonation contours in spoken languages; again, BTS includes them in the complex of meaning components. The notation is **^dis'X ...** ^ . In the following example, a Deaf SLN-signing mother responds to her 2-year-old's labeling of the lights on a picture of an ambulance. Note that there are two types of nonmanual elements in this utterance. The first is an operator, indicating confirmation (**YES**); the second is a discourse marker checking whether the child agrees (**CONF** = confirmation check). The operator (repeated head-nodding) extends throughout the utterance, including the discourse marker (a sort of questioning facial expression). The offset timing of the two non-manuals coincides (^ ^).

***MOT:** **^opr'YES CAR ^dis'CONF LIGHTSIGNALS ^ ^ .**

Role shift

A pervasive aspect of sign language communication is the subtle shifts of gaze and posture that allow the signer to convey the utterances, thoughts, or actions of other people. This part of sign language needs much more careful study, and BTS does not present a fine-grained analysis of role shift at this time (see, e.g., Emmorey & Riley, 1985; Engberg-Pedersen, 1993; Liddell, 1998; Taub, 2001). However, it is definitely a meaningful dimension, and one that follows conventional, linguistic patterns. At this point, BTS simply indicates role shift by **RS**. Note that capital letters are used for this element, treating role shift as a meaning component in an utterance. The carat (^) is not used to indicate onset and offset of role shift, in order to make it possible to search separately for nonmanual features and role-shifting. Instead, BTS uses the reverse apostrophe (left single quote, grave accent,) for this function: **'RS ... '** . For example, in a book-reading activity, a Deaf ASL-signing mother points out a picture of a dog, and then role shifts into the dog to indicate that the dog is excited. She signs **EXCITE** with an accompanying non-manual indicating the dog's affect (**INTENSE**). The notation **'RS(dog)** indicates that she has taken on the role of the dog. Note that **^aff** can co-occur with role shift.

***MOT:** **DOG 'RS(dog) EXCITE-^aff'INTENSE ' .**

Polycomponential analysis and the issue of morphological productivity

BTS relies heavily on criteria of *morphological productivity* for the analysis of a sign into components. That is, the level of transcription is based on a thoroughgoing analysis of signs into meaning components. To the extent that we have succeeded for a particular sign, this is a contribution to linguistic description. However, in many cases children who are learning a language may not yet have carried out the adult analyses reflected in the transcription. This problem is a familiar one in child language research, where it is well known that children's early forms may be "amalgams" or unanalyzed gestalts that correspond to more complex and analytic adult forms. The only way to determine if a particular morphological analysis is productive for a given child is to try to find evidence of productivity. Such evidence is available in two forms: (1) One can search the corpus for uses of a given morpheme across lexical items and contexts, looking for diversity in use. Overgeneralizations are particularly informative; for example, when an English-speaking child says "breaked" we have evidence for the productivity of the past-tense inflection. (2) One can present the child with new lexical items (often nonsense, or "nonce" terms made up for experimental purposes), putting them in contexts that should elicit a particular morpheme if it is productive. For example, if an English-speaking child is presented with a nonce verb, *wug*, and says that someone "wugged" yesterday, we have evidence for productivity (e.g., Berko, 1958).

The same issue of rote-learned versus productive forms applies to the acquisition of signed languages. The purpose of the detailed componential analysis embodied in BTS is to make it possible to discover, for a particular child, when there is sufficient evidence to credit the child with control of various components of signs. The advantage of detailed analysis is that it pushes the investigator to describe the language carefully, and makes one sensitive to critical dimensions of acquisition. The process of lexicalization in children is clearly such a dimension, however the current study of early SLN acquisition does not stretch beyond the first three years. In most instances, our data of the current study do not present sufficient examples of particular meaning components and constructions to decide issues of

productivity. Therefore, BTS transcriptions in this dissertation are presented in their full form, with the understanding that evidence for productivity is generally still needed.

Notations of communicative behavior, context, and additional coding

BTS is designed for studying the development of signing within the context of ongoing communication; therefore there are means of noting attention-getting devices and gestures and actions that are relevant to communicative events. Gestures (**%ges**) and actions (**%act**) can be entered as part of the utterance line, or on a dependent tier, at the discretion of the transcriber. In transcriptions of parent-child interaction with 2-year-olds, it is often useful to include such information on the utterance line. For example, an SLN-signing 2-year-old is looking for a pen. The child gestures that she "doesn't know"; signs **WHERE** with an interrogative operator; and then looks around the room. The mother shows the pen to the child and signs **FIND**.

***CHI: [%ges: don't know] WHERE**^opr'WHQ **[%act: looks around room] .**
***MOT: [%act: shows pen to chi] FIND .**

BTS also provides means of indicating factors that are relevant to analysis of child signing, with notation conventions for gaze direction, errors, interruptions. For example, errors are noted by [*], with further information on a dependent tier (**%err**). In the following example, an ASL-signing child of 1;9 signs **HORSE** with a handshape error. For this analysis, the transcriber is not concerned with the phonology of the error and simply notes on the error tier that there was a handshape error (**$hs**); however, another transcriber might have added a dependent tier for phonological notation (**%pho**).

***CHI: HORSE [*] .**
%err: HORSE $hs ;

In addition, following CHILDES format, dependent tiers can be created for additional information and coding (e.g., morphology, syntax, vocalization, situation, etc.). For example, a hearing ASL-signing mother is signing to a 3-year-old; the comment tier (**%com**) provides the transcriber's clarifications:

***MOT: ^opr'YNQ SISTER ^ .**
%com: asking if girl doll is sister
***MOT: SISTER PNT_3 WHO**^opr'WHQ **PNT_3 .**
***MOT: ^opr'NEG NOT SISTER ^ NO .**
%com: commenting on mislabeling of doll as SISTER

Using BTS to study sign language acquisition

Chapter 4 presents numerous BTS analyses of the data of this study. At the moment, in order to provide the reader with an idea of research applications of BTS, I present several examples from Slobin, Hoiting et al. (2003). (See Lindert [2001] for a detailed report of the use of polycomponential predicates by ASL-using children and their Deaf or hearing parents.)

Early uses of handshapes in polycomponential verbs

As discussed above, BTS treats "classifiers" as *property markers* that reference entities on the basis of salient object properties, manner of manipulation, or by the use of fixed forms ("whole entity classifiers"). For purposes of demonstration, consider two types of handshapes

that are based on properties involved in manipulation ("instrumental classifiers," "handle classifiers," "manipulators"):

- *manipulative handle:* The handshape represents the hand that is manipulating an object (e.g., ASL property marker for 'screwdriver', using a rotating S-handshape for the grasping hand);
- *depictive handle:* The handshape represents a physical feature of the object being manipulated (e.g., ASL property marker for 'screwdriver', using a rotating H-handshape for the tip of the screwdriver).

The Berkeley researchers expected that manipulative handles would be acquired earlier than depictive handles, both for our L1 (child) learners and our L2 (hearing parent) learners. BTS transcripts of both SLN and ASL, however, showed early use of both types, by L1 as well as L2 learners.

Manipulative handles.

BTS transcribes property markers of this sort in a preliminary way, using an abbreviation for the physical form of the handshape involved. This is because it is not yet possible determine the semantic categories underlying the use of such handshapes. By indicating the handshape in physical terms, one can search individual transcripts to determine the range of uses of a particular handshape. With sufficient data, these preliminary physical descriptions can be replaced by semantic definitions of manipulative property markers. Thus the transcription format allows for search of the contexts—linguistic and situational—in which individual meaning components are used. For example, an SLN-DH girl of age 2;6 is seated on the floor with her hearing mother, looking through family photos. She describes a picture in which she is seated in a baby buggy being pushed by her father. The manipulative handle component of the verb 'push' is realized as two S-hands, palms down, arms straight, incorporated in a forward motion. The property marker is transcribed as a form of hold (**pm'HO**), with an indication of the handshape using designations derived from the ASL hand alphabet (**pm'HO_S**); a parenthetical **2h** indicates that this is a two-handed form. The direction of the sign is represented by a *path* component (**pth**) that is realized as *forward* motion (**pth'F**):

***CHI: FATHER PNT_1 (push)-pm'HO_S(2h)-pth'F .**

Dependent tiers could provide further information, such as a description of the situation, a paraphrase (e.g., 'father push me'), and perhaps more detailed description of handshape form and orientation and the physical movement of the signer.
The transcripts of both SLN and ASL show that hearing parents also make early and appropriate use of manipulative handle property markers. The hearing mother of this Dutch girl had been using SLN for eight months when she produced the following utterance. The girl had put a doll to bed in a toy cradle. The mother tells her to close the curtains around the cradle, moving two S-hands in a closing arc towards her own chest. The *path* of movement is *backwards*, and the hands move toward *each other* (**pth'B_EO**):

***MOT: (close)-pm'HO_S(2h)-pth'B_EO .**

With a sufficiently large corpus—unfortunately not yet available in any sign language—it will be possible to search for all instances of property markers such as **pm'HO,** and all instances of **pm'HO_S**, in an attempt to determine the semantic dimensions and productivity of property markers, as well as their developmental changes. Note, too, that the use of hyphens between components allows for a calculation of sign complexity. In these two examples, both

verb signs have two meaning components—a manipulative handle and a path. Parenthetical glosses ('push', 'close') are not included in quantitative analyses; they only serve to aid legibility. This measure of complexity is applied to our data in Chapter 4.

Depictive handles.

Property markers of this sort are transcribed in terms of the salient dimension of the referenced entity—e.g., whether it is a plane, a stick-like object, a cylindrical object, and so forth. For example, consider an utterance dealing with placement of a thin, flat object. The handshape is a horizontal flat 5-hand, palm down, which BTS treats as a *horizontal plane* (**pm'PL_H**). An SLN-DH girl of 2;11 comments to her mother about putting a flat rubber alphabet letter into the corresponding puzzle space. She points to the space, indicated by a *3rd-person point* (**PNT_3**) followed by a parenthetical indication of the aim of the point, and then moves her hand to that object as a *goal* (**gol**):

***CHI: PNT_3(puzzle_space) (put)-pm'PL_H-gol'OBJ(puzzle_space) .**

BTS counts elements that are separated by spaces as lexical items; thus there are two lexical items in this utterance. The second item has two meaning components; thus there are three "morphemes" in this utterance. However, I prefer to withhold the linguistic label "morpheme" until much deeper corpus analysis has been carried out, along with more extensive linguistic work.

The transcription system also makes it easy to pick up nonconventional uses of meaning components ("errors"). For example, an American girl of 2;6, learning ASL from Deaf parents, is also signing about the insertion of a flat piece into a puzzle. In this case, the piece is a disc, which would be treated as two-dimensional in ASL. The child, however, uses a cylinder handshape (**pm'CYL**), moving it downwards, palm to the side, to make contact with the puzzle board. An asterisk in square brackets indicates that this is an error from the point of view of the adult language, and an asterisk within the polycomponential verb indicates the location of the error. A dependent tier (**%err**) identifies the nature of the error: that this is a property marker error, in which **CYL** should have been a *flat disc* (**FD**), indicated by a dollar sign (**$pm = FD**).

***CHI: (put)-pm'CYL*-gol'OBJ(puzzle) [*] .**
%err: CYL $pm = FD

A dependent tier for comments (**%com**) could add the transcriber's ideas about this utterance—for example, the task of inserting the piece into a puzzle may have highlighted its three-dimensional quality to the child; or perhaps this is a phonological error, reflecting lack of fine digit control. With a sufficiently large corpus, a search for errors can be useful in revealing acquisition strategies and problems.

Conclusion

The Berkeley Transcription System provide a tool to look into the component structure of signs, with all of their simultaneous manual and nonmanual features. BTS is based on linguistic analysis of each sign language being studied, and is continually open to revisions as linguistic descriptions improve. It is also open to revision in response to insights about child language, as well as challenges of computer technology.

In Chapter 4, examples are presented in BTS format along with discursive summaries to aid the reader. It is the experience of users of BTS that, with some practice, it is not too difficult to read a transcription and visualize/enact the transcribed utterance—provided, of course, that

one knows the sign language in question. This is comparable to the ability of practiced linguists to read morphological transcriptions and glosses of a spoken language and get an idea of the structure and content of transcribed and annotated utterances.

Chapter 4
Morphosyntactic Analysis of Sign Language Acquisition

"iconic motivation does not simplify a child's task."
Schick (2005, p. 128)

Introduction

Children's morphosyntax is a hard nut to crack, as discussed in the general introductory first chapter. This linguistic domain in signed languages is still far from being clear, even in adult versions, and especially since several African and Asian sign languages have been introduced into the field, suggesting a wider range of types of patterning then had been earlier assumed. (Meir et al., in press; Nyst, 2007; Zeshan, 2000).

Without an "accepted" adult model of any given language, or without adequate linguistic descriptions of the constituting elements and combinatorial rules, it is risky to analyze a language via its child versions. It is therefore that the preceding vocabulary study (Chapter 2) and a carefully designed transcription project (Chapter 3) were needed in order to pave the way for the morphosyntactic analysis of SLN acquisition presented here. This chapter reports on the effort to componentially analyze children's utterances into lexical and sublexical units consisting of a verbal core and one or more meaning components, revealing morphosyntactic construction types.

After introducing sources and features of the data, the analysis is constructed top-down along the rough lines of quantity of lexical units per child per clause in comparable amounts of time, followed by analysis of complex signs per child. The next section presents types and frequencies of complex signs in terms of combinations of verbal cores, property markers, and other meaning components. The chapter closes with an analysis of particular lexical units in clauses, leading to two hypothesis about such seemingly "simple" units as points. The results suggest facilitating effects of iconicity, as indicated by the epigraph from Schick, above, and unlike earlier research on sign language acquisition (e.g., Klima & Bellugi, 1979; Newport & Meier, 1985).

Although the work presented here is to be seen as a beginning analysis from utterance level to smaller units, the effort has offered insights into important complexities that just begin to show in early periods of SLN acquisition.

Sources of Data

The data presented in this chapter are based on the most complete available video recordings and transcripts from the three groups: SLN-D, SLN-H, and SSD-H. All in all, 19 children and their parents have been completely transcribed by BTS standards and have been checked by a second transcriber, in 15 cases including a deaf transcriber as third check.

The overall age range is 17–36 months, with data both from recordings made both at home and at preschool. The morphosyntactic data presented in the current chapter come from home recordings; preschool recordings are discussed in the following chapter, with regard to input. In sum, a detailed analysis of a relatively large group, over time, allows for both quantitative and qualitative approaches to issues of morphological analysis and development. Table 4.1 provides basic data on the three groups. Transcription times refer to segments of video

recordings that contained transcribable data; the actual recording sessions were considerably longer. (Note that this sample is smaller than the sample of 30 children in the vocabulary study presented in Chapter 2. This subsample represents those children whose data provided sufficient numbers of utterances for morphosyntactic analysis and comparisons, with the exception of several children who had to be excluded due to limitations of time and resources for transcription—which can take up to one hour per minute of videotape.)

Table 4.1. Research Sample

Language	Parents	Age range in months	N	Transcription time
SLN (SLN-D)	Deaf	21–36	3	204 min (3.4 hrs)
SLN (SLN-H)	Hearing	17–36	8	757 min (12.6 hrs)
SSD (SSD-H)	Hearing	17–36	8	728 min (12.1 hrs)

The following tables provide data on the individual children in each of the three groups, with both calendar age and "adjusted age," as described below.

Rationale for Calculating Adjusted Age

As discussed in Chapter 2, chronological age is a misleading comparison point for children with Deaf parents—with early exposure to sign language, and children with hearing parents—whose first exposure to sign occurred at varying ages (due to age of detection of deafness and the point in time when the parents began to learn to sign). Therefore, in an attempt to calibrate DD and DH children, the Berkeley research group created an "adjusted age" for each child with hearing parents, based on the age at which the parents started to sign to the child. (As noted in Chapter 2, I am grateful to the late Elizabeth Bates for advice in devising this means of calibration of the children.) In order to relate DD and DH children on the same developmental scale, I reasoned that DD children start using sign-like gestures communicatively at about 10 months of age. Accordingly, I set the "adjusted age" for the DD children at 10 months, rather than birth. For example, a DD child of 15 months of age would have an adjusted age of 5 months, comparable to a DH child who was first exposed to signing five months before the date of recording. (See footnote 6, Chapter 2, p. 26.)

An indirect support for this calibration measure comes from comparing DD and DH children with regard to rate of vocabulary development on the MCDI, as discussed in Chapter 2. When using the adjusted age calibration, the growth curves for the SLN-D and SLN-H children line up perfectly, as discussed in Chapter 2. That is, for each adjusted age for which data points are available, the figures are almost exactly comparable. Furthermore, the SSD-H children are comparable at the very earliest ages, but then level off for a bit; when these children start showing a vocabulary increase, it's exactly parallel to the SLN-learning children, but always lower. Given these parallels, it seems reasonable to use adjusted age in data comparisons drawn from the naturalistic video recordings.

Tables 4.2.a, 4.2.b, and 4.2.c present gender, chronological age, adjusted age, and length of transcribed sample in minutes for each child. Children are identified by meaningless codes of three capital letters, following CHILDES format. The trigrams were invented to be pronounceable, and bear no relationship to the child's actual name.

Table 4.2.a. Deaf Children of Deaf Parents,
SLN Input as Parents' Native Language

SLN-D			
Child (gender)	*Chronological age*	*Adjusted age*	*Video sample in minutes*
1. JES	28	18	39.7
(F)	34	24	22.1
2. LIN	21	11	25.0
(F)	29	19	48.5
3. SIS	30	20	32.2
(F)	35	25	36.6
Total: 204 min (3.4 hrs)			

Table 4.2.b. Deaf Children of Hearing Parents,
SLN Input as Parents' 2nd or 3rd Language

SLN-H			
Child (gender)	*Chronological age*	*Adjusted age*	*Video sample in minutes*
1. BER	19	5	24.5
(M)	26	12	33.5
	31	17	42.0
2. BOB	21	3	27
(M)	25	7	34.9
	29	11	43.2
3. ELS	21	7	45.1
(F)	28	14	25.2
4. HAN	30	5	30.3
(M)	33	8	21.3
5. LEA	17	2	67.4
(F)	23	8	46.4
	34	19	40.4
6. LIZ	25	2	29
(F)	30	7	19.4
7. ROB	20	2	27.4
(F)	25	7	45.7
	34	16	45.0
8. SOL	20	2	28.4
(F)	28	10	41.6
	30	12	39.4
Total : 757 min (12.6 hrs)			

Table 4.2.c. Deaf Children of Hearing Parents,
SSD Input as Parents' 2nd or 3rd Language

SSD-H			
Child (gender)	*Chronological age*	*Adjusted age*	*Video sample in minutes*
1. BAS (M)	33	11	78.0
2. DAN (M)	15	5	46.3
	27	17	33.3
3. IDA (F)	9	26	115.3
4. KAS (M)	27	14	77.0
5. MIA (F)	22	5	30.1
	32	15	42.2
6. RIA (F)	17	5	26.7
	26	14	16.2
	30	18	14.6
	35	23	38.2
7. TOM (M)	34	8	73.0
	36	10	69.2
8. TON (M)	26	20	37.8
	34	28	30.2
Total: 728 min (12.1 hrs)			

Analysis

Measuring early signing

Measurement in terms of mean length of utterance (MLU) without consideration of the internal complexity of items is relatively uninformative in a highly inflectional language such as SLN. Therefore it is more revealing to attend to the internal composition of items. Accordingly, in this analysis utterances are compared on two dimensions: length and componential "density" of individual items. For both types of analysis, I first group points and lexical signs together ("items"), and then examine points and signs separately as different sorts of items.

The overarching unit of analysis is the utterance. BTS is based on established CHILDES conventions for establishing utterance boundaries, with adjustments for the visual/manual modality. An utterance ends with one or more of the following criteria: hand-dropping, long pause followed by change of topic, return of eye-gaze to the addressee, or a response of the interlocutor. For example, BER (Adjusted Age 17 months) is looking at a picture book. He points at a picture of a cookie and signs COOKIE and then YUMMY. If this string of a point and two signs had fallen under a single intonation contour, with no change of activity, this would have been transcribed as a single utterance. But the intonation and change of action (page turning) indicate that this was better treated as two utterances—the first one setting up a topic and the second adding a comment while BER went on to search for another picture.

(1) *BER: [%act: turns page] PNT_3(on_picture) COOKIE .
*BER: YUMMY [%act: continue turning pages] .

By contrast, BOB (Adjusted Age 7 months) is studying a puzzle piece and comments that its button is missing, with no change in attention or intonation. This is transcribed as one utterance.

(2) *BOB: PNT_3(on_puzzle_piece) BUTTON OFF [%act: examines puzzle_piece] .

As in analyses of spoken child language, these criteria are not unproblematic. Pauses in child signing are a problem, as well as the "beading" or stringing along of signs without any pause. When in doubt about dividing a string of signs into more than one utterance, I sought evidence for a propositional boundary—that is, a division of the string into separate predicates.

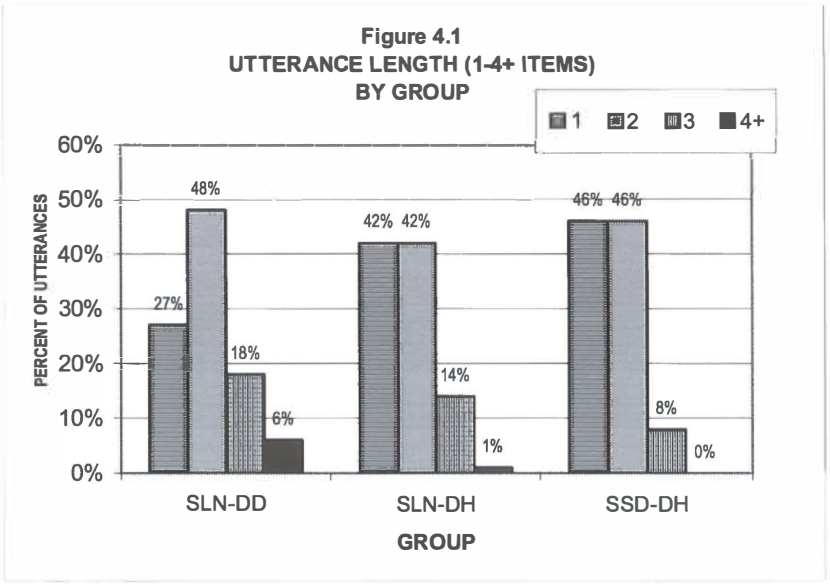
To begin with, it should be pointed out that utterance length in deaf children is not easily comparable to hearing children, for reasons based on use of the visual/manual modality. Of particular importance is the physical presence of referents in early child communication—that is, people, objects, and pictures that are the focus of attention and communication. Such referents will be pointed to or glanced at before deaf children take the opportunity of making a statement about them. This lowers the amount of acquired lexical items as a total in comparison with hearing children. The item counts do include points, but although one could imagine including deictic gaze shifts in the counting, in videotaped data with one camera one cannot be sure of catching every relevant eye movement for that purpose. Gaze is therefore excluded from the counts, although it is discussed as a significant cue later in this chapter. In defining signs, it was necessary to exclude various ad hoc or nonlinguistic gestures; signs were therefore defined as handshapes/movements corresponding, to a recognizable degree, with signs in the established SLN lexicon. Accordingly, the analyses presented below adhere to a strict rule of counting only points and SLN lexical items.

MLU is a familiar and widely used measure of early grammatical development, in spite of several limitations, particularly problems of counting morphemes in different types of languages and establishing normative data based on comparable sample sizes and text types. Nevertheless, MLU counts, of either words or morphemes, have proven useful in establishing developmental criteria and raising issues for more detailed analysis. As Bates and her colleagues have shown (Bates et al., 1995), vocabulary growth occurs after the age of 12 month in hearing children and is connected to an increasing number of words per utterance per time unit, as well as growing complexity in forms. In speech development a correlation between vocabulary size and multiword speech typically begins once 50-100 words have been acquired. Verb vocabulary and verb morphology follow a nonlinear relationship, suggesting that grammatical generalizations do not arise until the system has found sufficient instances for supporting these generalizations. Most of the data based on MLU and vocabulary counts, however, come from English-speaking countries. Indeed, Roger Brown (1973), who introduced the MLU measure, was struck by the close developmental correspondence—in early stages—between MLU and the emergence of English grammatical morphemes (function words and suffixes). For adaptation of these measures to deaf children acquiring a sign language, some considerable differences are to be expected, both with regard to elaboration of pointing and the development of sign-internal morphological complexity, as discussed below.

MLU counted in terms of items (unanalyzed signs and points)

I will begin with simple counts of basic communicative elements, excluding gestures and gaze. Figure 4.1 presents data on unanalyzed points and signs, referred to as "elements." Functions of particular elements or components are not yet included in these counts. The

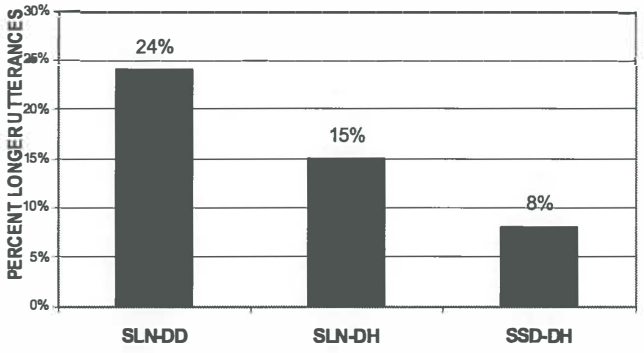
figure presents gross MLU by group, summing across individual children and ages.[29] The figure presents utterance length by 1, 2, 3, and 4+ elements.



Note that children in all three groups use, by definition, use 1-element utterances. But only for SLN-D children are such short utterances in the minority. For both groups with hearing parents, SLN-H and SSD-H, the majority of utterances have 1-2 elements, used in equal proportions. All three groups have some 3-element utterances, but in declining proportions, with DD>DH and SLN>SSD. Although utterances with 4+ elements are rare, they occur primarily in the SLN-D group (6%), with 1% in SLN-H and none in SSD-H. The differences between the three groups are revealed more clearly in Figure 4.2, presenting data only of longer utterances of 3-4 items. There is a clear cline: SLN-D > SLN-H > SSD-H. The SSD group shows only 8%, which is about half of the production rate of SLN-H and a third of SLN-D. So although the SSD group is able to show some growth in longer utterances, it is clearly not a lot.

[29] Data on individual children is provided in Appendix A.3; all analyses are based on the total sample for each child, as documented in Appendix A.1. Small sample size—both in terms of numbers of children and numbers of utterances—precludes statistical analysis beyond the use of chi-square.

Figure 4.2[a]
Longer Utterances (3-4+ Items) by Group

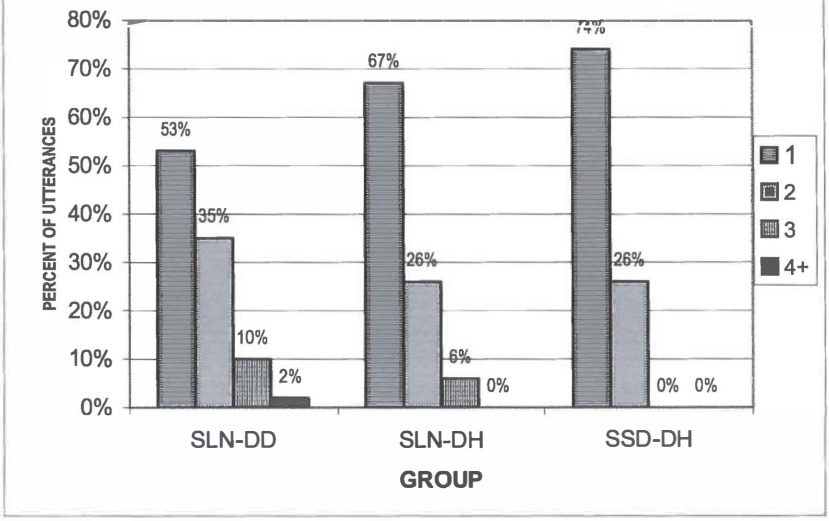


[a] (χ^2=4.57, df = 2, p=.10)

Overall, these differences are only marginally significant, with p=.10. In pairwise tests, the only significant difference is between SLN-DD and SSD-DH (χ^2=8.5, df = 1, p<.01), as predicted.

On this gross measure of length in terms of unanalyzed items, then, one finds the familiar clear advantage for children with Deaf parents, and an advantage for children with hearing parents who
receive SLN as input, in comparison with SSD. These initial data clearly call for a closer examination of the internal complexity of items for a more differentiated picture of development, as shown in the following figures. The first issue is to separate out points and lexical signs, which are both included in the item definitions of Figures 4.3 and 4.4. I know at least that the important function of pointing is deictic identification and placement of referents, rather than lexical identification; therefore, analysis of complex signs alone may differentiate the groups more strongly. Figure 4.3 is parallel to the format of Figure 4.2, but with the exclusion of points. The MLU counts are restricted to lexical signs, indicated as "signs" in the figures and following discussion.

Figure 4.3
UTTERANCE LENGTH (1-4+ SIGNS) BY GROUP



For all three groups more than half of the utterances have only one sign, but with clear increase by group: 53% for SLN-D, 67% for SLN-H and 74% in the SSD group. On this measure only SLN learners produce utterances longer than two signs, with DD producing twice as many as DH (12% vs. 6%). Thus when only signs are considered, excluding points, the picture is more dramatic.
These findings make it urgent to get insight beyond a crude measure of length in unanalyzed items.

Complexity of internal composition of items

How does one get an impression of the types of complexity that these children are dealing with, since the preceding rough measures simply show increase in numbers of countable, unitary elements? Such counts don't give any insight into growth of morphology—that is, the internal structure of communicative forms. BTS approaches morphological complexity—as defined in Chapter 3—by systematically pulling apart the simultaneous and sequential components of utterances or constructions. This sort of internal analysis allows for a more detailed analysis of the forms and functions of signs (and also of points) used by the deaf children in the three groups in natural interactions at home. In order to assess the productive competence of the child, it is necessary to exclude pure labeling, simple repetition of adult utterances, and prompted responses to adult questions and imperatives. The following criteria were developed for the identification of children's spontaneous utterances for purposes of morphological analysis. (Note that the term "morphological" is used here in a loose sense, corresponding to semantic components as defined by BTS. As discussed in Chapter 3, the linguistic status of elements of SLN, and other sign languages, remains an open question.)
The starting point of analysis is a *proposition*, defined as an utterance that predicates an action, state, or an attribute of a situation or entity that has been established as topic. That is, utterances included in the analysis are those that add information to a current situation. By this criterion, all utterances are included that meet the following criteria:

- The utterance contains a verb:
  - verb alone, or:
  - verb and one or more signs, or:
  - verb and POINT that identifies a participant or situation relevant to the verb (agent, patient, instrument, location, source, goal), or:
  - verb and lexical identification of an object or picture that refers to a participant or situation relevant to the verb (agent, patient, instrument, location, source, goal), or:
  - attribute ("adjective") relevant to topic, or:
  - attribute alone (e.g., uttering a color term relevant to a picture), or:
  - attribute and POINT to object or picture that includes that attribute.

The counts are limited to full, spontaneous productions by the child. The following sorts of utterances are excluded:

- The utterance contains unidentifiable material, indicated by XX;
- or: it is an exact repetition of a preceding adult or child utterance;
- or: it is an instance of pure labeling, without predication, i.e.:
  - POINT to object or situation, or:
  - POINT and provide noun or name sign, or:
  - provide only noun or name sign;
- or it is a non-propositional response to an adult question (e.g., providing only attribute, name, etc.).

The counts presented below simply differentiate between a "unitary item"—an unelaborated POINT or lexical item, and a "complex item"—any POINT or lexical item that contains one or more semantic components, defined as hyphenated BTS elements. Lexical items include SLN signs, points to persons, and question words. Because the sample is so small, it was not profitable to carry out a more fine-grained analysis of complex elements in terms of numbers of semantic components (discussed below with regard to individual examples). If an operator (-^opr) applies to a POINT or lexical item, that combination is counted as a single complex item; however, an operator standing alone is not counted as a lexical item in word counts.

In sum, an item—as defined above—is counted as either non-complex (no hyphens) or complex (any number of hyphens). To clarify the range of items counted as complex, all of the following types of items would be counted as single complex items :

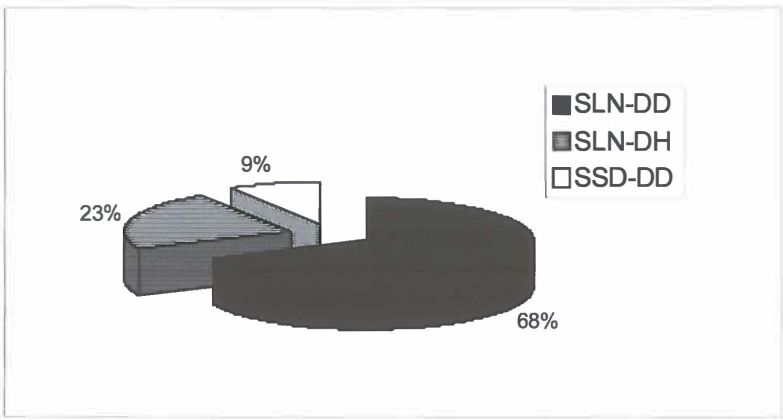
Table 4.3
Examples of Types of Complex Elements

CRY-^mod'EFF	(call)-pm'HOOK-mov'LEX-src'1-gol'2
PNT_3-^mod'AUG	WASH-loc'BO_FAC
PNT_3-^mod'NEG	HOUSE-^mod'AUGM
LARGE-^mod' AUGM	(fall)-pm'VL-mov'PUSH-path'D
^opr'YNQ PNT_2^	^opr'NEG CRY
LOOK_AT-^opr'NEG	^opr'AFR CRY

Applying these criteria, I will first consider all complex items—points and signs—where all complex items in the total data set (all three groups) are treated as a composite. The question,

then, is: what proportion of the composite is due to each group? The comparison between the three groups on this measure is shown in Figure 4.4. In order to make the data comparable across groups, a correction was made for differences in the amount of recording time. Only samples with complex items were considered. In this analysis, the SLN-H group provides the longest corpus: 567.8 minutes, compared with 179.5 minutes for SLN-D and 534.8 minutes for SSD-H. The number of tokens of complex points and signs for each of the two smaller groups was adjusted by a multiplication factor equalizing all three groups to 567.8 minutes (factor of 3.16 for SLN-D and 1.06 for SSD-H).

Figure 4.4[a]
Percentage of Complex Items by Group

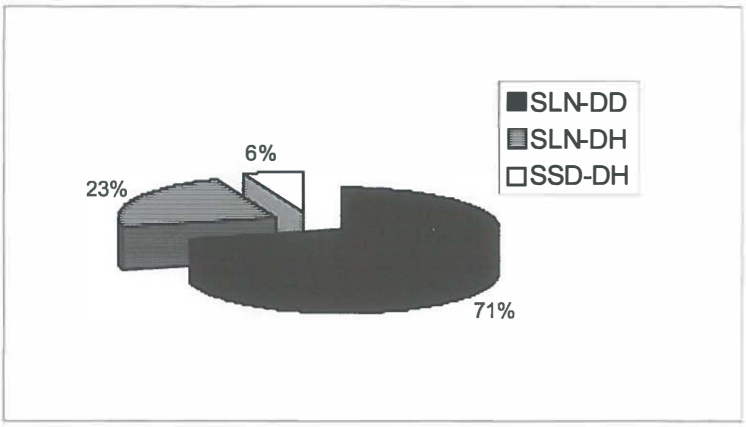


[a] (χ^2=57.38, df = 2, p<001)

Again SLN-D comes out with the largest proportion of complex items. Note that this analysis includes both complex points and complex lexical items. It is noteworthy that points are modified in a number of ways, including locative specification, various sorts of modification, and various operators. That is, children are treating points in ways that are similar to the grammatical marking of lexical signs, even though this may not necessarily be formally the case in SLN grammar. I will return to this important finding after separating complex signs from complex points.

Figure 4.5 is comparable in format to Figure 4.4, but restricted to complex *signs* only. What we see here is an almost identical pattern as in the previous figure. Therefore, complexity as defined above seems to be a general characteristic of the children's early grammatical elaboration, whether applied to points or signs.

Figure 4.5[a]
Percentage of Complex Signs by Group

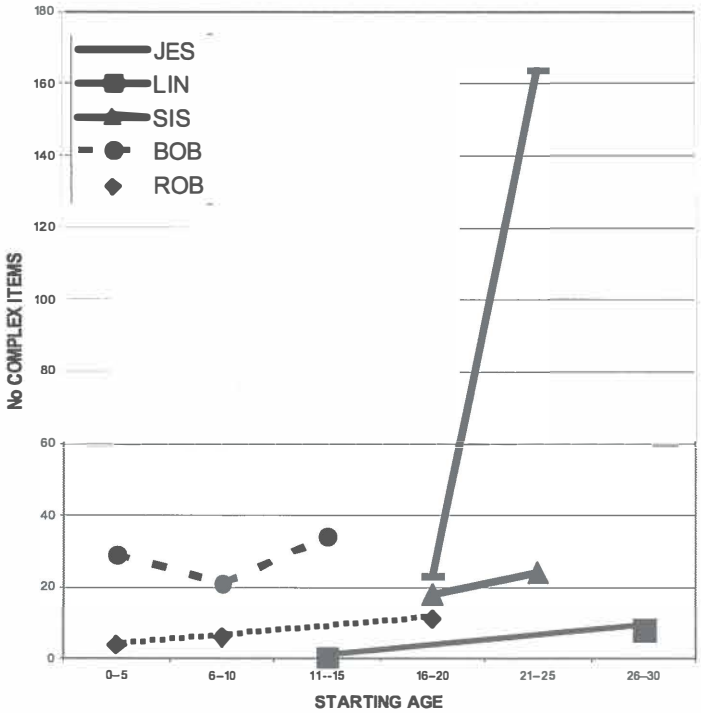


[a] (χ^2=68.88, df= 2, p<001)

The data allow only limited possibilities for longitudinal comparisons of individual growth patterns. What is needed are samples with a sufficient number of complex items and at least two developmental points. In addition to the three SLN-D children (JES, LIN, SIS), there are two SLN-H children with suitable longitudinal corpora to allow for systematic comparison (and no comparable samples for SSD-H). Figure 4.6 shows growth over time in the composite count of complex points and complex signs in the SLN productions of the two SLN-H children (dotted lines) and the three SLN-D children (solid lines). These two SLN-H children have three data points with complex items at each point. The three SLN-D children represent the entire sample from that group, with two data points for each child; only LIN produced no complex items in the first sample. In order to make the data comparable across children, two adjustments were made: (1) the data points are given by adjusted age, rather than chronological age; (2) a correction was made for differences in the amount of recording time. The second sample from LIN was the longest, with 48.5 minutes. Accordingly, a separate correction factor was applied to the totals of each of the other samples to make them equivalent to this time length.

It is clear that all five SLN-learning children develop in terms of item complexity. JES is the "superstar" by the second age point, but all five children show roughly comparable numbers of complex items at about 20 months beyond starting age. And, apart from JES, a projection of the curves suggests that the other SLN children—regardless of hearing status of their parents—would be at comparable levels after 30 months of exposure. Early growth of complexity, whether of points or signs, seems to be the expected process in acquisition of SLN.

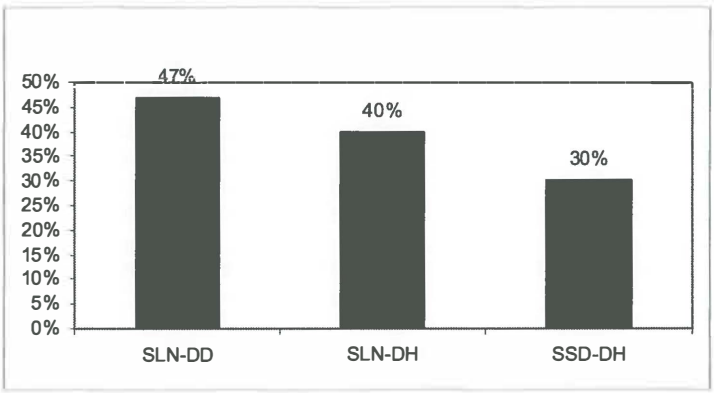
Figure 4.6
GROWTH IN ITEM COMPLEXITY



Having established these overall patterns of growth of complexity, it is useful to separate complex signs and complex points, searching for possible differences. First consider complex signs alone. Figure 4.7 separates the three groups and shows, for each group, the percentage of lexical signs that are complex, as defined above. The total for each group consists of all signs occurring in propositions, excluding simple labeling. The total number of relevant sign tokens for each group is: SLN-D 282, SLN-H 337, SSD-H 116. Here we see the familiar pattern again:
SLN-D > SLN-H > SSD-H. The data show that, overall, all of the children are working on extending their sign base by adding complexity in terms of modifications coded in BTS. At the same time, the type of input—SLN versus SSD, as well as the competence of the parents—Deaf or hearing, influence the rate of development. I will return to the role of input in Chapter 5.

Figure 4.8 applies a parallel analysis to complex points, as defined above. The total for each group consists of all points used by each child. The total number of relevant points for each group is: SLN-D 423, SLN-H 716, SSD-H 286. Here we no longer see the familiar pattern. The SLN-D children do use far more complex points than the children with hearing parents, but the latter show no advantage of SLN versus SSD input.

Figure 4.7[a]
Percentage of Complex Signs
by Group

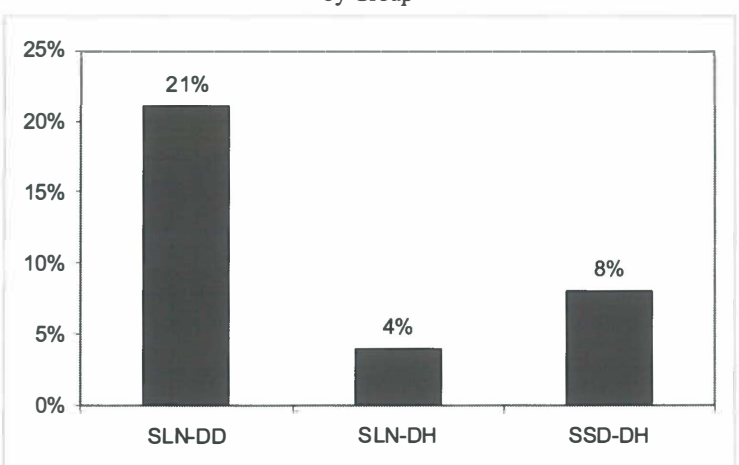


[a] (χ^2=3.74, df = 2, p>.20: *ns*)

None of these pairwise comparisons is significant. No evidence that the groups differ, though there does seem to be a trend in the predicted direction.

The use of complex points is so infrequent for both of these groups that I can only conclude that children who receive the fluent input provided by Deaf parents are exploring pointing as potentially part of the grammatical system of SLN. This is an unexpected finding, and it calls for more detailed attention to types of complex pointing in the transcripts of the three groups.

Figure 4.8[a]
Percentage of Complex Points
by Group



[a] (χ^2=14.35, df = 2, p<001)

In pairwise tests, the differences between SLN-DD and each of the other groups is significant (SLN-DD vs. SLN-DH: χ^2=11.56, df = 1, p<.001; SLN-DD vs. SSD-DH: χ^2=5.78, df = 1, p<.02). The difference between SLN-DH and SSD-DH is not significant.

The role of pointing in the acquisition of SLN morphosyntax

Pointing in the early stages of sign acquisition has not received abundant attention in the literature. Generally, it has been dismissed as a sort of deictic gesture that stands outside of the linguistic system. My research, however, shows that not only do deaf children use an impressive amount of pointing, but—more important—its forms and functions seem to be integrated into the processes of conventionalization of gesture and control of the signing space.

To begin with, it is useful to have an overview of the forms and functions of points found in the data. Pointing is not a simple matter of extending the index finger; rather, there are combinatorial dimensions of finger, wrist, and arm configuration, and movement. And pointing serves a range of discourse functions.

Forms

- fingers:
  - straight / limp / curved
  - index / 5- hand / thumb (back- or sideward)
  - movement: stationary / waving / flopping
- wrist:
  - straight / bent
  - movement: up and down / back and forth
- elbow/shoulder:
  - bent and moving hither & thither
  - straight and moving up and down / back and forth

These descriptions cover the main forms as found in the data. Because many forms, whether points or signs, are still in early stages of acquisition and thus not precise or "correct" at all times, they have not be analyzed for phonetic details.

Functions

- attention getting (often combined with flapping arm movement)
- locative
- topic for associated comment (predication)
- deictic (identify referent by indexical act)

As a general rule, as mentioned above, pointing serves many functions: referring to present and absent referents – such as objects, pictures, real and imaginary locations, locatives; highlighting referents in a demonstrative function; and identifying speaker and adressee(s) as participants in messages.

Complex pointing

One may not be surprised any more to find the DD children ahead of the other groups, although pointing was not the domain in which large differences were expected. Of particular interest here are types of pointing that I propose to call "complex pointing." In this type of pointing, children provide various types of additions that they add to lexical signs:

modification (augmentative, intensification), aspect (iterative, continuous, distributive, stationary), and particular types of tracing of directions and contours. They may also combine some of these additions. Additions of this kind share the central feature of adding semantic information; furthermore, this information tends to be *gradient* in one way or another. It seems clear that children treat at least some sorts of points in the same way as they treat lexical signs. It is striking is that these additions may be attached to any point (PNT_1, PNT_2, PNT_3), with regard to source or goal, and that such information can be provided for points that serve the range of functions listed above. Another criterion for "complexity" is the integration of one or more points into propositions, in which pointing identifies topics for predication in a prosodically integrated unit.

The following examples demonstrate some of the kinds of form/function combinations used by DD children in their pointing. Similar examples could be adduced—though with far less frequency, for the two DH groups. Ages are provided here as chronological ages.

(3) SIS (35 months) has been asked by her mother to look for a particular picture in one of the books they have been reading. SIS points to the first book with a simultaneous negative operator (head shake) and then provides a contrastive, stressed point on the second book, asking her mother to read that book. The second point is stressed and repeated, to direct the mother's attention to search for the picture in the second book.

*SIS: BOOK ^opr'NEG PNT_3(book_1)^ PNT_3-mod^AUG(book_2) READ
%gls: not this (book), read that one

(4) LIN (29 months) wants both her parents to help build a tower, and invites them to sit next to the place where she plans the building to take place. Her father does not respond to the plan. She looks at him and points to a location on the floor, signs SIT, and points to the location again. Then she looks at her mother, signs SIT, points at her mother, signs SIT, points to another location, signs SIT. The combination of points, gaze, and locations involves the participants in a complex scenario. Again, points serve a contrastive function.

*LIN: *fat PNT_3(floor_spot_1) SIT PNT_3(floor_spot_1) .
*LIN: *mot SIT PNT_2 SIT PNT_3(floor_spot_2) SIT.

The points in the following examples are complex not because each one makes a reference, but because they are complex in context—that is, they serve as topics for predication function. The points to the mother and to the floor location, along with the verb SIT, thus serve an integrated propositional function, as do the points in the following examples (5) and (6) from JES

(5) JES (34 months) sets up a situation by the use of successive points, and than produces a lexical sign that summarizes the observation. Her mother has been drawing faces of family members on a piece of paper. JES looks at them carefully, pointing to each one; then she looks to her mother and provides a predicate that applies to the total.

*JES: PNT_3(face_1) PNT_3(face_2) PNT_3(face_3) *MOT LOTS .
*gls: this one, this one, and this one, that's a lot

(6) JES (34 months) has made a drawing of her house on a slate, indicating the bedrooms, and uses the drawing as a device to get her mother to take JES in mother's bed tonight. In addition to pointing at self, mother, drawing and slate, JES modifies a point to indicate the location of her actual bedroom. In so doing, she distances reference from symbolic depiction to a corresponding real-world, nonvisible location.

*JES: PNT_2 MAMA PNT_3(drawing_of_door) PNT_3(slate) .
%gls: you mama, here (door in drawing) on this (on slate) .
*JES: PNT_3(drawing) PNT_1 SLEEP(1h) PNT_3-mod'DIS .
%gls: there I sleep, upstairs
*JES: PNT_1 PNT_1_2 .
%gls: me, both of us together

The examples in (5) and (6) are complex because, as a series, they serve as the topic of a single predication. In (6) JES modifies a point to indicate the location of her actual bedroom—that is, she points in the direction of the bedroom, relying on shared knowledge with her mother. (JES 's first points are to the concrete physical situation at close range that is physically present and visible things, whereas the point to the actual bedroom is only in the direction of an invisible location that is common ground for the child and her mother.)

The integration of deixis and referent modification

A question that one has to ask on a more general level concerns the functions that are served by the superabundance of pointing. As a general rule, pointing serves many functions: referring to present and absent referents—such as objects, pictures, and real and imaginary locations, locatives; highlighting referents in a demonstrative function; and identifying speaker and addressee(s) as participants in messages. Early in development, children (especially DD) seem to make use of points to explore spatial devices as well as some meaningful sign components, eventually developing into conventionalized parts of the grammar. There are at least two important dimensions of points that make them potent entry points to morphological marking.
For one thing, children may experience both points and lexical signs—when the referent is under visual control of both signer and addressee—as equal candidates for morphological attachments: markers of modification and aspect accompany points, just as they are attached to lexical signs. These markers fulfill the very same functions for both points and signs: they provide additional information about referents by intensifying, expanding, locating in space, etc.

At the same time, points belong to the deictic system—that is, they index locations of speaker and other entities. Unlike a simple deictic, however, a point can also be modulated to indicate relative distance, visibility, size, or motion; and points to loci in signing space can maintain or reactivate entities in discourse. or previous mention. Similar to demonstratives and locative adverbs in various spoken languages, points that are integrated into a sign language are conventionalized to indicate a fixed set of relative distances, comparable to the bipartite English distinction *this/here* versus *that/there* or the Turkish tripartite distinction *bu* 'near speaker, 1st person', *şu* 'near addressee, 2nd person', *o* 'yonder, 3rd person'. In SLN, three levels of relative distance are conventionalized, as indicated in the BTS notations: PNT_PRX [proximal], PNT_MID [mid-distance], PNT_DIS [distant]. The most advanced SLN-D child, JES, has systematized a simpler, bipartite distinction between PNT_PRX and PNT_NONPRX [nonproximal].

In sum, the development of competence in pointing, along with marked forms of points, involves the elaboration and integration of three functions: the deictic, the referential, and what I will call the navigation of signing space. In this process, the use of eye gaze turns out to play a critical role. Because this issue has not been systematically explored in the literature, I will examine examples of the signing of JES in some detail.

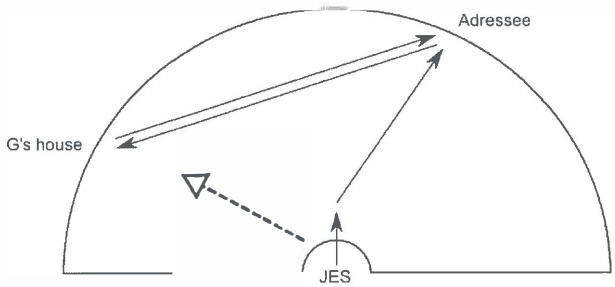
The integration of gaze with the spatialization of points and signs

I propose that pointing—apart from the variety of deictic and referential functions it performs—may also serve in close connection with gaze allocation to help the child explore dimensions in signing space. By pointing to present and absent referents, and attending to their locations, children start to orient to spatial proximities and distances in relation to themselves, to an object/picture, and to an addressee. For example, when JES, at age 34 months, is talking about drawing her grandmother's house, she points (according to her mother) in the right direction. (Grandma lives some streets apart from the family and JES is used to cycle to her, so she knows how to go there and the direction in relation to their house.) The manner of her pointing is with her arm partly extended, referring to the real world distance from the current location to a location that is at some distance and out of sight. At first, the eyes follow the hand, moving back and forth between referents and addressee. Separate control of the two systems requires a long developmental process.

As an illustration of these issues, compare the following examples of ways of signing the same utterance by three performers of different age groups, paying close attention to the co-occurring gaze allocation. The example is drawn from the JES transcripts, and is the actual utterance discussed above. The other two examples are hypothetical versions of the same utterance performed by a less-experienced 2-year-old and by a fluent adult. Note that the utterance critically involves a point that makes reference to an absent and distant referent. JES is sitting at her little table next to a window and wants to make a drawing of her grandmother's house; she communicates this intention to her mother and a visitor, both seated opposite her table. Following BTS notation, an asterisk indicates gaze direction; thus, for example **paper* indicates gaze directed at a sheet of paper. Unanalyzed SLN signs are given in capital letters. The point is transcribed as 3rd person, middle distance, left. (However, as discussed above, it might be more accurate to transcribe it as nonproximal, since there is no clear evidence that JES distinguishes three levels of pointing.)

(7) JES: *paper *addressee PNT_3(on_drawing_paper) HOUSE GRANDMA *leftwards *addressee **PNT_3-mod'MID_L** .

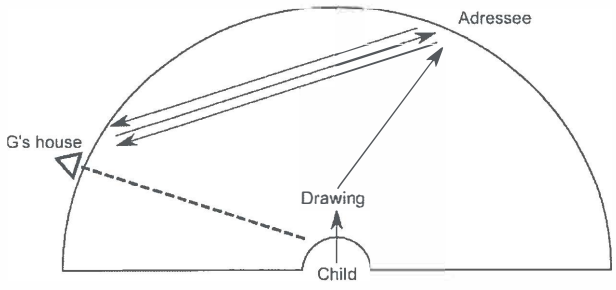
The transcription indicates that JES looks at the paper, shifts gaze to the addressee while pointing on the paper and signing HOUSE GRANDMA; shifts gaze to her drawing; shifts gaze to the addressee and points with a semi-extended arm to the left (towards the actual location of grandma's house). Schematically, there are four gaze shifts, indicated by line arrows, followed by a mid-distant point, indicated by a filled arrow.



Note that JES keeps her point to G's house *within the signing space.* And the angle of her head matches the degree of extent of her arm. The developmental time required to gain control over signing space is one of the few issues that researchers agree upon. In my observations of many deaf-of-deaf children over the years, I conclude that it takes these children a minimum of three years of basic manipulation of the signing area and exploration of spatial grammar before the "narrow window" of prefrontal space becomes a conventional frame for linguistic messages.

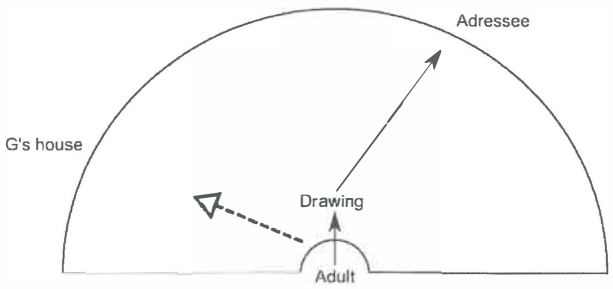
Consider now a younger child who is still working on coordination of attention to addressee and referents, and has not yet mastered the constraints of signing space. In the following hypothetical example (grounded, however, on observations), a young 2-year-old child shifts gaze more frequently and points in the direction to G's house with a full arm extension and head thrown back, gazing toward a distant point beyond signing space. Such a point and gaze look more like an attempt at gestural, deictic pointing, without adherence to the conventions of signing space.

(8) CHI: *paper *addressee PNT_3(on_drawing_paper) HOUSE GRANDMA *leftwards *addressee *leftwards **PNT_3-mod' DIS_L.**



By contrast, a hypothetical fluent adult signer would demonstrate an economy of both pointing and gaze, entirely within signing space. In the following hypothetical adult version of JES's utterance, the adult looks at the drawing and then shifts gaze to addressee for the duration of the utterance. (This hypothetical version has been affirmed by three native signers; however their claim only holds for interaction with adult partners.)

(9) ADT: *paper *addressee PNT_3(on_drawing_paper) HOUSE GRANDMA **PNT_3-mod' MID_L .**



Pointing as a bridge to distancing between symbol and referent

If pointing belong to the tools of linguistic exploration of the signing space for children, could one of the functions of pointing be to assist the child in finding spatial paths in the signing space?
A very young child will often point *on* a picture or object (deictic function with no distancing from physical referent), then look at the addressee while pointing a second time *to* the picture (deictic function with distancing from referent), and then provide the referent sign (symbolic function with distancing). In this way, by visually observable distancing from the referent, the deictic function of pointing gradually moves to the mental space, where it grows as it were into its symbolic function. That is , when there is no physical referent available in the visual field, a point makes a reference to a symbolic referent (as noted also with regard to JES's point to her bedroom in example (6) as well as her trace-point to her drawing activity in Fig. 4.9). Liddell (2003) makes extensive use of mental space theory (Fauconnier, 1985) in his innovative approach to sign language linguistics. He notes (2003, p. 79) that points can refer to "either physically present entities or conceptual entities in the discourse." It is precisely in this sense that the deaf child's points discussed here represent a growing symbolic function: They are directed toward physically distant entities (e.g., grandma's house) or conceptual entities in the discourse (e.g., completed drawing activity). It is likely that this developmental change is one of the starting points of the process that Liddell (2003) refers to as grounding.

The concept of distancing was introduced into the field of child development by Werner and Kaplan (1963). In their terms: "[I]n the course of development there is a progressive distancing or polarization between person and object of reference, between person and symbolic vehicle, between symbolic vehicle and object, and between the persons in the communication situation" (p. 488). As McNeill (1992) has put it: "At an early stage of development the signifier and signified have little distance between them" (p. 298). The pointing and signing of the deaf child make the process of distancing concretely visible to the investigator, due to the literal physical distancing of a point or sign from its referent object or event. As a first example, consider an example from JES at age 34 months.

JES has been drawing on a magic slate with her index finger and tells the researcher (*nin*) about what she has done. She traces a circle *above* the slate, using a bent-5 handshape (see Appendices D and E for pictures of handshapes) to cover the area of the slate, and then points at the slate—*but without contact*—and then, without a prosodic break, signs EASY (a 5-hand brushed down the chin) while looking at the researcher.

(10) *JES: (trace)-pm'BF-rel'C-loc'SUP PNT_3(slate) *nin EASY

The act of drawing has coalesced into a sign-like tracing verb and finally into a point which is a kind of distanced symbol. JES is pointing now *at an event*—the completed action of drawing a circle—which then becomes the topic of a comment, that is, a sort of predication in which EASY is predicated of the action on the slate, which is pointed to. JES's point is smoothly incorporated into an utterance (the equivalent of something like 'That was easy'). It is, at one and the same time, a gesture, an index, and a budding linguistic symbol. In a signed language, thus, elements of the physical space can be integrated into the linguistic space.

Similar examples of complex points and the distancing of points and gestures from their referents—both physical and temporal distancing—are found in both SLN-D and SLN-H groups. However, children exposed to SSD as primary input show much less use of these processes of moving away from physical deixis. The form of their pointing does not change over time; it is not integrated with gaze; and it frequently goes beyond the borders of the signing space. Children in this group do not seem to expand the pointing function in exploring forms and functions, except in labeling In the SLN groups, physically directed pointing and simple labeling is seen early on, followed by changes in form and functions of points and signs. There are clearly important factors of input, discussed in the following chapter.

Gestures and signs

When comparing the course of language development in speaking children versus signing children, we know that the child acquiring a spoken language has minimal opportunities to invent vocal symbols that are referentially iconic. The deaf child acquiring a manual language has ample opportunities to express semantic intentions in gestures that depict object characteristics and manipulative actions involving objects. The sign-acquiring child, whether having Deaf or hearing parents, faces the problem of adapting natural gestures to the schematized and conventionalized gestures that constitute the lexicon and morphology of an established sign language. From the point of view of the investigator, it is often hard to determine whether an early approximation to a conventional sign is the child's attempt to reproduce a form in the input or a spontaneously created gesture that bears fortuitous similarity to a conventional sign of the language.

Deaf children will produce sequences of meaningful manual elements, either gestures or signs. An important distinguishing feature, in emerging production, is to be found in the means of execution of individual movements. In comparison with gestures, conventional lexical items are articulated with crisper onset and offset, and with greater muscular tension. However, it takes the child some time to gain control over this prosodic distinction. Early signs are often partly *enactments*, i.e., the child is demonstrating, rather than simply signing. The prosodic contours of a sequence of units often suggest that a gesture can be integrated into a signed utterance without a prosodic break, as if it were a sign. That is, GESTURE+SIGN or SIGN+GESTURE can be articulated under the same kind of prosodic envelope as a SIGN+SIGN utterance. Conventional lexical items gradually free themselves from this prosodic matrix, but even in fluent adult production, they are subject to affective modulation and can be effortlessly embedded in signed utterances that contain elements of demonstrating. These issues pose a continuing challenge to formal analyses of the grammars of sign languages.

Miming and the acquisition of meaning components

Deaf children pay close attention to details of objects and actions, often showing exceptional abilities to mime actions and to depict components of scenes by means of body representation. Mimed acts reveal dimensions that are perceptually salient to children, including posture and facial expression, as well as object characteristics.

For example, JES (Age 34 months) intensely examines a picture that shows a clown catching a ball. After careful study, she performs three "stills" that depict the action, indicating analysis of its salient components. Before each re-enactment she carefully studies the picture again.

(11) Stages of depicting catching a ball:
- a. loose catching gesture
- b. repeat, with improvement of body posture expressing 'caught just in time' and facial expression expressing effort
- c. repeat, with precision in arm position as a "freeze-frame"

At the same chronological age, ROB (Adjusted Age 16 months) announces that she will play tennis (with no racket), and then performs five slow-movement postures over an extended time period:

(12) Stages of playing tennis:
- a. prepare start position, stepping backwards and bending knees
- b. move arms apart, focusing eyes
- c. move service-hand further back
- d. slowly stand upright
- e. swing arm at imagined ball

Refinements of mimed acts require attention to a number of dimensions of fluent signing, including prosody, posture, and nonmanual expression. One can only imagine that fine-tuning the perceptual-motor system for acts of depiction serves in the mastery of a manual/visual language.

Manipulative and depictive handshapes (property markers)

A major source for gestural elements in sign languages is the use of the hand to demonstrate how an object is manipulated or to use the hand to "draw a picture" of salient features of an object, such as shape. All sign languages that have been studied thus far have a set of conventionalized handshapes ("classifiers," "property markers") that serve as referring elements within verbs. The gestural basis of manipulative and depictive handshapes is evident in the communication systems devised by deaf children without access to a sign language. Such systems have been designated as "homesign," with extensive analysis by Goldin-Meadow and her colleagues (Goldin-Meadow, 1979, 1982; Goldin-Meadow et al., 1994; Goldin-Meadow & Mylander, 1984, 1990a, 1990b; Goldin-Meadow, Mylander, & Butcher, 1995; Morford & Goldin-Meadow, 1997; Morford, Singleton, & Goldin-Meadow, 1995). These studies demonstrate that individual deaf children systematically use a limited set of handshapes, combined with motion, to refer to objects on the basis of specific physical properties tied to characteristics of handling, shape, and size. Goldin-Meadow, Mylander, and Butcher (1995) carried out a detailed analysis of components of handshapes in four homesign systems, created by children between the ages of 2;10 and 4;11. All four children used a set of basic handshapes, described by the researchers as Fist, O, C, Palm, Point, Thumb, V, and L. Components of hand breadth and finger curvature systematically mapped

onto features of the referenced objects: Point and Thumb handshapes referred to manipulation of very narrow objects, Fist and O referred to wider objects, and C and Palm were used for the widest objects. For example, all four children used a large C-handshape to represent handling an object greater than 5 cm in width. All of the children used Point (index finger) for straight skinny objects, such as straws, candles, pencils. Three of the children used a flat palm for vehicles. Overall, handshapes could be placed in systematic paradigms or matrices of contrasts for each child. In addition, most handshapes were combined with one or more type of motion.

When the deaf child receives signed input, the matrices of contrasts are inherent in the language. Appropriate use of property markers is richly demonstrated in the video recordings of both SLN and SSD receiving children. Consider the following example, discussed in Chapter 3: ELS (SLN-H, Adjusted Age 14 months) tells the investigator about a photograph of her father pushing her in a baby buggy. An appropriate SLN lexical item meaning 'push' is part of a full sentence meaning something like, 'Papa, there in the picture, me pushes'. She first makes the lexical sign PAPA, points to the photo, points to herself, and then extends two S-hands, palms down, arms straight, and moves arms forward. This looks like a pushing gesture, but it is also the appropriate sign, incorporating the property marker handshapes and orientation that indicate a horizontal bar.

(13) *CHI: PAPA PNT_3(on_photo) PNT_1 (push)-pm'HO_S(2h)-pth'F .

The close relation between gesture and conventional sign no doubt provides a bridge for the acquisition of lexical items.

Gesture/signs like the form of the verb in (13) can be characterized as SLN lexical items when they begin to fit into systematic sets of contrast. For example, two flat hands with palms extended away from the body might be used to refer to pushing a box; or the two-fist configuration used in (11) might also move toward the body to designate an act of pulling a baby buggy. And so forth. As a system emerges it becomes possible to describe the child's signing in a set of paradigmatic contrasts, including number of hands, handshapes, orientation, direction and type of movement, and so forth. The heart of SLN—like all signed languages that have been described in detail—lies in the construction and use of such polycomponential verbs, as discussed in Chapter 3 (also see, e.g., Engberg-Pedersen, 1993; Slobin, Hoiting et al., 2003).

The deaf children learning SLN (with rare and later examples from SSD-learning children) are at work in beginning to produce such constructions, drawing upon their own motor productions and imaginations, along with the linguistic forms of the sign language that they are exposed to. The data contain numerous creative extensions of lexical items that indicate that the child is exploring parameters of handshape in signs. For example, JES signs that her little brother has thrown an object against the wall. She uses the conventional sign for throwing, but opens her hand to a flat palm at the end of the sign, moving her hand up and down to indicate the flat extent of the wall. This kind of extension could be conventional in SLN, but it is not. Yet, the handshape and the prosody of the sign make this look like a lexical item, rather than a gesture.

Note too that gestures have characteristics that can be used as symbols. One such characteristic is the literal physical distancing of a gesture/sign from its referent object or event. For example, consider the situation depicted in Figure 4.9.[30] JES, at chronological age 2;8, moves from a pointing gesture to a tracing movement that refers to a completed activity.

[30] This example is discussed in Hoiting and Slobin (2007).

She has been drawing on a magic slate with her index finger and tells her mother (seated opposite) about what she has done. She traces a circle above the slate and then points at the slate—but without touching it, and then, without a prosodic break, signs EASY (a 5-hand brushed down the chin) while looking at her mother. The gesture of drawing has thus coalesced into a moving point which is a kind of distanced symbol. JES is pointing now at an event—the completed action of drawing a circle—which then becomes the topic of a comment, that is, a sort of predication in which EASY is predicated of the action on the slate, which is then pointed to from a little distance. JES's point in Fig. 4.9 is smoothly incorporated into an utterance (the equivalent of something like 'that was easy'). It is, at one and the same time, a gesture, an index, and a budding linguistic symbol. In a signed language, elements of the physical space can be integrated into the linguistic space.

Figure 4.9
Distanced Point at Trace of Event[31]

The transition from gesture to sign, from iconic enactment to conventional symbols, is gradual. There is no clear line at which one can say: Now, and only now, has the child begun to use an established sign language.

Development of componential structure of verbs

Paths of movement

The combination of a simple path and a pm that designates a moving figure is basic to sign language, and easily accessible to very young learners. Path is an inherent part of the meaning of many verbs, particularly those that designate falling or directed object manipulation. The following are examples from all three groups. In the interest of consistency across groups, all ages are given as Adjusted Age.

(14) SLN-D (JES 18 months): JES has been writing with a pen which then falls down. She keeps her hand in a baby-O (BO) handshape, but carries out the conventional path for the verb 'fall', which requires palm inversion and downward path. The correct version requires a property marker that indicates

[31] Special thanks to Yolanda Duyn for producing the drawing on the basis of a videoclip.

the shape of the fallen object, namely pm'STK (stick-like object, indicated by extended index finger). This is an example of an attempt to incorporate an ongoing handshape into a verb, maintaining the movement pattern of the verb. An asterisk in square brackets indicates an error.

*JES: (fall)-pm'BO[*]-pth'D-ori'U-'mvt'INV

(15) SSD-H (BAS 11 months): By contrast, an SSD-learning child uses the default 5-handshape to refer to all types of falling objects. That is, he has a frozen form which is generically correct, but not adjusted to the level of verb specificity of SLN. As such, there is no evidence in the use of 'fall' to credit the child with polycomponential analysis of this verb. This is probably due to the nature of SSD input, as discussed in Chapter 5. Parents who have been taught SSD tend to use canonical verb forms for most entities, being unaware of the characteristic level of verb specificity SLN. In the following example, as in (14), BAS is referring to a fallen pen:

*BAS: (fall)-pm'5[*]-pth'D-ori'U-'mvt'INV

(16) SLN-H (ELS 14 months): A good example of appropriate and productive use of both a property marker and path of movement is ELS's description of her father pushing her in a buggy, discussed in Chapter 3 as well as presented as (13) above. Both handshape and path are appropriate, and there is evidence that the child uses other handshapes for other sorts of object manipulation. Example (13) is reproduced here as (16):

*ELS: PAPA PNT_3(on_photo) PNT_1 (push)-pm'HO_S(2h)-pth'F .

A property marker and a path are also easily combined for purposes of designated an actual path traversed by an entity in space. One example is sufficient.

(17) SLN-H (BER 12 months): The child comments on the path of a helicopter using the handshape for airplane. This is no doubt due to the fact that the entity handshape for helicopter is infrequent and was not known by his hearing parents. The path moves laterally upward, depicting the upward movement of the helicopter.

*BER: (fly_helicopter)-pm'AIRPLANE[*]-pth'L_U .

The use of the *pth* component to indicate actual movement is often not precise, especially with regard to starting point. This reflects the widely-documented tendency in early child speech, across languages, to attend more to goals than sources (e.g., Lakusta & Landau, 2005). It is generally clear, however, that the combination of a property marker and path is intended to communicate the child's idea about an actual or potential path.

Difficulties arise, however, when the source-goal direction of a path encode relations between two human participants (often referred to as "agreement" in the literature based on formal grammars of spoken languages). It has been often reported that deaf children, learning various sign languages, have difficulty with the use of space to indicate argument roles of verbs. A good example comes from the most advanced child, JES. She wants to indicate that her baby brother has grabbed a paper crown off of her head. She correctly executes the verb 'grab'—but in its canonical source-goal path, which moves towards the signer. Her use of an

open bent-5 handshape that closes into a fist while moving is correct, but the path in this instance should have moved from her head toward the brother, rather than from the brother toward JES. The closing of the hand is part of the lexical composition of the verb 'grab'; therefore it is notated at mvt'LEX. Path is indicated by source (src'BRO) and goal (gol'JES). In addition, the verb is performed rapidly (JES is angry with her brother). She looks at her brother and then looks at her mother and signs:

(18) *JES: (grab)-pm'BF-mvt'LEX-src'BRO[*]-gol'JES[*]-mod'RAP .

It is not clear whether (18) represents a genuine "agreement error" or simply an automatic use of the canonical form of 'grab'. There is good evidence elsewhere in JES's data that she does use appropriate source-goal path for other sorts of interpersonal acts. It may well be, following Tomasello and others (Merriman & Tomasello, 1995; Tomasello, 1992), that the early lexicon consists of a number of "verb islands"—that is, there are many item-specific regularities before the emergence of systematic morphological marking across verbs.

Figures and grounds

The children often omit designation of a ground object when commenting on the path of a figure. This has been observed by T. Supalla (1982) in early ASL experiments on children's descriptions of stimuli of moving animated forms. Again, we see the saliency of the moving figure itself, with less attention to either source or the location in which movement occurs. In addition, small children have difficulty controlling the hands separately to indicate relations between figure and ground.

Types of property markers

The data of all three groups show early and varied uses of property markers to indicate referents both in terms of manner of handling ("manipulative property markers") and shape ("depictive property markers"). Examples (14) (JES's 'pen fall') and (16) (ELS's 'papa me push') demonstrate manipulative property markers. The following demonstrates a depictive property marker.

(19) SLN-H (GRE 17 months) The child is reminiscing with her mother about having seen a hot-air balloon at a shopping mall. She depicts the object by using two curved vertical 5-hands, palms facing, arms extended wide and drifting about, puffed cheeks and pursed lips. The use of both hands and accompanying arm extension and nonmanuals indicate exceptional size.

*GRE: (float)-pm'SPHERE(2h)-mvt'WANDER-loc'SUP-^mod'AUG .
%gls: a very big balloon (was) floating about in the air

Example 17 (BER's helicopter) is an example of use of an entity property marker.

In this database I find no clear instances of tracing in space to indicate the shape of a referent. Three cases of tracing by the DD group all refer to tracing features of outlines on their own body, in particular the head and face, when talking about salient characteristics of people, such as a hairdo, a moustache, or a beard. These signs are often partly conventional, since tracing is part of SLN, but children often select the wrong handshape.

Polycomponential constructions

There are scattered examples of complex verbs in all three groups, although the rate of productivity is lower than found in hearing children learning inflectional languages. For example, see the high rates of complex verb productions reported for very young children, learning such spoken languages as Georgian (Imedadze & Tuite, 1992), Hebrew (Berman, 1985), Turkish (Aksu-Koç & Slobin, 1985), West Greenlandic (Fortescue & Olsen, 1992), and others. The core of the SLN system of complex verbs is clearly present early on, but limited input for most of the children, along with the circumstance that most of the video recorded situations deal with here-and-now activities, no doubt account for the relatively slow development of complex constructions. In fact, none of the children produced very many complex verbs in the video samples. Nevertheless, there are sufficient examples to underline the point that after less than one year of exposure, deaf children with hearing parents, using SLN, produce a range of verbs that are made up of one or more property markers, path and movement components, and modifications of intensity, size, affect, and aspect. In addition, complex verbs fall under the operator scope of affirmation, negation, and interrogation.

Chapter 5
Input and Interaction:
Child Directed Signing and Consequences for Acquisition[32]

Introduction

Linguistic input to toddlers is a multifaceted phenomenon. This chapter deals with a selection of interactive issues between adult linguistic models and sign-acquiring children. First reviewing some very early sign input features, the chapter serves as the starting point for various pragmatic frames in caregiver signing in which different types of repetition come with various forms to not only keep the child's linguistic attention by offering a platform for dialogue, but in particular to illustrate the available frames in which signed verbs and nouns may appear.

Again this type of interactive patterning seems hardly present in SSD input, as shown by comparative data from the two groups SSD-H and SLN-H, as measured by utterance length and morphological complexity. Production rate is added as a factor of comparison between groups. Finally, input complexity in terms of verb constructions, as measured by semantic complexity in polycomponential verbs, is compared between a Deaf and a hearing teacher.

The role of the parent: Child-directed communication

In all situations of language acquisition, the parent serves as a model for communication and provides the child with access to the language. Parents and other language users are the source of word meanings and grammatical constructions. Through the use of such discourse patterns as question–answer sequences, planning, narrative, and so forth, children are socialized in the linguistic and communicative practices of the community. There is a large body of research on child-directed *speech*, across a number of languages, showing that parents naturally make various adjustments in communicating with infants and toddlers (see Snow 1995). For example, child-directed speech has special intonation contours, simplification of vocabulary and syntax, and much repetition. As the child shows abilities to join in interaction, parents gradually increase the level of complexity of their own messages, allowing the child to grow as a communicative partner.

Studies of Deaf parents show similar patterns of child-directed *signing* (Holzrichter 2000, Masataka 2000). Parents are careful to sign within the child's field of vision, using signs that are larger or slower than usual, close to the child—often even on the child's body. They are adept at gaining and maintaining the child's visual attention. And early sign input, like early speech input, is characterized by short, simple utterances with much repetition.

An important aspect of child-directed communication—whether in speech or sign—is *variation*. It is natural, when attempting to secure the child's comprehension, not only to

[32] This chapter is based, in part, on N Hoiting & D. I. Slobin (2002). What a deaf child needs to see: Advantages of a natural sign language over a sign system. In R. Schulmeister & H. Reinitzer (Eds.) *Progress in sign language research. In honor of Siegmund Prillwitz / Fortschritte in der Gebärdensprachforschung. Festschrift für Siegmund Prillwitz* (pp. 267-278). Hamburg: Signum.

repeat, but to repeat with slight changes of vocabulary or word order. This is not a conscious process, but it is almost unavoidable when the child doesn't fully comprehend or comply. Previous research suggests that systematic variation in child-directed speech can provide the child with valuable information about the lexical and grammatical structures of the language (Küntay & Slobin 1996; Naigles 1996; Naigles & Hoff-Ginsberg 1995; Slobin & Küntay, 1995). The data of the present study show clearly that hearing parents who are learning SLN are able—remarkably quickly—to provide their deaf children with meaningful patterns of child-directed signing and variation, while parents trained in SSD, by comparison, are quite limited. This is not the fault of the parents or of the training procedures. The pre-1995 SSD classes were serious attempts to teach hearing parents and teachers how to communicate with deaf children, and the adult pupils were devoted learners. Apparently there is something in the nature of a sign *system* that is not conducive to the long-term growth of successful communication.

Variation in child-directed signing

What can a parent do if a child does not immediately respond to a parental question, request, or imperative? There are several possibilities, from simple to more complex. Consider brief examples of each, drawing from the data of home video recordings. (For more details on "variation sets" in child-directed communication, see Küntay & Slobin, 1996.)

Repetition without variation

The least demanding strategy is to simply repeat what one has said, using the same items, in the same order. From a developmental point of view, this seems to be the first technique used by parents—but it is soon followed by more elaborate forms in the course of the child's linguistic and cognitive growth. It is, however, this type of simple variation that we typically find in the child-directed signing of the hearing parents who have been taught SSD. Repetition without variation remains a dominant strategy for these parents throughout the age range under study. The following is an example of a hearing mother signing to a child of age 2;11[33]. She wants the child to gather up the toys that have been scattered about, and is limited in her verb lexicon. (For the purposes of this chapter, it is sufficient to revert to traditional capital-letter glossing of signs, unless the internal structure of a particular sign is at issue.)

(1) %MOT: *chi HELP CLEAN-UP .
YOU HELP CLEAN-UP # CLEAN-UP .

The only difference we see here between the two utterance lines, is an indication of gaze direction at the child (*chi), followed by a manual point at the child (YOU). The two utterances simply repeat the same signs, substituting pointing by gaze with pointing by finger. Such a simple repetition may sometimes succeed in drawing the child's attention to the desired behavior, and to some relevant lexical items—but it *does not open up possibilities for dialogue* nor does it invite further exploration of linguistic possibilities. In this case the child did not answer the request; instead the mother started to clean, as if to give an actual example herself.

[33] Because the focus of this chapter is on the speech of adults, rather than children, it is sufficient to identify examples by providing the hearing status of the mother, the birth age of the child, and the form of input.

Repetition with variation

More sophisticated repetitions require that the parent have a degree of flexible control of lexical and grammatical options. This comes as the child shows increasing capacity to act as a conversational partner. At this level of child-directed communication, the parent holds the general content of the message constant, but tries out different versions—different "variations on a theme." Child-directed signing in SLN, like child-directed speech in a range of languages, shows several types of variation. The parent can:

- change grammatical marking;
- change lexical items;
- change word order;
- add and delete lexical items.

The following is an example of repetition with variation in the SLN signing of a mother to a child of 2;2. The mother has been learning SLN for 12 months, and is already capable of this level of variation. She is trying to interest the child in reading a book. She varies the verb: READ, LOOK-AT; and she elaborates the descriptions of a book to be read: FARM (=a book about a farm), NEW BOOK.

(2) BOOK READ?
BOOK READ?
FARM?
BOOK LOOK-AT?
NEW BOOK?
LOOK-AT?

I suggest that the mother feels free to explore the possibilities of variation because she is not tied to finding signed equivalents for Dutch words and sentences, and because her training—even at this beginning level—has provided her with an appropriate SLN lexicon and basic sign order rules.

Repetition with variation and elaboration

When the child begins to respond—becoming an interactive partner with the parent—the parent is encouraged to elaborate and vary the message further. This is, of course, due to the child's increasing indications of linguistic and cognitive competence. The following example, from a deaf father to a child of 2;9, shows the high degree of variation that is available in normal SLN communication. In this situation, the child and the father are seated on a couch, and a visiting, hearing adult is on a nearby chair. There is a play kitchen at some distance, and the father and visitor try to engage the child in going to the kitchen and bringing them something to drink. What is especially interesting in this variation set is the father's fine-tuning of the object that he wants the child to get from the kitchen: COFFEE, POT, GREEN, GREEN POT. He also opens up possibilities for inference, going from I WANT COFFEE to TAKE-TO-ME COFFEE. In the process, there is variation in word order, variation in eye gaze and considerable use of deixis, both as individual points and as incorporated in the verb TAKE.

(3) I WANT COFFEE $\text{POINT}_{\text{to-kitchen}}$ WANT.
(Visitor: YOU. I WANT TEA WANT YUMMY.)
TAKE-TO-ME TEA $\text{POINT}_{\text{to-kitchen}}$ ·
COFFEE TAKE-TO-ME $\text{POINT}_{\text{to-kitchen}}$ ·

COFFEE POINT$_{\text{to-kitchen}}$ ·
GREEN TAKE-TO-ME GREEN POT POINT$_{\text{to-kitchen}}$ ·

At some point, the child joins into the parent's repetitions and variations, and dialog starts to emerge. Little interactive dialogs are already possible with minimal SLN, as shown in the following example of a hearing mother and her daughter of age 2;4. The mother has only been learning SLN for eight months, but can respond to her child's initiative with a short variation set that engages the child. Indeed, the child herself ends the discussion with a little elaboration of her own. The topic is a candle-holder that has five arms, some with candles, and some empty. The child begins, and the mother carries on:

(4)		
	Child:	POINT$_{\text{at-empty-holder}}$ GONE.
	Mother:	POINT GONE POINT TOO-BAD.
		EXTINGUISH EXTINGUISH POINT TOO-BAD.
	Child:	GONE.
		POINT$_{\text{at-a-candle}}$·
		POINT$_{\text{at-empty-holder}}$·
		POINT$_{\text{at-a-candle}}$·
	Mother:	ONE GONE, YES.
	Child:	POINT$_{\text{at-empty-holder}}$·
	Mother:	POINT$_{\text{at-empty-holder}}$ SAME.
	Child:	POINT$_{\text{at-other-empty-holder}}$ GONE.
	Mother:	SAME GONE.
		SAME GONE.
	Child:	POINT$_{\text{at-first-empty-holder}}$·
	Mother:	SAME GONE.
	Child:	POINT$_{\text{at-second-empty-holder}}$·
	Mother:	YES.
	Child:	YES.
	Mother:	GONE.
	Child:	POINT$_{\text{at-base-of-candle-holder}}$·
		DON'T KNOW.
		BROKEN?
		POINT$_{\text{at-base-of-candle-holder}}$·

Constraints of co-speech signing

I do not find these sorts of variations, elaborations, and emergent dialogs in the SSD-trained families from before 1995. It seems that a hearing parent, formulating utterances out loud in Dutch, is not open to the flexibility of reordering signs that one finds in SLN. Rather, utterance production is paced by the timing and rhythm of Dutch, producing sign sequences that are often difficult for the child to interpret. Consider the following example, produced by an experienced SSD-using mother. She has been using SSD for three years, and is addressing her second deaf child—a boy of age 2;11. They are looking at a picture book together and the child wants to make a drawing. Let me first consider just her signing, since this is, after all, the only input that the deaf child actually receives in this situation:

(5)(a) KNOW?

POINT$_{\text{at-child}}$·

POINT$_{\text{at-child-and-self}}$.
HOUSE.
DRAW.
POINT$_{\text{far-off}}$.

The message is not very clear. It seems to mean something like: 'Do you know? You, you and I, draw a house, somewhere over there in the distance.' But now let us line up the signing with the speaking. The mother probably can't help but believe that the child can also process what she is saying. Putting the two parallel messages together, one can determine that she was trying to suggest that the child draw a house like the one that they had drawn earlier: 'Do you remember that we drew a house together?' (*Weet je nog... toen wij samen een huis getekend hebben?* 'Do you still know... when we together a house have drawn?') The Dutch words in the second column were produced at the same time as the signs in the first column.

(5)(b)	signs/gestures	spoken Dutch	translation of Dutch
	KNOW?	weet je nog	(=do you still know)
		toen	(=when)
	POINT$_{\text{at-child}}$.	wij	(=we)
	POINT$_{\text{at-child-and-self}}$.	samen	(=together)
	HOUSE.	een huis	(=a house)
	DRAW.	getekend	(=drew)
	POINT$_{\text{far-off}}$.	hebben	(=have)

A corresponding SLN version of the mother's communicative intent might be:

(5)(c) KNOW? NEAR-PAST. POINT$_{\text{two-fingers-between-self-and-child}}$ HOUSE DRAW. KNOW?

In addition to different word order, SLN requires two different verbs for the Dutch concept of 'know', distinguishing 'know' and 'remember'. But this distinction is lost here. In addition, this mother—as experienced as she was in simultaneous speech and sign—was compelled to use some sign to accompany the final Dutch auxiliary, *hebben* 'have'; but all she did was point vaguely behind her. Here it is important to note that past tense in SLN is indicated at the beginning of a discourse rather than the end, and that there are obligatory distinctions between degrees of distance of a past event from the moment of speaking. Such distinctions are not marked in Dutch, and the mother's bare use of the sign KNOW, followed by what might be a distant-past gesture at the end of the utterance, is not compatible with the fact that the event took place in the recent past. On the other hand, early in the simultaneous Dutch version, the mother says *toen* 'then', indicating the time frame, but not accompanying it with a sign, as would be expected in SLN, as indicated by NEAR-PAST in (5)(c). The child did not respond to the mother's message, and a dialogue did not ensue. Instead, the mother began to draw.

The SLN videotapes are quite different. What does SLN input provide that SSD input does not? SLN input gives the child experience with:

- signs in many different contexts
- lexical choices
- appropriate verb forms, with multiple components

- models for sentence construction
- models for speech acts (questions, requests, demands, plans, etc.)
- principles of visual discourse
- principles of reference

In brief, SLN input provides the tools for building a natural language in the manual/visual modality.

My conclusion as a clinician and psycholinguist—after having examined hours of SSD videotapes—is that Sign-Supported Dutch does not work sufficiently if the child does not know Dutch. Systems like SSD can be useful between Deaf and hearing adults who are bilingual in SLN and Dutch, and for those hard-of-hearing or children who have some access to the spoken language (perhaps also children who are successful in making use of a cochlear implant). And such systems can be useful for pedagogical purposes of contrastive linguistics, once students have some command of SLN. But they do not function successfully as a first language for deaf children or as a second language for their hearing parents, as has been claimed before by Livingstone (1983) for ASL, or Knoors (1992) for SLN. Insights on the influences of various types of child-directed signing can be assessed by examining the productions of the children, as discussed in Chapter 4. To conclude this overview of input issues, consider a selection of data from Chapter 4 to support the claims made in this chapter.

Children learning SLN and SSD: Some comparative data

The data presented below constitute a subsample of five of the SLN-H and five of the SSD-H children, based on 180 minutes of videotape from each child-parent pair, and selected as children of hearing parents with a high rate of production and complexity. Note that the children in this selection are partly the same and that this group does not involve deaf-of-deaf.

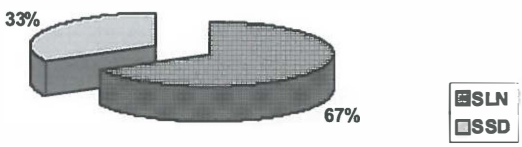
Table 5.0 Research sample

Language	Parents	Age Range	N
SLN (SLN-H)	Hearing	1;4–3;0	5
SSD (SSD-H)	Hearing	1;5–3;0	5

Utterance length

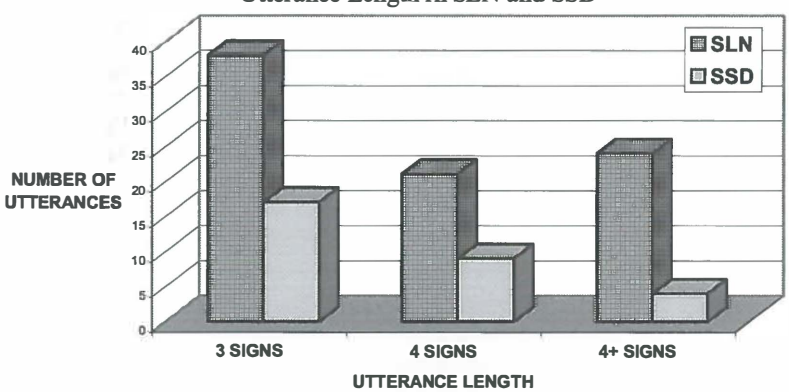
To begin with, consider simple utterance length in signs. Figure 5.1 presents the percentage of utterances, across the two groups, that have two or more signs. The figure shows that the majority of longer utterances (67%) are produced by children learning SLN.

Figure 5.1.
Utterances with 2+ Signs



The contrast between the two groups is even stronger when we consider utterances with three or more signs, as shown in Figure 5.2. The figure shows the numbers of utterances with 3, 4, and 4+ signs. For each of these utterance lengths, the SLN children produce a greater number

Figure 5.2.
Utterance Length in SLN and SSD



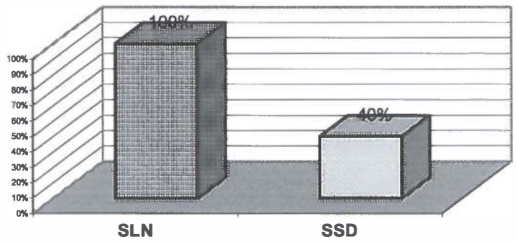
of signs. One can also see a sharp decline in utterance length for the SSD group, but not for the SLN group (compare the columns for 4 signs and 4+ signs for the two groups). In brief, with increasing utterance length the SSD children fall farther and farther behind the SLN children.

In addition to these quantitative differences between the two groups, there are also qualitative differences. The SSD children use fewer questions, and show less variety in sentence type overall. Such lack of variety in sentence types, of course, provides limited data for discovering rules of word order and ellipsis in the language.

Morphological complexity

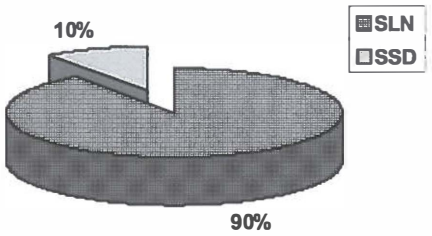
Finally consider children's use of verbs with variation of handshape and directionality—that is, signs that have internal complexity. Figure 5.3 shows that all of the five SLN-learning children (100%) made use of complex verbs, but only two of the five SSD-learning children (40%) did so. Clearly, SSD input does not provide sufficient models of the substitutable components of sign language verbs.

Figure 5.3.
Percentage of Children using Complex Verbs



The pattern is even more striking if we group together all of the complex verbs used by these seven children, as shown in Figure 5.4. The SSD children make up 29% of this group, but they produced only 10% of the complex verbs in the transcripts. That is, 90% of the complex verbs were produced by the five SLN children. Even given this small number of participants, the different starting ages and the amount of data, it is apparent that SSD has limiting consequences at the level of the word, as well as at the level of the sentence.

Figure 5.4.
Percentage of Complex Verbs per Group



Again, these groups may be small in number, and as is clear from the absolute numbers in Appendix A.b, contain within-group variation, however the overall differences per group are salient, suggesting that even from these limited and fairly rough data important patterns can be discerned: the SLN groups simply grow earlier and faster in linguistic complexity.

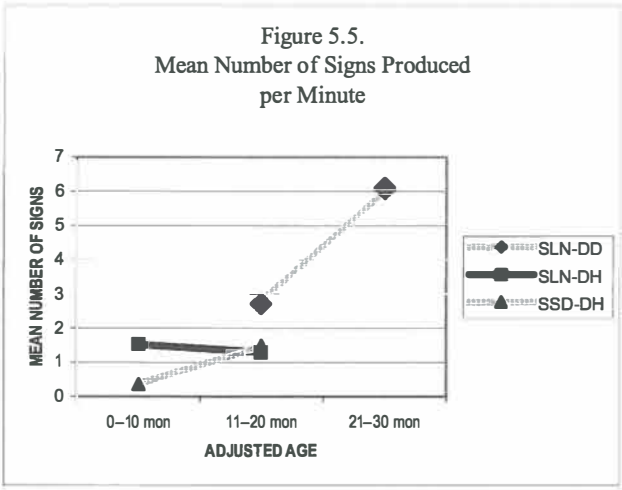
Rate of production

Another way to compare the SLN and SSD groups is to examine the mean number of signs produced per minute. This can be taken as rough indication of the child's fluency in the language. The data are presented in Figure 5.5. The graph compares the three input groups, SLN-D, SLN-H, and SSD-H. The data come from across all available samples, counting the

production of signs—regardless of their internal complexity—per minute of recording. In order to make the data comparable, they are presented in terms of Adjusted Age.

On this measure there is a clear advantage for children with Deaf parents—that is native or near-native signers. There is essentially no increase in rate of sign production for SLN-H children in the first 20 months of exposure. The SSD-H children start quite low, and after 20 months succeed in matching the SLN-H level of less than two signs per minute—which is, in comparison with children learning a spoken language, very low indeed. One must bear in mind, however, the numerous factors listed in Chapter 2 that account for an overall low rate of sign production in early stages of signing during ongoing object manipulation and play. At this level of Adjusted Age, children with Deaf parents are already signing about three signs per minute—again, low by comparison with speaking children, but clearly higher than either of the groups with hearing parents. The SLN-D curve continue to progress steeply, reaching six signs per minute by the end of the period under study, as defined by Adjusted Age.

Figure 5.5.
Mean Number of Signs Produced per Minute



The data here provide—again via a rough type of measure—an indication of a clear advantage not only for SLN input, but for fluent SLN input. Note that both SLN groups were equated on cognitive and social measures, and that the only relevant difference here is the signing competence of the parents.

In order to examine the issue of input quality in more detail, I will turn next to measures of the complexity of SLN input that children receive in the preschool from fluent signing adults.

Input in a natural sign language versus sign-supported speech

As these data suggest, supported also by the more detailed data presented in Chapter 4, children receiving primary input in SSD—by the age of 3—produce shorter and less complex utterances than children exposed to SLN. I propose that the explanation lies in the collection of burdens imposed on parents who use SSD.

The most basic issue, of course, is that the grammar of SSD is based on Dutch, rather than on principles of sign language organization. This means that verbs exist only in citation forms,

and movement in space cannot be used for agreement resulting in SSD users who do not use the signing space as a linguistic tool. Furthermore, the face is not used as part of the linguistic system, thus depriving SSD of the necessary simultaneous use of operators on the face and lexical items on the hands. Therefore, the hands must deal with all grammatical issues, rather than the division of labor between hands and face that exists in natural sign languages. Another consequence of reliance on Dutch syntax is that users of SSD don't have recourse to the natural reordering of signs for functions such as foregrounding, topicalization, emphasis, and so forth. And, in general, it is difficult to coordinate speaking and signing, often resulting in asynchronicity. Ungrammatical signing and/or unprosodic and a-rhythmic speech are often the result in these bi-modal, bi-lingual systems. This combination of factors prevents most SSD-using parents from feeling confident with the system, because they are not provided with sufficient means for creating an automatized and flexible means of communication. Thus their children receive a limited and often noncoherent sign input. The burden imposed on the parents becomes a burden imposed on the child, as reflected in findings hereafter.
One might wonder why this issue is relevant in 2006, after Dutch institutions abandoned SSD in the 1990s. The answer is that sign systems have again attracted attention, as a possible form of input for deaf children with cochlear implants. I would argue that these children have to acquire a natural language as a first language—and the only accessible language, in the early years, is a natural sign language. And, because the parents must communicate with these children, the parents must also be trained in a sign language that they can effectively master and use with their children. Therefore it is urgent to examine available data that provide for comparisons of SSD and SLN in the 1990s, with the hope of easing the way for deaf children and their parents in this era. Although language choice is a parental responsibility, it is currently the advice in the schools of the KEGG that parents use SLN with their children, regardless of their hopes for eventual success of cochlear implantation. Further research on SSD and SLN can provide necessary linguistic and psycholinguistic grounding for issues of language learning and education.

Verb complexity in fluent SLN input

The data from the teachers in the preschool (*peuterspeelzaal*), who provide children with SLN, gives a view of the potential complexity in verbs presented to children in the age range of this study. Polycomponential verbs have been extracted from all of the utterances of the Deaf teacher in eight preschool sessions of about a half-hour each[34]. Table 5.1 lists all of the verbs with their frequencies of use (265 tokens).

[34] The following children of the current our study took part in these sessions: BOB – SLN-H, JES – SLN-D, LEA – SLN-H, LIZ – SLN-H, SOL – SLN-H.

Table 5.1
All Polycomponential Verbs Used by the Deaf Teacher

VERB	FREQ		
be located	5	*pick up*	2
bite	2	*pour*	1
blow out	2	*pull*	11
catch	2	*push*	11
comb	3	*put down*	3
come back	2	*put in*	1
cut	5	*put on*	5
cut apart	3	*receive*	1
cut through	2	*ride*	1
drink	4	*run*	2
eat	11	*shake*	6
empty	1	*shine*	5
fall	12	*shove*	2
fall apart	1	*shove*	1
fall over	3	*sink down*	2
flutter	11	*sneak*	6
fly	5	*spread out*	6
give	13	*stamp*	4
go	3	*steal*	1
gobble	2	*stick on*	2
grab	1	*suck*	1
hand	2	*swim*	1
hang	18	*take*	7
hit	4	*take apart*	2
hold	2	*take away*	1
hop	1	*take off*	4
jump	6	*take out*	4
lick	1	*tear*	3
lift	2	*throw*	9
light	3	*tiptoe*	2
line up	1	*tumble*	2
look	2	*turn*	6
nibble	2	*waddle*	2
open	6	*wag*	4
pat	1	*walk*	9
peel	2		

The input is obviously rich and varied. The verbs were transcribed in BTS and given a complexity rating on the basis of the number of components per verb. Each verb contains at least one property marker (*pm*) and one or more additional components. Table 5.3 lists all of the combinations of components that occur in these verbs—again, a great range and diversity of complex forms. Table 5.2 lists the semantic components that appear in Table 5.3:

Table 5.2
BTS Semantic Components Used by the Deaf Teacher

aff	Affect
asp	Aspect
bmu	body meaning unit
dis	discourse marker
gol	movement to a place or to contact
loc	locative relation between figure and ground
mod	modification of the referential meaning being expressed by adding a dimension
mvt	internal movement pattern of a verb
opr	grammatical operator which operates on a whole phrase or clause
ori	orientation of palm, fingertips, when semantically meaningful
pst	posture of figure
pth	path of movement, when semantically meaningful
rel	movement relative to a fixed referent object
src	movement from a place or from contact
trc	trace shape of referent object

Table 5.3
All Combinations of Semantic Components
in Polycomponential Verbs Used by the Deaf Teacher

SEMANTIC COMPONENTS						FREQ
pm	mvt					**14**
pm	mvt	src				**6**
pm	mvt	src	mod			**1**
pm	mvt	src	asp			**1**
pm	mvt	src	gol			**4**
pm	mvt	src	gol	dis		**1**
pm	mvt	gol				**12**
pm	mvt	gol	aff			**1**
pm	mvt	gol	mod			**3**
pm	mvt	gol	asp			**1**
pm	mvt	gol	opr			**2**
pm	mvt	gol	asp	mod		**2**
pm	mvt	gol	bmu	opr		**1**
pm	mvt	gol	bmu	aff		**4**
pm	mvt	gol	bmu	mod	aff	**7**
pm	mvt	asp				**5**
pm	mvt	asp	mod			**1**
pm	mvt	pth				**27**
pm	mvt	pth	asp			**1**
pm	mvt	pth	rel			**4**
pm	mvt	pth	mod			**1**
pm	mvt	pth	bmu			**1**

pm	mvt	pth	aff			1
pm	mvt	pth	opr			2
pm	mvt	loc	pth			2
pm	mvt	loc	mod			1
pm	mvt	rel				1
pm	mvt	rel	bmu			1
pm	mvt	opr				1
pm	mvt	bmu	aff			3
pm	mvt	trc				1
pm	src					1
pm	src	gol				16
pm	src	gol	mod			1
pm	src	gol	asp			1
pm	src	gol	opr			5
pm	src	gol	mod	opr	aff	1
pm	src	mod	opr			1
pm	gol					8
pm	gol	opr				2
pm	gol	mod				1
pm	gol	mod	aff			1
pm	pm	mvt	gol			4
pm	pm	mvt	pth			1
pm	pm	mvt	src	gol		2
pm	pm	gol				1
pm	pm	loc	asp			1
pm	pm	loc	mvt			3
pm	pm	loc	mvt	asp		2
pm	pm	loc	pth	asp		4
pm	pst	mvt	pth			1
pm	loc					3
pm	loc	gol				1
pm	loc	pth				11
pm	loc	pth	gol			1
pm	loc	pth	asp			4
pm	loc	pth	asp	mod		1
pm	pth					13
pm	pth	mod				7
pm	pth	dis				1

pm	pth	asp				6
pm	pth	rel				3
pm	pth	rel	mod			4
pm	pth	rel	asp			1
pm	pth	asp	mod	opr		4
pm	ori	mod				1
pm	ori	loc				2
pm	ori	loc	pm			7
pm	ori	pth				2
pm	ori	pth	loc			2
pm	ori	pth	mod			1
pm	ori	pth	loc	pm		9
pm	ori	mvt	pth	asp		3
pm	ori	pm	ori	loc	asp	1
pm	ori	trc	rel			1
pm	trc	mod				2
pm	trc	trc				2
pm	trc	trc	asp			1
pm	trc	rel	mod			1

The summary overview provided above indicates the rich polycomponential and head-marking nature of SLN. It also demonstrates that deaf toddlers are exposed to a great range of complex verbs from early on, although it will take them another several years to gain fluent mastery of the system—beyond the age-range considered in this study. The adult signing includes simultaneous indication of source and goal, simultaneous modifications of aspect and other event characteristics, detailed attention to paths of movement, and discourse markers. As Morgan et al. (2008) have shown with regard to acquisition of BSL, and Newport & Meier (1985) with regard to ASL, mastery of a sign language beyond the early phases is marked by extended problems with controlling simultaneous information conveyed by two hands with varying handshapes, locations, and movement, along with several dimensions of nonmanual expressions of face and body. Baker, van den Bogaerde, and Woll (2005), present an unpublished longitudinal summary of Loew and Kegl, which concludes that mastery of the productive use of classifiers and spatial verbs is not completed before age 10.

There is also an experienced hearing teacher in the playschool. She, too, uses a range of complex verbs, though with less fluency than the Deaf teacher, and with a considerably smaller rate of production (73 tokens, in comparison with 265 for the Deaf teacher). Figure 5.5 shows that both teachers present the children—as young as 18 months of age—with verbs of which the majority have three or more semantic components. In order to focus on the strictly grammatical components of verbs, the calculations represented in Figures 5.6.a and 5.6.b exclude components of modification, affect, and discourse.

Figure 5.6.a.
Deaf Teacher - Semantic Components per Polycomponential Verb

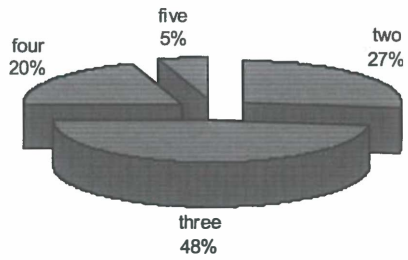
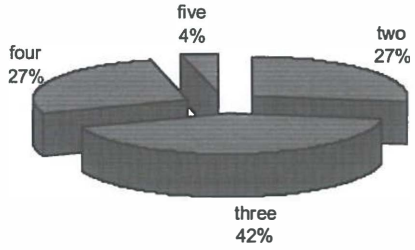


Figure 5.6.b.
Hearing Teacher - Semantic Components per Polycomponential Verb



Conclusion

A natural sign language such as SLN has the potential for providing very young deaf children with a rich input that is complex in its morphosyntax, semantics, and pragmatics. Hearing parents who are given SLN instruction when their children are tiny can successfully establish linguistic communication that allows not only for mutual understanding but for the child's growth in the language. Additional input from fluent adult signers, inside the preschool and outside the school in family life, especially from native signers, is critical for exposing young learners, from very early on, with a full range of possible constructions and meanings. By contrast, those parents who, in an earlier era, were encouraged to speak Dutch to their children while simultaneously providing some signs, did not succeed in establishing a comparably rich pattern of interaction and linguistic growth. However, long-term observation of children who began with SSD has shown that when those children encounter SLN early in their school experience, they are able to make significant progress towards fluency.

Chapter 6
Conclusions

"I'm all in favour of people doing descriptive work on things that they do not have any way of integrating at present into what they would consider a satisfactory theory, simply because you can achieve an appreciation of what is there only by beating a path into this untrodden, overgrown territory. It's greatly to one's benefit just to be aware of what there is, through whatever means of awareness happen to be available to him."
James McCawley (in Aarts, 1977, p. 235)

Complexity in any language is relatively easy to observe in children but hard to define for linguists because of the interactions of a variety of processes—both known and unknown, existing on several levels. These processes also differ due to typological features; furthermore, in signed languages, characteristics of the visual/manual modality add different dimensions of complexity, as the preceding chapters have illustrated. In this concluding chapter I return to problems of types of complexity and try to relate them to general linguistic and acquisitional issues. Reference is made throughout to the questions (Q) and hypotheses (H) set forth in Chapter 1.

To review: After the introductory materials on sign languages in general and SLN in particular in Chapter 1, the umbrella question—"Can deaf children learn SLN from hearing parents?"—was translated into linguistic terms: *What sorts of lexical and morphosyntactic development are demonstrated by deaf children exposed to three types of input situation?* The overarching linguistic question was broken down into questions and guiding hypotheses for each chapter. Chapter 2 presented early evidence for typological characteristics of SLN and their consequences for vocabulary development. Parental vocabulary checklists, as well as transcriptions of home video recordings, showed salient *preferences for verb acquisition* as compared to hearing children. This was true for all three groups of children—those acquiring SLN and SSD, and those with hearing as well as Deaf parents. In Chapter 3 a new sort transcription device is presented, derived from the underlying presumption that evidence of all potentially meaningful components should be represented in order to provide the opportunity of linguistic analysis based on full information of the internal structures of signs. It was argued that this innovative approach to the transcription of sign language productions allows for analyses and insights that are not possible when using existing procedures that either rely on written language glosses or finegrained phonological description. Results of analysis at the level of meaning components were presented in Chapter 4 on morphosyntactic development. The data provide evidence of growing complexity in quantitative as well as qualitative terms. Verbs (but not exclusively verbs) may serve as a starting category where an array of modifications begin to be applied to manual lexical items, most notably in the SLN input groups. There is evidence that some morphological processes emerge as modifications of points, as a bridge toward the acquisition of polycomponential lexical elements. The process of integrating manual and nonmanual components under scope control is clearly a prolonged task of growing control over the timing and placement of nonmanual items, as shown from gaze allocation to exploring the signing space. Chapter 5 showed comparable evidence of componential uses of signs in SLN input, but less so in SSD input. The notion of "variation sets" was introduced to highlight some of the event frames that parents and teachers provide to maintain discourse and alert the child to further complexity in ongoing discourse. Typological linguistic comparison of SLN and SSD underlined the problem of

using SSD as a primary input language. New perspectives arose from the consideration of an array of phenomena discussed in Chapters 2-5, and this chapter examines their potentials by comparing the research presented here to existing theories of child language acquisition, and the acquisition of signed languages in particular.

Vocabulary

The vocabulary study presented in Chapter 2 has shown that children acquiring SLN—whether from Deaf or hearing parents—show comparable developmental curves in vocabulary, as measured by the parental checklist. As compared to hearing children, the size of a spoken vocabulary is considerably larger at the age of three years than that of the signed vocabulary of deaf children (cf. Q2.1). In addition, comparisons between the three groups of deaf children show that SSD children stay behind in comparison with both SLN groups after the earliest period.

The possibility of comparing parental checklist data with the children's videotaped interactions, both with the parents at home and in the preschool, demonstrated a preponderance of action-orienting signing. When using signs that make reference both to actions (verbs) and entities involved in those actions (nouns), the ways deaf children use their first signs is in all cases in verb-like execution, even for object reference. Comparing this type of "over-use" of movement, even for nouns, led me to a change in perspective on the deaf child's early signed vocabulary. First, the child language literature—back to Dewey (1896), and continuing through Tomasello's work on early verbs, stressed the salience of action designations, even casting doubt on "noun" and "verb" as valid part-of-speech designations in very early child language. On the other hand, conflicting work stemming from Gentner's proposal that nouns are easier to learn than verbs, placed this issue in the midst of an ongoing "noun versus verb" debate in the field of child language. Examination of published work on these issues reinforced my claim that action-oriented object designations are better classified either as verbs or as whole event designations.

For those lexical items in which the same property marker is used in both the verb and noun forms, the child may begin with only the verb form, or may use a generalized form that does not clearly distinguish between "verb" and "noun."

- In the adult grammar, both the verb and noun are derived from a common underlying root form, as in Semitic consonant trigrams.
- The root form consists of both a given property marker and the location in which the property is articulated, generally with a characteristic movement contour.
- In the adult grammar, for such lexical items, the verb-noun distinction is expressed in the form of aspectual modulation of the movement.

These findings suggest different processes of *conceptualization* of the distinction between nouns and verbs, which were earlier claimed to be universal categories—at least for a subclass of lexical items. In this subclass, SLN verbs provide the context for noun acquisition, and also for overarching semantic categories that include both action and object expressions. If the processes of lexical learning operate like those that I have proposed for these data, then it will be necessary to reconsider traditional cognitive explanations, according to which the noun as a universal "prelinguistic" concept is available to any child, prior to the acquisition of verbs (Gentner, 1982).

Further, the pattern of verb acquisition observed here for SLN shows similarity to what P. Brown (2001) has observed for Tzeltal, and de León (2001) Tzotzil. Both of those Mayan languages provide the learner with specific lexicalization patterns that provide verb labels for finegrained subcategories of activities, implicitly including information about the types of objects involved in the activity (e.g., eating soft solids versus crunchy solids). Children learning SLN seem to have no particular difficulty with verb specificity, learning to use verbs that incorporate categorical information about types of objects or actions. Such acquisition patterns suggest that, in many instances, verbs can provide contexts for noun learning—and that the proposed "noun bias" may be more language specific than earlier claims suggested. The "preponderance of verbs in early vocabularies," then, as proposed by H2.1, is substantiated in the lexicons of the deaf children studied here. Thus a nuanced answer must be provided to Q2.3, "Are standard linguistic part-of-speech categories such as noun, verb, adjective, etc., applicable to sign languages and their acquisition?" The categories are not applicable across the board; rather, some lexical items, such as SLN signs with general meanings related to combing, may not only enter the lexicon as action designations ("verbs"), but, in the long run, both the "verb" and "noun" forms may be aspectual variants of a common semantic and handshape/location core. As proposed in Chapter 2, this common core can be realized with the aspectual modulation of repeated motion as a "verb" and with the aspectual modulation of a single motion followed by a hold as a "noun." If this analysis is correct, then, indeed, the standard part-of-speech categories may not be applicable to a language like SLN in the same way as they apply to a language like Dutch.

At the same time, H2.1 goes on to attribute a preponderance of early verbs "to children's tendency to represent events in terms of the movement and manipulation of entities that can readily be depicted by meaningfully moving handshapes". This hypothesis is part of the multifaceted issue posed by Q2.5: "Is there a clear distinction between signs and gestures?" BTS proposes a general criterion for distinguishing between signs and gestures in transcription (Appendix D, Section 5.1: "If part of an utterance consists of non-signed but meaningful activity, notation of such activity is included as main line commentary in square brackets"). However, this criterion assumes that signs can be distinguished from other meaningful actions—and this is exactly the question that remains theoretically troublesome. This issue has been discussed in Chapter 4 with regard to form–function distinctions, particular in relation to the linguistic modulation of pointing—signs, deictic gestures, or something else?

In attempting to deal with questions of "signs" and "gestures" we are confronted most seriously with the consequences of the modality and ongoing debates about the linguistic status not only of gestures, but of "iconic" elements in signed languages. Taub (2001) has opened up a constructive discussion by demonstrating the productive uses of iconicity signed languages, and consequently of the role of gestures. Liddell (2003) reviews this perspective in a thorough discussion of what he calls the "rule-governed integration of grammar and gesture" (pp. ix), introducing the notion of "gradiency" (Okrent, 2002) to deal with the space between gesture and sign. His standpoint is directly relevant to some of the conclusions of this dissertation:

> Since the hand can point in an unlimited number of directions, the range of pointing movements is gradient. Gradience is a problem because the field of linguistics generally defines language so as to exclude not only meaningful gestures but also to exclude meaningful gradient aspects of the speech signal (Liddell, 2003, p. ix).

What must be added from the perspective of sign acquisition is that the learner must come to constrain the range of pointing movements—and all signs that move from one location to another—in *conventional*, i.e. grammatical terms. Gradiency and iconicity in a sign language do not mean that the signer is unconstrained in the use of space and movement to encode meaning.

In spite of his uneasiness with defining what is "linguistic," Liddell strives to maintain some distinction between signs and "other aspects of the language signal [that] are more clearly gestural" (p. 356). He cites, as an example, the use of a "surrogate space" when signing the ASL verb meaning 'look-at' as directed to a child (aimed low) versus to an adult (aimed level). In his summary, he presents the structure of a language such as ASL as an amalgam of dimensions, noting that spoken languages are similarly constituted:

> I have been describing the ASL language signal as consisting of combinations if signs, grammatical constructions, gradience in the signal produced by the primary articulators as signs are being produced, and gestural activities independent of the primary articulators. If one replaces "signs" with "words" in the description above, it applies equally well to spoken language discourse (Liddell, 2003, p. 357).

Going further, Mathur and Rathmann (2004) propose a model in which gradient aspects are a linguistic part of ASL syntax, in particular in verb agreement. More recently Perniss (2007), in her analyses of spatial aspects in DGS (Deutsche Gebärden Sprache: German Sign Language), stresses the modality-specific aspects of signed languages. She pays particular attention to the influence of different iconicity principles on the structure of spatial representations in signing space, including their interaction with linguistic and discourse organizational principles.

Whether linguistic or not, one may expect that—when gradiency is at issue—it will take a child considerable time to explore the borders and conventional forms of different aspects of gradiency, whether reflected in pointing, verb inflections, or locations and movements in space.
All of the contemporary analyses show complexities in sign language input to deaf children that stretch far beyond the cognitive capacities of the very young children studied in this dissertation. The adequate treatment of "gestures" and "signs" may not have been solved, nevertheless the study presented here motivates ways of looking at early signs, taking into account complexities as reflected in the input and relating these to the child's executions.

The study of sign language acquisition draws attention to more general problems of acquiring a full communicative system, beyond what has been treated as "linguistic" or, more narrowly, "core syntax." And preliminary formulations of sign language grammar, such as those of Liddell, Mathur and Rathmann, and many other twenty-first century linguists, have opened questions of the formal status of "gesture," broadly conceived, in linguistic description.

Bringing these considerations back to the findings of Chapter 2, vocabulary data on all three groups of this study, at each developmental level, showed that predicates constitute about 30% of the sign types, as measured by vocabulary checklists, in comparison with 20% predicates for spoken English—at the highest developmental level (400 words). Furthermore, the English data show a linear developmental trend, beginning at about 5% in the 0–50 word period, whereas there is no evident development in percentage of predicate types in any of the deaf groups beyond the 50-word level, which begins at about 25% predicates. Examination of the meanings of individual verbs in child SLN provides support for P. Brown's Verb

Specificity Hypothesis, reinforcing the proposal that signed languages are typologically quite different from the surrounding spoken/written languages in all of the literate and industrial countries in which sign language acquisition has been investigated.

Later acceleration of noun acquisition, such as H2.3 suggested, may be suggested by a slight downward curve in percentage of predicates in later vocabulary acquisition by SLN-D (Figure 2.4). That is, it may be only after having acquired a number of predicate items does the learner begin to devote more attention to nouns. This seems to be affirmed in particular by observations of TIM, whose progress was followed after age 36 months. However, a number of other factors may also influence noun learning, such as increased communication away from the here-and-now, necessitated lexical items rather than pointing to present objects. Analysis of these later changes in vocabulary is under study.

The MCDI research presented in Chapter 2, along with research by Anderson and Reilly (2005), Rooijmans (1995), and others, promote the application of the MCDI to sign languages. At the same time, it is clear that the MCDI must be adapted to the type of language for which it is used. For the deaf population it is suggested that parents be provided with video examples of lexical items, rather than written words in Dutch, or another spoken language. This is an essential modification, enabling parents to choose between versions of sign execution, ensuring that lexical items are properly attributed to the child (cf. Q2.2: adaptation of MCDI for sign language). Rather than direct translation of vocabulary items to part-of-speech categories, it may be more useful to deal with broader categories, such as the entities, predicates, and operators of Chapter 2 (cf. Q2.3: parts of speech). In addition, it is essential that the test be presented to the parents by a linguistically-trained clinician, allowing for discussion to ascertain the child's productive and receptive competence. The interim conclusion is thus that following the traditional use of the MCDI, as designed for spoken/written languages, is inappropriate for signed languages. However, such a useful tool—for both diagnosis and crosslinguistic comparison—deserves continuation in appropriate adaptations for the comparison of signed and spoken languages.

Transcription as a tool of sign language investigation

A basic prerequisite for the analysis of videotaped sign language interaction is the provision of a format that both provides for insightful linguistic analysis and that can be electronically archived and searched. Comparing several types of available transcription methods did not suffice in meeting these goals. Particularly misleading is the prevailing use of capital-letter glosses of complex signs in single written words or phrases of Dutch (or any other surrounding spoken language). This method goes against all established linguistic practice in the analysis of spoken languages. It not only masks much of the internal complexity of polycomponential signs, but it leads to conclusions based on the morphological and semantic structures of the glossing language.

A grant from the U. S. National Science Foundation to an international group of sign language researchers made it possible to create a system that allows for componential analysis of signed languages on their own terms, as well as computational demands on analysis and archiving of data. The result is the Berkeley Transcription System (BTS), presented in Chapter 3 and underlying the analysis in Chapter 4. Experience in using BTS makes it clear that it certainly needs more refinement (a new grant proposal for an international consortium is underway), however, for purposes of the current study, BTS revealed patterns of acquisition and use that are not evident at the levels of either phonological or global lexical (glossing) procedures.

Growing complexity

Morphological structures of SLN

Internal complexity of signs will reflect the tendencies discussed above: meaningful use of movement in space and incorporation of property markers ("classifiers") for reference-making (introduction, maintenance, reintroduction of referents). At the same time, components of signs are also used for utterance-level operators and discourse markers.

The transcription system led to the morphosyntactic explorations of deaf toddlers' early signing as presented in Chapter 4. The goal of this in-depth study aimed at the analysis of growing complexity in signing in both the children and adults involved in the study. Various measures of utterance length showed a consistent order of decreasing length by group: SLN-D > SLN-H > SSD-D. This first rough indication is true for measures that include or exclude points. A closer examination of internal complexity of items indicated different patterns for signs and points:

- Signs show a consistent order of decreasing complexity by group: SLN-D > SLN-H > SSD-H.
- Some SLN-H children show growth in sign complexity that is comparable with children in the SLN-D group.
- Only SLN-D show a relatively frequent use of complex pointing

Although the initial goal of analysis focused on components of verbs, it turned out that most early verbs did not demonstrate the expected complexity in terms of meaning components, hereby weakening H4.2, which suggested a stronger increase of complex verbs in the age range between 1;7 and 3;0. Rather, children with the most fluent input—namely, SLN-D—treated points as well as signs as items available for addition of meaning components, as predicted in H4.1 and H4.3. However, all of the SLN-learning children showed command of several contrasting verbs within a given semantic domain, suggesting more than had been proposed in H4.7. For example, they used different handshapes for the object of manipulation in verbs of eating or verbs of handling, or different handshapes for the moving figure in verbs of motion. Thus, verb specificity does not seem to pose a problem in early acquisition, as it also does not for children acquiring a spoken language with a high level of verb specificity, such as Mayan languages (K'ich'e: Pye, 1992; Tzeltal: P. Brown, 2001; Tzotzil: de León, 1999).

As pointed out above, for those lexical items in which the same property marker is used in both the verb and noun forms, when the child begins with the verb form, acquisition of the noun form follows later in development, with eventual mastery of the aspectual contrast between verbs and nouns in the adult grammar. However, it may well be that the child must acquire a number of noun-verb pairs as separate lexical items before realizing the general aspectual characteristics that differentiate the two parts of speech. Children's early learning of item-based constructions on the way to general grammatical principles has been demonstrated for English and other spoken languages by Tomasello (1992) and Lieven (Lieven et al., 1992) and their collaborators.

In acquiring verbs of motion with a path component, children easily trace goal-directed paths, but often with an inappropriate handshape, and generally omitting specification of source location (starting point). Lindert (2001) has shown that children acquiring ASL begin to use motion verbs with correct handshapes in their fourth year of life.

Summarizing sources of complexity

Sources of complexity have been defined for the BTS searches, based on internal composition of lexical items, and elaborated in Chapter 4. The children's productions were further divided into complex *items* (including points) and complex *signs*. Thus it was useful to follow H4.1 in attending to sign-like modifications of points: "A pointing gesture can be modified in ways that are also appropriate to a sign." Considering the forms and functions of such modified points, "complex pointing" seems to be qualitatively different from early points, since this type of pointing provides various types of additions as if the points were lexical signs. Their central function looks like the addition of gradient information, but more and more within the constraints of prosody and signing space. This discussion leads back—more than expected—to issues of the gesture–sign continuum and progressive conventionalization of gesture, as discussed in the concluding section of Chapter 4 (Gestures and Signs) above. In addition, examples given in Chapter 4 (examples 5 and 6) suggest complexity in pointing within a particular discourse context, in which pointing serves a predicative function. The integration of deixis and pointing, along with distancing, is illustrated, finally, in the three drawings (examples 7-9), where pointing is directed toward a physically distant entities (grandma's house), and in Figure 4.9, where pointing is directed toward a conceptual entity in the discourse (completed drawing activity). It is suggested that such examples may a developmental transition toward the process that Liddell (2003) refers to as grounding.

Many early signs and points are performed directly on their referents (objects, pictures). An emerging developmental achievement is the physical distancing of signs and points from referents, eventually leading to the ability to comment on nonpresent situations. This sort of distancing has long been discussed in the development of hearing children. In our recordings, absent reference is typically evoked by the immediate disappearance of real referents, or by pictures to past events such as visits to relatives, trips to the zoo, parties, and the like. This observation affirms H4.8 with regard to the rate of development of reference to absent objects and events—but apparently only for skilled signers.

Eye gaze provides another sort of information about the child's growing mastery of discourse-based modification of points and signs. As discussed below, another dimension of complexity is coordination of pointing and gaze direction.

Nonmanual components of SLN

Various nonmanual modifications of signs begin to appear in the period under investigation in the current study. Children are acquiring operators for negation, affirmation, yes/no question, wh-question, and affirmation. In this respect Reilly's (2006) claims on acquisition of nonmanuals in ASL appear to be confirmed in SLN. The distinction between the early gestural manifestation of nonmanual negation and questioning, immediately preceding or following negated phrases (indeed often under a prosodic envelope), is clearly present in the Dutch data. Evidence of the periodic disappearance of operators as mentioned by Reilly has not been observed in the SLN child groups. Also, gestural head nodding and shaking seem to survive happily in the Dutch data, continuing to exist as less communicatively functional forms, next to increasing correct use of operators for affirming, negating, and questioning, as expected by H4.4, H4.5, and H4.9. Interestingly, the operators can be applied to both points and lexical items. The proposed order of appearance in the Dutch database is negation > affirmation > yes/no questions > wh-questions. Apart from operators, children acquire modification markers for augmented and diminished size, rate, and intensity, applicable both to points and lexical items. Some children acquire modification of points for distance, differentiating proximal from distal locations. The only aspectual markers acquired seem to be CESSIVE and ITERATIVE. In addition, some children begin to acquire the aspectual

distinctions between verbs (repeated movement) and nouns (single short movement and hold). Increased noun acquisition may be one of the consequences, as suggested in Chapter 2.

Finally gaze allocation presents a long developmental course. The young child tends to frequently shift gaze between addressee and referent situation, whereas competent adult signers maintain gaze on the addressee, with only linguistically motivated gaze shifts. In the SLN-D group, where most complex pointing occurred in the period under investigation, the quick changes of the child's visual shifts between referents (immediate space), addressees (interacting space), and the environmental space show an increasing awareness of the linguistic function of eye gaze as one of their linguistic tools. That is, in the time period under investigation, some children begin to limit the expansiveness of their pointing and signing to the narrower space that is conventionally used in sign language—which is earlier than suggested by H4.6.

Signing space

Considerations of modified signs and their coordination with eye gaze have led to new hypotheses. It seems that one of the functions of a close coordination of pointing and gaze direction is to help the child *navigate the signing space.* Because pointing belongs to the deaf child's tools of linguistic exploration of the signing space, it may well be that another function of pointing in this age range is to assist the child in finding spatial paths in the signing space, bridging the distance between symbol and referent. As a result of these observations, I propose two hypotheses setting forth new functions of pointing: (1) The "Navigation Hypothesis" suggests a process of starting to use the signing space in a more integrated way, combining pointing, gaze allocation, and attention shifts. (2) The "Bridge Hypothesis" is based on the observed close developmental relations between gesture and conventional sign (including pointing). These relations seem to provide a bridge for the acquisition of lexical items, resulting in the "dwarfing" of real space into the syntactic signing space. Both processes can be seen as the part of the process of "growing" into sign linguistics:

- *The **Navigation Hypothesis**: Gaze allocation becomes confined to the signing space in increasing cooperation with locating signs/points for present and absent referents.*
- *The **Bridge Hypothesis**: Distancing in sign acquisition is a (partly) visible process: signifier and signified are physically distanced from one another*

The area of linguistic complexity that deaf children have to master in order to create a signing space has not been observed in either of the groups with hearing parents, and probably still lies outside of the competence of most of those adult learners. Since these fine-tuned mechanisms in sign language acquisition require time-controlled observations and experiments, that were not part of the naturalistic recordings of this study. It is suggested that future use of a system of digitized, time-linked analysis, such as provided by ELAN (www.mpi.nl), could be a road into this important part of sign language, and in particular its acquisition.

Summarizing:

Although very young children display nonmanual behaviors that modulate the meanings of messages, they are only beginning to attend to the conventional linguistic regularities of the integration of manual and nonmanual components in the language, and are only beginning to allocate gaze, pointing, and signing in the construction of a linguistic signing space..

Input complexity

The third study of the dissertation, presented in Chapter 5, deals with aspects of input to the children. The analysis starts with an examination of characteristics of parental signing. Parents using SSD are limited in the variety and complexity of the linguistic models that they offer their children, and are less adept in attracting, maintaining, and shifting attention, in comparison with parents using SLN, whether Deaf or hearing. Again the non-natural communication system, SSD, suffers from the constraint of co-speech signing. It is noteworthy that some parents creatively overcame this constraint by their "homesign-like" inventions, in particular for directed movement.

When fluency is measured in terms of signs/minute, both groups of children with hearing parents (SLN-H, SSD-H) lag behind those with Deaf parents. After 20 months of exposure to signing, these two groups reach the same of level of fluency, which about half that of the SLN-D children. However, the SSD-H children begin at a much lower level than either SLN group.

In addition a comparison of verb input from a Deaf preschool teacher and a hearing preschool teacher competent in SLN shows that the Deaf teacher used a higher proportion and greater variety of complex verbs, although both teachers did provide complex verb input that went beyond the hearing parents..

It must be stressed that the parents of these children rarely have the time to get out of the daily tasks of raising a deaf child (and perhaps hearing siblings as well) to learn a new (unfamiliar) language and explore an unknown culture. It is to their credit that all of them have taken the goal of signed communication seriously, and that all of them have established communicative relations with their toddlers that would not have been impossible with reliance on spoken Dutch and ad hoc gestures. All of these demands may deprive some parents, for a while, of their natural capacities of parenting, including their native (spoken) language as a tool of caring. This affects their natural communicative and linguistic interaction, and as a consequence of learning and using patterns of the "new" language, the nature of natural communication may get affected. Such effects are evident in comparing types of variation that the parents provide to their children. Particularly relevant is the ability of the parent to present successively varying formulations of the same message—that is, to use "variation sets" which help draw the child's attention to relations between form and content in the language. The findings of Chapter 5 show that flexible presentation of linguistic messages in variation sets is facilitated by the use of SLN, in comparison with SSD.

Chapter 5 clearly provides positive answers to the questions concerning utterance length, as posed by Q5.2 and Q5.3, but the term "impoverished language input" is inappropriate. For SLN-using hearing parents I would suggest that they are just in the beginning stages of learning SLN as a foreign language; by contrast, I would prefer to call SSD an "inappropriate language model" for primary language input to a deaf child. The hypotheses proposed as H5.1–H5.6 all seem to be have been confirmed, however the details deserve far more attention.

Chapter 7
Summary in Dutch / Samenvatting in het Nederlands

Dit proefschrift documenteert een zo gedetailleerd mogelijke analyse van verschillende aspecten van de vroege taalontwikkeling van jonge dove kinderen in de Nederlandse Gebarentaal als eerste taal en het taalaanbod van hun dove en horende ouders als respectievelijk eerste of tweede taal. De kwestie die aan dit streven ten grondslag lag, ligt opgesloten in de centrale vraag: "Hoe creëren dove kinderen betekenis uit het aanbod van een pakket multimodale communicatie middelen van dove en horende ouders"? Deze paraplu vraag vormde het uitgangspunt voor meer specifieke vragen gerelateerd aan verschillende taaldomeinen, zoals de lexicale ontwikkeling, de morfosyntaxis, de modaliteit van gebarentalen en tenslotte het taalaanbod aan deze kinderen door hun ouders en verzorgers. Elk van deze taaldomeinen is bestudeerd om een zo volledig mogelijk beeld te krijgen van de taalontwikkeling in de eerste levens jaren van een doof kind. Omdat het taalaanbod aan dove kinderen al meer dan 200 jaar een zaak blijkt van medische, opvoedkundige, onderwijskundige en maatschappelijke discussies is gestreefd naar detailstudies op elk van de genoemde taaldomeinen, zoals gepresenteerd in de hoofdstukken 2 – 5, waarin vragen en hypotheses per hoofdstuk behandeld zullen worden. Het 1e hoofdstuk functioneert als een introductie om de lezers inzicht te geven in de geschiedenis en taalkundige kwesties van gebarentalen in het algemeen en de Nederlandse Gebarentaal (hierna: NGt) in het bijzonder.

In het **eerste inleidende hoofdstuk** wordt de lezer geïntroduceerd in de geschiedenis van de Nederlandse Gebarentaal die aan het eind van 18e eeuw wordt gesitueerd met de oprichting van de eerste onderwijsinstantie voor Doven in het kader van de Verlichting. Onderwijs via *"de Taal der Teekens"* en het Nederlands betekende niet alleen het ontstaan en de groei van Dovengemeenschappen rond deze scholen. Mede als gevolg van groepsvorming kwam de manueel–visuele taal tot wasdom en gaf daarmee de aanzet tot vroeg tweetalig onderwijs aan dove kinderen, destijds bekend onder naam "Old Dutch or Mixed Method". Halverwege de 19e eeuw werd op grond van medische keuzes de gebarentaal verbannen uit het toenmalige dovenonderwijs, dat zich vanaf toen uitsluitend via de zogeheten "Orale Methode" richtte zich op de ontwikkeling van het spreken en schrijven van het Nederlands. De terugkeer naar gebruik van gebaren in het onderwijs werd door een internationale groep ouders ruim 100 jaar later opnieuw gepropageerd in Kopenhagen, 1979. Tezelfdertijd werden gebarentalen bevestigd als een groep natuurlijke talen met een compositie structuur zoals gesproken talen, waarin kleinere eenheden/bouwstenen (handvormen, richting/orientatie van beweging, non manuele aspecten en locaties binnen de gebarenruimte) gecombineerd worden tot niveaus van hoger liggende structuren zoals complexe gebaarformaties, uitdrukkingen, zinsdelen en zinnen. Traditionele taalkundige domeinen zoals wij die kennen uit taalkundig onderzoek in gesproken talen (fonetiek, fonologie, morfologie, syntaxis, en pragmatiek) zijn dan ook snel te herkennen in gebarentalen, ondanks het verschil in modaliteit: deze talen onderscheiden zich door een visuele perceptie en een primair manuele productie.

Taalkundig onderzoek door het Amerikaanse duo Klima & Bellugi in 1979 bracht aan het licht dat en hoe ASL over alle centrale eigenschappen beschikte waar ook gesproken talen over beschikken, met als gevolg de linguïstische status van een echte taal. Nederlands onderzoek startte in de jaren '80 van de 20e eeuw en richtte zich aanvankelijk vooral op fonologische eigenschappen (Bos, Harder & Schermer, 1986) van de NGT, in 2001 theoretisch herzien en aangevuld door Crasborn (2001). Gebaarformatie in nieuwvorming, buiging, flexie en afleiding van gebaren als een belangrijke verbinding tussen de fonologie en de zinsbouw kreeg eveneens grote aandacht in het basiswerk van Klima & Bellugi en vond spoedig in veel

landen navolging. Speciale aandacht ging daarbij uit naar "classifiers", een fenomeen bekend uit vele gesproken talen, dat in gebarentalen een van de meest karakteriserende en in het oog springende – maar complexe – eigenschappen bleek. Fortgens (1993) en Zwitserlood (2003) besteedden hieraan aandacht binnen de NGT. Aan taalontwikkeling kon uiteraard pas aandacht worden geschonken toen de basis contouren van de NGT duidelijk werden en de eerste studies dienaangaande richtten zich dan ook op de tweetalige ontwikkeling van dove kinderen (Hoiting 1997) en hun taalaanbod (Bogaerde 2000).

De studies in de hoofdstukken 3, 5 en 6 in deze studie gaan dieper in op de lexicale en morfologische ontwikkeling in de NGT en verbinden de uitkomsten van deze taaldomeinen taalkundig deels aan de eigenschappen van het taaltype waartoe de NGT met meer gebarentalen zou behoren.

Het laatste deel van dit eerste hoofdstuk is gewijd aan theoretische issues en vraagstukken inzake kindertaalverwerving, waar in de laatste decennia veel aandacht is gegroeid naar vergelijkend crosslinguïstisch onderzoek. Uitgangspunten in deze benaderingen centreren rond een cognitief functionele aanpak, zoals bekend uit de traditie van filosofen als Peirce, semantici als Bowerman en psychologen als Tomasello wiens aandacht voor 'intention reading' en 'pattern finding' als menselijke capaciteiten ook de meeste kansen bleek te bieden voor de algemene vraag die mij zo lang bezig hield: *Hoe zoeken, vinden en maken dove kinderen betekenis uit het hen omringend taalgebruik, bestaand uit gebarentaal, of een mixture van gesproken - en gebarentaal*? Deze brede invalshoek bood de mogelijkheid tot deelvragen en hypotheses omtrent lopende discussies over gesture of/en gebaar, de gebaren morfologie, het NGT gebruik van de visus, relaties met cognitie en tenslotte het taalaanbod.

Hoofdstuk 2 presenteert vroege evidentie voor typologische karakteristieken van NGT en toont gevolgen aan voor de groei van een gebarenlexicon bij jonge dove kinderen. De analyse gegevens, die bestaan uit zowel oudervragenlijsten (MCDI) en video analyse van spontane interactie in huiselijke en peuterspeelzaal setting, laten tevens zien dat dove kinderen van horende ouders een gangbare lexicale ontwikkeling volgen, voorop gesteld dat hun ouders vroegtijdig een natuurlijke taal als NGT aanbieden. Meest opvallend is dat alle drie groepen kinderen, dus zowel de twee groepen die NGT leren als de groep die NmG gebruikt en dus ongeacht of deze kinderen horende of dove ouders hebben, een voorkeur laten zien voor het vroege gebruik van werkwoorden ten gunste van naamwoorden . Echter ondanks dat NmG kinderen eveneens een relatief hoog gebruik van werkwoorden vertonen in relatie tot horende kinderen, blijken zij achter te blijven in groei en tempo van een gebarenlexicon. De uitkomst via de vergelijking van geschreven respons en de daadwerkelijke uitvoer van taalproductie door kinderen bevestigt de reeds lang bestaande kennis dat gebarensystemen (in dit stadium van ontwikkeling) niet in dezelfde mate de linguïstische capaciteiten voeden waarover deze kinderen potentieel beschikken.

De modaliteit van gebarentalen, die handelingen en beweging benadrukt, richt kennelijk de aandacht op werkwoorden (als informatiedragers bij uitstek), hetgeen de verwerving van predikaten lijkt te bevorderen. De vroege gebarenschat van deze kinderen laat zien dat op het totale vocabulaire een hoger percentage predikaten zichtbaar wordt in vergelijking met gesproken talen zoals het Engels, als 'dependant– markerende' taal, waarin naamwoorden méér dan werkwoorden centraal staan in de codering van de argumentstructuur. De vroege werkwoord dominantie in gebarentaalverwerving komt overeen met data uit andere gesproken talen (zoals Yucatec Mayan), waarin werkwoorden, meer dan naamwoorden, het merendeel van de grammaticale - en semantische informatie vervoeren. Deze talen zijn typologisch te groeperen als "head - marking" oftewel deze woorden markeren de kern/het hoofd van de informatie. Gebarentalen typologisch als head - marking te behandelen, geeft aan hoe belangrijk

werkwoorden zijn, immers aan nominale argumenten worden niet meer in aparte uitdrukkingen gerefereerd wanneer zij eenmaal geïdentificeerd zijn.
De onderneming om de *gebarenschat van Nederlandse dove kinderen te meten* door middel van het ontwikkelen van een aan NGT aangepaste MCDI heeft waardevolle gegevens opgeleverd zowel taaltheoretisch, alsook inzicht gegeven in methodologische - en toepassingsprocedures van dit instrument. Met betrekking tot toekomstig gebruik, heeft het huidige aanpassing proces van de MCDI als diagnostisch instrument vooral laten zien dat *taalspecifieke lexicale categorieën* niet langer ontkend kunnen worden en meer aandacht verdienen.

Hoofdstuk 3 introduceert een innovatief transcriptiesysteem voor gebarentalen, het Berkeley Transcriptiesysteem (hierna BTS), dat ontwikkeld werd in het Berkeley Sign Language Acquisition Project tussen 1998 -2001.* Het systeem is gebaseerd op de grondgedachte dat betekenisdragende elementen zodanig gecodeerd worden dat linguïstische analyse niet langer gebaseerd zou worden op vertaalde glossen van locale gebarentalen. (vb?. Niet alleen bleven daarmee specifieke vormen ontoegankelijk voor bestudering, ook de afgeleide analyse was oncontroleerbaar als gevolg van de voorafgaande vertalingen, die immers grammaticale en semantische eigenschappen van gesproken of geschreven taal reflecteerden.

Onze theoretische interesse ging uit naar het niveau van betekenis
componenten, dat wil zeggen de wijze waarop semantische elementen verbonden worden tot lexicale eenheden en zinnen. Uitgangspunt daarbij was de volledige reeks van betekenis elementen te 'vangen' uit het samenspel van simultaan geuite componenten, manueel en non-manueel, conventioneel en gesturaal, maar zonder vooropgezet oordeel met betrekking tot eventueel linguïstische status. Met deze aanname hoopten wij te voorkomen dat het begrip 'productiviteit' van linguïstische vormen geclaimd zou worden, zonder voldoende zekerheid over gebruiksfrequenties. Fonologische analyses van gebarentalen voor de ontwikkeling van een notatiesysteem, destijds geïntroduceerd voor ASL door William Stokoe (1965), werden doorgaans gebruikt om de formerende basiselementen en hun frequenties van handvormen, beweging en plaats in de gebarenruimte aan te geven. Dit beschrijvingsniveau komt overeen met de wijze waarop de interne samenstelling van woorden wordt gecomponeerd uit articulatorische en akoestische elementen. Deze vormen zijn toegankelijk binnen het BTS en kunnen aanvullend gebruikt worden teneinde maximale documentatie te garanderen van de fysieke en temporele parameters van gebarentalen.

Het doel van elke transcriptie is het produceren van een blijvend, geschreven document van communicatieve gebeurtenissen, die onderzoek en hèronderzoek mogelijke maken, zoals het wereldwijd gebruikte archief het Child Language Data Exchange System bestaan CHILDES, waarin ook BTS is opgenomen.

Gebarentalen vertonen overeenkomsten met de zogeheten polysynthetische talen. Deze talen verschillen van de ons omringende talen vooral in hun morfologische vormgeving en complexiteit van werkwoordstructuren. De stammen in deze werkwoorden verwijzen naar specifieke vormen, houdingen en consistentie en maken daarbij gebruik van pre-, in- en suffixen. Polymorfeme combinaties komen overeen met werkwoorden van beweging en object overdracht in veel Europese gebarentalen. In een eenvoudige vergelijking tussen twee NGT zinnen kan dat verschil al duidelijk gemaakt worden. Vergelijk daartoe de zinnen "Ik geef jou papier" en "Jij geeft mij papier".

1: PAPIER (geven)-em'HOU_T(1h) -bro'1-dol'2.
2: PAPIER (geven)-em'HOU_T(1h) -bro'2-dol'1.

In Nederlandse Gebarentaal bestaan de zinnen "Ik geef jou papier" en Jij geeft mij papier" elk uit slechts twee lexicale gebaren: een gebaar voor papier, dat op borsthoogte gemaakt wordt, gevolgd door een gebaar voor geven: een gevende hand ("-bro" voor "bron") die zich beweegt van de gebaarder(1) naar de gesprekspartner (2), of – zoals in voorbeeld 2_ van de gesprekspartner (2) naar de gebaarder(1). Het zijn deze ogenschijnlijk simpele verschillen die belangrijke syntactische functies en beregeling inzichtelijk maken en daarmee bijvoorbeeld een maatstaf kunnen worden om complexiteit in gebarentaal gebruik te meten ter bepaling van taalontwikkelingsniveaus bij kinderen. BTS heeft bewezen succesvol bruikbaar te zijn in een morfeem-per-morfeem analyse door de componenten van complexe gebaren zo te representeren dat in een oogopslag duidelijk wordt hoe productieve gebaren, zoals bijvoorbeeld GEVEN of ETEN gebruikt en vervoegd kunnen worden in verschillende gebarentalen. BTS wordt inmiddels gebruikt voor de analyse gebarentalen in zes verschillende landen.

Hoofdstuk 4 behandelt de uitkomsten van analyses op basis van BTS transcripten en illustreert de werking ervan. De onderscheiden componenten permitteren het onderscheid tussen afzonderlijke en componentiele elementen in uitingen van dialogen tussen ouders en kinderen. Daarmee worden de patronen zichtbaar die in de hoofdstukken 5 en 6 zullen worden gepresenteerd. Dit hoofdstuk start met een overzicht van de bronnen van gegevens en de onderzoeksampel: 28,11 transcriptie uren van 17 dove kinderen, verdeeld in drie taalaanbod groepen, in de leeftijd van 17 – 36 maanden. Eerst wordt de taalaanbodleeftijd in plaats van de chronologische leeftijd als uitgangspunt verantwoord, waarmee het verschil tussen DKDO en DKHO uitgewogen wordt. Daarna worden gemiddelde uitingslengte (MLU) en de morfologische complexiteit berekend van alle kinderen. De uitkomsten van de verschillende berekeningen met betrekking tot MLU, bevestigen dat DKDO aanmerkelijk hoger scoren dan de DKHO en dat dove kinderen met een NGT aanbod hoger scoren dan kinderen met een aanbod in NmG. Aanvullend is gebruik gemaakt van een 'fluency' test, gemeten in termen het aantal gebaren per minuut, maar ook via deze controlerende techniek vertonen de DKHO achterstand ten opzichte van de dove kinderen met dove ouders.

In de tweede plaats is gekeken naar de complexiteit van de interne compositie van lexicale items. Deze complexiteit werd gedefinieerd in termen van condities van proposities. Op basis van deze definities werden achtereenvolgens percentages berekend van het aantal complexe items per groep, het aantal complexe gebaren per groep en werd een voorbeeld gegeven van de groei van item complexiteit van de DKDO. Ook deze resultaten bevestigen opnieuw een inmiddels 'bekende' uitslag: NGT-D > NGT-H > NmG-H.

In de derde plaats werden percentages berekend van complexe gebaren en complex wijzen per groep. In beide berekeningen bleken de DKDO op dit punt verschillen te vertonen met de DKHO: interne complexiteit blijkt – zoals vermoed – een ontwikkelingsaspect dat zich vroeg manifesteert in T1 leerders. Omdat het complex wijzen van de DKDO opvallend afsteekt ten opzichte van de DKHO, inclusief de kinderen met een T2 – NGT aanbod, is dit verschijnsel aan nader onderzoek onderworpen. Zowel de verschillende vormen als de functies van wijzen blijken bij DKDO niet alleen gevarieerder en frequenter, het lijkt bovendien de bewerking en integratie van drie verschillende functies te bewerkstelligen. Deictische - , referentiele - en de "navigerende" functies in de gebarenruimte worden in onderlinge afstemming gebracht samen met blikrichting en – locatie. Dit laatste aspect, de afstemming tussen de blikrichting en oogcontact enerzijds en de visuele localisering van adressanten en referenten binnen de gebarenruimte anderzijds, geeft aanleiding tot twee nieuwe hypotheses:

- *de navigatie hypothese: integratie van deixis en referent posities in de gebarenruimte*
- *de afstand hypothese: wijzen als 'brug' tussen symbool en referent*

Ten vierde is nader onderzocht hoe het gebruik van de handen als middel om de werking van objecten te demonstreren of saillante afbeeldingen en vormen te 'schetsen' een bron kunnen zijn van gesturale elementen in gebarentalen. Zoals bekend beschikken alle gebarentalen over een lexicon van deels conventionele handvormen (voorheen "classifiers", hier eigenschapsmarkeerders) die als refererende elementen terugkeren in werkwoord vormen. Correct gebruik van eigenschapsmarkeerders is ruimschoots aangetoond in de video opnamen van zowel NGT- als van NmG kinderen. Gestures en gebaren kunnen beide gekarakteriseerd worden als lexicale items in NGT op het moment dat zij in paren van systematische contrasten beginnen te verschijnen. Vanaf die momenten is mogelijk het gebarengebruik van een kind te beschrijven binnen een reeks paradigmatische contrasten, inclusief 1- of 2-handig gebruik, handvormen, orientatie, richting en soort van beweging en verschillende andere componenten. De transitie van gesturale naar conventionele gebaren, of van iconische uitbeelding naar conventionele symbolen, lijkt een graduele overgang. Tot dusver valt in dit opzicht geen scherpe lijn of ontwikkelingsmarkering aan te wijzen, die de start van NGT kenmerkt.

Hoofdstuk 5 vertegenwoordigt het taalaanbod aan de in hoofdstuk 4 gedefinieerde groepen kinderen. Gegevens in deze studie zijn gebaseerd op dezelfde video analyses zoals in hoofdstuk 4, met dien verstande dat de gegevens nu worden besproken, volgen uit de ouderlijnen binnen de (BTS) dialogen. Hier blijkt dat ouderlijk taalaanbod evenals het taalaanbod van de dove en horende peutergroep leiding verschillende gradaties vertoont met betrekking tot Kind Gericht Gebaren als visuele (NGT) variant op CDS (Child Directed Speech). Het ouderlijk taalaanbod in deze dialogen bevat veel herhalingen met variaties en bewerking in de zogeheten "variatie sets". Dit type aanbod voorziet kinderen van een rijke bron van semantische en formele structuren op interactie formaat en is bovendien goed aangepast op activiteiten binnen een gegeven context. Ouders die NGT aanbieden aan hun dove kinderen, zowel dove als horende ouders, blijken gebruik te maken van deze variatie sets in de interactie met hun kinderen. Ditzelfde type natuurlijk taalaanbod in variatie sets en bewerkingen van uitingen in ontwikkelende dialogen wordt niet of aanmerkelijk minder aangetroffen in het NmG taalaanbod van ouders vóór 1995. De veronderstelling is dat deze creativiteit gehinderd wordt door het gelijktijdig produceren van gesproken Nederlands en het maken van gebaren. Deze tijdrovende combinaties uit twee verschillende modaliteiten lijkt een zekere (talige) flexibiliteit in de weg te staan en verhindert daarmee tevens de vlotte herschikking van gebaren in NGT zinsverbanden. Bovendien wordt de productie van uitingen bepaald door de timing en het spreekritme van het Nederlands, waardoor gebarenreeksen worden geproduceerd, die voor kinderen moeilijk te interpreteren zijn.

Een natuurlijke taal zoals NGT heeft daarentegen het potentieel om zeer jonge dove kinderen van een rijk taalaanbod te voorzien, dat voorziet in een complexe morfosyntaxis, semantiek en pragmatiek. Horende ouders die NGT hebben geleerd als tweede, of derde taal en dit gebruiken met hun peuters, blijken succesvolle communicatie te kunnen creëren, die niet alleen de wederzijdse interactie gunstig beïnvloed, maar klaarblijkelijk ook gangbare processen van taalontwikkeling voedt en bevordert. Uiteraard is aanvullend en kwalitatief hoogwaardig taalaanbod vereist van volwassen natieve gebarentaal gebruikers. Dit is waarschijnlijk kritiek in de vroege stadia van taalaanbod aan jonge dove kinderen. Mogelijke verklaringen kunnen liggen in de aard, werking en onderlinge afstemming van verschillende geheugentypen, waar ook automatiseringsprocessen in informatieverwerking deel van uitmaken.

Deze studie bevestigt dat de complete reeks van mogelijke constructies en betekenissen in taal-aanbod een belangrijke rol speelt in de taalontwikkeling. Daarnaast is opnieuw inzichtelijk geworden dat het gebruik van NmG, zoals gangbaar de tijd voor 1995, niet of onvoldoende basis vormt voor een vergelijkbaar rijk taalaanbod in de ouder -kind interactie en daarmee de taalontwikkeling vertraagt. Anderzijds heeft de lange termijn observatie bij deze NmG

kinderen laten zien dat een drietal van deze kinderen op den duur opmerkelijke vooruitgang kunnen boeken met betrekking tot fluency: deze ouders en kinderen onderscheiden zich door intensieve contacten met dove familieleden en vrienden. Voor alle in dit onderzoek betrokken kinderen, geldt dat zij op basis van een stevige verankering in een eerste taal het Nederlands hebben geleerd als tweede taal.

SYNOPSIS

The previous chapters document detailed analysis of several aspects of acquisition of SLN in the early stages of deaf children's language development. The umbrella question of the study, "Can a deaf child learn to sign from hearing parents?" covers many specific issues on different linguistic levels, as presented in Chapters 2 to 5.

Chapter 1 functions as an introduction to familiarize readers with the history and linguistics of sign languages, and in particular the Sign Language of the Netherlands. The chapter continues with an overview of theoretical considerations, paying attention to child language acquisition, sign language linguistics, and discussing problems concerning the satisfactory linguistic description of elements. The concluding guiding hypotheses group around issues of the gesture–sign distinction, morphology, eye gaze, cognition, and input. The chapter closes with the overview of the plan of the dissertation.

Chapter 2 presents early evidence for typological characteristics of SLN and their consequences for sign vocabulary development. The data gathered by means of both the MCDI–SLN and video analysis of natural interaction demonstrate that deaf children with hearing parents can have normal early vocabulary growth when parents are trained to use a natural language such as SLN. Interestingly, all three groups of children—those acquiring SLN and SSD, and those with hearing as well as deaf parents—show clear preferences for verb acquisition as compared to hearing children. Although the SSD learners show the expected relatively high use of predicates, they lag behind in overall vocabulary size and rate of growth. This affirms the long-standing knowledge that sign systems do not empower all the linguistic capacities that deaf children potentially possess.

With regard to the acquisition of predicates, the modality of sign languages makes action and motion salient, drawing attention to verbs. Accordingly, early sign vocabularies show relatively high proportions of predicates in comparison with spoken languages such as English, where nouns rather than verbs are central to the encoding of argument structure ("dependent-marking languages"). The early saliency of verbs in sign language acquisition is similar to data on the acquisition of spoken languages in which verbs rather than nouns, carry most grammatical and semantic information ("head-marking languages"). Treating sign languages as head-marking in typology underlines the salience of verbs, since nominal arguments do not separate expression once their identities have been established. The endeavor to assess the vocabularies of Dutch deaf children using an adaptation of the MCDI has yielded valuable data, with suggestions for theory, methodology, and application. With regard to future assessment, the process of adapting the MCDI for SLN made it clear that the instrument must attend to language-specific lexical categories.

In **Chapter 3**, a new sort of transcription device is presented, derived from the underlying presumption that evidence of all potentially meaningful components should be represented in order to provide the opportunity of linguistic analysis based on full information of the internal structures of signs. It was argued that this innovative approach to the transcription of sign language productions allows for analysis and insights that are not possible when using

existing procedures that either rely on written language glosses or fine-grained phonological description.

Chapter 4, on morphosyntactic development, presents the results of the analysis at the level of meaning components. The analysis starts with introducing the *data overview*, concluding that chronological age is a misleading comparison for children with deaf parents—with early exposure to sign language, and children with hearing parents—whose first exposure to sign occurs at varying ages (due to the detection of deafness and the point in time when parents began to learn to sign). Therefore, in an attempt to calibrate DD and DH children, an "exposure age" was calculated for each child with hearing parents, based on the age at which parents started to sign to the child.

On measures of utterance *length* and morphological complexity, children with deaf parents rank higher than those with hearing parents, and those exposed to SLN rank higher than those exposed to SSD. With regard to fluency, as measured in terms of signs/minute, both groups of children with hearing parents (SLN-H, SSD-H) lag behind those with Deaf parents. Both points and conventional signs can exhibit *morphological complexity*. Early in development, children (especially DD) seem to make use of points to explore spatial devices as well as some meaningful sign components, eventually developing into conventionalized parts of the grammar.

The development of *pointing*, along with marked forms of points, involves the elaboration and integration of three functions: the deictic, the referential, and the "navigation of signing space." In this process, the use of e*ye gaze* turns out to play a *critica*l role. Since the types of data in this dissertation do not allow for controlled experiments, two hypotheses are formulated:

1. The ***navigation hypothesis***: emerging integration of deixis and referent positions in signing space.
2. The ***bridge hypothesis***: pointing as a bridge between symbol and referent.

The data show that, overall, all the children are working on extending their sign base by adding complexity in terms of *types of modifications* coded in BTS. Although very young children display nonmanual behaviors that modulate the meanings of messages, they are only beginning to attend to the conventional linguistic regularities of the integration of manual and nonmanual components in the language.

A major source for *gestural elements* in sign languages is the use of the hand to demonstrate how an object is manipulated or to use the hand to "draw a picture" of salient features of an object, such as a shape. All sign languages that have been studied thus far have a set of conventionalized handshapes ("classifiers," "property markers") that serve as referring elements within verbs. Appropriate use of the property markers is richly demonstrated in the video recordings of both SLN and SSD receiving children. Gesture/signs can be characterized as SLN lexical items when they begin to fit into systematic sets of contrasts. As a system emerges it becomes possible to describe the child's signing in a set of paradigmatic contrasts, including number of hands, handshapes, orientation, direction, and type of movement and other components. The *transition from gesture to sign, from iconic enactment to conventional symbols, is gradual*. There is no clear line at which one can say: now, and only now, has the child begun to use an established sign language.

Chapter 5 is devoted to the language models of deaf children. *Parental input* that includes repetition with variation and elaboration ("variation sets") provides the child with a rich

database of semantic and formal structures, in an interactive format, supported by activities in context. Parents using SLN, both deaf and hearing, *make use of variation sets* in interacting with their child. We do not find these sorts of variations, elaborations, and emerging dialogues in the SSD-trained families before 1995. It seems that a hearing parent, formulating utterances out loud in Dutch while supporting by signs, is not open to the flexibility of reordering signs that we find in SLN. Rather, utterance production is spaced by the timing and rhythm of Dutch, producing sign sequences that are often difficult for the child to interpret.

The concluding Chapter 6 demonstrates that a natural sign language such as SLN has the potential for providing very young deaf children with a rich input that is complex in its lexicon, morphosyntax, semantics, and pragmatics. Hearing parents who are given SLN instruction when their children are tiny can successfully establish linguistic communication that allows not only for mutual understanding but for the child's growth in the language. Additional input from fluent adult signers, especially native signers, is critical for exposing young learners, from very early on, with a full range of possible constructions and meanings. By contrast, those parents who, in an earlier era, were encouraged to speak Dutch to their children while simultaneously providing some signs, did not succeed in establishing a comparably rich pattern of interaction and linguistic growth. However, long-term observation of children who began with SSD has shown that when those children encounter SLN early in their school experience, they are able to make significant progress towards fluency.

Finally, the current chapter provides a synopsis in both Dutch and English.

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Appendix A.1
MCDI Vocabulary Scores by Vocabulary Size and Language Group[35]

Vocab size	Language Groups and Numbers of Children									
	SLN-D	N		SLN-H	N		SSD-H	N		ENG
0-50	24.5	2		26.6	11		26.4	9		7
51-100	32.5	2		29.9	8		29.3	7		11
101-150	31.0	2	32.3	28.1	7	30.6	36.0	4	36.2	14
151-200	33.0	4		36.3	3		37.0	1		
201-250	35.0	1	35.0	27.0	1	26.1	34.0	2	34.0	17
251-300	-	-		31.2	5		-	-		
301-350	28.0	1	31.5	-	-	31.0	-	-	-	21
351-400	35.0	1		31.0	1		-	-		

[35] Numbers of children at each vocabulary level are not available for English, but the numbers are considerably higher than the Dutch samples (overall sample of 1800 children in English).

Appendix A.2
Information on Individual Children: MCDI[36]

Child: Group	Age (months) / Total MCDI Score			
*JES: SLN-D	28 / 130	33 / 267	36 / 421	
*LIN: SLN-D	19 / 56	24 / 134		
*SIS: SLN-D	15 / 4	24 / 10	30 / 189	36 / 153
TIM: SLN-D	30 / 24	36 / 93		
ANN: SLN-H	18 / 33	28 / 141	30 / 153	35 / 237
ARI: SLN-H	19 / 10	36 / 75		
*BER: SLN-H	20 / 12	28 / 110	32 / 290	
BIL: SLN-H	24 / 8	27 / 31	36 / 241	
*ELS: SLN-H	23 / 57	32 / 123		
GRE: SLN-H	20 / 40	30 / 245	36 / 403	
*HAN: SLN-H	25 / 58	34 / 251		
*LEA: SLN-H	16 / 4	23 / 67	30 / 86	34 / 348
*LIZ: SLN-H	20 / 16	28 / 62	36 / 104	
NIC: SLN-H	21 / 208	28 / 106		
*ROB: SLN-H	21 / 68	28 / 164	36 / 229	
*SOL: SLN-H	20 / 12	24 / 134		
TEA: SLN-H	18 / 17	24 / 97	36 / 209	
ALI: SSD-H	30 / 20	34 / 102		
*BAS: SSD-H	8 / 48	33 / 84		
*DAN: SSD-H	15 / 3	20 / 12	23 / 15	27 / 78
FIE: SSD-H	28 / 58	31 / 83		
GIN: SSD-H	25 / 20	36 / 200		
*IDA: SSD-H	28 / 40	34 / 86		
*KAS: SSD-H	30 / 48	35 / 160		
*MIA: SSD-H	20 / 2	23 / 36	32 / 104	36 / 120
*RIA: SSD-H	18 / 46	24 / 115	30 / 237	
TEO: SSD-H	29 / 8	31 / 31	36 / 54	
TIO: SSD-H	23 /5	25 / 26	33 / 64	
*TOM: SSD-H	30 / 73	35 / 120		
*TON: SSD-H	26 / 70	34 / 106		

[36] Children marked with an asterisk are in the sample of videotaped data for morphosyntactic analysis reported in Chapter 4.

Appendix A.3
Information on Individual Children: Basic Data

Child and Group	Gender	Chron Age	Adjusted Age	Minutes Transcribed	Total Turns	Total Utterances	Total PNT_3	Total Sign Tokens	Total Sign Types
SLN-D									
JES	F	28	18	39.7	183	148	135	98	51
JES		34	24	22.1	184	142	106	273	92
LIN	F	21	11	25	53	7	0	12	3
LIN		29	19	48.5	138	109	52	117	44
SIS	F	30	20	32.2	177	113	72	111	46
SIS		35	25	37.6	130	94	58	87	44
SLN-H									
BER	M	19	5	24.5	23	6	6	1	1
BER		26	12	33.5	31	17	7	8	5
BER		31	17	42	152	56	34	50	38
BOB	M	21	3	27	123	115	83	91	42
BOB		25	7	34.9	122	116	102	111	59
BOB		29	11	43.2	145	124	68	102	41
ELS	F	21	7	45.1	77	50	39	34	19
ELS		28	14	25.2	77	31	10	38	26
HAN	M	30	5	30.3	31	36	23	35	14
HAN		33	8	21.3	35	26	21	12	9
LEA	F	17	2	67.4	54	11	12	1	1
LEA		23	8	46.4	79	37	39	38	16
LEA		34	19	40.4	146	93	44	96	45
LIZ	F	25	2	29	86	65	70	35	23
LIZ		30	7	19.4	91	80	65	41	28
ROB	F	25	7	45.7	16	57	26	58	32
ROB		34	16	45	75	35	26	28	23
SOL	F	28	10	41.6	34	17	7	13	12
SOL		30	12	39.4	84	42	37	29	17
SSD-DH									
BAS	M	33	11	78	127	108	44	89	48
DAN	M	15	5	46.3	27	19	7	24	21

Appendix A.3: Individual Data

IDA	F	35	9	115.3	86	41	42	24	19
KAS	M	27	14	77	208	186	26	196	108
MIA	F	22	5	30.1	39	11	4	3	1
MIA		32	15	42.2	74	35	14	32	22
RIA	F	17	5	26.7		11	7	1	1
RIA		26	14	16.2	30	36	22	32	22
RIA		30	18	14.6		18	8	13	7
RIA		35	23	38.2	72	40	18	33	24
TOM	M	34	8	73	6	4	4	1	1
TOM		36	10	69.2	91	73	48	33	25
TON	M	26	20	37.8	109	72	57	39	31

Appendix A.4
Information on Individual Children: MLU[37]

Child and Group	Chron Age	Adjusted Age	MLU: W+P	MLU: W-P	MLU: M+P	MLU: M-P
SLN-D						
JES	28	18	2.93	1.44	3.22	1.72
JES	34	24	2.86	1.87	3.16	2.14
LIN[38]	21	11	-	-	-	-
LIN	29	19	1.41	0.93	1.53	1.06
SIS	30	20	1.58	0.94	1.64	1.00
SIS	35	25	1.77	1.16	1.80	1.18
SLN-H						
BER	19	5	1.33	0.33	1.33	0.33
BER	26	12	1.21	0.71	1.21	0.71
BER	31	17	1.62	1.00	1.65	1.04
BOB	21	3	1.6.0	0.88	1.94	1.17
BOB	25	7	1.00	0.33	1.67	1.00
BOB	29	11	2.44	1.4	2.91	1.68
ELS	21	7	0.93	0.21	0.93	0.21
ELS	28	14	1.55	1.23	1.74	1.42
HAN	30	5	1.55	0.72	1.83	1.00
HAN	33	8	1.21	0.42	1.29	0.50
LEA	17	2	1.36	0.27	1.36	0.27
LEA	23	8	1.95	0.89	2.08	0.89
LEA	34	19	1.5	0.5	2.00	0.75
LIZ	25	2	1.92	0.85	3.05	1.95
LIZ	30	7	1.78	0.69	2.03	0.95
ROB	25	7	1.87	1.37	2.25	1.75
ROB	34	16	1.86	1.18	2.55	1.86

[37] MLU W+P = MLU in words including points ("items")
MLU W-P = MLU in words excluding points ("signs")
MLU M+P = MLU in morphemes (BTS hyphens) including points ("complex items")
MLU M-P = MLU in morphemes (BTS hyphens) excluding points ("complex signs")

[38] Only 7 utterances: no MLU counts calculated.

Appendix A.4: Child Data: MLU

SOL	28	10	1.44	0.94	1.50	0.94
SOL	30	12	1.76	0.88	2.05	1.17
SSD-DH						
BAS	33	11	1.50	0.96	1.62	1.03
DAN	15	5	1.30	0.83	1.30	0.83
IDA	35	9	1.55	0.63	1.93	0.83
KAS	32	19	1.28	1.08	1.28	1.11
MIA	22	5	1.18	0.82	1.55	1.18
MIA	32	15	1.43	1.03	1.46	1.06
RIA	17	5	0.82	0.18	1.00	0.18
RIA	26	14	1.64	1.03	2.69	2.03
RIA	30	18	1.44	1.00	1.56	1.06
RIA	35	23	1.52	1.07	1.62	1.12
TOM	34	8	1.25	0.25	1.75	0.75
TOM	36	10	1.15	0.49	1.48	0.68
TON	26	20	1.04	0.49	1.18	0.58

Appendix B
MacArthur Developmental Inventory (MCDI)
Parental Checklist to be used by parents of children acquiring SLN

A brief English summary of the main points is provided here. The form begins with an explanation of the goals and procedures. The checklist is divided into the following categories, with examples of the first few items in each category.

Actions, Pointing, and Games. When children begin to communicate, they use many body expressions to make their wishes clear. Which of these does your child use? Check: *not yet / sometimes / often.*

- offers and gives you something
- points to something with an outstretched arm
- lifts both arms to be picked up
- ...

Does your child play the games listed below? Check: *yes /no.*

- plays "peek-a-boo"
- plays "catch me"
- dances
- ...

Comprehension of Gestures and Words. Before children use signs and/or words, they show people that they understand simple expressions. A few examples are given below. Does your child understand any of these expressions? Check: *yes/ no.*

- your child reacts to his/her name
- your child reacts to "don't"
- ...

Below is a list of frequently used expressions. Does your child understand any of these expressions. Check: *understands.*

- are you hungry?
- are you tired?
- be quiet!
- look there
- does mama/papa get a kiss?
- ...

On the next page a list of concepts begins. There you will find signs/words that children use frequently. The concepts are grouped by topics, as in the sign-language dictionary. Some signs or words are understood by a child; others can be used by the child by himself or herself. If your child understands and uses the signs, put a check in the space. If your child also understands the words, add *+W* in the space. Check: understands /uses.

- Animal names: cat, dog ...
- Food: apple, banana ...
- Body: hands, feet ...
- Question word: what, where ...
- Vehicles: car, bike ...
- Clothing: pants, sweater ...
- Toys: ball, blocks ...
- Time: now, right away ...
- People: mama, papa ...
- Place: away, back ...
- Action words: walk, go, give ...

- Home: living room, kitchen, sleep, bed ...
- Quantity: all, more, a lot ...
- Descriptive word: gone, broken, soft, wet ...
- Objects of use: blanket, bottle, box ...
- Outside: outside, grass, sun, school ...

Use of voice and sound. Some children enjoy imitating. Sometimes they imitate sounds in words or expressions, sometimes mouth movements. How often does your child do this? Check: *never / sometimes / often.*

- imitates sounds
- imitates mouth movements
- ...

Some children like making sounds; others rarely do so. What sounds does your child make? Check: *never / sometimes /often.*

- aaa and ooo
- eee and iii
- mmmmm and bbbb
- ...

Some children have residual hearing and make use of it. What sounds does your child react to? Check: *never /sometimes / often.*

- the doorbell
- the telephone
- the door of a room
- ...

Can you list other sounds that your child reacts to?

Some children have a monotonous voice; other children have clearly audible changes of voice. What voice distinctions do you notice? Check: *never / sometimes / often.*

- high voice
- low deep voice
- questioning voice
- demanding voice
- ...

Use of handshapes. Below are a few questions about the way in which signs are made. Just like the first words of a child, the first signs are also not yet "complete." At first a child may call a horse [*paard*] "pa" or "paat." We find these kinds of simplifications in signs, too: a HOUSE might be signed as if it had a completely open roof; the signs for "cat" and "lion" may look the same for a while. This is because the handshapes aren't complete yet: signs often are made bigger and float about in space. Pictures of a number of handshapes are given below. Can you indicate which handshapes your child can produce well?

[pictures of handshapes]

In conclusion, there is some space for your own questions or observations.

Many thanks for your cooperation.

Appendix C
All Lexical Items Used in Children's Transcripts, by Group, with Frequencies of Use

LEXICAL ITEM (total = 382 types)	SLN-D	SLN-H	SSD-D
Complex Items (1+ BTS hyphens) (50 types)			
be-long		13	
build		1	
build-tower		1	
call	1		
carry		1	1
comb			1
crash	1		
drink		1	
eat		9	2
fall		2	
fly-airplane			1
give	1		1
grab	5	1	5
hold		1	1
jump			1
knock down		1	
look	1	2	1
look for		1	
make-bridge			1
move-arms	1		
peel		1	
pick-up			1
pour		1	1
press	1		
pull		2	
push	2	2	
put	1	1	
put-on (clothes)	4		
put-hearing-aid-in-ear		4	
ride		3	
scatter		1	
shoot	2		
shut	1		1
sing	1		
snip		1	
spit		1	
spread-out	1		
stand-like bear		1	
stir			1
take-off		1	

take-out	1		1
take-picture	1		
throw	9	1	
trace	8		5
turn		5	1
unpack		3	
vomit		1	
walk		1	
wash	5		
write	1	3	

Unelaborated Lexical Items (no BTS hyphens)

(332 types)

airplane	1	1	1
allowed			1
a-lot		1	
also	1	2	
angry	4	3	3
apple			8
around			1
asleep			1
at-home			1
awake	2	2	4
away	2		
baby	1	9	
bah	4	1	
ball	3	4	5
banana			1
bang	3		
bath	5	2	
bear		4	11
begin		1	
big	3	2	
big-long	2		
bike	3	2	2
bike-ride	5	3	
bird	6	3	2
birthday		3	
blame	1		
block		4	
blow-bubbles		1	
blue	9	1	5
book	8	2	2
boy	4	1	2
bread		1	
break	21		1
broken	9	4	8
brush-teeth		2	1
buggy	2		

burner			1
bus	1		
butter		1	
butterfly	1	2	2
button		3	
cake		3	
candy		1	3
can't			1
cap			2
car	7	3	1
carrots		1	
cat	11	19	5
chair		1	3
cheese		1	
chicken		10	7
child	1		
children		1	
chocolate-sprinkles		2	
Chocomel			1
clap		2	
clay (action)		2	
clean (action)	1	1	
clear-away		9	1
clock	1	1	1
clown			2
cold	1		
comb	3	1	
comb (act)			1
come	1		
cook		1	
cookie		6	
corner		1	
count	1		
cow	3	5	2
crash	1		
crocodile	5		
cry	8	10	2
cup		2	
cupboard	1		
dear		1	1
dirty	2	4	1
do		2	
dog	3	3	6
doll	3	6	2
done	5		
donkey	1		
door	2	3	
dots	1		
draw	3		
drink		9	6

Appendix C

duck	1	2	6
dumb	8		
easy	1		
eat	3	7	5
egg			1
elephant	2	4	1
enough		3	
eye			1
fall	1		
fence	1		
field			1
film (action		4	2
fish	5	1	12
fit		1	
fix	9	1	
flower	3		3
fly (action)	3		
forbidden	7	1	10
fork		2	
found			1
frog	5		
garden			1
get	2		
giraffe	1	2	
girl	4	1	2
glue (action)	1		
gnome	1	4	
goat	1		1
gone	13	10	
good	1	10	
goose	1		
grandma	5	7	3
grandpa	1	4	
green	2	4	
group		1	
grow-taller	1		
guinea-pig		1	
hat			3
have		1	
head	1		
hedgehog	2	3	1
helicopter	1		
hello	6	11	1
helmet	1		
help	2	2	1
hen			1
here		1	
hide			1
high	1		4
hippo			1

horse	7	4	8
hot	1	2	
house	7		4
how-much			1
hug	1		
icecream	3		2
ILY (I love you)			1
in	3		1
iron (action)		1	
jacket-on (action)		1	3
keep-off	1		
kiss (action)	2		3
kitchen		2	
knife		2	
know			1
lady		1	
ladybug		2	
lamp	1		2
laugh			1
leg			1
lemonade		2	
lick			1
lion	2	2	
little	2		1
little-bit			2
look	6	1	13
look-for		2	1
make			6
mama	8	7	5
man	2		
market		2	
match (object)		3	
mess (situation)		1	
Mickey-Mouse		1	
milk		2	3
mill			3
mirror			1
monkey	1	3	
mouse	6	1	
moustache	1		
much	1		2
mushroom	1	1	4
name-signs (no of types)		14	10
naughty	3		1
necessary		1	
NEG		1	2
new			2
nice		1	
no		1	11
nothing	1		

not-yet		1	
off	9	4	2
old	1		
on (action)		1	
on	3	10	
one		1	1
ooh	8	6	
open		1	
orange	1		1
other		2	2
ouch	1	3	1
out	1		
outside	1		
pacifier		2	
paint (action)		2	
pancake		1	
pants		1	
papa	15	9	3
parrot			2
penguin		1	3
phone-call (action)			1
photo			1
pig	1	3	5
plant (object)			1
play	3	3	8
please	1		
PNT_1	20	18	13
PNT_1_2	1	1	
PNT_2	1	10	7
poop	1		
POSS_1		1	
pot		1	
potato		1	
pregnant			1
pretty	3		1
pull			2
puzzle		2	
puzzle (action)		1	
quiet	8	2	
rabbit	3	3	2
rain	3		
raisin		3	
read	11	2	2
ready	12	24	10
red	8	3	6
rhino		2	
right-away			1
rub-eyes	1		
same	3	1	3
sand		1	2

sandwich		2	
sausage		2	2
say			1
school		3	
scissors	1	2	
scoop (action)	1		
sea			2
seal		3	
sheep	3	2	3
shoe(s)	3	5	2
shower	4		
sick	2		1
sister		1	
sit	10	6	2
skirt			1
sleep	16	2	8
smell	1		
snail			1
snake		2	
soap	1		
some-more		5	
spoon			1
stay			1
steal			1
stick-on			1
stink	1		
stop	2		
strong	1		
sugar		1	
sun			1
surprised	1		
swallow (action)	1		
swim	1	2	
swing (action)		1	
swing (object)		2	
take-off (clothes)		1	1
tear	1		
tears	1		
teeter-totter	1	1	
Teletubbies		2	
tennis		1	
thanks	1		
there	5	2	
the-same	1	2	
throw			2
tide			2
tiger			2
time		1	
tiny	1		
tired	2		

to		1	
tomato	1		
tomorrow	1		
tongue	1		
too-bad		2	
toothbrush	2		1
top (object)		3	
towel	1	1	
tower			1
tractor			1
train	2	3	
tree	4	2	
t-shirt			1
tub		2	
turn-pages		1	
turtle		1	5
two			2
umbrella	2		
uncle	2		
upstairs			3
up-to			1
urinate			1
very-good			1
video		4	1
wait			3
wake-up		11	
walk	3		1
want	1	3	
warm	2	1	
warn	2		
wash		1	
watch-out			6
water			1
wave		1	
wet	4	1	
what	4	1	5
what-now			1
where	15	23	3
white	2		2
who			2
wolf		3	
yellow	4	2	4
yes			14
yesterday	1		
yummy	4		
Zwarte-Piet	1		

Appendix D
BTS Manual – 2001 Version

The Berkeley Transcription System (BTS)
Manual

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1. GOALS OF TRANSCRIPTION

The following conventions are intended to be consistent with CHAT and CLAN (with some necessary additions, given the nature of sign languages).[39] The goal is to represent utterances in a consistent morphological and semantic notation, following the grammars of ASL and SLN (and, potentially, other sign languages). We have avoided any sort of phonological transcription of utterances in the basic representation of turns. These conventions are thus intended for the speaker tier (*). Dependent tiers (%) will be addressed later. Manual and non-manual elements are represented in a single line, using ASCII characters only.

Lexical items are written in capitals and bounded by spaces. Because of this distinctive use of capitalization, searches in CLAN must use the +k switch to recognize the distinction between upper/lower case. A sign is represented by at least two upper-case letters. There can be no spaces within a lexical item: The components of polycomponential lexical items are separated by hyphens (as discussed in Section 3, Polycomponential Signs); other elements are joined by underscore or parentheses without spaces. An utterance line ends with a period or question mark, preceded by a space.

Polycomponential signs and some other signs contain meaning components that fall into different categories. In this situation, the linguistic or meaning category is written in lowercase letters, followed by an apostrophe and the instantiation of that category in uppercase letters. For example, if one were transcribing a spoken language, a meaning category might be "number," and the instantiation of that category might be "singular." This would be transcribed as follows: number'SINGULAR. Similarly, a word that is marked for gender might be transcribed as: gender'MALE. An example from spoken English is the word "birds," which would be transcribed as follows: BIRD-num'PL. The unit category'INSTANTIATION is counted as a single meaning unit for the purpose of CLAN searches. See examples of this convention in Section 3, Polycomponential Signs.

1.1 Features Pertaining to Individual Lexical Signs

SIGN # SIGN	pause between SIGNs
SIGN(*2)	sign repeated twice, but only counted once (for analysis)
SIGN(*N)	sign repeated multiple times, but only counted once (for analysis)
SIGN_SIGN	two English words which represent a single sign, e.g. OH_I_SEE (one meaning component)
SIGN-SIGN	two signs combined to produce one new sign, e.g. NOT-NEED (two meaning components)
SIGNSIGN	two signs combined to produce one new, compound sign, e.g. GOODNIGHT, WHITEHOUSE (one meaning component)
&SIGN	uncompleted SIGN
<SIGN> [?]	uncertain transcription
XX	unintelligible but definite sign, to be included in word counts
xxx	unintelligible sign or gesture, to be excluded from word counts
SIGN(fs)	SIGN is a fingerspelled loan sign
S_I_G_N(fs)	SIGN is fingerspelled, not a loan sign

1.2 Additional Specifications of Individual Lexical Signs

SIGN:	SIGN is held
SIGN-^mod'PRX	SIGN directed to close/proximate location
SIGN-^mod'MID	SIGN directed to intermediate location
SIGN-^mod'DIS	SIGN directed to distant location

[39] See the CHILDES website for the full set of required conventions: http://childes.psy.cmu.edu/ .

SIGN(1h)	one-handed SIGN (if usually 2h)
SIGN(2h)	two-handed SIGN (if usually 1h)
SIGN(nh)	non-dominant-handed SIGN (if anomalous)
SIGN(dh)	dominant-handed SIGN (if anomalous)

Note: If marking both number of hands and which hand(s), the number of hands comes first. e.g., SIGN(1h)(nh). If SIGN is (1h), only mark which hand if the non-dominant hand is used.

SIGN(v)	SIGN is a verb (if ambiguous)
SIGN(n)	SIGN is a noun (if ambiguous)
SIGN	citation form
SIGN2	alternative form (e.g., WHERE, WHERE2)
X@ns	name sign (with X handshape)
X@is	idiosyncratic/invented sign (with X handshape)
X@hs	home sign (with X handshape)
SIGN@in	initialized sign

1.3. Numerical Signs

Signs which incorporate a number into the handshape are indicated using the numerical sign followed by an underscore and the incorporated number:

ORD_1	ordinal sign ("first item")
AGE_1	age sign ("one-year-old")
WEEK_1	week sign ("one week")
MONTH_1	month sign ("one month")
PLACE_1	competition place sign ("first place")

2. POINTS, INDEXES, AND PRONOUNS

PNT_1	point to self
PNT_2	point to interlocutor
PNT_3(person)	point to third person, if present
PNT_3(obj)	point to object, if present
IX_3(person/object)	index a person or object in signing space, if not present
PNT_1_2	1st & 2nd person singular ('me and you')
PNT_1_3	1st & 3rd person singular ('me and him/her', 'two of us')
PNT_1+	1st person plural ('me and somebody', generic 'we')
PNT_S	Selective: specific points to each of the people or objects being referenced. This is used either to emphasize the individual referents or if the people being referenced are not physically near each other.
PNT_M	Multiple: The referents are indicated using a "1" handshape (index finger extended) and a sweeping motion. This can be used for any number of referents greater than 1.
PNT_N	Numbered: The number of people (or objects) being referenced is incorporated into the handshape of the pronoun (for 1-5 referents).

PNT_1_2_S	1st & 2nd person plural, selective ('me and specific others of you')
PNT_1_2_M	1st & 2nd person plural, multiple/sweep ('me and all of you')
PNT_1_2_N	1st & 2nd person plural, numbered ('me and a certain number of you')
PNT_1_3_S	1st & 3rd person plural, selective ('me and specific others')

PNT_1_3_M	1st & 3rd person plural, multiple ('me and all others')
PNT_1_E	1st person plural, exclusive ('we', excluding addressees)
PNT_1_I	1st person plural, inclusive ('we', including addressees)
POSS_1	1st person singular, possessive
POSS_2	2nd person singular, possessive
POSS_3	3rd person singular, possessive
POSS_1+	1st person plural, possessive
POSS_2+	2nd person plural, possessive
POSS_3+	3rd person plural, possessive
SIGN_S	fingerspelled S for possessive (e.g. MOM_S = Mom's)

Examples of more complex pronouns:

PNT_1 PNT_2	1st person, 2nd person, in succession ('me, you')
PNT_1_2*2	1st & 2nd person (2) ('me and you two')
PNT_1_2*3	1st & 2nd person (3) ('me and you three')
PNT_2_3*2	2nd & 3rd person (2) ('you and them two')

AREA	sign produced when an open-5 hand, face down, makes small circles in neutral space.
AREA-loc'X	sign AREA produced somewhere other than neutral space. The -loc'X component is added to indicate the location of the area being indexed, e.g. AREA-loc'CHEST'B or AREA-loc'L.

3. POLYCOMPONENTIAL SIGNS

In the fullest possible elaboration, a polycomponential construction includes:

1. a gloss, indicated in lower case letters enclosed in parentheses to avoid counting it as a lexical item
2. paths of movement in the form -pth'X (also -src, -gol, and -rel)
3. property markers (figures and grounds) in the form -pm'X
4. locations in the form -loc'X
5. posture in the form -pst'X
6. movement patterns in the form -mvt'X
7. non-manual elements in the form -^mod'X (also -^opr, -^aff, and -^dis)
8. aspect in the form -asp'X

Only the gloss and one property marker are obligatory. Locations, movement patterns, and paths of movement may be absent or may have several entries. There can only be one aspect entry. These component morpheme types are indicated in lower case, followed by an apostrophe and specification of the content component; e.g., -pm'TL indicates a two-legged animate being. The order of the components is: parenthetical gloss, property marker(s), (ground/figure), location/movement, modification, aspect (see examples).
Each of the eight possible components of polycomponential verb transcription is presented below, with examples at the end of this section.

3.1. Gloss

The first symbol in the verb transcription is the approximate English gloss (e.g., jump, dismount, ride_seated, ride_mounted). The elements within a gloss are separated by underscores, in order to retrieve them as units.

3.2 Paths of Movement

-pth'X	path of movement, when semantically meaningful
-src'X	movement from a place or from contact
-gol'X	movement to a place or to contact
-rel'X	movement relative to a fixed referent object

The components "source" and "goal" can be combined with the component "locative relations" (see Section 3.4.1) to indicate which part of the figure and ground are in contact, e.g., (jump)-pm'PL_H-pm'TBL-src'PL_H_TOP-pth'A ('two-legged figure jumps from the top of a horizontal plane in an arc path'). The components of path, source, and goal are indicated by uppercase letters from the following list. (The locative components of referent points in relative movement are the same as those for locative relations, and are listed in Section 3.4.1.)

3.2.1 Shape (path only):

I	line
A	arc
C	circle
W	wandering
Z	zigzag
R	rotating

3.2.2 Vertical direction:

U	up
D	down

3.2.3 Front/back direction:

F	forward
B	backward

3.2.4 Lateral direction:

S	side

3.2.5 Body-oriented direction:

R	right
L	left

3.2.6 Oscillating direction:

BF	back-and-forth

3.2.7 Other directions:

TOG	two property markers moving towards each other
AP	two property markers moving apart from each other
OBJ(ref)	real-world object referent (e.g., -gol'OBJ(paper))
X_pm'X	location/direction in relation to property marker (e.g., L_pm'CYL 'left of cylindrical object')
OUT	out
IN	in

3.3 Figures and Grounds

The notation -pm'X indicates a property marker of type X. The following list of property markers is partial, and is open to refinement; handshape pictures are provided with this section. Note that property markers are given semantic (e.g., 'two-legged animate being') rather than phonological (e.g., 'V') definitions. However, in some cases (as in HOLD property markers), the general semantic category (HOLD) is followed by an abbreviation for the specific handshape used. Sometimes there is no single English word that summarizes the semantic content of a property marker; and in many cases the meaning range of a property has not yet been fully determined. Therefore the abbreviations should be treated as mnemonics for the category indicated by the handshape. When two property markers are part of a single verb, the order of notation is **ground** followed by **figure**. When specification is required regarding which property markers represent the figure and ground, this is indicated in parentheses following the property marker (e.g. pm'STK(F), for a stick property marker that acts as a figure). If the two hands represent two entities (e.g. a cup and its lid), use two separate pm's. If the two hands represent a single entity, use one pm (e.g. pm'HO_C(2h)).

3.3.1. Entity property markers:

Note: The pictures below are of a right-handed model. Thus pictures of the right-hand represent the dominant hand, while pictures of the left hand represent the non-dominant hand.

LEX: Lexical property marker for a specific polycomponential sign
LEX(x): Lexical property marker with x handshape

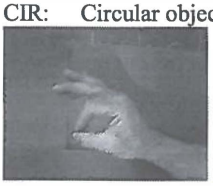
AIR: Air

AIRPLANE: Airplane

BULK: Bulky mass, such as a block

BOX: Box-shaped object

CIR: Circular object



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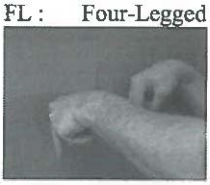
CN : Container

CYL: Cylindrical object

FBL: Four Bent Legs (e.g. four-legged animal)

FD: Flat Disk or Hole

FL : Four-Legged erect being (two-hands)



GUN: Gun-like object

LID: Lid (to be used in conjunction with ground pm)


OBJ: Real object (specified in parentheses)

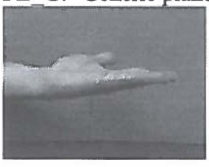
PW: Parallel walls

PL: Plane (non-specific posture)

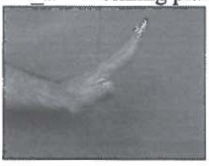
PL_D: Declining plane

PL_H: Horizontal plane (palm down)

PL_G: Generic plane (horizontal, palm up)



PL_I: Inclining plane

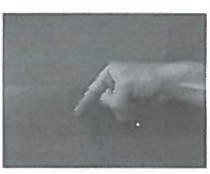
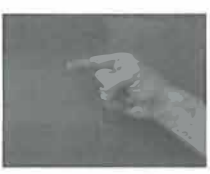
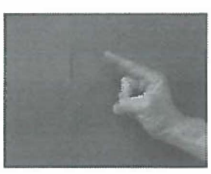


PL_N: Narrow plane (horizontal)

PL_VH: Plane showing vertical height (fingertips up)

PL_VL: Plane showing vertical length (fingertips forward)

PTH: Path property marker, used to show the path that a figure travels (shown: to the left, forward, uphill)

SPHERE: Spherical object (e.g. ball, balloon)

STK: Stick-like object

TBL: Two Bent Legs (e.g. small animal, seated person, chair)

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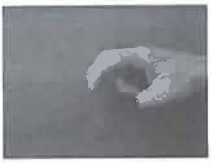
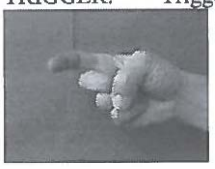


TL: Two-Legged animate being

TREE: Tree

TRIGGER: Trigger finger



VEH: Vehicle property marker

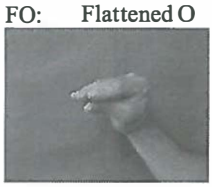
3.3.2. Handle property markers:

HO_* Handle property marker, where * is a label for the handshape.

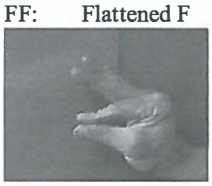
Handshape labels follow the ASL manual alphabet (e.g. HO_S represents a closed fist as in the S handshape). In addition, there are handshapes which do not match a letter in the manual alphabet. These are labeled following Tenant & Brown (1998).

BO: Baby O

FO: Flattened O

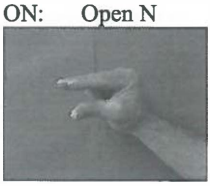


FF: Flattened F



BL: Bent L

ON: Open N



WON: Wide Open N

OO: Open O

WC: Wide C

WSC: Wide squarish C

BF: Bent 5

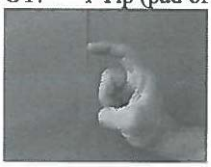
BT: Bent 3

OB: Open B

XA: Thumb on side of bent index finger (2 views)

OXA: Thumb off side of bent index finger

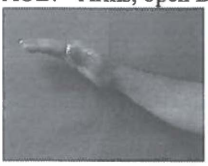
OT: 1 Tip (pad of index finger)



OAT: Open A Tip (pad of thumb)

OF: 1 Face (face of index finger)

AOB: Arms, open B (whole arms, including hands)



3.3.3. Tracing property markers

TR_* Tracing property marker, where * is a label for the handshape.

Tracing property markers are transcribed as pm'TR_*-trc'X, where * is the handshape used to do the tracing and X is the shape traced, e.g. pm'TR_STRIP-trc'LONG. The following trace handshapes have been defined:

PLANE

CS: Curved surface

STRIP:

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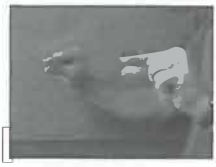
BROAD_STRIP:


THIN_STRIP:

THREE_D_STRIP:

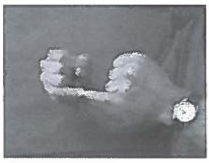

TUBE:


THIN_TUBE:

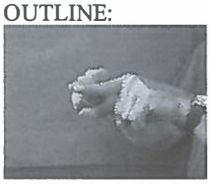

LARGE_TUBE:


INSIDE_TUBE:

THREAD:



OUTLINE:



HALLWAY:

3.3.4. Body part designation:

If the signer uses an actual body part, rather than a manual sign to designate a body part, use the following notations:

pm'B_BODYPART — referential use of the signer's body to represent an actual body part, e.g. pm'B_HEAD.

*Note: In a polycomponential construction, the body often serves as the **ground** when used in this way.*

pm'OBJ(bodypart) — a sign articulated towards another person or object, in which case body parts are treated like other objects. It is possible to specify whose body the sign was directed towards, e.g. gol'OBJ(mouth_2) to represent a sign articulated on the addressee's (2nd person) mouth

3.4. Locative relations

The notation -loc'X indicates a locative relation between figure and ground of type X. Locative components are used to indicate the location of the figure property maker with respect to the ground property marker. The following is a partial list:

INT	interior ('inside')
SUP	superior ('above')
INF	inferior ('below')
TOP	top ('upper surface')
BOT	bottom ('under surface')
EDG	edge
FRO	front
BAC	back
PAR	parallel
NXT	two property markers articulated at the same time and are articulated next to each other, but do not indicate a figure/ground relationship.
BHD	behind
AHD	ahead
RSP	referent space: discourse implied, previously established
0	referent space: frame implied, not previously established

Note: Two locative components can be combined; e.g., FRO_EDG *(front edge).*

The notation loc'CON is used to describe two property markers which do not have a figure-ground relationship but are in contact. To add further information about where the two pm's make contact, use a parenthetical description to indicate where on the HANDS the two pm's were in contact:

loc'CON	contact without a figure-ground relationship
loc'CON(x)	contact at x location on the hands, e.g. loc'CON(fingertips)

3.5. Posture

The component "posture" (pst'X) indicates the posture of the figure for the subset of polycomponential verbs which indicate posture. Examples of such verbs are sit, stand, lie, mount, and ride. The following posture components have been defined:

ERC	erect	STR	straddling
RCL	reclining	SIT	sitting
RCL_V	reclining ventrally		
RCL_D	reclining dorsally		

3.5.1. Orientation

The component "orientation" is used to indicate the orientation (relative to the signer) of either the figure or the ground. In a polycomponential construction, information about orientation and posture should follow the property marker to which it refers. Orientation is only marked when it differs from the default orientation for that property marker in that referent situation. It is possible to define orientation by the direction in which the palm and fingertips are facing (e.g., ori'FF = palm forward, fingertips forward):

Palm:

F	forward
B	back
S	side

U	up
D	down

Fingertips:

F	forward
S	side
B	back

Orientation information can be written as two letters, one for palm orientation and one for fingertip orientation. If the orientation component does not add meaning to the construction, add orientation as part of the figure or ground property marker (e.g., pm'VEH_SF is a vehicle property marker with the palm sideways and the fingertips forward).

3.6 Movement patterns

The notation -mvt'X indicates the movement pattern of a verb. Lexical movement (mvt'LEX) indicates the movement pattern that identifies the particular verb. The lexical movement pattern does not contrast with other movement patterns; its only function is to indicate that the configuration has the meaning of the particular verb.

-mvt'LEX(verb)	movement which defines a lexical item but gives no further meaning; e.g., the ASL verb 'ride' (on an animal) consists of property markers indicating the configuration of ground (vertical plane), figure (two-legged creature), and posture (straddling), plus a non-directional component of movement (rotating). Because this movement does not contrast with any other movement using this pattern of components, it is simply transcribed as -mvt'LEX(ride).
-mvt'WIG	wiggling movement
-mvt'BOUNCE	bouncing movement
-mvt'SHAKE	shaking movement
-mvt'WAVE	waving movement
-mvt'CLOSE	hand closing movement
-mvt'OPEN	opening movement
-mvt'JAB	short, jabbing movement
-mvt'LONG	showing long object, e.g. shelf of bed
-mvt'BEND	bending movement
-mvt'CP	change in posture
-mvt'CO	change in orientation
-mvt'WANDER	wandering movement
-mvt'ALT	alternating movement (single-handed or between hands)

3.7 Tracing

The notation trc'X indicates a construction in which the shape of an object is traced.This is used primarily for SASS's and descriptive signs.When tracing is used, the transcription includes a pm'TR_* (tracing handshape) component as well as a trc'X (shape of tracing) component.For example:

pm'TR_STRIP-trc'F_A(an object indicated using a STRIP handshape follows a forward arc)

Refer to Section 3.3.3. (Tracing property markers) for a partial list of tracing handshapes.

3.8 Non-manual components

See Section 4.2 for an explanation of non-manual components and a list of non-manual components that may be included as part of a polycomponential construction.

3.9 Aspect

The notation -asp'X indicates an aspect of type X. Various aspects can be superimposed on a verb. A full list is not yet ready. Example codes are:

CES	cessive (includes a sudden stop or cut off)
ITR	iterative (continuous with clear pauses or stops)
ITR_CUM	iterative cumulative (e.g., stacking of blocks, one on top of the other)
CONT	continuous
DIST	distributive
DEL	delayed inceptive (about to do something)

3.10 Other features of polycomponential constructions

3.10.1 Configurations as units

A configuration of property markers can act as a unit with respect to another component, including real-world objects. Curly brackets are used to indicate simultaneity. With regard to verbs, a configuration can move to a new location; for example, a doll on top of a board is moved to be located on a table:
(put){-pm'PL_H-pm'TL-loc'PL_H_TOP}-gol'OBJ(table)

3.10.2 Continuation from previous utterances

In a series of utterances, a configuration can be held or continued from a previous utterance. For example, if the doll-on-board had already been set up in a previous utterance, the tilde (~) is used for each component which is continued, to indicate that this component was not created anew in the following utterance:

(put){~pm'PL_H~pm'TL~loc'TOP}-gol'OBJ(table)

In addition, the component may serve as a different element in the second utterance, e.g., src'INT can become ~loc'INT in a subsequent utterance.This means that the element with the tilde is continued from the end-product of the previous utterance.

If part or all of an entire polycomponential construction is continued from a previous construction, this is indicated using a tilde (~) before the whole construction. This may happen when one motion is continued across several constructions.

3.10.3 Continuation with handshape change

The percent sign (%) is used when the handshape changes to form a new sign which adds meaning, yet the configuration is held over from the previous utterance.In the following example, in the first construction—(head_move)—pm'HEAD is formed with one handshape,

but in the second construction—(look_around)—the index and middle fingers are extended forwards to form pm'%LOOK:
(head_move)-pm'CN-pm'HEAD-src'INT-pth'U-gol'OUT-pm'HEAD'B-mvt'ULR'B-^aff'B

(look_around)-~pm'CN-pm'%LOOK-~loc'INT_SUP-mvt'LR-pm'HEAD'B-mvt'LR'B ~^aff'B

3.10.4 Shorthand for figure and ground

When property markers or other elements are repeated more than once in a polycomponential construction (e.g. first as pm and then as src or gol), the later instance(s) of the element can be notated using the shorthand F (for Figure) or G (for Ground).For example:
(put)-pm'PL_G(book_G)-pm'PL_H(book_F)-gol'PL_G(book_G)_TOP
could be written as:
(put)-pm'PL_G(book_G)-pm'PL_H(book_F)-gol'G_TOP

3.11 Examples of polycomponential signs

The following are examples of polycomponential verbs, with possible translations in parentheses.(Note that this analysis reveals derivational relationships between verbs of location and verbs of movement.)
(sit_on)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR = 'sit on a horse'
(mount)-pm'PL_VL-pm'TL-gol'PL_VL_TOP-pst'STR = 'get on a horse'
(ride_mounted)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR-mvt'LEX(ride) = 'ride a horse'
(dismount)-pm'PL_VL-pm'TL-loc'PL_VL_TOP-pst'STR-src'PL_VL = 'get off of a horse'
(mount_seated)-pm'CN-pm'TBL-gol'CN-pst'SIT = 'get into a car'
(ride_seated)-pm'CN-pm'TBL-loc'CN_TOP-pst'SIT-mvt'LEX(ride) = 'ride in a car'

(jump)-pm'PL_G-pm'TL-pst'ERC-mvt'LEX(jump) = 'jump up and down'
(jump)-pm'PL_G-pm'TL-pst'ERC-src'PL_G = 'jump off of a horizontal plane' (jump)-pm'PL_G-pm'TL-loc'PL_G_TOP-pst'ERC-src'PL_G-gol'PL_G = 'jump from one point to another on a horizontal plane'
(get_on)-pm'PL_H-pm'TBL-gol'PL_H_TOP-pos'USL = 'cat gets on high, side, left table'
(give)-pm'LEX(give)-src'3-gol'1 = 'give from her to me'
(give)-pm'CYL-src'3-gol'1 = 'give cylindrical obj from her to me'

3.12 Verb agreement

Verb agreement is indicated by the same conventions as used for transcribing directionality in verbs of motion (i.e., by use of src/goal and numeric indications, as in the examples of 'give', above).For example, 'you show me': (show)-pm'LEX(show)-src'2-gol'1.

4. TEMPORAL COMPONENTS OF SIGNS

4.1 Manual simultaneity

4.1.1 Simultaneity within an utterance

Single curly brackets surrounded by spaces enclose elements that co-occur in an utterance. For example, a child signs CANDY while pointing on a book with the non-dominant hand:
*CHI: { CANDY PNT(nh)(on_book) }.
Note:Indicate which sign is on the non-dominant hand; the default is the dominant hand.

Curly brackets that enclose more than one sign are surrounded by spaces. To indicate earlier onset of one sign in curly brackets, append (o) to the sign, e.g.:
*CHI: { CANDY(o) PNT(nh)(on_book) } .
Curly brackets that indicate simultaneity within a complex sign are not surrounded by spaces, as in the the following example, given in Section 3.10.1 (configurations as units):
(put){-pm'PL_H-pm'TL-loc'PL_H_TOP}-gol'OBJ(table)

4.1.2 Simultaneity between utterances

Overlaps are coded in the standard CHAT fashion:
*CHI: WANT < BOOK > [>] PNT_2 ?
*MOT: < WANT > [<] .

***Note on utterance segmentation**:If a signed utterance is grammatical, break the utterance by proposition or clause boundaries. If a signed utterance is ungrammatical, break the utterance by prosody (indicated by pauses, placing the hands down, etc.).*

4.2 Manual/non-manual simultaneity

Non-manual elements are indicated by a carat (^).There are four types, as described below: operator (^opr), modification (^mod), affect (^aff), and discourse marker (^dis).Such an element can be added to a single sign; however, if the non-manual element has scope over several signs, this is indicated using the following conventions:

SIGN-^opr'X	non-manual element associated with a single sign
^opr'X SIGN SIGN ^	non-manual element has scope over several signs

If two different non-manuals are superimposed on a single sign or utterance, each has its own carat, using the following conventions:

{ ^opr'X ^mod'X } SIGN	simultaneous onset of two non-manuals
^{ opr'X ^mod'X } SIGN SIGN ^	two simultaneous non-manuals over two signs
SIGN ^ ^	simultaneous offset of two non-manuals
^opr'X ^mod'X SIGN	sequential onset of two non-manuals
^aff'X ^opr'X SIGN opr^ SIGN aff^	sequential offset of two non-manuals
SIGN-^opr'NEG	non-manual which adds a component to a sign
SIGN-^opr'NEG-^aff'X	simultaneous onset of two non-manuals within a sign

4.2.1 Operators

^opr'X	grammatical operator which operates on a whole phrase or clause (e.g., negation, yes/no question, wh-question, topic marker, relative clause marker, conditional marker) (partial list)
^opr'NEG	negation
^opr'YNQ	yes/no question
^opr'WHQ	wh-question
^opr'TOP	topic marker
^opr'REL	relative clause marker
^opr'COND	conditional marker
^opr'AFR	affirmation (head nod)
^opr'RHQ	rhetorical question

4.2.2 Modification

^mod'X	modifies the referential meaning being expressed by adding a dimension (e.g.,augmented/diminished size, rate, intensity) (partial list)
^mod'RAP	rapid movement
^mod'DUR	durative activity, situation
^mod'AUG	augmented size, rate, or intensity
^mod'EFF	with exaggerated effort
^mod'CARE	with care or caution
^mod'FADE	fading movement or articulation

4.2.3.Discourse markers

^dis'X	markers which regulate the flow of discourse (e.g., checking for agreement, comprehension, confirmation) (partial list)
^dis'CONF	confirmation check
^dis'AGR	agreement
^dis'PRMPT	prompt

4.2.4 Affect

Affect is added to signs in different ways.When a signer is talking about his or her own experience, or is acting as a narrator describing his or her own view of someone else's experience, affect is transcribed as a component in the form aff'X:

^aff'X	freely varying affective accompaniment to a lexical item or utterance to indicate the signer's attitudinal stance towards the situation being communicated (e.g., disgust, surprise)
^aff'DISGUST	disgust
^aff'SURPRISE	surprise
^aff'ANGER	anger

Alternatively, when a signer takes on the affect of another character for a specific sign, or of his or her own affect at a different point in time (e.g., telling a narrative about one's self), the signer uses a form of role shift.This can occur as a component of a polycomponential sign, or as an added meaning component to an individual sign, and is transcribed as follows:

^aff'RS_X	freely varying affective accompaniment to a lexical item or utterance to indicate the affect of the character being represented, e.g. ^aff'RS_SCARED(baby).

(See Section 4.2.5., Role Shift, for transcription of role shifting which has scope over several signs or utterances.)

*Note:In a polycomponential construction, the body often serves as the **figure** when used in this way.*

4.2.5 Role shift

When a signer takes on the perspective of the character being represented for an extended period of time, this is transcribed as a role shift:

`RS(char) SIGN `	role shift

The entire signed utterance contained within the role-shift marker is produced from the perspective of the character being represented. Onset and offset of role shift are indicated by a reverse apostrophe (left single quote, grave accent) and indication of the person represented by the role shift is indicated in parentheses.
Note:RS is in capital letters, since it is a meaningful element.

4.2.6 Gaze

It is often essential to know where signers direct their gaze while signing. Gaze direction is indicated by an asterisk (*) and an indication, in lower case, of the object of gaze; e.g.:

*mot	looks at mother
*book	looks at book

Gaze direction is indicated only when the transcriber considers that it is relevant to analysis of the interaction. Special notations are used to indicate a recipient's view of particular signs, indicated by backslashes (\). Such information is especially important for assessing a child's comprehension.

\- SIGN \	recipient does not see SIGN
\q SIGN \	unsure whether recipient sees SIGN

Note: For any modification other than the extension of neutral signing space, insert a %com *line to explain how the SIGN is modified*

4.2.7.Modification of signs

\@ SIGN \	signer modifies location of SIGN outside its normal location
\@\- SIGN ...	simultaneous onset of two recipient markings (gaze and modification markings may occur simultaneously)
... SIGN \\	simultaneous offset of two recipient markings
... SIGN @\ -\	sequential offset of two recipient markings

5. EXTRALINGUISTIC COMMUNICATIVE BEHAVIOR

5.1 Gestures and actions

If part of an utterance consists of non-signed but meaningful activity, notation of such activity is included as main line commentary in square brackets, as follows:

[%ges: identification]	identifies the gesture and lexical interpretation for gestures occurring without the use of any object or prop, and/or outside of typical signing space, e.g., [%ges: write](See Section 3.3.3. for gestures which are reported actions of another person or object.)
[%act: identification]	identifies the activity that replaces some or all ofan utterance, performed with or on some object, e.g., [%act: throws doll]
[%mim: description]	mimed gesture:the signer is reporting the actions of another person or object and these actions include mimed gestures, e.g. [%mim: wave]

5.2 Attention-getting devices

Various means are used to get the attention of the recipient. These devices are indicated by @ag. The @ag is part of the utterance line. The following attention getting-devices have been identified:

t@ag	tap on person
w@ag	wave at person
g@ag	grab person
f@ag	touch face of person
p@ag	pound on surface

l@ag person flashes light

6. PERFORMANCE AND CONTEXTUAL SITUATION

6.1 Errors and unconventional signs

An error is indicated by [*], in the standard CHAT fashion.If an entire utterance is ungrammatical, with no localizable error within the utterance, [*] is placed at the beginning of the line. If an error can be localized, the intended SIGN is given in square brackets with an equal sign, followed by [*]; e.g.:

*CHI: DAD CHAIR [= SIT] [*] HERE .

Explanations of errors are given on a %err dependent tier, using codes including the following:

$dir	directional error
$pm	property marker error (wrong pm used)
$hs	handshape error
$lex	sign error (wrong sign used)
$loc	location error
$mvt	movement error
$po	palm orientation error
$syn	syntax error (ungrammatical utterance)

If there is more than one error on a line, separate each explanation with a semicolon bounded by spaces. For example, if a child used the wrong handshape for DAD and signed CHAIR with a movement pattern that means SIT, the transcription and error coding would be as follows:

*CHI: DAD [*] CHAIR [= SIT] [*] HERE .
%err: DAD $hs ; CHAIR $mvt = SIT ;

In words with multiple components, use the [*] with a number to indicate which component has the error. However, if the child confuses src and gol, mark this as an error with the * symbol only on the first component, and then add[*] at the end of the classifier construction to mark the error, e.g:

CHI: BOY (grab)-pm'HOLD-mvt'CLOSE-src'3-gol'1 [*] .
%err: src'3-gol'1 $agr = src'1-gol'3 ;

Additional error notations:

[*q]	possible error
[*u]	unspecified error somewhere in the utterance, but not tied to one particular SIGN
[*g]	a sign that is gestural in nature but incorporates conventional sign language handshapes, seen in second language learners and signers using manual codes for spoken language

Note:For phonological errors, the utterance line should represent what is semantically meant by the sign, i.e., what the addressee should get from the message, and not a phonological representation of what the signer signed.The notation of phonological errors will depend on the transcriber's specific research question.

Note:Some "errors" may in fact be creative uses of signs by non-native language users or users who have limited native language models (e.g., hearing parents, children, individuals exposed only to signed systems).In these cases, the transcriber must decide how notate the errors.Some may wish to transcribe them as true errors, while others may want to invent new conventions to represent these creative or non-conventional uses of signs.

6.2. Empty utterance line

If a turn consists of a definite, but non-signed response, use the standard CHAT convention of beginning the utterance line with zero (e.g., *CHI: 0). The zero is used when the interlocutor uses only an attention getter (*CHI: 0 t@ag), action, and/or gesture.

6.3. Continuation across utterances

If a sign is continued or held from the previous utterance, the tilde (~) is used to indicate that this sign was not created anew in the following utterance, e.g. ~SIGN.

6.4. Interruption

Interruption and continuation after interruption are coded in the standard CHAT fashion.For example:

*MOT:	WANT +/ .
*CHI:	PNT_3(on_book) .
*MOT:	+, READ BOOK .

6.5. Retracing

Standard CHAT conventions are used for retracing and retracing with correction, as in these examples:

*CHI:	<MOTHER> [/] MOTHER LEAVE .
*CHI:	<BEAR> [*] [//] BEAR .
%err:	BEAR $mov

6.6Repeated, compressed constructions

Sometimes a signer will repeat a construction that has been previously produced in order to re-instate a perspective from which the signer had temporarily shifted.In this type of repetition, the construction is produced in a compressed form, without the set-up or explanation that was required the first time.This is indicated as:

^cmp UTTERANCE ^	the utterance contained within the carats is a repeated, compressed version of a previous utterance.

7. DEPENDENT TIERS

The following is a partial list of dependent tiers for analysis of sign language. Other tiers can be added, based on the particular research question being addressed.

%act	modifies the preceding utterance line, describing actions of signer or recipient that are necessary for the understanding of the transcription
%att	describes participants' attention (e.g., CHI and MOT not attending to one another)
%com	comment
%fg	description of figure/ground relationship
%ges	phonological description of gesture
%gls	gloss (written-language paraphrase for particular complex utterance lines)
%mor	morphology
%pho	phonology
%sem	semantics
%spa	speech act

8. EXAMPLES

8.1. SLN (Sign Language of the Netherlands)

This is a segment of joint drawing activity between a mother and her daughter of 2;8 (data of Nini Hoiting):

*MOT: PNT(nh)(with_pen_on_slate) < FATHER > [>] .
*CHI: < MAN > [<] FATHER PNT_3(on_slate) .
*MOT: t@ag MAN .
*CHI: MAN .
*MOT: PNT_3(at_drawing) .
*CHI: PNT_3(at_drawing) PNT_1 [%ges: long ears] .
*MOT: PNT_2 PNT_3(on_slate) .
*CHI: PNT_3(on_slate) GRANDPARENTS .
*MOT: GRANDMOTHER .
*CHI: PNT_3(on_slate)(*N) < A_LOT(*N) > [>] .
*MOT: <^dis'CONF A_LOT FACES > [<] A_LOT FACES ^ .

8.2. ASL (American Sign Language)

This is a segment of book reading between a mother and her daughter of 1;9 (data of Reyna Lindert):

*MOT: t@ag(*2) w@ag ^opr'WHQ SEE WHAT(lh) ^ ?
*CHI: MOUSE(*N) .
*MOT: t@ag g@ag(nh): \- ^opr'WHQ WHAT(lh) ^ \ ?
*CHI: 0 [%act: lifts panel in book] *mot .
*MOT: ^opr'WHQ WHAT(lh) ^ ?
*CHI: < PNT_3(on_book) *mot > [>] .
*MOT: <^opr'WHQ WHAT(lh)(*2) ^ > [<] ?
*MOT: ^opr'YNQ \- CAT \ t@ag(nh) CAT PNT_3(at_cat_in_book) ^ < CAT > [>]?
*CHI: < ^opr'NEG 0 ^ > [<] [%ges: don't know/not me] .
%ges: open 5s, wrists rotate out
*MOT: ^opr'WHQ WHAT(lh) ^ ?
*CHI: <BEAR> [*] [//] BEAR .
%err: BEAR $mvt

Reference

Tennant, R. A., & Brown, M. G.(1998).*The American Sign Language handshape dictionary*.Washington, DC: Gallaudet University Press.

Appendix E
Dutch Version of BTS Manual

BERKELEY TRANSCRIPTIE SYSTEEM (BTS)
Nederlandse handleiding.
versie 5 – 21.02.02

vertaling: Baukje Bosma & Nini Hoiting

1. TRANSCRIPTIEDOELEN

De volgende conventies zijn bestemd om consistent te zijn met CHAT en CLAN (met een aantal noodzakelijke toevoegingen, gezien de aard van gebarentalen)[40]. Het doel is uitingen te representeren in een consistente morfologische en semantische notatie, volgens de grammatica's van ASL en NGT (en, mogelijkerwijs, andere gebarentalen). Fonologische transcriptie van uitingen is zoveel mogelijk vermeden in de basisrepresentatie van beurten. Deze conventies zijn dus bestemd voor de sprekerslijn(*). Afhankelijke lijnen (%) zullen later behandeld worden. Manuele en non-manuele elementen worden gerepresenteerd in een enkele regel, waarbij alleen ASCII tekens gebruikt worden.

Lexicale items worden in hoofdletters geschreven en omsloten door spaties. Vanwege dit distinctieve gebruik van hoofdletters, moet voor het zoeken via CLAN gebruik gemaakt worden van de +k schakel, opdat het onderscheid tussen hoofd- en kleine letters gegarandeerd blijft. Een gebaar wordt gerepresenteerd door tenminste twee hoofdletters. Er kunnen geen spaties in een lexicaal item voorkomen: de componenten van polycomponentiële lexicale items worden gescheiden door middel van koppeltekens (zoals beschreven in par. 3, Polycomponentiële gebaren); andere elementen worden samengevoegd door middel van lage streepjes of ronde haken zonder spaties. Een uitingslijn eindigt met een punt of vraagteken, vooraf gegaan door een spatie.

1.1 Kenmerken die betrekking hebben op individuele lexicale gebaren

GEB # GEB	pauze tussen gebaren
GEB(*2)	gebaar wordt tweemaal herhaald, maar eenmaal geteld (in onderzoek)
GEB(*M)	gebaar wordt meerdere malen herhaald, maar eenmaal geteld(„)
GEB_GEB	twee Nederlandse woorden die één enkel gebaar representeren, bijv. NAAR_BED_GAAN (één betekenis component)
GEB-GEB	twee gebaren die gecombineerd worden om één nieuw gebaar te produceren, bijv. KEUKEN-DEUR (twee betekenis componenten)
GEBGEB	twee gebaren die gecombineerd worden om één nieuw, samengesteld gebaar te produceren, bijv. BLOEDNEUS (één betekenis component)
&GEB	onvoltooid gebaar

[40] Zie de CHILDES-website voor de volledige lijst van vereiste conventies: http://childes.psy.cmu.edu/

<GEB>[?]	onzekere transcriptie
XX	onbegrijpelijk, maar duidelijk gebaar, dat moet worden mee-
geteld bij	het tellen van gebaren
xxx	onbegrijpelijk gebaar of beweging, of gebaar buiten beeld, dat moet worden uitgesloten van het tellen van gebaren
GEB(vs)	gebaar is een gevingerspeld leengebaar
G_E_B(vs)	gebaar wordt gevingerspeld, maar is geen leengebaar

1.2 Verdere specificaties van individuele lexicale gebaren

GEB:	gebaar wordt aangehouden
GEB-^mod'DIC	gebaar gericht naar een locatie dichtbij
GEB-^mod'TUS	gebaar gericht naar een tussenliggende locatie
GEB-^mod'VER	gebaar gericht naar een locatie veraf
GEB(1h)	eenhandig gebaar (indien normaal 2h)
GEB(2h)	tweehandig gebaar (indien normaal 1h)
GEB(nh)	gebaar gemaakt met de niet-dominante hand (indien afwij-
kend)	
GEB(dh)	gebaar gemaakt met de dominante hand (indien afwijkend)

NB: Als zowel het aantal handen, als welke hand(en) moet worden aangegeven, komt het aantal handen eerst, bijv. GEB(1h)(nh). Als een gebaar (1h) is, alleen aangeven welke hand, indien de niet-dominante hand wordt gebruikt.

GEB(v)	gebaar is een werkwoord (indien afwijkend)
GEB(n)	gebaar is een zelfstandig naamwoord (indien afwijkend)
GEB	citeervorm
GEB2	alternatieve vorm (bijv. WIE, WIE2)
X@ng	naamgebaar (met X-handvorm)
X@zg	zelf bedacht gebaar (met X-handvorm)
X@tg	thuisgebaar (met X-handvorm)
GEB@in	geïnitialiseerd gebaar

1.3 Numerieke gebaren

Gebaren die een aantal in de handvorm incorporeren worden aangeduid door middel van het numerieke gebaar gevolgd door een laag streepje en het geïncorporeerde aantal:

ORD_1	ordinaal gebaar ("eerste item")
DUR_1	duratief gebaar ("een uur"), mogelijk van 1 t/m 5

NB: In NGT worden getallen voorafgaand (of volgend) gekoppeld aantijdsindelingen, zoals weken, maanden, jaren. In tegenstelling tot ASL is in NGT dus meestalsprake van twee lexicale items. Zie ook par.2: PNT_A..

2. WIJZEN, INDEXEN EN PRONOMINA

PNT_1	wijzen naar zelf

Appendix E:

PNT_2	wijzen naar gesprekspartner
PNT_3(pers)	wijzen naar derde persoon, als deze aanwezig is
PNT_3(obj)	wijzen naar object, als dit aanwezig is
IX_3(pers/obj)	index in de gebarenruimte naar een ***afwezig*** persoon of object
PNT_1_2	1e en 2e pers sing ('ik en jij')
PNT_1_3	1e en 3e pers sing ('ik en hij/zij', 'wij tweeën')
PNT_1+	1e pers plur ('ik en iemand', generiek 'wij')
PNT_S	Selectief: specifieke verwijzingen naar elk van de personen of objecten waaraan gerefereerd wordt. Dit wordt gebruikt óf om de individuele referenten te benadrukken, óf wanneer de personen waaraan gerefereerd wordt, fysiek niet dichtbij elkaar zijn.
PNT_M	Meerdere: de referenten worden aangegeven door middel van
een "1"-	handvorm (uitgestoken wijsvinger) en een lange 'veeg'-
beweging. Dit	kan gebruikt worden voor elk aantal referenten meer dan 1.
PNT_A	Aantal: het aantal personen (of objecten) waarnaar gerefe-
reerd wordt	is geïncorporeerd in de handvorm van het pronomen (voor 1-
5	referenten).
PNT_1_2_S	1e en 2e pers plur, selectief ('ik en specifieke anderen van
jullie')	
PNT_1_2_M	1e en 2e pers plur, meerdere ('ik en jullie allemaal')
PNT_1_2_A	1e en 2e pers plur, aantal ('ik en een bepaald aantal van jul-
lie')	
PNT_1_3_S	1e en 3e pers plur, selectief ('ik en specifieke anderen')
PNT_1_3_M	1e en 3e pers plur, meerdere ('ik en alle anderen')
PNT_1_E	1e pers plur, exclusief ('wij', exclusief geadresseerden)
PNT_1_I	1e pers plur, inclusief('wij', inclusief geadresseerden)
POSS_1	1e pers sing, possessief
POSS_2	2e pers sing, possessief
POSS_3	3e pers sing, possessief
POSS_1+	1e pers plur, possessief
POSS_2+	2e pers plur, possessief
POSS_3+	3e pers plur, possessief
GEB_S/EN	gebaar direct gevolgd door meervouds uitgang (-s/-en)
GEB_DIM	gebaar direct gevolgd door verkleinings uitgang (-tje)

Voorbeelden van meer complexe pronomina:

PNT_1 PNT_2	1e pers, 2e pers, achtereenvolgens ('wij', inclusief geadresseerden)
PNT_1_2*2	1e en 2e pers (2) ('ik en jullie tweeën')
PNT_1_2*3	1e en 2e pers (3) ('ik en jullie drieën')
PNT_2_3*2	1e en 3e pers (2) ('jij en zij tweeën')
VELD	gebaar geproduceerd met een 5 hand, palm naar beneden, dat kleine cirkels maakt in neutrale gebarenruimte
VELD-loc'X	gebaar VELD geproduceerd op een andere plaats dan in de neutrale gebarenruimte. De –loc'X component is toegevoegd om de locatie van de geïndexeerde ruimte aan te geven, bijv. VELD-loc'BORST'B of VELD-loc'L.

3. POLYCOMPONENTIËLE GEBAREN

In de meest volledige uitwerking houdt een polycomponentiële constructie in:

1. een *gloss*, aangegeven in kleine letters tussen haakjes om te voorkomen dat het als een lexicaal item wordt geteld
2. *paden van beweging* in de vorm -pad'X (ook -bro, -dol en -rel)
3. *eigenschapsmarkeerders* (figuren en ondergronden) in de vorm -em'X
4. *locaties* in de vorm -loc'X
5. *houding* in de vorm -hou'X
6. *bewegingspatronen* in de vorm -bew'X
7. *non-manuele elementen* in de vorm -^mod'X (ook -^opr, -^aff en -^gsp)
8. *aspect* in de vorm -asp'X

Alleen de gloss en één eigenschapsmarkeerder zijn verplicht. Locaties, bewegingspatronen en paden van beweging kunnen afwezig zijn of uit verschillende ingangen bestaan. Er kan maar eenem voor een aspectingang zijn. Deze componentmorfeem types worden aangegeven in kleine letters, gevolgd door een apostrof en een specificatie van de inhoudelijke component: bijv. -em'TB geeft een tweebenig levend wezen aan. De volgorde van de componenten is: gloss tussen haakjes, eigenschapsmarkeerder(s) (ondergrond/figuur), locatie/beweging, modificatie, aspect (zie voorbeelden).

Elk van de acht mogelijke componenten van polycomponentiële werkwoordtranscriptie wordt hieronder weergegeven, met voorbeelden aan het eind van deze paragraaf.

3.1 Gloss

Het eerste symbool in de werkwoordstranscriptie is de meest dichtbij komende Nederlandse gloss (bijv. springen, op-/afstijgen, zittend_rijden, op_een_paard_rijden). De interne elementen in een gloss worden gescheiden door lage streepjes, om ze als één samenhangend geheel te zien.

3.2 Paden van beweging

-pad'X	pad van beweging, als dit semantisch betekenisvol is
-bro'X	beweging vanuit een plaats of vanuit contact
-dol'X	beweging naar een plaats of naar contact
-rel'X	beweging relatief aan een nabijreferentobject

De componenten "bron" en "doel" kunnen gecombineerd worden met de component "locatieve relaties" (zie par. 3.4.1) om aan te geven welk deel van het figuur en de ondergrond met elkaar in contact zijn, bijv.: (springen)-em'HV-em'TGB-bro'HV_TOP-pad'B ('tweebenige figuur springt van de top van een horizontaal vlak af, via een pad met een boog'). De componenten van pad, bron en doel worden aangegeven door middel van hoofdletters uit de volgende lijst. (De locatieve componenten van referentiepunten in een relatieve beweging zijn dezelfde als die voor locatieve relaties, en worden opgesomd in par. 3.4.1)

3.2.1 Vorm (alleen voor pad)

I	lijn
B	boog
C	cirkel
K	kronkeling
Z	zigzag
R	roterend

3.2.2 Verticale richting

O	op
N	neer

3.2.3 Voor/achter richting

V	vooruit
A	achteruit

3.2.4 Laterale richting

IJ	opzij

3.2.5 Lichaamsgeoriënteerde richting

R	rechts
L	links

3.2.6 Oscillerende richting

VA	voor- en achteruit

3.2.7 Andere richtingen

NA	twee eigenschapsmarkeerders die naar elkaar toe bewegen (bijv. -dol'NA)
AF	twee eigenschapsmarkeerders, die van elkaar af bewegen
OBJ(ref)	bestaande object referent (bijv. -dol'OBJ(papier))
X_em'X	locatie/richting in relatie tot een eigenschapsmarkeerder (bijv. L_em'CIL = 'links van cilindervormig object')
UIT	uit
IN	in

3.3 Figuren en ondergronden

De notatie -em'X geeft een eigenschapsmarkeerder van type X aan. De volgende lijst van eigenschapsmarkeerders is niet volledig en staat open voor aanvulling/verbetering. Op den duur wordt deze paragraaf voorzien worden van afbeeldingen van handvormen uit de NGT[41]. Merk op dat eigenschapsmarkeerders semantische definities krijgen, zoals 'tweebenig levend wezen, in plaats van fonologische (bijv. 'V'). In sommige gevallen wordt de algemene semanti-

[41] Door ons gebruikte handvormen zijn ontleend aan de "Handvormen van de NGT", de NSDSK-lijst uit 1986. Deze lijst is deels fonologisch gebaseerd, deels semantisch benoemd. Een volledig semantische lijst is nog niet beschikbaar.

sche categorie (HOUD) gevolgd door een afkorting van de specifieke handvorm die wordt gebruikt. Omdat er niet altijd een afzonderlijk Nederlands woord is, dat de semantische inhoud van een eigenschapsmarkeerder samenvat, moeten de afkortingen behandeld worden als ezelsbruggetjes voor de categorie die wordt aangegeven door de handvorm. Als twee eigenschapsmarkeerders deel van één enkel werkwoord zijn, is de volgorde van notatie **ondergrond** gevolgd door **figuur**. Indien specificatie nodig is over welke eigenschapsmarkeerder de grond en welke de figuur representeert, wordt dit tussen haakjes aangegeven na de eigenschapsmarkeerder (bijv. -em'STOK(F) voor een stokvormige eigenschapsmarkeerder die als figuur optreedt). Als de twee handen twee entiteiten representeren (bijv. een beker met bij behorend deksel), gebruik dan twee verschillende em's. Als de handen één enkele entiteit representeren, gebruik dan één em (bijv. -em'HO_C(2h)).

3.3.1 Entiteit eigenschapsmarkeerders

LEX	Lexicale eigenschapsmarkeerder voor een specifiek polycomponentieel gebaar
LEX(x)	Lexicale eigenschapsmarkeerder met x handvorm
BOL	Bolvormig object (bijv. bal, ballon)
CIL	Cilindervormig object (gesloten)
CIR	Cirkelvormig object (2 C-handen[42])
CNT	Container (open)
DEK	Deksel (klauw-hand)
DOOS	Doosvormig object
GO	Gebogen Oppervlakte
OBJ	Object (gespecificeerd tussen haakjes)
HAAK	? Haakvormige index, gebruikt om voorwerpen op te hangen
KRO	Klein rond objekt
PAD	Pad eigenschapsmarkeerder, gebruikt om het pad dat de fi-
guur aflegt	te laten zien
PS	Platte Schijf (dichte snavel-hand)
STOK	Stokvormig object
TB	TweeBenig levend wezen
TGB	Twee Gebogen Benen (of poten)
VB	VierBenig rechtopstaand wezen (tweehandige eigenschapsmarkeerder)
VGB	Vierbenig dier (Vier Gebogen Benen; tweehandige eigenschapsmarkeerder)
VUIST	? of VGB_V voor Vierbenig, plomp/massief dier zoals olifant, neushoorn, nijlpaard
MAS	Massa (mensen, dieren, vloeistoffen)
VL	Vlak (geen specifieke stand)
VL_D	Dalend Vlak
VL_G	Generiek vlak (horizontaal, palm naar boven) .....?? juist voor NGT??
VL_H	Horizontaal vlak (palm naar beneden)
VL_S	Stijgend Vlak
VL_SV	Smal vlak (horizontaal)
VL_VH	Vlak dat verticale hoogte aangeeft (vingerrichting: omhoog)

[42] In deze omschrijvingen is de Nederlandse terminologie voor handvormen gebruikt zoals bekend van de NGT-cursussen, NSDSK 1984

VL_VL	Vlak dat verticale lengte aangeeft (vingerrichting: naar voren)

3.3.2 Hanteer- en spoorvormende eigenschapsmarkeerders:

HO_*	Hanteereigenschapsmarkeerder, waarbij * een label is van de handvorm

Handvorm labels volgen het NGT vingeralfabet (bijv. HO_S representeert een gesloten vuist in de S-handvorm). Daarnaast zijn er handvormen die niet overeenkomen met een letter in het handalfabet. Deze zijn als volgt gelabeld (terminologie volgens NGT-cursussen, NSDSK, 1984):

GELD	Geld
BC	Baby C
BO	Baby O
BS	Baby Snavel
DS	Dichte Snavel
OS	Open Snavel
TN	T-nul
DOU	Douche
HOEK	Hoek
1	Eén
5	Vijf
KLAU	Klauw

3.3.3

SP_*	Spoorvormende eigenschapsmarkeerder, waarbij * een label is van de handvorm

Spoorvormende eigenschapsmarkeerders worden getranscribeerd als em'SP_*-sp'X,waarbij de spoortrekkende handvorm wordt weergegeven en X staat voor het afgebeelde spoor, bijv. em'SP_STRIP-sp'LANG. Tot dusver zijn de volgende handvormen gebruikt:

MUUR	Muur, of groot plat vlak met B handvormen
GO	Gebogen Oppervlak
STRIP	Strip, spoor met OS handvormen
BREED_STRIP	Breed Strip, spoor met xC-handvormen
DRIE_D_STRIP	Drie Dimensionale Strip met HOEK-handen, duimen voorwaarts
BUIS	Buis-vormig spoor met C-handvormen
KL_BUIS	Kleine Buis vormig spoor met bO handvormen
GR_BUIS	Grote Buisvormig spoor met xB handvormen
DRAAD	Draadvormig spoor met pink-handvormen
SCHETS	Schetsende spoorvorming, waarbij contour met 1-handvormen wordt uitgedrukt
GANG	Gangvormig spoor met twee Bo handvormen (? STRAAT?)

3.3.4. Aanduiden van lichaamsdeel:

Als de gebaarder een daadwerkelijk lichaamsdeel gebruikt, in plaats van een manueel gebaar om een lichaamsdeel aan te geven, gebruik dan de volgende notaties:

-em'L-LICHAAMSDEEL	referentieel gebruik van het lichaam van de gebaarder om een actie te representeren, bijv. -em'L_HOOFD

NB: In een polycompentionele constructie dient het (eigen) lichaam vaak als ondergrond (G).

-em'OBJ(lichaam)	een gebaar dat wordt gearticuleerd in de richting van een ander persoon of object. In dit geval worden lichaamsdelen behandeld net als andere objecten. Het is mogelijk te specificeren naar wiens lichaam het gebaar was gericht, bijv. – dol'OBJ(mond_2) om een gebaar te representeren dat werd gearticuleerd in de richting van de mond van de geadresseerde (2^e persoon)

[Indien een gebaarder karakteristieken van iemand of iets overneemt door middel van gebruik van gezichtsuitdrukking of andere lichaamsdelen, dan wordt dit aangemerkt als een lichaam betekenis eenheid, en genoteerd als:

-lbe'X	lichaam betekenis eenheid, waarbij X de persoon is wiens karakteristieken worden overgenomen. Bij voorbeeld: als een gebaarder een moeder uitbeeldt die trots een baby buggy duwt, noemen we dit: -aff'TROTS-lbe'MOEDER

Indien de gebaarder vertelt over de acties van een ander persoon of object en deze acties ook gemimede gestures inhouden, wordt dit getranscribeerd als:

?? mim'X	gemimede gesture, bijv. mim'ZWAAIEN (mim'X valt samen met een lbe om aan te geven wiens acties worden weergegeven).

cf. "surrogates by Liddell]

3.4 Locatieve relaties

De notatie -loc'X geeft een locatieve relatie aan tussen figuur en ondergrond van het type X. Locatieve componenten worden gebruikt om de locatie van de figuur-eigenschapsmarkeerder aan te geven met betrekking tot de ondergrond-eigenschapsmarkeerder. De volgende lijst is nog niet volledig:

INT	interieur ('in')
SUP	superieur ('op')
INF	inferieur ('onder')
TOP	top ('bovenste oppervlak')
BOD	bodem ('onderste oppervlak')
RAN	rand
VOR	voor

ACH	achter
VK	voorkant
AK	achterkant
PAR	parallel
NAA	twee eigenschapsmarkeerders gemaakt op hetzelfde moment en gemaakt naast elkaar, maar zonder een aangegeven figuur-ondergrond relatie.
RR	referentiële ruimte: impliciet in de conversatie, al eerder vast-gesteld
ZIK	zijkant
0	referentiële ruimte: impliciet in het kader, niet eerder vastge-steld

NB: Twee locatieve componenten kunnen gecombineerd worden; bijv. VOR_RAN (voorrand).

De notatie -loc'CON wordt gebruikt om twee eigenschapsmarkeerders te beschrijven die geen figuur-ondergrond relatie hebben, maar wel in contact zijn. Om informatie toe te voegen over waar de twee em's contact maken, gebruik een beschrijving tussen haakjes om aan te geven op welke plaatsen op de HANDEN de twee em's in contact waren:

-loc'CON	contact zonder een figuur-ondergrond relatie
-loc'CON(x)	contact op x locatie op de handen, bijv. -
loc'CON(vingertoppen)	

3.5 Houding

De component "houding" (hou'X) geeft de lichaamshouding weer van een figuur voor de deelverzameling van polycomponentiële werkwoorden die lichaamshouding uitdrukken. Voorbeelden van zulke werkwoorden zijn zitten, staan, liggen, op-/afstijgen en (paard)rijden. De volgende houdingscomponenten zijn gedefinieerd:

REC	rechtop
LEU	leunend
LEU_V	voorover leunend
LEU_A	achterover leunend
ZIT	zittend
GEP	gespreid

3.5.1 Oriëntatie

De component "oriëntatie" (-ori'X) wordt gebruikt om (uitgaande van de gebaarder) de oriëntatie aan te geven van de figuur óf de ondergrond. In een polycomponentiële constructie moet informatie over oriëntatie en houding volgen op de eigenschapsmarkeerder waaraan het refereert. Oriëntatie wordt alleen gemarkeerd indien deze verschilt van de default (algemeen gebruikte)oriëntatie voor die eigenschapsmarkeerder in die referentie situatie. Het is mogelijk orientatie te definieren door middel van de wijsrichting van hand palm en vingertoppen. (bijv. ori'VO = palm voorwaarts, vingertoppen opwaarts.De volgende oriëntatiecomponenten zijn gedefinieerd:

Appendix E:

Palm:

V	voorwaarts
A	achterwaarts
Z	zijwaarts
O	opwaarts
N	neerwaarts

Vingertoppen:

V	voorwaarts
A	achterwaarts
Z	zijwaarts
O	opwaarts

Oriëntatie-informatie kan worden geschreven als twee letters, één voor palmoriëntatie en één voor vingertoporiëntatie. Als de oriëntatiecomponent geen betekenis toevoegt aan de constructie, voeg dan oriëntatie als onderdeel van de figuur- of ondergrond-eigenschapsmarkeerder toe (bijv. –em'PS_ZV is een 'platte-schijf' eigenschapsmarkeerder met de palm zijwaarts en de vingertoppen voorwaarts[43]).

[43] Let op, in de NGT wordt de vingerorientatie –bij gegeven palmorientatie - benoemd als in uitgestrekte positie

3.6 Bewegingspatronen

De notatie -bew'X geeft het bewegingspatroon van een werkwoord aan. Lexicale beweging (bew'LEX) geeft het bewegingspatroon aan dat een bepaald werkwoord identificeert. Het lexicale bewegingspatroon contrasteert niet met andere bewegingspatronen: deenige functie(hier) is om aan te geven dat de configuratie bij de betekenis (vertaling) van dat bepaalde werkwoord hoort.

-bew'LEX(ww)	beweging die een lexicaal item definieert maar geen extra betekenis geeft; bijv. het ASL-werkwoord 'rijden' (op een dier) bestaat uit eigenschapsmarkeerders die de vorm van ondergrond (verticaal vlak), figuur (tweebenig wezen) en houding (schrijlings) aangeven, plus een niet-directionele component van beweging (roterend). Omdat deze beweging niet contrasteert met enig andere beweging in deze samenstelling, wordt dit eenvoudigweg getranscribeerd als –bew'LEX (rijden).
-bew'SCHOM	schommelende beweging
-bew'DRAAI	draaiende beweging (rotatie van pols)
-bew'STUIT	stuiterende beweging
-bew'SLUIT	beweging waarbij de hand zich sluit
-bew'OPEN	openende beweging
-bew'STOOT	korte stotende beweging
-bew'SCHUD	schuddende beweging
-bew'LANG	laat een lang voorwerp zien, bijv. plank of bed
-bew'BUIG	afbuigende beweging
-bew'STRE	(samen)strengelende beweging
-bew'VH	verandering in houding
-bew'VO	verandering in oriëntatie
-bew'ZWERF	zwervende beweging
-bew'ALT	alternerende beweging (kan alternatie inhouden tussen twee handen in tweehandige gebaren)

3.7 Spoorvorming

De notatie -spr'X geeft een constructie aan waarin de vorm van een object wordt nagevolgd. Dit wordt voornamelijk gebruikt voor vormaanduidende en beschrijvende eigenschapsmarkeerders. Waneern spoorvorming wordt gebruikt, omvat de transcriptie zowel een –em'SP_* (spoorvormende handvorm) component alsook een spr'X (vorm van het spoor) component. Bij voorbeeld:

-em'SP_STRIP-spr'V_B	(een object aangeduid met een strip-handvorm die een voorwaartse boog volgt)

Zie par. 3.3.3 (Spoorvormende eigenschapsmarkeerders) voor de deellijst van mogelijke spoorvormende handvormen.

3.8 Non-manuele componenten

Zie par. 4.2 voor een uitleg van non-manuele componenten en een lijst van non-manuele componenten die kunnen worden meegerekend als onderdeel van een polycomponentiële constructie.

3.9 Aspect

De notatie -asp'X geeft een aspect van type X aan. Verschillende (tijdinherente) aspecten kunnen aan een werkwoord gehecht worden.Een volledige lijst is nog niet voorhanden. Voorbeeldcodes zijn:

STIL	tot stilstand komend
HER	herhaald
HER_CUM	herhaald cumulatief (bijv. stapelen van blokken, de ene boven
op de	andere)
DOOR	doorlopend
DIST	distributief
VBE	vertraagd beginnend (op het punt staan te....)

Bij voorbeeld, een enkel werkwoord in ASL kan aangeven dat het rijden snel ging en beëindigd werd. Het resultaat is een werkwoord van zes componenten:

ASL :(ride_mounted)-pm'VP-pm'TL-pst'STR-mvt'LEX(ride)-mod'RAP-asp'CES
NGT: (rijden_op_een_paard)-em'VV-em'TB-hou'GEP-bew'LEX(rijden)-mod'SNEL-asp'STIL/

3.10 Andere kenmerken van polycomponentiële constructies

3.10.1. De configuratie als eenheid

Een configuratie van eigenschapsmarkeerders kan fungeren als een eenheid met betrekking tot een andere component, inclusief objecten uit de werkelijkheid. Accolades worden gebruikt om simultaneïteit aan te geven. Wat werkwoorden betreft, kan een configuratie verplaatsen naar een nieuwe locatie; bij voorbeeld, een pop boven op een plank wordt verplaatst om op een tafel te worden gezet:

(zetten){-em'HV-em'TB-loc'HV_TOP}-dol'OBJ(tafel)

3.10.2. Vervolg van voorgaande uitingen

In een serie van uitingen kan een configuratie worden aangehouden of vervolgd vanuit een voorafgaande uiting. Bij voorbeeld, als de pop_op_de_plank al in een voorafgaande uiting geïntroduceerd was, wordt de tilde (~) gebruikt voor elke component die wordt vervolgd, om aan te geven dat deze component niet nieuw gecreëerd is in de volgende uiting:

(zetten){~em'HV-~em'TB-~loc'HV_TOP}-dol'OBJ(tafel)

Verder kan een component dienen als een ander element in een tweede uiting, bijv. -bro'INT kan worden ~loc'INT in de daaropvolgende uiting. Dit betekent dat het element met de tilde vervolgd wordt vanuit het eindprodukt van de voorafgaande uiting.

Indien een gedeelte of het geheel van een polycomponentiële constructie wordt voortgezet vanuit een voorafgaande uiting, wordt dit aangegeven door een tilde te plaatsen (~) voor de hele uiting. Dit kan gebeuren wanneer één beweging wordt voortgezet gedurende verschillende constructies.

3.10.3. Vervolg van een handvorm-verandering

Het percentage teken (%) wordt gebruikt wanneer de handvorm verandert om een nieuw gebaar te vormen dat betekenis toevoegt, terwijl de configuratie uit de voorafgaande uiting aangehouden wordt. In het volgende ASL-voorbeeld (voor NGT is dit nog onvoldoende gecheckt) wordt in de eerste constructie, (om_zich_heen_kijken), em'HOOFD gevormd met de ene handvorm, maar in de tweede constructie, (hoofd_bewegen), worden de index en de middelvingers naar voren gericht om em'%KIJKEN te vormen:

ASL : (head_move)-pm'CN-pm'HEAD-src'INT-pth'U-gol'OUT-pm'HEAD'B-mvt'ULR'B-^aff'B .
NGT:(hoofd_bewegen)-em'CNT-em'HOOFD-bro'INT-pad'O-dol'UIT-em'HOOFD'L-bew'OLR'L-^aff'L/

(look_around)-~pm'CN-pm'%LOOK-~loc'INT_SUP-mvt'LR-pm'HEAD'B-mvt'LR'B-~^aff'B
/(om_zich_heen_kijken)-~em'CNT-em'%KIJKEN-~loc'INT_SUP-bew'LR-em'HOOFD'L-bew'LR'L-~^aff'L/

3.10.4. Snelschrift voor figuur en ondergrond

Indien eigenschapsmarkeerders of andere elementen meer dan één keer worden herhaald in een polycomponentiële constructie (bijv. eerst als em en daarna als bro of dol), dan kunnen het later voorkomen van dit element genoteerd worden door de stenografische F (voor Figuur) of G (voor onderGrond) te gebruiken. Bij voorbeeld :

ASL : (put)-pm'PL_G(book_G)-pm'PL_H(book_F)-gol'PL_G(book_G)_TOP
NGT: (leggen)-em'VL_G(boek_G)-em'VL_H(boek_F)-dol'VL_G(boek_G)_TOP/

zou men kunnen schrijven als:

ASL : (put)-pm'PL_G(book_G)-pm'PL_H(book_F)-gol'G_TOP
NGT: (leggen)-em'VL_G(boek_G)-em'VL_H(boek_F)-dol'G_TOP/

3.11 Voorbeelden van polycompentionele gebaren

De volgende lijst bevat voorbeelden van polycomponentiële werkwoorden in NGT en ASL, met mogelijke vertalingen tussen haakjes. Merk op dat deze analyse, derivationele relaties laat zien tussen werkwoorden van locatie en werkwoorden van beweging.

NGT:
(springen)-em'HV-em'TB-hou'REC-bew'LEX(springen)
= 'op en neer springen'
(springen)-em'HV-em'TB-hou'REC-bro'HV
= 'van een horizontaal vlak springen'
(springen)-em'HV-em'TB-loc'HV_TOP-hou'REC-bro'HV-dol'HV
= 'van het ene punt naar het andere springen op een horizontaal vlak'

(komen_op)-em'HV-em'TGB-dol'HV_TOP-pos'OIJL
= 'een kat komt op een hoge tafel aan de linker zijkant'
(geven)-em'LEX(geven)-bro'3-dol'1 = 'zij geeft iets aan mij'
(geven)-em'CIL-bro'3-dol'1 = 'zij geeft een cilindervormig voorwerp aan mij'

ASL en NGT en NL vertalingen
(sit_on)-pm'VP-pm'TL-loc'VP_TOP-pst'STR
(zitten_op)-em'VV-em'TB-loc'VV_TOP-hou'GEP = 'op een paard zitten'

(mount)-pm'VP-pm'TL-gol'VP_TOP-pst'STR
(opstijgen)-em'VV-em'TB-dol'VV_TOP-hou'GEP = 'op een paard klimmen'

(ride_mounted)-pm'VP-pm'TL-loc'VP_TOP-pst'STR-mvt'LEX(ride)
(opgestegen_rijden)-em'VV-em'TB-loc'VV_TOP-houGEP-bew'LEX(rijden) = 'paardrijden'

(dismount)-pm'VP-pm'TL-loc'VP_TOP-pst'STR-src-VP
(afstijgen)-em'VV-em'TB-loc'VV_TOP-hou'GEP-bro'VV = 'van een paard klimmen'
(mount_seated)-pm'CN-pm'TBL-gol'CN-pst'SIT
(opstijgen_gezeten zijn)-em'CNT-em'TGB-dol'CNT-hou'ZIT = 'in een auto gaan zitten'

(ride_seated)-pm'CN-pm'TBL-loc'CN_TOP-pst'SIT-mvt'LEX(ride)
(zittend_rijden)-em'CNT-em'TGB-loc'CNT_TOP-hou'ZIT-bew'LEX(rijden)
= 'in een auto rijden'

3.12 Werkwoordagreement

Werkwoordagreement wordt aangegeven door middel van dezelfde conventies als die worden gebruikt bij het transcriberen van directionaliteit in werkwoorden van beweging (d.i. door gebruik van bron/doel en numerieke indicaties, zoals in de voorbeelden van 'geven' hierboven). Bij voorbeeld: 'Jij laat mij zien': (laten_zien)-em'LEX(laten_zien)-bro'2-dol'1

Appendix E:

4. TEMPORELE COMPONENTEN VAN GEBAREN

4.1 Manuele simultaneïteit

4.1.1 Simultaneïteit in een uiting

Enkele accolades omgeven door spaties, omsluiten elementen die tegelijkertijd voorkomen in een uiting. Bij voorbeeld: een kind gebaart SNOEP terwijl het met de niet-dominante hand op een boek wijst:

*CHI: { SNOEP PNT(nh)(op_boek) } .

NB: Geef aan welk gebaar met de niet-dominante hand gemaakt wordt, de default is de dominante hand.

Accolades worden omgeven door spaties. Om een eerder begin van één gebaar tussen accolades aan te geven, moet (b) aan dat gebaar toegevoegd worden, bijv.:

*CHI: { SNOEP(b) PNT(nh)(op_boek) } .

Accolades die simulteit aangeven binnen een complex gebaar worden niet door spaties aangegeven, zoals blijkt uit het volgende voorbeeld uit par. 3.10.1. (configuraties als eenheid):

(zetten){em'HV-em'TB-loc'HV_TOP}-dol'OBJ(tafel) .

4.1.2 Simultaneïteit tussen uitingen

Overlappingen worden op de standaard CHAT-manier gecodeerd:

*CHI: WIL < BOEK > [>] PNT_2 ?
*MOT: < WIL > [<] .

NB bij uitingssegmentatie:

4.2 Manuele/non-manuele simultaneïteit

Non-manuele elementen worden aangegeven door middel van een karaat (^). Er zijn vier types, zoals hieronder beschreven wordt: operator (^opr), modificatie (^mod), affect (^aff) en gespreksmarkeerder (^gsp). Zo'n element kan aan één enkel gebaar toegevoegd worden; maar als het non-manuele element bereik heeft over meerdere gebaren, wordt dit aangegeven door gebruik van de volgende conventies:

GEB-^opr'X	non-manueel element geassocieerd met een enkel gebaar
^opr'X GEB GEB ^	non-manueel element dat bereik heeft over meerdere gebaren

Als twee verschillende non-manuele elementen aan één enkel gebaar of uiting gehecht worden, heeft elk element zijn eigen karaat, met gebruik van de volgende conventies:

{^opr'X ^mod'X} GEB	simultaan begin van twee non-manuele elementen
^{opr'X^mod'X} GEB GEB ^	twee simultane non-manuele elementen over twee gebaren
GEB ^ ^	simultaan einde van twee non-manuele elementen

^opr'X ^mod'X GEB	opeenvolgend begin van twee non-manuele elementen
^aff'X ^opr'X GEB opr^ GEB aff^	opeenvolgend einde van twee non-manuele elementen
GEB-^opr'NEG	non manueel element dat een component aan een gebaar toevoegt
GEB-^opr'NEG-^aff'X	simultaan begin van twee non-manuele elementen in een gebaar

4.2.1 Operatoren

^opr'X	grammaticale operator die uitwerking heeft op een heel zinsdeel of zin (bijv.: negatie, ja/nee- of w-vraag, onderwerpsmarkeerder, markeerder van een relatieve bijzin, conditionele markeerder) (onvolledige lijst)
^opr'NEG	negatie
^opr'JNV	ja/nee-vraag
^opr'WHV	wh-vraag
^opr'OND	onderwerpsmarkeerder
^opr'REL	markeerder van een relatieve bijzin
^opr'COND	conditionele markeerder
^opr'BEV	bevestiging (knikken)
^opr'RV	retorische vraag
^opr'VERZ	verzoek

4.2.2 Modificatie

^mod'X	modificeert de referentiële betekenis die wordt uitgedrukt door er een dimensie aan toe te voegen (bijv.: vermeerderde/verminderde omvang, snelheid, intensiteit) (onvolledige lijst)
^mod'SNEL	snelle beweging
^mod'DUR	duratieve activiteit, situatie
^mod'VERM	vermeerderde omvang, snelheid of intensiteit
^mod'INS	met vergrote inspanning
^mod'ZORG	met zorg of voorzichtigheid
^mod'VERV	vervagende beweging of articulatie

4.2.3. Gespreksmarkeerders

^gsp'X	markeerders die de informatiestroom reguleren, zoals controle voor overeenstemming, begrip, bevestiging
^gsp'CONF	overeenstemmings markering
^gsp'AGR	bevestigings markering
^gsp'OBR	onderbrekingsmarkering
^gsp'ADHO	aansporende markering

4.2.4. Affect

Het uitdrukken van gevoelswaarde kan in NGT op meerdere manieren. Wanneer een gebaarder over zijn/haar eigen ervaringen communiceert, of wanneer h/zij als vertell(st)er zijn/haar

eigen visie of die van iemand anders beschrijft, wordt die toegevoegde waarde getranscribeerd in de vorm aff'X:

^aff'X	vrij variërende affectieve begeleiding van een lexicaal item of uiting om de houding van de gebaarder ten opzichte van de situatie waarover wordt gesproken weer te geven (bijv.: afkeer, verbazing) (onvolledige lijst)
^aff'AFKEER	afkeer
^aff'VERBAZ	verbazing
^aff'WOEDE	woede
^aff'VREUGDE	vreugde
^aff'VERDRIET	verdriet
^aff'LIEF	lief
^aff'GRAP	grappig

4.2.5 Rolname en -wisseling

Als een gebaarder voor enige tijdhet gezichtspunt van een andere persoon of een specifiek uit te beelden karakter (een hoger geplaatst persoon, de zeurende echtgenoot, Jan Klaassen) aanneemt, wordt dit als rolname en/of –wisseling getranscribeerd.

'RW(boef) GEB ... '	De totale uiting die door een rolname wordt gemarkeerd, wordt geproduceerd vanuit het perspectief van het voorgestelde karakter, zoals tussen haakjes aangegeven. Aanvang en eindevan een rolname worden aangegeven door een spiegelende (grave) accenten, terwijl het aangenomen kakrakter daarachter tussen haakjes wordt aangegeven. Merk op dat RW – als belangrijk betekenis element -in hoofdletters wordtaangegeven.

4.2.6 Blikrichting

Het is vaak van essentieel belang te weten waarnaar gebaarders hun blik richten terwijl ze gebaren. Blikrichting wordt aangegeven door middel van een ster (*) en, in kleine letters, het object van de blik; bijv.:

*moe	kijkt naar moeder
*boek	kijkt naar boek
*bez	kijkt naar bezoeker

Blikrichting wordt alleen aangegeven als de transcribent dat relevant acht voor de analyse van de interactie. Speciale notaties worden gebruikt om het zicht van de ontvanger op bepaalde gebaren aan te geven, genoteerd door middel van backslashes (\). Deze informatie kanvooral van belang zijn bij het vaststellen van het begrip van een kind.

\- GEB \	ontvanger ziet GEB niet

\q GEB \	onzeker of ontvanger GEB ziet

NB: Voor elke modificatie anders dan de uitbreiding van de neutrale gebarenruimte, moet een %com lijn toegevoegd worden om uit te leggen hoe het GEB wordt gemodificeerd.

4.2.7 Modificatie van gebaren

\ @ GEB \	gebaarder modificeert de locatie van GEB buiten zijn normale locatie
\ @ \- GEB ...	simultaan begin van twee ontvanger-markeerders (blikrichtings- en modificatie-markeerders kunnen tegelijkertijd voorkomen)
... GEB \\	simultaan einde van twee ontvanger-markeerders
... GEB @ \ -\	opeenvolgend einde van twee ontvanger-markeerders

5. EXTRALINGUISTISCH COMMUNICATIEF GEDRAG

5.1 Gestures en acties

Als een deel van een uiting bestaat uit een niet gebaarde, maar wel betekenisvolle activiteit, dan moet de notatie van zo'n activiteit opgenomen worden als hoofdlijncommentaar tussen vierkante haken, op de volgende manier:

[%ges: identificatie]	identificeert het gesture en de lexicale interpretatie van gestures die voorkomen zonder gebruik van een object of ondersteuning, en/of buiten de normale gebarenruimte (bijv. [%ges: schrijven]). Zie par. 3.3.3 voor gestures die gerapporteerde acties van een ander persoon of object zijn.
[%act: identificatie]	identificeert de activiteit die een deel of een gehele uiting vervangt, uitgevoerd met of op één of ander object (bijv. [%act: gooit pop weg])
??? [%mim: description]	**gemimede gesture: de gebaarder geeft de handelingen van een ander persoon of object aan bijv. : [%mim: wuiven]**

5.2 Strategieën voor het trekken en vasthouden van de aandacht

Verschillende manieren worden gebruikt om de aandacht van de ontvanger te trekken. Deze strategieën worden weergegeven door middel van @ at. Dit maakt deel uit van een uitingslijn. De volgende strategieën voor het trekken van de aandacht zijn geïdentificeerd:

t @ at	iemand aantikken
w @ at	naar iemand wuiven
p @ at	iemand vastpakken
g @ at	iemands gezicht aanraken
s @ at	op de grond stampen
b @ at	op een oppervlak bonzen
l @ at	met het licht flitsen
v @ at	naar iemand vocaliseren

6. UITVOERING EN CONTEXTUELE SITUATIE

6.1 Fouten en ongebruikelijke gebaren

Een fout wordt aangegeven door middel van [*], op de standaard CHAT-manier. Als een hele uiting ongrammaticaal is, zonder een localiseerbare fout in de uiting, dan wordt [*] geplaatst aan het begin van de lijn. Als een fout wel gelocaliseerd kan worden, dan wordt het bedoelde GEB gegeven tussen vierkante haken en met een isgelijkteken, gevolgd door [*]; bijv.:

*CHI: PAP STOEL [= ZITTEN] [*] HIER .

Uitleg van fouten wordt gegeven in een %err afhankelijke lijn, gebruik makend van onder andere de volgende codes:

$dir	directionele fout
$em	eigenschapsmarkeerder-fout (verkeerde eigenschapsmarkeerder gebruikt)
$hv	handvorm-fout
$lex	gebaar-fout (verkeerde gebaar gebruikt)
$loc	locatie-fout
$bew	bewegingsfout
$pr	palmrichtingsfout
$syn	syntactische fout (ongrammaticale uiting)

Is er meer dan één fout in een lijn, scheid dan elke uitleg af met een puntkomma omgeven door spaties. Bij voorbeeld: als een kind de verkeerde handvorm gebruikte voor PAP, en STOEL gebaarde met een bewegingspatroon dat ZITTEN betekent, dan zou de transcriptie en foutencodering er als volgt uitzien:

*CHI:	PAP [*] STOEL [= ZITTEN] [*] HIER .
%err:	PAP $hv ; STOEL $bew = ZITTEN ;

Gebruik bij woorden met meerdere componenten de [*] met een nummer om aan te geven welke component de fout bevat. Maar, als het kind bro en dol verwart, markeer dit als een fout met het *symbool alleen bij de eerste component, en voeg dan aan het eind van de eigenschapsmarkeerder-constructie [*] toe, bijv.:

*CHI:	JONGEN (grijpen)-em'HOUD-bew'SLUIT-bro'3*-dol'1 [*]
%err:	bro'3-dol'1 $agr = bro'1-dol'3 ;

Aanvullende fout duidingen

[*m]	mogelijke fout
[*o]	ongespecificeerde fout ergens in de uiting, maar niet gebon-
den	aan een bepaald GEB
[*g]	een gebaar dat gesturaal van aard is, maar conventionele gebarentaalhandvormen incorporeert. Dit wordt gezien bij tweede-taalleerders en gebaarders die manuele codes voor gesproken taal gebruiken.

NB: Voor fonologische fouten moet de uitingslijn weergeven wat semantisch bedoeld wordt met het gebaar, d.i. wat de geadresseerde zou moeten begrijpen van de boodschap, en niet een fonologische representatie van wat de gebaarder gebaarde. De notatie van fonologische fouten is gekoppeld aan specifieke (fonologische) onderzoeksvragen.

NB: Sommige" fouten" kunnen wijzenop een creatief gebruik van gebaren door niet natieve gebaarders, die beperkt toegang hebben totnatieve taalmodellen (bijv. horende ouders, kinderen, ofNmG gebruikers). In dergelijke gevallen moet de transcribentbeslissen welke notatie dan het meest geeigend is. Naar keuze kan men dit type "fouten" als fouten te beschrijven, of als nieuwe convetie in te voeren.

6.2 Lege uitingslijn

Als een beurt bestaat uit een duidelijke, maar niet gebaarde respons, gebruik dan de standaard CHAT-conventie om de uitingslijn met een nul te beginnen (bijv. *CHI: 0). De nul wordt gebruikt wanneer de gesprekspartner alleen een aandachtsstrategie (bijv. *CHI: 0 t @ at), actie en/of gesture gebruikt.

6.3 Voortzetting in uitingen

Als een gebaar wordt voortgezet of aangehouden vanuit de voorafgaande uiting, wordt de tilde (~) gebruikt om aan te geven dat dit gebaar niet opnieuw gecreëerd wordt in de volgende uiting, bijv. ~GEB.

6.4 Interruptie

Interruptie en voortzetting na een interruptie worden op de standaard CHAT-manier gecodeerd. Bij voorbeeld:

*MOT:	WIL /+ .
*CHI:	PNT_3(op_boek) .
*MOT:	+, BOEK LEZEN .

6.5 Ergens op terugkomen

Standaard CHAT-conventies worden gebruikt voor het terugkomen op iets en voor verbeteringen, zoals in deze voorbeelden:

*CHI:	< MOEDER > [/] MOEDER WEGGAAN .
*CHI:	< BEER > [*] [//] BEER .
%err:	BEER $bew

6.6. Herhaalde of samenvattende constructies

Som s zal een gebaarder een vorige constructie herhalen teneinde een gezichtspunt opnieuw in te brengen. Dit is een soort herhaling, waarbij de constructie in een 'samengevatte' (gecompresseerde) vorm terugkomt, echter zonder de uitleg, zoals de eerste keer werd vermeld. Dit wordt als volgt aangegeven:

^cmp UITING	de uiting tussen karaten is een herhaalde, gecompresseerde versie van een eerdere uiting

7. AFHANKELIJKE LIJNEN

De volgende afhankelijke lijnen zijn ontwikkeld voor de transcriptie van gebarentaal:

%act	modificeert de voorafgaande uitingslijn, door acties van de gebaarder of ontvanger te beschrijven die noodzakelijk zijn voor het begrijpen van de transcriptie
%aan	beschrijft de aandacht van de deelnemers (bijv. CHI en MOT letten niet op elkaar)
%com	commentaar
%fg	beschrijving van de figuur/ondergrond relatie
%gls	gloss (geschreven-taal parafrase voor bepaalde complexe uitingslijnen)
%ges	gesture (fonologische beschrijving)
%fon	fonologie
%mor	morfologie
%sem	semantiek
%tad	taaldaad
%vet	vertaling van polycomponentiële constructies

8. VOORBEELD

Dit is een segment van een gezamenlijke tekenactiviteit van een moeder en haar dochter van 2;8Moeder heeft verschillende (familie)gezichten en een konijn op haar papier getekend, het kind werkt met een (uitwisbaar) toverleitje (data van Nini Hoiting):

*MOT:	PNT(nh)(met_pen_op_toverlei) < VADER > [>] .
*CHI:	< MAN > [<] VADER PNT_3(op_lei) .
*MOT:	t @ at MAN .
*CHI:	MAN .
*MOT:	PNT_3(op_tekening) .
*CHI:	PNT_3(op_tekening) PNT_1 [%ges: lange oren] .
*MOT:	PNT_2 PNT_3(op_toverlei) .
*CHI:	PNT_3(op_toverlei) GROOTOUDERS .
*MOT:	GROOTMOEDER .
*CHI:	PNT_3(op_toverlei) *bez < VEEL *bez > [>] .
*MOT:	<^gsp'OVEEN VEEL GEZICHTEN > [<] VEEL GEZICHTEN ^ .

Zie voor ASL-voorbeelden de Amerikaanse versie van BTS

Appendix F
Dutch Equivalents of English BTS Codes

Note:Items are listed in the order in which they appear in the BTS Manual.Items that are identical in both languages are not listed.

DUTCH	ENGLISH	DUTCH	ENGLISH
GEB	SIGN	VL_VH	PL_VH
(*M)	(*N)	VL_VL	PL_VL
(vs)	(fs)	SP	TR
DIC	PRX	GELD	XA
TUS	MID	BC	? (BABY-C)
VER	DIS	BS	FO (?)
VELD	AREA	DS	?
-pad	-pth	OS	ON (?)
-bro	-src	TN	?
-dol	-gol	DOU	?
B	A	HOEK	?
K	W	KLAU	BF (?)
O	U	-em	-pm
N	D	-em'L	-pm'B
V	F	BOD	BOT
A	B	RAN	EDG
IJ	S	VOR	FRO
VA	BF	ACH	BAC
NA	TOG	VK	(front side)
VA	AP	AK	(back side)
UIT	OUT	NAA	NXT
BOL	SPHERE	RR	RSP
CIL	CYL	-hou	-pst
CNT	CN	REC	ERC
DEK	LID	LEU	RCL
DOOS	BOX	LEU_V	RCL_V
GO	CS	LEU_A	RCL_D
PAD	TR	ZIT	SIT
PS	FO	GSP	STR
STOK	STK	Z	S
TB	TL	-bew	-mvt
TGL	TBL	SCHOM	WIG
VB	FL	DRAAI	TURN
VL	PL	STUIT	?
VL_D	PL_D	SLUIT	CLOSE
VL_G	PL_G	STOOT	JAB
VL_H	PL_H	LAAT	LANG
VL_S	PL_I	BUIG	BEND
VL_SV	PL_N		

Appendix G
Instructions for Automated Searches of BTS Transcripts

There are two versions of BTS—English and Dutch—equivalent in all respects except for language.BTS is designed in CHAT format:

- standard set of initial headers, beginning with `@` (e.g., `@Date`)
- every file begins with `@Begin` and ends with `@End`
- utterance lines begin with `*` and a 3-letter uppercase participant ID (e.g., `*NIN` for Nini)
- dependent tiers for various sorts of additional information, beginning with `%` and a 3-letter lowercase code (e.g., `%com` for a comment)

Searches are carried out on utterance lines, for a particular signer.Sometimes an utterance line and associated dependent tier will have to be retrieved together (e.g., an error code, `[*]` on an utterance line and a description of the error on a `%err` line).

Every utterance line ends with a period or question mark.

A "word" is a string that is bounded by spaces and including uppercase letters.For example, the following are all words:

- `WANT`
- `NOT_WANT`
- `PNT_3(on_book)`
- `D_A_N(fs)`
- `^opr'NEG`
- `(put)-pm'PL_G(book_G)-pm'PL_H(book_F)-gol'G_TOP`
- `XX` (=unintelligible, but definitely a sign)

The following are not words, although bounded by spaces *(note that these do not have uppercase letters)*:

- `xxx`, indicating unintelligible sign or gesture
- lowercase, beginning with `*`, indicating gaze direction, e.g., `*nin` = looks at Nini
- lowercase, including `@`, indicating an attention-getting device, e.g., `t@ag` = tapon person)
- enclosed in square brackets
    - gesture, e.g., `[%ges: write]`
    - mimed gesture, e.g., `[%mim: wave]`
    - act, e.g., `[%act: throws doll]`
    - error `[*]`
    - possible error `[*q]`
    - unspecified error `[*u]`
    - gestural sign `[*g]`
    - retracing `[/]`
    - retracing with correction `[//]`
    - beginning of overlap `[>]`
    - end of overlap `[<]`

- enclosed in angle brackets, indicating false start, e.g., <BEAR> *(note that this is the only item that matches the definition of "word," with uppercase letters, that is not included in word counts)*
- freestanding angle brackets, indicating overlap, e.g., < BEAR > *(note that BEAR is counted as a word in this case)*
- freestanding curly brackets, indicting simultaneously signed elements, e.g., { CANDY PNT(on book) } *(note that the two words in this string are counted)*
- freestanding ^, indicating end of scope of operator, e.g., ^opr' NEG READ ^= not read *(note that the two words in this string are counted)*
- #pause
- +/ interruption
- +, continuation after interruption
- \- recipient doesn't see sign: \- SIGN \ *(note that sign is counted)*
- \q unsure whether recipient sees sign: \q SIGN \ *(note that sign is counted)*
- \@ signer modifies location of sign: \@ SIGN \ *(note that sign is counted)*
- \@\- simultaneous onset of two recipient markings: \@\- SIGN *(note that sign is counted)*
- \\ simultaneous offset of two recipient markings: SIGN \\ *(note that sign is counted)*
- @\-\ sequential offset of two recipient markings: SIGN @\-\ *(note that sign is counted)*

The following are considered as words for some counts, but not for others:

- a string beginning with ^, indicating an operator, e.g., ^aff' SAD = sad facial expression
- PNTpoint at person or object
- IXpoint at location that serves as index for absent person or object
- 'RSrole shift, e.g., 'RS(dog) = signer takes on role of dog

Meaning components ("morphemes") within words are separated by hyphens; e.g., the following string is composed of three meaning components:

(put)-pm'PL_G(book_G)-pm'PL_H(book_F)-gol'G_TOP
↑↑↑