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## **CAN A DEAF CHILD LEARN TO SIGN FROM HEARING PARENTS?**

*Dan I. Slobin*  
*Department of Psychology*  
*University of California*  
*Berkeley, CA 94720-1650*  
([slobin@cogsci.berkeley.edu](mailto:slobin@cogsci.berkeley.edu))

*Nini Hoiting*  
*Royal Institute for the Deaf "H. D. Guyot"*  
*Rijksstraatweg 63*  
*9752 AC Haren, Netherlands*  
([guyot@guyot.nl](mailto:guyot@guyot.nl))

### ***AIMS OF PROPOSED RESEARCH***

For many years, most young deaf children have received little or no primary language input in a natural sign language. The low levels of success achieved by methods using oral training, artificial sign languages based on spoken language, or various combinations of type of input have led to policy revisions in many states and foreign countries. A number of recent and ongoing projects strongly suggest that initial use of a *natural sign language* (such as ASL) leads to early and rapid communicative and linguistic development in deaf children. However, there have been almost no detailed longitudinal studies to lend scientific and pedagogical substance to these suggestions. It is the aim of this project to document and compare a number of individual case studies of initial acquisition of a natural sign language by very young deaf children. The title of this proposal is a question: "Can a deaf child learn to sign from hearing parents?" The expected answer, on completion of the project, is: Yes—provided that the parents are well trained and that the language is a natural sign language.

Furthermore, the majority of studies of the acquisition of sign language as a natural first language have selected children with deaf parents. However, almost all deaf children are born to hearing parents. We are in possession of a rare database, allowing us to study the acquisition of a natural sign language with input from hearing parents who have begun to learn the language while their deaf child was still an infant. A comparison group of deaf parents will allow us to identify patterns of successful parenting and to assess the extent to which sign language can be acquired under situations of imperfect input. An additional subject population will allow us to compare two types of signed input from hearing parents: a natural sign language and an artificial sign language based on the spoken language.

Preliminary study indicates that deaf children can attain high levels of competence in a natural sign language used by hearing parents, but that a non-natural sign language is an inadequate means of communication for parent and child alike. We aim to assess these indications in depth. At the same time, detailed documentation of the course of acquisition of the natural sign language will greatly enhance our ability to assess the linguistic development of deaf children (both unimpaired and multiply handicapped) and to design home-training and preschool curricula for such children.

The study will make use of data gathered in the Netherlands, because social policy in that country has provided a population of hearing parents who are trained in the natural sign language of the country, Sign Language of the Netherlands (SLN). SLN is, in most important respects, very similar to ASL. Certainly in the age range under consideration, 18-36 months, patterns of development are comparable in ASL and SLN. Parental training in SLN has been in place in the Netherlands since 1992. Prior to that time, hearing parents received training in Sign-Supported Dutch (SSD), a manual language closely patterned on the spoken language (similar to various versions of Signed English in this country). It is thus possible for us to compare

SLN and SSD as input languages under similar social and demographic conditions. There are relatively few deaf children born to deaf parents, and we will include several case studies of children acquiring SLN from native-signing parents. The sample consists of longitudinal sign data on 30 deaf children, 13 acquiring SSD (before 1992) and 17 acquiring SLN (after 1992). With the exception of four children learning SLN from deaf parents, these children have hearing parents. The data consist of videotapes in home and preschool settings, along with vocabulary checklists provided by parents, and standard scales of motor and cognitive development. We thus possess a rare and highly important database, with significance both for the understanding of child language acquisition and for the evaluation and improvement of social and educational policy with regard to deaf children. The findings should be broadly applicable to all countries, since the issues of early language development in deaf children are independent of the particular sign language involved.

[We have added five ASL families in California, two with Deaf parents and two with hearing parents who are learning ASL. This is the doctoral dissertation research of Reyna Lindert, UC Berkeley.]

The sample is restricted to normally-developing, profoundly deaf children in two-parent families living in the northern part of the Netherlands. We identify the three sample types with regard to the hearing status of the parents (D=Deaf, H=Hearing) and the type of signed input, SLN or SSD. The three groups are thus: **D-SLN** (N=4), **H-SLN** (N=13), and **H-SSD** (N=13).

*There are four major guiding hypotheses with regard to these subject samples:*

1. *The overall course of language and communicative development will be similar in cases of D-SLN and H-SLN.* That is, adequate sign language development is possible with “imperfect input” of a natural sign language from hearing parents. [Also predicted for D-ASL and H-ASL.]
2. *The overall course of language and communicative development in both SLN populations will be comparable to developmental patterns attested for hearing children acquiring spoken languages.* That is, SLN is a natural language, and is acquired in similar fashion to other natural languages. [Also predicted for both ASL populations.]
3. *The overall course of language and communicative development in cases of H-SSD will be slower than H-SLN, with smaller vocabulary, less complex constructions, and a lower level of productivity.* That is, a sign language supported by a spoken language is insufficient input for adequate primary language acquisition.
4. *Hearing parents learning SLN, in comparison with those learning SSD, will demonstrate more rapid acquisition, greater productivity, and more successful communication with the child.* That is, a natural sign language can successfully function as a second language for hearing parents in interacting with a deaf child.

Measures will include statistics of vocabulary growth from parental checklists, Bayley and Hunt/Uzgiris Developmental Scales, and detailed transcription and coding of videotapes for qualitative and quantitative analysis. Coding will include: semantics and pragmatics of signs and sign combinations, morphology and word order of signs, use of pointing and gesture, eye gaze and non-manual facial features, attention getting, turn taking, and interpersonal coordination of communication and action. The signing and communicative behavior of children, parents, and deaf and hearing preschool teachers will be analyzed. Quantitative and qualitative data summaries will be prepared, and a final developmental and familial case study will be written for each child. A parental training manual is envisaged, along with a monograph-length presentation of the study and articles in professional journals.

## **BACKGROUND AND SIGNIFICANCE**

As indicated above, although most deaf children have hearing parents, there are almost no detailed studies of the acquisition of sign language in cases of input from hearing parents. The Dutch social program of early detection and intervention provides us with a rare database of such cases. A well functioning infant screening procedure generally assures that hearing impairments are detected at an early age, usually by 8 months or so. The parents of such children are immediately involved in a family-guidance program such as that administered by the Royal Institute for the Deaf in Haren (the Dutch base of the proposed project). The

overall goal of the program is the prevention of communicative disorders in deaf children, supported by an intervention program for parents aimed at the development of communicative skills. The program provides information about effects of deafness on cognitive and language development, special education for the deaf, and social aspects of deafness; in addition, parents are given opportunities for contacts with the local Deaf community and with the national association for parents of deaf children. Along with regular visits from social workers, speech therapists, and an assigned family counselor, a series of 15 courses in SLN (SSD before 1992) is conducted in the home for parents and other hearing family members. Thus the parents have some preparation for sign-language communication with their child while the child is still very young—usually an infant. Over the subsequent five years, the parents take part in regular courses at the Institute, where they are taught SLN by a deaf teacher and take part in courses that teach skills of interaction with deaf children (e.g., *How to Cope with Your Deaf Child*, *How to Read with Your Deaf Child*). At 18 months, the child begins regular attendance at the Institute preschool, spending several half-days each week interacting with a deaf teacher and a hearing teacher and a small group of deaf children. In the case of the Institute in Haren, the psycholinguist (Hoiting) makes regular videorecordings of the child at home and in the preschool, and visits the parents regularly to inform them of the communicative development of their child. There are weekly parent meetings at the Institute, and annual family weekends based on special themes, such as storytelling, SLN, cochlear implants, and so forth. Wherever possible, hearing parents are involved with deaf parents and other deaf people. In short, the Dutch program not only provides a valuable model for early intervention in other countries, but also provides us with a body of data consisting of signed input from hearing parents to very young deaf children.

The significance of the study lies in its contributions both to developmental psycholinguistics and to the development and education of deaf children. On the theoretical plane, we wish to ascertain the extent to which children can acquire a natural language with imperfect input, and the ways in which their acquisition compares with children receiving normal input in that language (the comparison between H-SLN and D-SLN [and H-ASL and S-ASL]). We also want to ascertain the extent to which an artificial language can serve as a means of communication and as a first language (the H-SSD sample). All of the developmental and linguistic hypotheses listed below, and others to come, will be of importance to current theoretical debates with regard to issues of input, nativism, modularity, and the human language capacity. We also anticipate that major revisions of our understanding of the grammar of natural sign languages will emerge from our analyses. On the applied plane, improvement of the Dutch delivery system requires norms for the development of SLN, along with more adequate understanding of the factors of successful parenting that lead to high-level SLN acquisition. A fuller understanding of the structure and acquisition of SLN is essential to curriculum design, and will have an impact on later school education and literacy training. (It will be possible, in follow-up studies, to investigate the success of children in our sample as they move on through the Institute school. Current American studies demonstrate a correlation between competence in ASL and literacy; cf. Hoffmeister [1996], Padden [1996], Prinz and Strong [1996].) Although the setting is Dutch, the issues apply equally to ASL and other sign languages. At some places in the U.S. similar early intervention programs are beginning, such as the Colorado Home Intervention Program.<sup>1</sup>

In California, one of Slobin's graduate students, Reyna Lindert, plans dissertation research on a sample similar to ours at the California School for the Deaf in Fremont. And, in all countries, it is essential to better understand the ways in which hearing parents can establish early communication and foster language acquisition in their deaf children. Thus we consider this study, based in the Netherlands, to have immediate implications for the U.S. as well.

### ***RELATION TO WORK OF PRINCIPAL INVESTIGATORS***

**Dan I. Slobin.** The PI, Dan Slobin, has been working in the field of child language acquisition since the early 60s, when he received basic training as a researcher in Roger Brown's (1973) original longitudinal

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<sup>1</sup> The FAMILY Project is headed by Arlene Stredler Brown, Director of the Colorado Home Intervention Program of the Colorado Department of Health, and Christie Yoshinaga-Itano, Department of Communication Disorders & Speech Science, University of Colorado at Boulder. We have visited the FAMILY Project, and plan to share experiences with the Colorado group.

study of language development (the “Adam, Eve, and Sarah” project at Harvard). Together with colleagues at Berkeley, from the fields of developmental psychology, linguistics, and anthropology, he edited *A field manual for the cross-cultural study of the acquisition of communicative competence* (Slobin, 1967). That field manual launched a large series of crosslinguistic studies of language development, including Slobin’s own studies of English, Serbo-Croatian, Russian, Italian, Spanish, Turkish, and Hebrew child language. He has edited and co-edited a number of volumes of crosslinguistic studies of child language (Berman & Slobin, 1994; Ferguson & Slobin, 1973; Slobin 1985b, 1985c, 1992, 1997a, 1997b). He has had extensive experience in recording, transcribing, coding, and analyzing child speech (Slobin, 1993). Under his direction, the Child Language Research Laboratory at the Institute of Human Development, University of California at Berkeley, has devised and applied various coding systems for the study of morphosyntactic, semantic, and pragmatic aspects of child language in a variety of languages, in the age range from 18 months to adulthood. This expertise will now be turned to similar issues in the study of early sign language development, as described in the current proposal.

Slobin has had a long interest in sign language, at least since his invited participation in the 1980 Dahlem Workshop on Sign Language and Spoken Language organized by Ursula Bellugi and Michael Studdert-Kennedy (Slobin, 1980). In the first volume of *The crosslinguistic study of language acquisition* (Slobin, 1985b), he commissioned Elissa Newport and Richard Meier to write a major survey of the acquisition of ASL, presented in the same theoretical framework that had been devised for the survey of the 14 spoken languages in the volume (Newport & Meier, 1985). Most recently, Slobin has taken two initiatives to further the study of sign language in the San Francisco Bay Area. (1) In 1995 he founded the Bay Area Sign Language Research Group, which has grown to be an active group of hearing and Deaf students, teachers, and researchers, meeting bi-weekly to discuss ongoing research and plan new research. The participants are drawn from the University of California at Berkeley and at Davis, Stanford University, San Francisco State University, Vista College, and the California School for the Deaf at Fremont. This group will provide a pool of consultants (and critics) in the new research proposed here. (2) In 1996, with Dr. Philip M. Prinz as co-director, he launched a joint doctoral program between the School of Education of the University of California at Berkeley and San Francisco State University. The program is a concentration in atypical developmental psycholinguistics, and is part of the long-standing joint doctoral arrangement between the two institutions in the field of special education. The program begins in fall 1997 with initial focus on the early acquisition of ASL and later literacy. [Currently there are three doctoral students in the program, all participating in the Slobin/Hoiting research.] Dr. Prinz is an expert on sign language acquisition and will be an important resource to the proposed research. In addition, Slobin is supervising three doctoral students working on the acquisition of ASL in the developmental psychology program of the Department of Psychology at Berkeley, and is co-supervisor of a doctoral dissertation in Linguistics on linguistic structures and iconicity in ASL. He is also a member of three dissertation committees at Stanford dealing with sign language acquisition. Berkeley research consultants will be Professor Susan Ervin-Tripp (developmental sociolinguistics), Professor Eve Sweetser (cognitive linguistics and sign language), and Professor Alison Gopnik (development of cognition and language).

In the current project, Slobin will work closely with Hoiting in devising the levels of transcription and coding described below and will code the data for semantic and pragmatic dimensions; will organize research seminars to explore the data together with students and colleagues dealing with the development of language (spoken and signed), communication, and cognition; and will be centrally involved in the analysis, theoretical interpretation, and public presentation of the findings at conferences and in publications. Slobin and Hoiting have done research together on the linguistics and acquisition of SLN since 1992 (Hoiting and Slobin, 1993; Slobin & Hoiting, 1994; Hoiting & Slobin, forthcoming [2000]). They have approached sign language from a functional/typological perspective, proposing re-analyses of verbs of motion and of borrowing of grammatical elements into sign language.

**Nini Hoiting.** The co-director of the project, J. F. A. Hoiting (appearing in bibliographies as N. Hoiting), has been working on sign language since 1980. Her training is in applied linguistics and psycholinguistics from the University of Groningen, to the level of Doctorandus (roughly equivalent to the American level of Candidate). She was the first psycholinguist to be hired with a career position in one of the five Dutch institutes for the Deaf, and received a tenured Civil Service appointment there in 1986. She has done linguistic work on SLN, participating in the construction and publication of the first SLN dictionary (T. C.

Working Group, 1983). She designed the teacher training program in sign language and communication for the Royal Institute for the Deaf "H. D. Guyot", including courses on language development in hearing, hard of hearing, and deaf children. In collaboration with deaf and hearing staff members, she has designed courses on sign language and communication with deaf children for parents and teachers (Hoiting & Dijkstra, 1992). She works with the psychological staff of the Institute in the language diagnosis of children from infancy through age 18, including children with multiple handicaps and language and learning disabilities. As a psycholinguist, she is responsible for making videotapes of each deaf toddler and preschool child, at home and in the preschool, and working with the parents in understanding their child's language development. She has also devised a Dutch version of the MacArthur Communicative Development Inventory (Fenson et al., 1993), providing parents with a checklist of language and communicative behaviors in the Sign Language of the Netherlands their families, as well as being a sign-

Hoiting has played a major role in redirecting the efforts of her Institute towards the design and implementation of bilingual/bicultural programs for deaf education, officially adopted by the governing board of the Institute in 1994. She was the responsible editor of the document that led to that decision (Bure et al., 1994). She presented a case study of successful early bilingual acquisition of SLN and Dutch by a deaf child of hearing parents to the 1997 Stanford Child Language Research Forum (Hoiting, in press [1998]).

On the national level in the Netherlands, Hoiting is centrally involved in editing a national journal and serving on advisory boards for institutes and congresses in the fields of deafness and bilingual education. Beginning in 1986, she was the founding director of a program for creating and disseminating videotaped stories, with accompanying written materials, for deaf children, families, and schools. This has become the widely successful *Kijkbibliotheek* ('visual library') in use across the country (Hoiting, 1996). It is a non-profit activity of the Royal Institute for the Deaf "H. D. Guyot".

Hoiting has presented research papers on sign language linguistics and acquisition to international conferences: the International Association for the Study of Child Language (Trieste, 1993; with Slobin); Northern European Language Acquisition Society (Reykjavik, 1994); Annual Conference of the Berkeley Linguistics Association (1994; with Slobin); Stanford Child Language Research Forum (1997). On the occasion of the 1995 Summer Linguistic Institute of the Linguistic Society of America, she was invited to participate in an international workshop/course, supported by the National Science Foundation, on crosslinguistic study of sign languages. The workshop, organized by Diane Brentari, was held at the University of New Mexico; its proceedings will be published, including Hoiting's work on borrowing from Dutch into SLN (Hoiting & Slobin, forthcoming [2000]). Most recently, Hoiting and Slobin have been invited to write a forward to a volume of papers on the acquisition of sign language (Morford et al., forthcoming [2000]). Hoiting has given invited lectures in Europe to professional organizations and congresses in the Netherlands, Belgium, Germany, and England; to Tsukuba Technical University in Tokyo, Japan; and at the University of California at Berkeley, San Francisco State University, and the University of New Mexico in the U.S.

In the current project, Hoiting will transcribe (gloss) the videotapes and check the glossing with native signers of SLN. She will be responsible for coding of all of the linguistic, psycholinguistic, and interactive dimensions of the data, and for training the Research Assistants in the dimensions that they will code. As part of this phase of the project, she will provide the RAs with sufficient knowledge of SLN to distinguish signs from non-sign gestures in the videotapes. She will work with Slobin and the RAs to achieve coding reliability on all dimensions, and will be centrally involved in the analysis, theoretical interpretation, and public presentation of the findings at conferences and in publications. She will also propose applications to assessment and parental intervention, in the Netherlands and in the U.S.

## ***RESEARCH DESIGN AND METHODS***

### **The Data**

The data have already been gathered, with full support from the Royal Institute for the Deaf "H. D. Guyot" in Haren, the Netherlands (henceforth "the Institute"). We have permission to make full scientific use of the materials. The data consist of: (1) developmental scales (Bayley, Hunt/Uzgiris), (2) parental checklists of

vocabulary development, (3) videorecordings of parent-child interaction in the home, and (4) videorecordings of preschool activities including several deaf children, a deaf teacher, and a hearing teacher. All of the children are considered profoundly deaf, with a hearing loss of at least 90 db and with no other known handicaps. A summary of the data is presented below:

	H-SLN	H-SSD	D-SLN
number of children	13	13	4
age range	1;4—3;0	1;5—3;0	1;3—3;0
total video duration	37 hrs 43 min	31 hrs 3 min	11 hrs 0 min
av no videos/child	5.8	5.2	5.5
av duration/child	2 hrs 54 min	2 hrs 23 min	2 hrs 45 min
av no checklists/chi	2.4	2.9	3.3

These data have been gathered with full informed consent from the parents, following rigorous standards of Dutch law, and have been released to the Institute and to Hoiting as the responsible researcher in the Institute. The data have been used for regular child assessment in the Institute. Anonymity of participants will be adhered to in all reports emanating from this project. Hoiting made all of the videorecordings herself and administered the parental checklists; the developmental scales were administered by members of the psychological staff of the Institute.

### The Analysis

The major scientific activity of the current project will be devoted to detailed transcription, coding, and analysis of the videotapes, along with quantitative analysis of relations between various coded categories, vocabulary as assessed by the checklist, and scores on developmental scales of motor and cognitive development. It will be necessary to design and pilot coding schemes for each of the various levels of analysis discussed below, to train assistants in the coding and analysis of data, and to establish inter-coder reliability.

videotapes on many simultaneous levels. The coding will be applied to the communication of the children, their parents, and the deaf and hearing teachers in the Institute preschool. We have developed preliminary codes for each of the proposed levels of analysis, but one of the basic tasks of the first year will be to test and refine these codes in practice, and in consultation with Bay Area colleagues with experience working with the various levels of our analysis. Here we will present a brief overview of the current state of our coding systems, and then go on to give a sample analysis of a single utterance from a 2-year-old child. It should be evident that this sort of multi-level, temporally-calibrated analysis is exceptionally time-consuming, but of central importance to the entire endeavor.

[The first two years of the project resulted in the Berkeley Transcription System (BTS), which has been tried on several sign languages, and has been adopted as the standard for sign language transcription by the international Child Language Data Exchange System (CHILDES). It has also been presented to the Intersign Project of the European Science Foundation as a model for Europe. See Slobin, Hoiting et al. (1999), or the postings on the websites of CHILDES <http://childes.psy.cmu.edu/chat.pdf> and the ESF Intersign Project: [http://www.sign-lang.uni-hamburg.de/Intersign/Workshop4/Slobin\\_Hoiting.html](http://www.sign-lang.uni-hamburg.de/Intersign/Workshop4/Slobin_Hoiting.html). The following list of coding issues has been considerably modified and refined in BTS.]

The bulk of the work consists in detailed coding of the

- **Situation [SIT]:** description of scene, people, locations of relevant objects, ongoing activity. (This level applies to a series of signed utterances; the following levels apply to individual utterances, as defined by criteria of pause, gaze shift, turn-taking, and the like.)
- **Signer/Addressee [S/A]:** sender and intended receiver of utterance.

- **Attention getting [ATT]:** means used by sender to gain attention of receiver; e.g., tap on body, stamp on floor, wave hand, emit sound.
- **Lexical (hands) [LEX]:** gloss of each manual sign. Glossing conventions follow Baker-Shenk & Cokeley (1980). Capital letters are used for lexical items, with indications of coindexation/agreement and classifiers; e.g., 1:GIVE:2 (=‘give’ sign moving from signer to addressee). Linguistic pointing will be coded here; hand preference will be noted.
- **Gaze (eyes) [GAZE]:** direction of visual attention; coordinated with lexical level of coding; e.g., >M (=looks at mother).
- **Non-lexical (hands, body) [NON-LEX]:** acted-out representation. Here we describe gestures and body movements that are not part of the conventional sign language, but are part of a communicative utterance; e.g., “child gestures petting movement while looking at dog.” Non-linguistic pointing will be coded here.
- **Morphosyntactic [MOR/SYN]:** linguistic category and morphological marking of each manual sign. Each sign is coded for part-of-speech (e.g., NOUN, VERB), associated morphemes (e.g., 2=2<sup>nd</sup> person), classifiers, aspectual modulation; the string of codes indicates word order. Topic/comment is coded on parts of the string of codes where appropriate (on the assumption that this dimension is grammaticized in SLN).
- **Temporality [TEMP]:** temporal reference of utterance. Here we are concerned with whether the utterance refers to the ongoing situation, a past event, or a proposed future event; and, within the situation, whether the event has just ended, is ongoing, or is about to begin. Codes: - - past before situation, - immediate past in situation, = ongoing, + immediate future, ++ future beyond situation.
- **Semantic [SEM]:** semantic category of each lexical item. Here we will explore various semantic analyses in the literature (e.g., Braine, 1976; Bowerman, 1976) and in our own previous work (e.g., Slobin, 1970; Slobin et al., 1993; unpublished coding manuals from 1972, 1986, 1996). One dimension deals with the participants in predications (agent, experiencer, patient, etc.); another dimension deals with predicate types (state, change of state, caused change of state, etc.). We have a good deal of experience with this type of coding, but will need practice to determine the most useful analysis for early SLN and SSD development. Operator (head, face) [OP]:\_ marker with scope over utterance (e.g., affirmation, negation). Utterance-level operators are marked in SLN by non-manual signs that extend over the duration of one or more manual signs. The major categories for this age range are NEGATION (head shake), AFFIRMATION (head nod), INTERROGATION (raised brows, wide-open eyes).
- **Manner [MAN]:** marked characteristics of motor pattern executing sign. Here we indicate features such as speed, intensity, laxness, etc., which do not change the basic meaning of the sign but indicate the signer’s evaluative stance with regard to the indicated situation.
- **Modulation (face, brows, mouth, tongue, nose) [MOD]:** facial movements. SLN-users use the face in conventionalized ways to modulate the meanings of utterances along various dimensions, such as affect, intensity, temporal contour (aspect); e.g., tensed face indicating negative affect; pursed lips, expulsion of air along line of upper teeth and lower lip (“fft!”) indicating rapid execution of an action.
- **Pragmatic [PRAG]:** communicative function of utterance. Again, we have experience with several different schemes of pragmatic (interpersonal, conversational) analysis. We will consult actively with our Berkeley colleague, Susan Ervin-Tripp, who has a research lab dealing with this dimension of child language. A promising preliminary scheme comes from earlier work with deaf children and their mothers (Meadow et al., 1981). To save space, we will only list the headings of each of their pragmatic categories: REFERENCE TO PRESENT OBJECTS; AGREE/ACKNOWLEDGE; COMMAND ATTENTION; SOLICITED CHOICE RESPONSE; BEHAVIOR REQUEST; REFERENCE TO SELF; REFERENCE TO OTHER; REGISTER APPROVAL; REGISTER DISAPPROVAL; QUESTIONS; TEACH/INSTRUCT; REFERENCE TO ABSENT OBJECTS, EVENTS, PERSONS; IMITATION.

**Sample analysis.** The following analysis of a single utterance indicates the use of these levels of analysis. The child is a girl (NM) of age 2;11, with deaf parents and a hearing younger brother of 0;9. The video-computer link will make it possible to indicate the onset, duration, and offset of each temporal dimension separately and in combination. The indications of codes here are preliminary, and are only intended to give an idea of the scope of the proposed analysis. [See BTS for the 2000 version.]

- **Situation:** living room; mother; brother in high-chair; brother has just grabbed paper crown from head of NM; NM takes crown back, faces brother.
- **Signer/Addressee:** NM → M
- **Attention getting:** mother already looking at NM
- **Lexical + Gaze:** >M BOY | >B 3:GRAB:1 | >M [=looks at mother and signs ‘boy’; looks at brother and erroneously signs ‘grab from him to me’; looks back at mother]
- **Non-lexical:** —
- **Morphosyntactic:** NOUN-[TOPIC] | \*3:VERB:1-[COMMENT] [=agreement error: directionality should be 1:VERB:3]
- **Temporality:** - [=immediate past in situation]
- **Semantic:** AGENT | ACTION-[CAUSE CHANGE LOCATION]
- **Operator:** --
- **Manner:** rapid, intense movement of arm and upper body
- **Modulation:** —
- **Pragmatic:** command attention; complain; accuse

## SOME HYPOTHESES

Based on multi-level analyses of this type, hypotheses can be explored with regard to both separate levels and combinations of levels. It should be evident, from this one example, that a major task in the acquisition and use of a sign language is the integration of a number of different motor and perceptual systems simultaneously. (The same is true, of course, of the coding and analysis of this type of language.) We hope to document the growing interrelations of these systems over the age range under study, as well as to pinpoint problems in the use of SLN by hearing parents (with implications for the use of ASL by hearing parents in North America). We have many preliminary hypotheses, based on experience in gathering the data and reviewing them with parents and in the laboratory. For each hypothesis we will look at age changes in the child data and differences between types of speakers in the adult data. Here we offer only a few hypotheses, in order to give an idea of the types of analyses to be undertaken. Explicit proposals are given in italics in the discussion below, where they are presented as “expectations.” In the course of the first year’s work, of course, many new hypotheses will emerge. In the third year, the dimensions will be reduced to quantitative scores that can be submitted to statistical analyses to reveal correlations and intercorrelations, developmental trends, and underlying factors.

***The Lexical and Non-lexical Levels: Pointing.*** The status of pointing is complex in the development of sign language, since a pointing gesture can serve both as a linguistic sign and as a non-lexical gesture. Pointing serves many functions in the development of children’s communication, both deaf and hearing; but in an established sign language, particular types of pointing gestures serve as conventionalized grammatical markers, equivalent to demonstratives or pronouns (see, for example, Petitto, 1987). Preliminary study

suggests that deaf children begin with rather general sweeping gestures, using either all five fingers or an index-finger point, to focus attention on a situation, often making physical contact with the referent object. Pointing gestures within an established sign language, however, are reduced in range of movement and are more precise in their timing. Children acquiring SLN begin to use this kind of focused point quite early (the pattern for SSD remains to be explored, but these children do not quickly develop linguistic uses of pointing). *We expect that early one-sign utterances will often consist of a single point, and that repeated points may serve as a “prosodic bridge” to multi-sign utterances. Early sign combinations will consist of two different points or a single point and an associated lexical item. However, the use of points to refer to absent people or objects, localized in signing space, will be a late development. A precursor of such pointing may be seen in reference to people who have left the room or to unexpected absences of objects in their usual locations.* (For patterns of development of pointing in children learning ASL see, e.g., Hoffmeister and Wilbur [1980] and references cited therein; we will examine our data in a similar framework.) Our data should make it possible to trace out in detail, for individual children, the separation of linguistic pointing from other functions and types of pointing. Although many studies of early signing, in various sign languages, have included points as early lexical items, in our analysis of the emergence of multi-sign combinations we wish to distinguish between the use of points to actual situations, points to absent situations, and points used as conventional lexical items (see Pizzuto, 1990, for an analysis of stages of the development of pointing in ASL). Our analysis of multi-sign combinations will be carried out separately for those with and without points, in order to better establish the functional development of this part of the system. (For representative literature on early sign combinations, see: *ASL*: Bonvillian et al., 1983; Newport & Meier, 1985; Orlansky & Bonvillian, 1985; Siple et al., 1990; Schlesinger & Meadow, 1972; *Italian Sign Language*: Caselli et al., 1984; Caselli, 1987; Volterra, 1983; *SLN*: Coerts & Mills, 1994; Mills et al., 1994; Rooijmans, 1995.)

**Gaze allocation.** A challenge to the deaf child is to allocate gaze between the addressee and the referent situation. The example from NM, presented above, shows a flexible use of gaze shift by a child of 2;11 with a deaf mother. She signs the topic, BOY, while looking at the mother; then shifts her gaze to the brother while signing the comment, GRAB; then shifts gaze back to mother to elicit response from mother. For younger children, it is difficult to separate the attentional gaze to the referent from the communicative gaze to the addressee. And, eventually, the child will have to master the flexible use of gaze to loci in signing space serving as anchors for referents established in discourse. The development of gaze is thus tied up with control of topic/comment organization and interpersonal pragmatics—and, later, to the flow of connected discourse. *We expect that hearing parents, whether using SLN or SSD, will not be very good models for these subtle uses of gaze, and that it will take children some time to fully master this dimension. Deaf parents and their children will be more competent in gaze allocation.* Observation of children in the preschool, interacting with the deaf teacher, may give clues to the effective training of gaze manipulation in both hearing parents and their deaf children. For example, we have observed attempts by the deaf teacher to direct the gaze of a child to an event happening at the door, while the child continued to gaze at the teacher. The child had not yet separated the roles of attention to addressee and attention to the referent situation.

**Attention getting.** Both parent and child must learn means of gaining and maintaining the attention of the other. Numerous devices are available, such as signing in the visual field of the other, enlarging signs in space, signing on the face or body of the other, hand waving, tapping, stamping on the floor, and—for children of hearing parents—vocalizing. (For work on attention getting in SLN, see Bogaerde [1992], Mills and Bogaerde [in press].) We will document success in managing attention in turn-taking, and attempt to relate it to other measures of language development, with the goal of better training hearing parents in signed communication. *We expect that parental success on this dimension will correlate with other measures of parental signing ability and with the signing development of the child.*

**Morphology.** The example from NM shows a morphological error of agreement in a “reversing” verb (Fischer, 1973), in that NM gestures GRAB moving from brother to self, while the referent action moved from self to brother. Such agreement errors have been reported in the literature for ASL (Fischer, 1973; Hoffmeister, 1978; Meier, 1981, 1982), leading Newport & Meier (1985, p. 908) to propose that ASL morphology is acquired relatively late. We will evaluate these proposals in our three Dutch populations. However, we also propose that there are other aspects of morphology that do not pose similar acquisition problems. For example, handshape classifiers incorporated in verbs of object manipulation seem to be a

precocious acquisition for children acquiring SLN (but somewhat later in SSD). This is especially evident in verbs referring to grasping (e.g., two-finger grasp for an object such as a pencil, cupped hand for a glass). Slobin (1985a) proposed that hearing children pay early attention to “Manipulative Object Scenes,” using direct physical manipulation of objects as an initial orienting event for acquisition of grammatical morphemes such as accusative or ergative inflections. The SLN acquisition data are in consonance with this proposal. More broadly, we will examine the embeddedness of handshape morphemes in verbs with regard to the semantic/pragmatic configurations in which they occur. *We expect that handshape morphemes that are involved in the representation of object manipulation will be an early acquisition. By contrast, those handshape classifiers that are involved in verbs of motion—lacking manipulative agent-patient meaning—will be later to develop (e.g., movement of person vs. animal vs. vehicle); the same will be true of incorporated morphemes indicating manner of movement* (cf. Slobin’s [1996a, 1996b, 1997c] recent crosslinguistic and typological theorizing on the linguistic expression of motion events, and Slobin and Hoiting’s [1994] proposal of a new typology of motion events in signed and spoken languages).

*We also expect that children acquiring SLN will show early use of mouth morphemes that accompany action verbs in a conventionalized fashion.* These morphemes have not received sufficient attention in other studies of sign language and its acquisition. For example, verbs of spatial movement are accompanied by expulsion of air between the upper teeth and lower lip (“fft!”) to indicate speed and intensity of movement; object nouns are accompanied by rapid mouth opening (“pahh!”) to indicate great size. Such mouth morphemes are a standard component of SLN grammar (e.g., Bos, 1990; Schermer, 1990) and seem to be a precocious morphological acquisition.

However, as Reilly and McIntire (1991) have found with regard to ASL acquisition, some facial morphemes are difficult to acquire, such as the facial configurations expressing wh-questions and conditionals. This is true in our data as well. However, whereas Reilly and McIntire conclude that simultaneous information is difficult for the child, we would differentiate different types of simultaneous expression. *We expect that object-manipulation handshape classifiers and mouth morphemes, as discussed above, will pose fewer acquisition problems than the integration of non-manual components that have utterance-level scope in their meaning.* This leads us to hypotheses with regard to operators and word order.

**Operators.** Operator morphemes take the utterance in their scope, such as negation, affirmation, and yes/no questioning (interrogation). For example, negation and affirmation are expressed by a head movement morpheme with duration extended over the predicate (comment) of the utterance. This requires simultaneous attention to the topic/comment organization of the manual signs and the production of a non-manual operator during part or all of the utterance. Our preliminary observations of SLN-learning children show an early stage in which head movement and the referring expression are produced sequentially, rather than simultaneously. For example, a child might shake her head and then gesture a particular verb or point to a referent. (We do not know yet if there is a stable order to these two components.) At about age 2;0 we begin to see children merging these two components into a simultaneous utterance, with a head shake or head nod accompanying a sign such as NICE, PLAY, or a POINT. These issues of sequence and simultaneity will be explored in detail in our three Dutch child samples as well as in the signing of their parents. *We expect that operators will first be expressed separately, in ordered combinations with lexical signs, and that simultaneity of operator and referent will emerge after some extended period of sequential expression of various notions in the child’s signing.*

**Topic/comment organization.** We have intentionally used the terms “topic” and “comment” above, rather than the syntactic categories, “subject” and “object,” or semantic categories such as “agent” and “patient.” It is our impression—requiring much more detailed study—that SLN (and perhaps many other sign languages) is a “topic prominent” language, in the sense of Li and Thompson’s (1981) analysis of Mandarin Chinese. They define topic as “what the sentence is about ... it always refers to something about which the speaker assumes the person listening to the utterance has some knowledge” (p. 15). A topic prominent language is one in which this notion “is crucial in explaining how ... sentence structure works” (p. 16). For example, a common word-order pattern in SLN consists of “bracketing” a comment (predicate) with a point to the topic fore and aft. (The topic can be an actual person or a locus established in signing space as the “pronoun” equivalent of a nominal referent.) Rather than analyze this as a pronoun-verb-pronoun word order, it might be more appropriate to search for a topic/comment analysis. Similarly, when the predicate alone is new information, the associated nominal referents may precede the predicate as established topics. For example,

a child comes to his mother to communicate that father has broken a cup. A possible sign order is MOMMY! DADDY CUP BREAK. We propose that this does not demonstrate subject-object-verb or agent-patient-action word order, but rather a topic-comment structure of the sort: “Mommy! You know what Daddy did to the cup? He broke it!” This sort of provocative re-analysis will be pursued in the analysis of the lexical, gaze, morphosyntactic, and semantic levels. A wealth of such examples leads us to expect that the notion of topic may well be “crucial in explaining how sentence structure works” in SLN. Note that, in the last example, the topic DADDY CUP does not play a syntactically defined role in the structure. As Li and Thompson characterize the situation: “What distinguishes topic from subject is that the subject must always have a direct semantic relationship with the verb as the one that performs the action or exists in the state named by the verb, but the topic need not” (p. 15). (Schick and Gale [1996] present evidence for early flexible word order in children’s acquisition of ASL from deaf parents, suggesting that topicalization and other pragmatic factors play a central role.) ***We expect to find much flexibility in the ordering of signs, and that many such patterns will be explainable in terms of topic/comment organization.***

***Temporality.*** In the example from NM, reference is made to a situation in the immediate past—the brother’s grabbing of a paper crown from her head. The torn crown is in her hand at the time of the utterance, and it is not lexicalized. In ongoing research in our lab at Berkeley, dealing with reference to motion events in the speech of preschool-aged children and their parents (in English, Spanish, French, and Italian), we find that reference to absent situations (past or anticipated) is richer in lexical reference to the physical objects and locations involved in those situations. ***We expect to find longer utterances, and more explicit signing of objects and actions, in utterances that refer to non-present events.*** For example, in a videotape of a girl of 2;9 discussing a past event in SLN with her hearing mother, explicit reference is made to a CLOWN and the PAPER that the clown had wrapped around his head. Such discourse is a useful indication of the lexical control of parent and child. A “bridging” context to absent reference is often provided by joint attention to a family photo album or to a home video of past events. We have a number of examples of such contexts in our data, and they will deserve detailed attention in the analysis.

***Vocabulary.*** As mentioned above, we have data on vocabulary size from Hoiting’s parental checklist, modeled on the MacArthur Communicative Development Inventory (Fenson et al., 1993) and Judy Reilly’s unpublished adaptation for ASL. A number of questions will be explored with regard to vocabulary growth. Our sampling begins at about age 16 months, so we don’t have data on the very first signs; however, all of the children in our sample with early signed input use some signs at this age, and most have at least ten signs by about 18 months. (A gesture is considered a sign if it has a more or less consistent form that matches a sign in the input language and is used reliably in appropriate contexts.) The 50-sign level is reached by age 20-25 months. The literature on ASL-learning children reports somewhat earlier ages—but note that almost all of our subjects have hearing parents, whereas most of the children of previous studies have deaf parents. The ages are not unusual in the crosslinguistic framework of the acquisition of spoken languages (see papers in Slobin, 1985b, 1985c, 1992, 1997a, 1997b), reinforcing our hypothesis that a sign language can be acquired on a generally normal timetable, although the input is imperfect. We will examine vocabulary growth in more detail, quantifying the rate of accumulating new words and the meanings of early vocabulary items. Preliminary summaries indicate quite normal and familiar developmental patterns. ***We expect that the semantic fields included in early vocabularies will be the same as those reported for hearing children (e.g., Dromi, in press) and ASL-learners (e.g., Bonvillian et al., 1983; Reilly, personal communication, July 1995): nouns for objects of everyday life, proper names, verbs of feeding, dressing, movement, and the like.*** The semantic processes of vocabulary development will be explored in detail. Another important issue is the relation between vocabulary size and the emergence of multi-sign combinations. Bates et al. (1995) report regular relations between these two measures in hearing children learning English. ***We expect to find reliable close relations between checklist vocabulary measures and utterance length in the development of SLN, with delay and more variability in the development of SSD.*** Our preliminary data suggest that, for some children, sign combinations appear after the acquisition of about 50 signs; however, there are considerable individual differences (as reported also for hearing children). We will explore these differences with regard to both parental input and scales of motor and cognitive development.

***Comparing SLN and SSD input.*** Based on our own observations, and comparable studies of ASL and various types of sign-supported English (Davidson, et al., 1996; Stack, 1996; Supalla, 1991), we

expect that children acquiring SSD will make various attempts to bring it closer to natural sign language. In the American studies, children innovated directionality in verb signs, marking relations such as agent-patient or agent-recipient. Sam Supalla reports: “When asked whether SEE 2 [Signing Exact English] performs like a language, the teachers replied with a firm no” (1991, p. 90). Similarly, Hoiting reports that a deaf teacher found it impossible to cope with teaching SSD to parents, signing: “I can’t do this any longer! This is not a language!” *We expect that the non-natural features of SSD (i.e., those modeled on spoken Dutch) will impede the learning and use of such a system, both by the hearing parents and their children in our sample.*

## QUANTITATIVE MEASURES

Performance on each dimension—to the extent possible—will be converted to quantitative scores for statistical analyses of differences, correlations, factors, and trends. At this point we can only anticipate some of those measures in rough form, leaving statistical refinement to the third year of the project. These scores will be used to track development in individual children, to compare groups of children, to summarize by age and input type, and to compare the various adults (deaf and hearing parents, deaf and hearing preschool teachers) and speech contexts (home, preschool). For the child measures, separate counts will be made for each developmental period, as well as overall counts where appropriate. Anticipated quantitative measures include:

### ***Vocabulary checklist:***

number of items produced and comprehended in each category and overall

### ***Attention-getting:***

proportion of successes on first try mean number of repeated attempts (successful/unsuccessful)

### ***Lexical:***

number of types and tokens, overall and by categories, TTR

number of types and tokens in each of the categories of the checklist

number of uses of each type of classifier

### ***Gaze:***

number of appropriate and inappropriate coordinations of gaze with other signal components

### ***Non-lexical:***

numbers of lexical and non-lexical points

percentage of non-lexical points out of total points

percentage of non-lexical gestures out of total sign+gesture

numbers of grammatical and expressive mouthings

### ***Morphosyntactic:***

MLU in signs (counted with points, without points)

composite measure of utterance complexity, including grammatical morphemes

numbers of clear instances of distinct parts of speech (noun, verb, etc.)

numbers of occurrences of each word-order pattern

counts of various error types

### ***Temporality:***

percentage of use each temporal category (-, -, =, +, ++)

mean number of lexical items, points, in each temporal category

MLU in each temporal category

### ***Semantics:***

mean number of utterances in each type of semantic utterance category

mean morphosyntactic complexity of each semantic utterance category

distribution of temporality for each semantic utterance category

**Operators:**

- mean number of simultaneous and sequential expressions
- proportion of simultaneous expressions out of total expressions with operators
- mean number of each type of operator construction (affirmative, negative, etc.)

**Pragmatic:**

- mean morphosyntactic complexity for each pragmatic utterance category
- distribution of temporality of each pragmatic utterance category

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