COMMUNICATIVE INTERACTION: MOTHER MODIFICATION AND CHILD ACQUISITION OF AMERICAN SIGN LANGUAGE

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COMMUNICATIVE INTERACTION: MOTHER MODIFICATION AND CHILD ACQUISITION OF AMERICAN SIGN LANGUAGE *

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Abstract. The communicative interaction in American Sign Language (ASL) of two deaf mothers with their deaf children was studied at 3-week intervals for 10 months to find what modification, if any, the mothers made in their language utterances addressed to the children (12-20 and 20-30 months old). As was hypothesized, and has been shown of hearing-speaking mothers' language, modification in the direction of simplified and more linear language was found.

Special attention was paid to POINTing behavior (i.e. pointing gestures constrained by the linguistic rules of ASL) and to verb "modulation" or inflection (changes from ASL citation forms to mark the sentential arguments of verbs). Phonological, semantic, syntactic, and pragmatic analyses were made of the data from these two mother-child dyads.

The language of the children was found to be like that reported in previous studies of ASL acquisition. These show verb modulation to be absent from the earlier stages, making a first appearance at about two and one half years. Lacking productive inflection of verb signs to mark semantic or grammatical roles in an utterance, the two children in this study, like those in previous studies, were found to combine deictic POINTs with lexical signs. Nearly 100% of the signs in the data base from the younger child in early sessions (ca. 12 months) are POINTs, but only 66% in the data base from later sessions with the older child (ca. 30 months).

This study is the first to examine mothers' language in conversations with their children for the use of the ASL verb inflecting system called Verb Modulation by Indexic Reference.

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* see note, page 278

In their conversations with their young deaf children the mothers do not use modulated ASL verbs. Most of their utterances contain lexical (i.e. citation) form signs and deictic POINTs. In the rare cases when modulation does occur, it is always in the presence of the verb-indicated referent, be it person, location, or object. There is only a single case of Indexic Reference in 2,035 of the mothers' utterances; i.e. use of a point in signing space to establish an "Index" for a non-present noun referent.

The mothers in the present study do not use the rich modulation system of adult ASL with their young deaf children but instead offer a model of ASL that separates out these highly analytic units into their simple components. Furthermore, they use several strategies to ensure comprehension during the course of development from these simpler forms of reference to the complex system of referencing non-present objects, locations, and persons by Indexic Reference and Verb Modulation. The strategies listed here are discussed more fully below:

1 Mothers bring the object they want to talk about (the referent object) directly into the dyadic conversational space; they show it. This strategy is the most explicit and does not even require the child to follow a pointing gesture to its target; it was used in an average of 20% of all the utterances of the mother of the younger child but in only 3% of the utterances of the other.

2 Mothers use POINTing extensively, both as a phonological replacement for other handshapes in lexical items and to mark semantic/grammatical roles in an utterance; POINTing accounts for about 50% of all signs in the mothers' corpus.

3 Mothers do not modulate verbs in their early conversations with their children. When modulation does occur, it is in the form of incorporating present objects, persons, and locations. As use of modulation increases so does the use of the redundant POINTing to mark grammatical/semantic roles. Locational verbs are the first to be modulated (moved toward or performed at the position of arbitrary or real Indexes).

Early communicative interaction. The importance of communication to the development of attachment and emotional bonding between infants and their mothers has been widely studied and recognized (e.g. Bowlby 1969, White & Held 1966). This communication manifests itself primarily by nonverbal means (e.g. voice quality, touch, or smiling) during early infancy, and shifts to symbolic/linguistic means during early childhood, as Schlesinger points out (1978).

Over the past decade communicative interaction of mothers and children has been studied by developmental psycholinguists to determine its influence on the course of language and cognitive development. There is evidence of reciprocal communication between mothers and infants long before the infant can comprehend or produce linguistic forms. Bateson (1971), Lewis and Freedle (1972), and others have noted that mothers and their children use nonverbal means to establish alternating interactions that appear to have conversation-like form. This interaction is maintained through the language learning years by the regular adjustments mothers make in the form (phonologic and syntactic), content (semantic), and conversational style (pragmatic) of the language they use when directly addressing their children (Snow 1972, Blount & Kempton 1976, Broen 1972, Farwell 1973). In general, mothers' language has been characterized as well formed, short in utterance length, repetitive, redundant, and simplified. In addition, mothers seem to be sensitive to their children's level of linguistic competence and to alter the characteristics of their conversation as their children's language evolves. The exact relationship between this process and the acquisition of specific linguistic structures is as yet undetermined, but researchers agree that it occurs extensively and cross-culturally (Ferguson 1974). It is very possible that by providing a special context for social interaction mothers are also providing an optimal early language learning environment.

The present study investigates this communicative interaction process between two profoundly deaf mothers and their profoundly deaf children all of whom use ASL to communicate. The hypothesis was that deaf mothers and their deaf children similarly engage in conversations that are carefully adjusted to the children's level of linguistic competence and that these conversations are made possible by the mothers'

modifications in their language. A restricted set of structures was chosen for analysis to exemplify this process.

POINTing behavior and modulated verbs were chosen for examination for several reasons. First, and most important, the POINT is the basis for the indication of pronominal reference, possessives, plurals, determiners, and a complex morpho-syntactic process called "Verb Modulation by Indexic Reference," which can regulate the agreement of the verb in an ASL sentence with its sentential arguments: subject, object, beneficiary, location, etc. This process constitutes one of the most important grammatical operations in ASL; the verb complex has the potential to carry most of the grammatical information in an utterance (see e.g. Friedman 1975, Klima & Bellugi 1979, Wilbur 1979).

Second, the POINT was chosen because Hoffmeister recognized and described the important role of POINTing behaviors in the early linguistic productions of a deaf child acquiring ASL (1978). His dissertation[1] provides a detailed account of its development. Third, the POINT, along with other gestural behaviors, is thought to function before and during the emergence of a hearing child's first words, during the shift from pre-verbal to verbal communication (Bruner 1975a, b, Bates et al. 1977, 1979). This raises the possibility that POINTing has linguistic significance in both spoken and signed languages.

Recent ASL linguistics. In the twenty-two years since the first investigation of the lexical sign (Stokoe 1960), much linguistic information about ASL has become available (For a review of the recent published and unpublished literature see Wilbur 1979). These investigations go beyond the question whether ASL is a language in the true linguistic sense of the word; rather they are well into the task of detailing its structure. Some of the early studies agreed that ASL may be a language but suggested that its structure is uniquely bound to its manual-visual modality and so very different from the structure of spoken languages (e.g. I.M.Schlesinger 1970—of Israeli sign language). More recent studies, however, have found formal devices that early investigators overlooked because of their lack of experience with signed languages and their tendency to be influenced by spoken language structure; e.g. facial expression, largely overlooked as a grammatical device (though identified as such in Stokoe 1960: 62-67), is

now recognized as a mechanism that operates systematically along with Indexic Reference and word order to mark subject versus object (Baker 1976, Fischer & Gough 1978, Liddell 1980). What has become increasingly clear is that ASL, like Serbo-Croatian and Japanese, is a highly inflected language that generally (but not always) relies on verb inflectional marking of grammatical/semantic roles in an utterance. The POINTing system and this process of verb modulation by indexic reference are integrally related and are the focus of this study.

The key to understanding ASL morph-syntax is the recognition that arbitrary spatial locations (portions of the space that a signer's hands can reach or approach) are used for inflectional purposes. This is accomplished in several ways. A noun phrase, when first introduced in discourse, can be accompanied by a "deictic marker" (Kegl[2]). This deictic marker is usually a POINTing gesture toward an arbitrarily chosen location in space and uses the index finger or any one of various handshapes for different specifications; e.g. Y-hand for demonstratives, 10-hand (Å) for reflexives, B-hand for possessives. The point in space toward which the deictic marker is directed serves as "index" and identifies the spatial location to which the noun phrase is uniquely related for later reference. If the referent is actually present, the deictic marking is accomplished by POINTing to the referent itself, which is thought of as occupying its spatial location. Any pronoun referring to the referent (present or absent) must agree in spatial position with the index. The specifics of location for these POINTs vary according to context, style, and signer. As a general rule, however, first person index is always the signer, second person is always the person the signer addresses (i.e. POINTing is inward or outward), and third person indices are generally to the right or left of the line from signer to addressee.

In summary, a signer will indicate a person, object, or location in the immediate environment by using a POINT (or appropriate handshape) to it, so that subsequent reference to this location is considered pronominal. If the referent is not present, an arbitrary spatial location is designated for it when the noun phrase is first made explicit in signing. The use of these spatial locations for referents present or absent is termed Indexic Reference.

Once the spatial location has been established for a noun phrase it has an index and does not need a discrete sign for subsequent reference. Many ASL verbs acquire sentential information in addition to their verb meaning when the signer performs them so that the hands approach one or more of these spatial indices. The referent of that location becomes the subject or object of the verb, because the verb action can be started at one index, which becomes the subject by that deflection from citation form, and finished at another index, which becomes the object or indirect object (recipient). The verb GIVE, for example, may start at the signer's body and move out directly toward the addressee to express 'I give you.' Reversing the direction signs 'You give me.' Moreover, if locations to the right and left of the signer (beside or a little beyond the addressee) are indexed for Bill and Jane, verb performance that moves from one to the other will indicate 'He gives her' or 'She gives him.' When the referent of a noun phrase is in the vicinity of the conversation, a verb can be oriented to refer to it, as one of its sentential arguments: e.g. 'break it' may be signed with the hands over or pointing toward the object English designates as it. This process of making the verb and argument agree by indexic reference is referred to as "Verb Modulation" (Fischer & Gough 1978, Klima & Bellugi 1979, Liddell 1980, Wilbur 1979).

This inflection (modulation) of the ASL verb for several arguments is more akin to the grammars of Japanese and Serbo-Croatian than to that of other highly inflected languages such as Turkish (Meier 1980).[6] In Turkish, case inflections are the only important devices used to mark grammatical/semantic roles; in most sentences word order is used only to indicate the topic or focus of the sentence. In Serbo-Croatian, however, as Slobin (1966) points out, widespread homonymity among noun inflections causes its users to mark roles with contrastive word order. Similarly, not all ASL verbs can be modulated for role. Fischer observed that body-anchored verbs cannot be modulated to refer to an index because of phonological constraints (Fischer & Gough 1978, Klima & Bellugi 1979). Where indexic reference is impossible, Liddell argues that ASL uses contrastive word order (1980) (Kegl[2] calls this the "flexibility condition"—the more inflected the verb, the freer the word order may be). In any case the young deaf signer of ASL (like the young Serbo-Croatian) must acquire two ways

to mark semantic role: verb modulation by indexic reference, and word order; this is unlike the case for young Turks, who need acquire only a totally regular exceptionless case-marking system.

Other inflectional processes can be applied to verbs (and other parts of speech) in ASL; e.g. there are processes that indicate number, manner, or aspect (Fischer & Gough 1978, Klima & Bellugi 1979, Newport 1982). Another way of making pronominal reference is by classifiers, which categorize nouns by salient, perceived characteristics of the referent, and which interact with indexic reference and verb modulation in the same way as do other pronominals. In summary, ASL employs a complex morphology such as is found in spoken languages. Morphemes in ASL make up a limited number of discrete components, which are combined in consistent, linguistically regular and constrained ways, with a combination usually simultaneous rather than sequential. Newport has summarized the structure of the "word" in ASL thus:

> ...as in spoken languages, complex forms are made up of a limited number of discrete components. Moreover, these discrete units are combined with a shell-like structure like that in spoken languages. Significantly, the inner layer of this shell consists of the root and derivational morphology, those components which add basic meanings to the root; operating outside of these is derivational morphology which changes the grammatical category of the stem from verb to noun; and outside of these is inflectional morphology. In short, ASL has the same kind of analytic character, with discrete units inside of discrete units that is displayed by spoken languages. (Newport 1982: 22)

Acquisition of indexic reference and verb modulation. The study of ASL acquisition is relatively limited (see Hoffmeister & Wilbur 1980 for a review), but it is clear already that deaf children learn ASL in stages as do hearing children learning a spoken language (McIntire 1977, Bellugi & Klima 1972, Hoffmeister[1] for ASL; Bloom 1970 for English). Fischer was the first to report on the acquisition of verb inflection in ASL.[3] She looked at two deaf children of deaf parents, whom she called Shirley and Corey. She divided

her data arbitrarily: for Corey stage 0 ended at 2 years, and 1 to 4 at six-month intervals; for Shirley she analyzed the corresponding stages 1-4. She divided the verbs she studied into three classes: 1) locational (these are not body-anchored and are modulated for indexic reference by being produced at or toward but their action does not involve movement; 2) reversing (also not body-anchored, these verbs involve reversing or modifying hand orientation toward an index); and 3) directional (these verbs can move between two indexes to indicate their nominal arguments).

In the data at stage 0 (2 years) Fischer did not observe any verb modulation in the productions of either child. In the following example Corey strings together a citation form verb and a deictic POINT, using the latter to indicate a location, which in the adult form would be indicated by the modulated verb.

Corey:	SIT	POINT (→addr.)	SIT	POINT (→loc.)	'You sit there.'
Adult:	POINT	#SIT-THERE#			'You sit there.'

(#...# : modulated ASL verb)

At stage 2 (3 years), both children tended to use locational verbs, even modifying directional verbs to look more like locational verbs. At stage 3 (3 years, 6 months), both children showed evidence of having learned a verb modulation rule and also to over generalize it: in several cases they modulated body-anchored verbs (which cannot be modulated according to the adult rules of ASL) such as DRINK and EAT. They also began to use directional reversing verbs in this stage. By stage 4 (4 years), both girls knew which verbs were modulated and in what way, with just a few lingering overgeneralizations.

Hoffmeister investigated the development of various grammatical/semantic systems based on the POINTing gesture.[1] He made videotape records of one child, Alice, once a month from age 25 to age 53 months and used data from another child (42 to 71 months of age) for comparison and verification. He divides his large corpus into five stages of 2,100 utterances each: Stage I, 25-29.months; II, 30-38; III, 39-45; IV, 46-50; and Stage V, 52 months.

In Stage I Alice's utterances were mostly deictic POINTs and lexical signs, with no verb modulation or indexic reference.

More than half (56.3%) of all semantic relations expressed consisted of a POINT and a noun sign for demonstrative entity, e.g. 'that cat' or POINT and adjective for demonstrative attribute, e.g. 'that is green.' This structure diminished to 24.3%, 12.8%, 5%, and 5% in Stages II to V. The other 43.7% of semantic relations expressed in Stage I were used to indicate agent (PT. +verb 'that flies' of a bird), patient, and locative. In these POINT was used syntactically only as a demonstrative. It is important to note that in this first stage, the POINT gestures were directed only at the signer, the addressee, or the objects present in the room; also that in two-sign utterances in this stage one sign was almost always a POINT. Plurals at Stage I were indicated usually by repeated POINTs to the same object. POINTing was also used for the early expression of possesion; e.g. PT (→ object) + PT (→ signer) 'that's mine.'

Verb modulation begins to emerge in Stage II (30-38 months). The demonstrative-entity relation continued to dominate the utterances produced, but three-term relations begin to emerge also in Stage II. The POINT shows up regularly in these three-term relations in the form of three POINTs, one sign and two POINTs, two signs and one POINT, and finally, late in the stage, three non-POINT signs. In this stage Hoffmeister finds what he calls "real world indexing;" i.e. POINTing toward the object followed by the production of a verb sign moved in the direction of that object, or the performance of a verb with the signer's hands actually on the object. He found also the use of the demonstrative sign THAT (with Y-hand) on the real world object followed by a POINT towards it. In the expression of the possessive third-person possessors emerged, but still with the immature POINT (G-hand) instead of the adult sign (B-hand).

In Stage III Hoffmeister reports development in other than POINTing behaviors; e.g. the appearance of conjoined and complex sentences. There was also refinement and some stabilization of the demonstrative; i.e. the adult demonstrative THAT (Y-hand) was used in the position previously filled by a POINT and without an accompanying POINT as in Stage II. Note that the use of abstract reference begins to emerge in Stage III; e.g. the child established a location for a bat on the living room drapes by using a deictic POINT, then later referred to this location (indexic reference) in a later sentence when the bat itself had disappeared. The child was also able to index a person not in the room and refer again to that index.

In Stage IV full control of all two-unit and three-unit semantic relations was observed. All possible possessive forms were produced correctly, and the reflexive pronoun (A-hand) emerged, although sometimes replaced by POINT. Reflexives were used at this stage only in reference to members of the conversational dyad. Later third person reflexive reference was attempted. In addition, third person reference was initially restricted to objects present (only later being extended to non-present objects), although early in Stage IV Alice was still using an object present in the room to substitute for another, similar, object not present.

By Stage V the child in Hoffmeister's study had mastered adult use of POINT for its function in possessives, plurals, reflexives, and indexing nouns in space with pronominal/verb agreement and with appropriate handshape. As each of the various functions based on POINT developed, a sequence emerged: reference only to the dyad and immediate context, followed by extension to objects and persons not present. Noun indexing for pronominal reference followed this sequence: indexing on the object, indexing toward the object or substitute object, and finally referencing non-present objects. But this sequence did not emerge for all POINT-functions simultaneously; instead, during Stage IV it emerged for the reflexive when control of pronominal and possessive POINTs was already well established. There is a movement from real world to abstract referencing, with a transition stage in which an object is used to substitute for another like it. The POINT was used in the first productions of possessives and demonstratives, simplifying phonology (from B-hand and Y-hand to G-hand).

Loew also analyzed indexic reference in the spontaneous linguistic production of a deaf child of deaf parents.[4] She studied five videotapes, selected from a larger collection, covering the period from age 3:1 to 3:7. Her data confirmed those of Hoffmeister and Fischer in indicating that indexic reference is a relatively late acquisition. By age 3:1 her subject had begun to use indexic reference for both present and non-present referents but with interesting modifications and constraints. At this age very few of the directional verbs appeared, modulated or unmodulated. Most of the verbs were non-modulating body-anchored (e.g. EAT, SLEEP), with an occasional use of verbs like SIT, which incorporate only a single argument (e.g. 'sit there'), in accord with Fischer's findings.[3] Loew's subject progressed from avoiding the

modulation of directional verbs by POINTing to or naming the people or objects involved, sometimes with non-sign gestures, to using directional verbs (GIVE, TAP, SHOVE) incorporating the index for the patient (Loew, "goal") of the verb but leaving unspecified the agent (Loew, "source"). In some instances, when the child herself was the agent, this was appropriate; in others, the omission of agent created ambiguous utterances with no indication of who was performing the action. All indexic incorporations in the verb were produced with referents present and with no instances of reversing the verb sign to incorporate herself as a patient (e.g. 'look at me' or 'ask me').

The first true modulations to incorporate two arguments were found when the subject was 3 years, 6 months old. She was also attempting then to modulate verbs for non-present referents but would do so without first explicitly establishing an index for each. This would be equivalent to a younger speaker's use in English of a pro-form he or she without first having introduced the nominal to which it referred. At the last taping, the subject (3:7) had still not acquired this process.

One last piece of confirming evidence comes from Newport and Ashbrook,[5] who studied the development of semantic relations in three 27 month to 36 month old deaf children with deaf parents. They originally separated semantic relations expressed in a sequence of signs from those expressed in a complex sign (one that incorporates an agent or patient through verb modulation) to see if there was developmental difference in expression type. No such difference was found. They noted also that before acquiring the incorporation process for marking grammatical/semantic role in ASL utterances the young signers relied on word order only; e.g. 'he gave ----- to her' would be signed as three discrete unmodulated signs and not with agent and beneficiary incorporated in a modulated GIVE; and the word order of the three was fixed.

In a working paper[6] Meier discusses the reports summarized above in terms of language universals and cross-linguistic generalizations that have been made in the psycholinguistic literature. He notes that most early psycholinguistic studies describe a two-word stage in the child's development in which no productive, inflectional morphology is used. The classic study of these is Slobin's (1966), in which a variety of other studies are cited showing that this two-word stage occurs in

analytic, fixed word order languages like English as well as in fused, inflecting languages with comparatively free word order like Russian. Without productive inflection, children mark grammatical/semantic roles by word order. Meier also notes that Slobin's more recent work (note7) finds exceptions to this phenomenon in Turkish children and speakers of other agglutinative languages that make early use of inflectional morphology. Slobin suggests that early versus late acquisition of inflectional morphology is dependent on typological characteristics of the language; i.e. whether the language is agglutinative or fusional in its morphology, regular or irregular in its paradigms, or uses prefixation or suffixation.

Meier reviews cross-linguistic data from Turkish and Serbo-Croatian in detail and concludes that in Turkish the case-marking system is totally regular and exceptionless. As a result, Turkish children develop its use early, in the one-word or two-word utterance stage of acquisition. In Serbo-Croatian, however, as in Japanese and in ASL, two contrastive strategies are employed to mark role: inflectional processes and contrastive word order. Furthermore, in all three languages, young learners who lack control of the inflectional system employ rigid word order to mark grammatical/semantic roles.

Meier does not accept the presence in ASL of two linguistic devices to mark role as sufficient to account for the relatively late acquisition of indexic reference. He suggests instead that indexic reference may be one facet of a highly fusional morphology and that these two characteristics of ASL typology are responsible for the late acquisition of verb modulation by indexic reference.

POINTing behavior in hearing children. Some psycholinguists treat POINTing behavior in hearing children acquiring a spoken language as paralinguistic phenomena (Bowerman 1973, Bloom 1970). Others have considered POINTing, along with other gestural behaviors, to be part of the repertoire of communicative strategies for interaction that is precursory to verbal language (Bruner 1975b).

Bullowa (1977) analyzed patterns of interaction between two small children and their caretakers. Her initial interest was to differentiate motor behaviors that might precede what she categorized as "performative" utterances (i.e. the child

vocalizing while doing what the utterance "describes") and behaviors that might precede "reportative" utterances (i.e. the child referring to non-self initiated actions). After careful analysis of these behaviors, Bullowa suggested that important conditions for the emergence of language in the ontogeny of communication are: 1) interaction with caretaking adults, 2) shared focal attention, and 3) specificity of reference. She further hypothesized that the first of these ways that an infant has for referring to specific things in his or her environment is to direct his or her gaze at it, augmented by the action of sucking. Head-eye movements (orientation and tracking) and arm-hand movements (reaching, giving, receiving, indicating) at three months of age, give way to reaching and pointing movements at nine to ten months of age as means for engaging the addressee's attention and for specifying direction. Further, reaching and pointing are related to the later development of naming, and therefore of categorizing and labeling. In the following example , mother and child attended together to an object in the environment through POINTing behavior:

> ... at 14 months, Dory pointed to the wall. Her mother pointed to a pattern in the wallpaper immediately after, as Dory withdrew her hand. Thus, both attended simultaneously to the same environmental object after Dory indicated it. (Bullowa 1977: 203)

Bruner was also interested in the pre-speech communication of infants and in identifying behaviors that might be considered precursors and prerequisites for later linguistic development (1975a, b). He also sought for these behaviors in the context of interactions between infants and their mothers. He discusses the differences between "indicating," "deixis," and "naming," and suggests that indication and deixis are instrumental to the development of naming. This is in keeping with his argument that it is necessary for the child to master certain cognitive skills as "the constituent skills for linguistic mastery." He argues that one set of behaviors is not replaced by a set of linguistic skills, but that the cognitive skills built on early motor behaviors are fundamental to and underlie the mastery of linguistic forms.

Bruner defines indication to include gestures, postural

leaning, and vocal patterns that serve to call an addressee's attention to an object, action, or state. Deixis according to Bruner's model involves the use of "spatial, temporal, or interpersonal-contextual features of a situation" to establish joint reference. Bruner's examples of indication behaviors, like Bullowa's, involve the mutual attention of the mother and child to the same object, action, or state. The mother uses the infant's focus of attention to infer the infant's needs or requests. In turn, the infant, by four months of age, will follow the adult's gaze when it is turned away from the child. By eight months the extended hand is used to focus on a line of regard rather than to focus on the direction of an action. To support his argument, Bruner notes what he calls "visual cross-checking" or "looking at the other face while in the process of indicating" (apparently to agree on a referent), which he considers to be part of a process of conventionalizing these indication routines. He also observed decontextualization and increased economy in their use over time.

Deictic markers appear at the linguistic level in spoken languages in such word classes as pronouns, adverbs, adverbial location, and more, all of which have constant meaning in common but a virtually infinite number of referents. Words like I, you, here, and there have referential meaning only in a particular discourse. Bruner argues that this process of fixed markers for variable reference emerges in interactions before the development of formal, verbal language. He sees this process developing from indication routines and other games of mother and child, e.g. in Peekaboo.

Games like Peekaboo require mother and child to establish roles and then reverse them. According to Bruner, the turn-taking actions are often accompanied or marked by distinctive vocalizations and direct eye contact at crucial places during the play, "as if to calibrate his intended action with hers (the mother's) and to check which one is playing which role" (Bruner 1975a). These games and other indication routines (which utilize gestures and POINTing) Bruner thinks are the beginnings of the capacity to understand the relational concepts that underlie the use of pronominal forms.

Bates and her associates (1977) were similarly interested in the relationship between manual gestures and linguistic/cognitive development. They conducted a series of studies to investigate the emergence of vocal symbols, i.e. names, in

hearing children between the ages of 9 and 13 months. Like Piaget (1962) and Werner and Kaplan (1963), Bates and her associates view naming as a process that gradually emerges out of a "complex of interactions with objects" (1977: 8). Further, all the above researchers view solitary naming (i.e. the tendency for infants to name things to themselves in the absence of eye contact or feedback from adults) as part of an active process of constructing and categorizing reality. Bates et al. point out that neither they nor any of these other researchers ignore the interactive and communicative functions of naming for shared reference; instead, they seek to find a common cognitive process that underlies the use of naming "inside and outside of" communication. Bates and her associates were interested in finding proof that language does not replace gestural communication (i.e. opposed a replacement model); they were interested in a model (expansion model) of development that sees gesture as foundational to language. Indeed it was the case in their study that children who most exercised the gestural schemes developed most quickly in language.

They outline four sets of gestural schemes: 1) POINTing for self (no adult feedback present); 2) object oriented imitation (stirring, sipping, etc.); 3) giving, showing, POINTing for others; and 4) "showing off routines, e.g. pattycake"—and consider them as functioning for communicative and for cognitive purposes in different degrees. Of most relevance here are the POINTing behaviors. They consider POINTing for self to be significantly different from communicative POINTing sequences that serve to orient another's attention to something external.

Communicative POINTing was found to be used in interaction to call an addressee's attention to some object, person, or state. Non-communicative POINTing (POINTing for self) occurred outside of interaction; these POINTs were made toward objects "close at hand in solitary exploration, with no evidence of communicative intent" (1977: 10). Further use of communicative POINTing is described in the following passage:

> She would first point to the object, then swing around and point to the listener, then turn around again to point to the apparent referent. It took several weeks for this chain of acts to smooth into a single action of pointing away while looking for confirmation. (Bates et al. 1977: 11)

Another interesting aspect of the Bates studies is the interrelationship of the different categories of behavior. One might expect gestural measures to correlate more highly with language production than with language comprehension. Such was not the case. Gestural development correlated with language comprehension at the same level as did referential speech and slightly higher than did non-referential speech. In particular, "the strong relationships between Communicative POINTing and Comprehension were similar to those for POINTing and Production" (1977: 12).

The use of deictic POINTing gestures and the use of what Bates et al. call "gestural schemes" come together in Goldin-Meadow's dissertation[8] study of a gestural language invented by six deaf children who were presumably not exposed to a conventional signed language (Goldin-Meadow & Feldman 1975). The study concentrated on the representation of semantic relations in the communication systems developed by these children whose ages ranged from one year and five months to four years and six months. Fillmore's case grammar (1968) was used to categorize the semantic nature of these children's productions into two basic kinds: deictic (POINTing) and "characterizing" signs. Characterizing signs as defined by Goldin-Meadow are very similar, if not identical, to Bates' "schemes"—usually gestures imitative of actions associated with their referents. E.g. Goldin-Meadow considers the child's pounding the air with a fist to mean 'hammering' and twisting a hand in a certain way to mean 'opening a jar.' In her analysis all "nouns" are realized in the children's productions as POINTs and "verbs" as characterizing signs. A typical two-sign phrase accordingly had a noun-equivalent, a POINT, and a predicate, a characterizing sign, to make up its surface structure expression. Goldin-Meadow charts the development of this self-generated sign system and finds it a progress remarkably similar to that of hearing children in the early stages of learning to talk.

Summary of acquisition studies review. The behavior called POINT has been shown to be fundamental to the development of the basic morpho-syntactic processes in American Sign Language as this behavior relates to indexing, and so also

fundamental to verb modulation by indexic reference. The studies just reviewed ascribe a vital role to the POINT in the early communication of deaf children acquiring ASL, of deaf children not exposed to signing but developing a self-created gestural system, and of hearing children acquiring a spoken language. The POINT is also a strategy used by hearing children and their mothers in early conversations. These studies support a cross-modal (vocal and gestural) and a cross-linguistic (English, ASL, and self-generated language) view of the importance of POINTing. For deaf children acquiring ASL, indexic reference (use of POINT as an anaphoric pronominal process) seems to be a late development and one with many modifications and different processes during its development. POINTing is used to express semantic/grammatical roles and relations that in adult grammar can be subsumed and expressed by verb modulation.

The study described below investigates the processes related to POINTing and verb modulation in the conversations of deaf mothers with their deaf children and asks:

1 How and when does verb modulation appear in a mother's language directed to her child?
2 Is POINTing a strategy employed by mothers, and if so, in what ways?
3 What evidence can be found in early conversation between deaf mothers and children for the general phenomenon of simplification that has been observed in conversations between hearing mothers and children?

The Method and Results

The data in this study come from two mother-child dyads. Both mothers are congenitally deaf (severely to profoundly), are native signers of ASL, and are married to deaf signing husbands. Mich's parents had some college education, Erin's did not attend college. Both fathers work night shifts and are at home during the day. Mich has an older sister, aged five, who is congenitally profoundly deaf. Erin has a set of deaf grandparents and several deaf cousins, aunts, and uncles. Both children were involved at the time of data collection in an early intervention program at the Boston School for the Deaf in Randolph, Massachusetts, which involves a few hours of structured play a week.

Mich is his parents' second child; he was twelve months old when first observed and twenty months old at the final observation session. Erin is her parents' first child and was observed from the time she was twenty months old until she was thirty-two months old. Both children appear to have a serious hearing loss, although precise measurement is not possible at this early an age. Both are of normal intelligence and have no neurological or other impairments

The data were obtained from one-hour video recordings made in the homes every three weeks for the one-year duration of the study. Two video cameras were used, one focused on the mother and one on the child. To minimize the effect of a hearing researcher on the kind of signing the mothers might produce, a deaf associate assisted in the recording and in interacting with the families. Recordings were made with a special effects generator to allow the mother's and the child's images to be viewed together on one monitor for analysis.

The mothers were told about my interest in their child's sign language development, and I asked them to interact with their children in a natural and usual manner. My deaf assistant and I filmed them during play and feeding times. Free play sessions allowed the child and parent to explore the child's toys without experimenter manipulation. Structured play sessions involved a specific activity to involve the parent more actively; e.g. "reading" together a book brought in by the researcher, putting together a puzzle or playing a game provided by the researcher. Each session lasted from forty-five to sixty minutes.

A total of eighteen videotapes were transcribed at least once by a native deaf signer and reviewed by a deaf and a hearing signer. Every utterance of both the mother and the child was included in a continuous transcription of each videotape. Utterance boundaries were judged by deaf native signer transcribers on an intuitive basis, using pause length to determine the last sign of an utterance. Contextual information was included for each communicative turn.

After transcribing, every utterance in the transcript that contained a POINT, an object brought into dyadic space, a possessive pronoun, or a modulated verb or any combination of these was then coded for information of seven kinds:

1 Semantic relation expressed by utterance.
The coding system allowed for all one-, two-, three-, four-, and five-term semantic relations expressed. (In fact, no five-term utterances emerged in the period under study, and only a few four-term). Terms for semantic relations are those used by Hoffmeister[1], based on Brown (1973) and Chafe (1975). Appendix A lists the possible relations and examples from the transcript.

2 Pragmatic function expressed by the utterance.
The function of the utterance was coded as one of seven types of reportatives or one of six types of questions or requests; the reportatives: name, confirm, disconfirm, negate, locate, comment, explain, describe; the questions/requests: wh- type, stative verb ('do you want?'), emphatic/directive type, action questions ('are you eating?'), clarifications ('did you say "me"?'), and the most subtle—indirect ('it's hot in here' ['please open a window']. Appendix B lists these categories with examples from the transcripts.

3 How the referent was indicated.
Hoffmeister[1] found a significant developmental progression from POINTing on the referent, to POINTing toward the referent, to use of a substitute object for the referent, to indexing a present referent. These differences in expression were therefore distinguished in the present data, as well as introduction of an object into the dyadic space.

4 Phonological information on deictic marker.
In this category the code specified the handshape used for the deictic marker: G-hand (POINT), B-hand, Y-hand, 10-hand, or 5-hand.

5 Introduction of referent.
Here was indicated whether mother or child introduced the referent for the deictic marker used in the discourse.

6 Number of signs & number of POINTs.
Coding thus allowed a sign-to-POINT ratio to be calculated to show the proportionate amount of POINTing, and from this a calculation of the change over time.

7 Verb-complex modulation.
The verb complex in an utterance was coded to indicate whether it incorporated an index for a present referent—where the present referent can be thought of as occupying its index in space; whether it incorporated a previously established index for a non-present referent; or whether it was a citation-form verb, with no modulation.

Results. In general, both children show increase over time of the number of utterances (and signs) produced. This is more marked in the older child, Erin (See Table 1). The younger child, Mich, remained in the one-sign utterance stage of development through most of the period under study; he therefore shows less of an increase in production over time. Erin, who seems to be a transitional two-sign utterance signer, averages more signs per utterance than Mich, a "one-sign-at-a-time" signer. This measure needs clarification. It should be understood that more than one morpheme can be expressed in one sign; however, a count of signs for the children here is still a meaningful measure because their productions consist almost entirely of POINTs and citation-form signs, with no modulation or inflection of any kind, and therefore a count of signs is approximately equal to a count of morphemes.

Table 1 also displays the number of utterances and of signs produced by the mothers over time. Both mothers show a trend of increasing production as their children develop. Mich's mother averaged 39 utterances in the first four sessions and 91 in the second four. Erin's mother averaged 89 utterances in the first five sessions and 213 in the second five. Even allowing for differences in talkativeness in the two women, there is a considerable difference in the number of utterances addressed to their children. These differences correspond with the differences between the children: as

Tape	Age in mos.	MICH Utterances	MICH Signs	Mother Utterances	Mother Signs
1	12	14	15	53	84
2	.	2	2	21	26
3	.	3	3	19	26
4	.	5	5	63	97
5	.	16	17	64	109
6	.	6	5	89	128
7	.	6	6	88	137
8	.	17	18	125	206
		ERIN Utterances	ERIN Signs	Mother Utterances	Mother Signs
9	20	58	90	85	142
10	.	71	114	71	130
11	.	34	56	73	175
12	.	41	74	90	186
13	.	53	93	127	310
14	.	118	187	172	421
15	.	82	126	166	381
16	.	119	201	263	660
17	.	141	229	321	887
18	30	72	108	173	411

Table 1. Number of utterances and signs produced over time by children and mothers. (Only utterances containing the four structures under study here counted.)

each child's production increases so does that of the mother. A regression line using the least squares method was taken for each mother-child dyad's production of utterances and signs. The correlation coefficient for production of utterances in the dyad Mich-Mother is 0.57, production of signs 0.61. The correlation coefficient for production of utterances in the dyad Erin-Mother is 0.89 and for the production of signs also 0.89. Figures 1 and 2 illustrate the growth of utterance and sign numbers over time.

Table 2 displays the average number of signs and average number of POINTs per utterance in the two children's production; most of Mich's early productions consisted of single POINTs and most of Erin's of two sign utterances in which one sign was always a POINT.

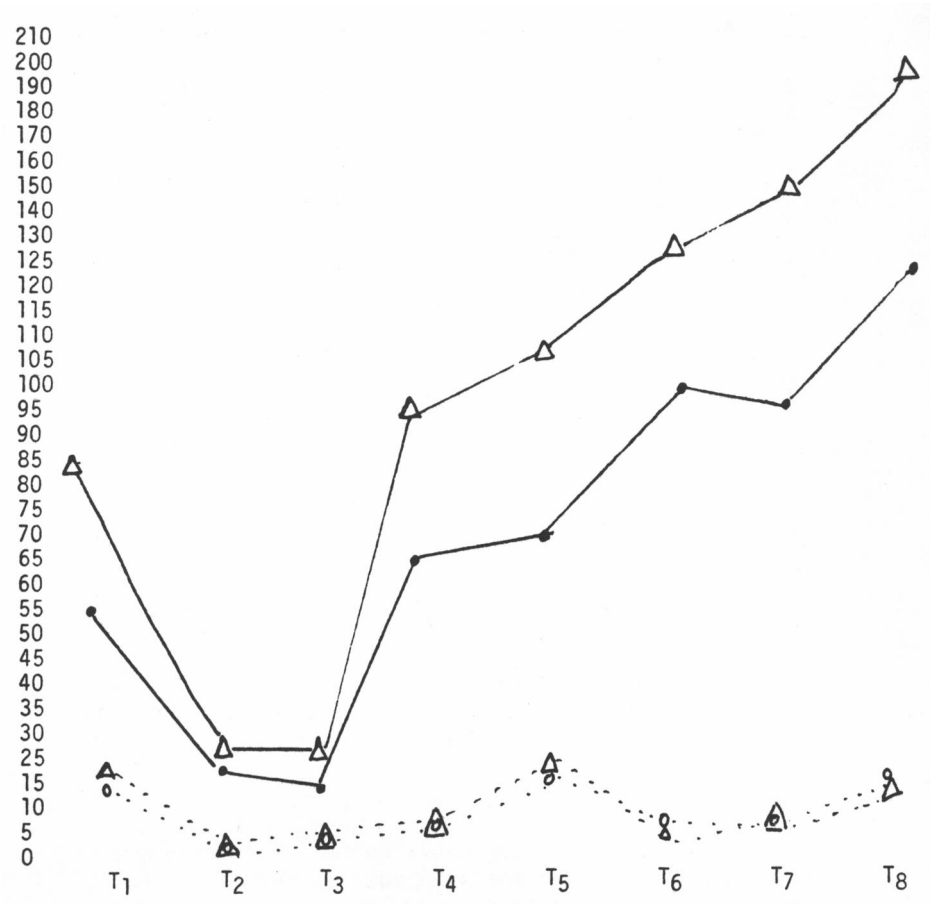

Figure 1. Number of utterances and number of signs per utterance by Mich (12 months to 20 months) and Mich's mother.

Key: Mich's utterances, o---o; Mich's signs, △---△
Mother's " , ●—●; Mother's " , △—△

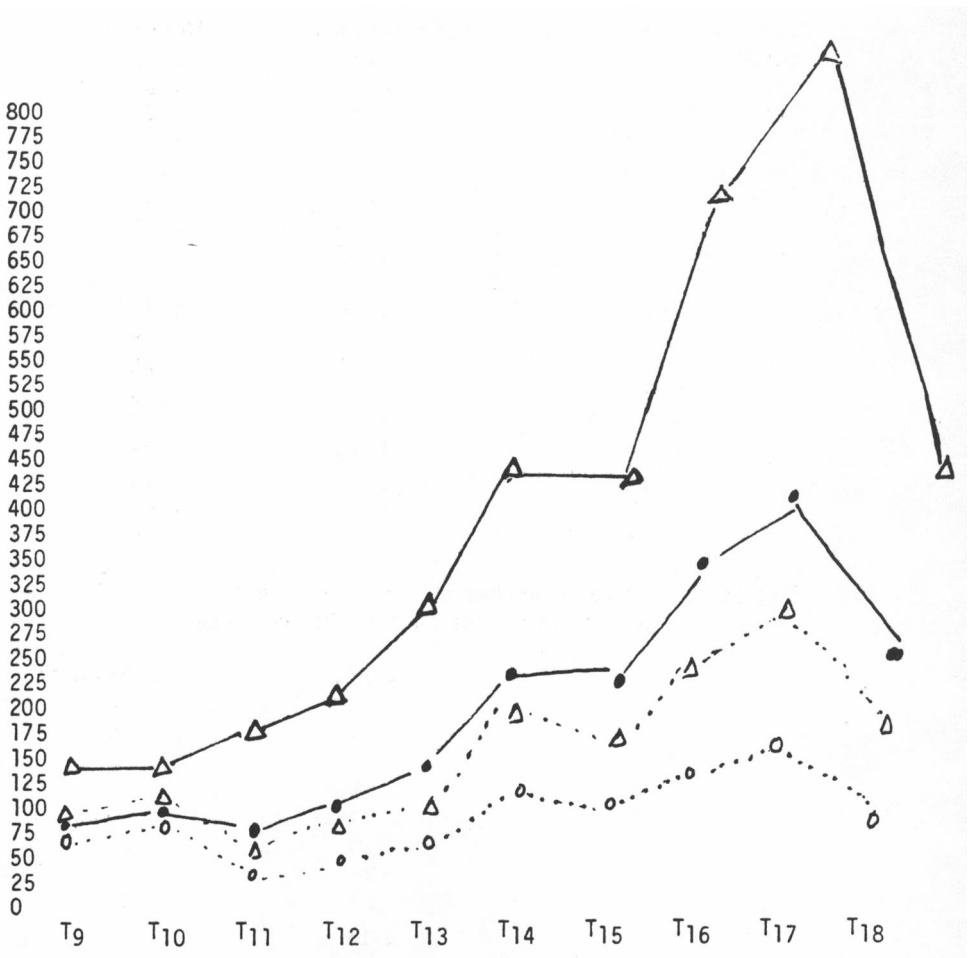

Figure 2. Number of utterances and number of signs per utterance by Erin (20 months to 30 months) and Erin's mother.

Key: Erin's utterances, o o; Erin's signs, △ △
Mother's " , ●——●; Mother's " , △——△

	Tape No.	Age in Months	Signs/ Utterance	POINTs/ Utterance
MICH	1	12	1.36	1.36
	2		2.00	0.00
	3		1.00	1.00
	4		1.00	1.00
	5		1.00	.81
	6		.83	.83
	7		1.00	.16
	8	20	1.05	1.00
ERIN	10	21	1.60	1.33
	11		1.64	1.09
	12		1.80	1.26
	13		1.75	1.15
	14		1.58	1.20
	15		1.53	1.06
	16		1.68	1.15
	17		1.62	1.09
	18	30	1.50	1.09

Table 2. Average number of signs per utterance and POINTs per utterance for each child over time.

Tape No.		MICH	M's Mother
1	12	52%	42%
2		66	36
3		20	23
4		21	32
5		43	46
6		20	28
7		38	44
8	20	37	46
		ERIN	ERIN's Mother
9	20	50%	46%
10		76	35
11		53	55
12		56	56
13		49	55
14		63	54
15		71	53
16		50	41
17		54	44
18	30	42	44

Table 3. Percentage of recorded and transcribed utterances containing structures under study.

Table 3 shows the percentage in each videotape of the utterances coded for analysis because they contained the structures under study (POINTs, pronominals, objects introduced into the dyad's signing space, and modulated verbs). The percentages for all four signers represents a fairly large sample ranging from a low of 20% to a high of 76%.

Objects, POINTs, & and modulated verbs

Mich's mother used the strategy of bringing the object she wished to talk about into the conversational space in 16% of all her utterances, with a high of 28% and a low of 5%. This conversational strategy seems intended to assure the young partner's comprehension. Mich's mother could not rely on her young son to follow the extension of her POINTing hand to a referent object somewhere outside of the immediate space between them. Instead she would pick up an object, bring it into the space between them, while exaggerating her facial expression, widening her eyes, or covering her mouth with her other hand, and then POINT to the object to obtain and hold her baby's attention. During this early stage her apparent purpose in most interactions was usually to introduce and label objects (with a sign). It was therefore crucial that the referent object to be associated with a label be clearly denoted to the child.

The use of this strategy by both mothers decreases over time; the children (not the tapes) represent an age span of twelve to thirty months with no overlap. Analysis showed that the older child's mother used this strategy less as the child matured, from a high of 6% to a low of 0%. As conversation moved away from the names of objects to their properties, she seemed less concerned with specificity.

Neither child makes much use of this strategy in conversing with its mother. The egocentric nature of children is no doubt such that they assume, or do not require, the attention of their conversational partner. Each child did have one session with an uncharacteristically high percentage of using the object introducing strategy: Mich in tape 7, 18%, and Erin in Tape 16, 22%. This was a result of the kind of play activity the mother-child pairs were engaged in, a "show me" or "where is X?" kind of routine similar to the word game described by Brown (1958). For example:

Mich's mother looks around, shrugging her shoulders and

signing WHERE YELLOW WHERE with questioning face during her production of the manual parts of 'where' Mich (at about 20 months) replies by picking up a yellow block, pointing, and signing—in transcription, (object) POINT (this/on yellow block) YELLOW. (The first word in the second parenthesis indicates the meaning of the POINT, the note after the virgule specifies the kind and direction of pointing)

While the object strategy is not used with reciprocal frequency, both members of the conversational dyad do make frequent use of POINTing; in fact, a strikingly high proportion of all coded signs were POINTs. Mich, the younger child, had four sessions (tapes 1, 3, 4, and 5) in which 100% of his coded utterances consisted of single POINTs. Of the four remaining sessions, two contained a high percentage of POINTing (t 6, 76% and t 8, 94%), and two were uncharacteristically low (t 2, 0% and t 7, 17%). His production of POINTs during the second session was the result of generally diminished output because he had a cold; he slept or cried through most of the taping. In fact, his only signing during this session was of two imitations of a modulated verb produced by his mother. His low production of POINTs in tape 7 was related to the game he and his mother were playing; the same which accounted for the high percentage of object introduction in the same session.

Erin also produced a high proportion of POINTing, from a high of 81% to a low of 66% of all signs in the coded utterances. In general, from tape 1 to tape 18, the use of non-POINT signs tends to increase slightly as the two children mature and the use of POINTs to do most of the expressing decreases.

Neither child makes use of verb modulation to indicate the sentential arguments in an utterance. In fact, Mich's only instances of modulated verbs occurred in the session mentioned above and were simply imitations of his mother's utterances. He never spontaneously used verb modulation during the course of the study.

Erin also used very little verb modulation in her early taped sessions. From tape 9 (her first session) to tape 16, her use of such verbs ranges from zero to three percent. There is a slight increase in production in her last two sessions; 7% of all her signs are modulated verbs. This increase occurred when Erin was twenty-nine and thirty

months old, as is consistent with previous reports of emergence of this process. Hoffmeister[1], Fischer[2], and Newport and Ashbrook[5] have all found that verb modulation is a relatively late and slowly developing acquisition that does not emerge until approximately thirty months of age.

The mothers' use of verb modulation is, perhaps surprisingly, as limited as their children's. Mich's mother introduced verb modulation during sessions before Mich was near thirty months old, but used it on a very limited basis. Erin's mother also chose to make infrequent use of verb modulation and showed an increase in the amount of its use during the same last two sessions in which her daughter began its use; in tape 17, 14% of the mother's signs were modulated verbs, and in tape 18, 11%.

In summary, a large proportion of utterances by all four signers contain a large amount of POINTing and a small amount of verb modulation to indicate sentential arguments in an utterance. The conversational strategy of bringing the referent object into the dyadic space instead of POINTing to its position at a distance is used by the younger child's mother with greater frequency, but it diminishes over time. Verb modulation begins to show up in the last two sessions of the older child at the same time that an increase in this usage is seen in her mother.

Indication of referents. Bringing the object to be referred to into the dyadic space and POINTing on the object, along with a POINT on an object already in the dyadic space, are the most explicit and direct strategies for ensuring the comprehension of the indicated referent by the addressee. Again, these ways of indicating are more heavily used by the mothers in early sessions. The method of POINTing toward (which is somewhat less explicit) increases as the child matures. In mothers' utterances, that is, POINTing on decreases as POINTing toward increases.

The children's patterns of usage are somewhat different. Analysis shows an almost even distribution between POINTs on and POINTs toward the referent in their productions.

In the case of modulated verb use the most important fact is the almost total absence of indication of non-present referents in both the mothers' and the children's utterances. (See Tables 4 and 5) In all but one case of verb modulation the index incorporated by the verb action is present, with the verb articulated on, toward, or over it. In the mothers' use of modulated verbs there is a slight trend toward increased

use of a redundant POINT as the frequency of modulated verbs increases. Mich's mother uses a redundant POINT in an average of 19 % of her utterances that contain a modulated verb, and Erin's mother in an average of 25 % of hers. This again seems to show a concern with specificity and the comprehension of language addressed to a young conversational partner. As use of a more abstract form of reference (i.e. verb modulation) increases, so does the apparently perceived need for a POINT to indicate the same referent that the changed movement of the verb refers to.

	On Referent	Toward Referent	Over Referent	Substitute For non-present Referent	Holding Referent	Index Established non-present Referent
T_1	1					
T_2		5				
T_3						Mich's
T_4		4				
T_5		5	5			Mother
T_6	2	6			2	
T_7		4	1			
T_8		2	1		4	
T_9		5	6			
T_{10}	2	4				
T_{11}	1	8	2		1	Erin's
T_{12}	2	7	1			
T_{13}	3		3			Mother
T_{14}	3	13	1		1	
T_{15}	2	10	5		3	
T_{16}	2	15		1		
T_{17}		21	13	1		
T_{18}	9	26	7			1

Table 4. Occurrence of various ways to indicate the referent in utterances with modulated verbs—Mothers' data.

	On Referent	Toward Referent	Over Referent	Substitute Object for non-present referent	Holding Referent	Index Established for non-present referent
T_1						
T_2		2				
T_3						
T_4						Mich
T_5						
T_6						
T_7						
T_8						
T_9			3			
T_{10}		1			1	
T_{11}	2					
T_{12}						
T_{13}						Erin
T_{14}						
T_{15}	1	1	1			
T_{16}						
T_{17}	5	4	2			
T_{18}	3	5				

Table 5. Occurrence of various ways to indicate the referent in utterances with modulated verbs—Children's data.

Expression and development of semantic relations. Mich's utterances, typical of young children, hearing or deaf, are restricted to a narrow range of eight semantic relations (cf Brown 1973). Most of his utterances are about the existence and location of objects, with few verb relations or object attributes. Mich also expresses mostly single term relations.

A parallel trend, from a restricted to a wider range of semantic relations, can be seen in the productions of Mich's mother. In tape 1 she uses only five semantic relations, which like his refer mostly to the existence of objects and their locations. This begins to change noticeably at the time of tape 4, in which an increase to fifteen semantic relations is seen in her production. This expansion continues over time to include more expressions of verb relations.

Erin, the older child, continues to converse more about objects than actions performed on objects but with a greater variety of terms; she begins to use attribution, 'That is green;' possession, 'That [book] is mine;' and location, '[You] sleep there.' Her trend over ten months of taping is toward a wider use of possible semantic expressions; in t 9 only nine relations were utilized, while in t 17 twenty different relations were expressed. Three-term relations begin to emerge in the third and fourth sessions (t 13, 22 months, t 14, 23 months), and these are seen with greater frequency in her ninth session (t 17, 29 months).

Erin's mother shows a parallel trend toward an increasing range of semantic relations, with a decreasing use of object-existence categories. She uses three-term relations more than does Mich's mother, and a few four-term relations emerge in her conversations with Erin.

Contrasting the combined categories of existence relations (e.g. demonstrative, demonstrative-entity, entity-recurrence, entity-locative) with the combined categories of verb relations (e.g. agent-action, action-patient, action-locative) shows that Mich uses mostly existence relations, while Erin shows a tendency toward use of more verb relations over time. This phenomenon of using existence relations before verb relations is consistent with reports on hearing children (Bloom 1970) and an earlier report on the development of semantic relations in deaf children.[5] Mich's mother in her first session uses in her coded utterances more existence than verb relations (87 % to 10 %); in later sessions there is a slightly more even distribution; e.g. at t 6, 63 % existence and 36 % verb relations. The distribution is more even in the data from Erin's mother: at t 9, 46 % existence, 44 % verb relations; and in the last three sessions she uses more verb relations than existence relations.

To summarize, the present data reveal that the developmental course for the expression of semantic relations found in hearing children acquiring spoken language (Bloom 1970, Brown 1973) is that of deaf children acquiring signed language. The data also indicate that these deaf mothers, like hearing mothers (Snow 1972), limit their utterances to the expression of ideas they know their children will understand.

Semantic relations in modulated verbs. When the semantic relations that are expressed in modulated verbs are separated out, it is found that Mich's mother uses only action-patient and action-location expressions in which the locative and the patient are present in the conversational context and can be incorporated in the verb production by movements on or toward them. Most of the action-patient expressions are directives and amount almost to a modelling of the action the mother is trying to evoke from the child; e.g. #PULL-TOY# 'You pull the toy' is performed with the verb PULL made over the toy. Mich shows no spontaneous productions of verb modulation.

Erin's process of verb modulation also begins with patient and locative incorporation. Later sessions show the indication of agent without specific agent incorporation. A redundant POINT to herself is used when she is the agent; e.g.

POINT (me) #WIPE-SPILL# (literally) 'I, myself, am wiping the spill'

The semantic relations expressed in modulated verbs by Erin's mother most often are the same ones Erin first used with modulated verbs; i.e. action-patient and action-locative. She also began during the period observed to modulate a few state verbs as well as action verbs; e.g. signing FINISH over a drawing,'the drawing is finished.' She also began to include more agents, benefactives, and locatives in three-term relations in verbs modulated, but she rarely made use of all three terms in one verb structure, though the potential was there. For example, she could have signed,

#SHE-WATCH-YOU# 'She is watching you'

That is, the verb WATCH might have been begun from the direction of the agent (the experimenter behind the video camera) and moved and directed toward the patient (Erin). Instead, Erin's mother signed,

POINT (she/toward Becky) #WATCH-YOU# 'She is watching you'

The verb WATCH was directed patientward but was begun in citation form, in front of the signer's face.

- - - #, modulated verb with included arguments

Development of pragmatic function. The distribution of pragmatic function in Mich's utterance over the time of the study is shown in Table 6. Most of his utterances express facts, e.g. '[The object] is over there' or are stative, e.g. 'I want that.' There is a slight trend to the use of other functions as the study progresses.

Time (tape)	1	2	3	4	5	6	7
Report fact	100		33	20	19	33	29
Ques. stative			66	80	12	50	59
Report nomin.			100		62		
Report confirm							2
Report negat.					17		
Report locate						16	

Table 6. Percentages of pragmatic functions in utterances of younger child Mich from 12th to 20th month.

Table 7 shows the distribution of (several more) pragmatic functions in Erin's output. Earlier sessions (tapes 9-14) contain a restricted set of functions, mostly fact reporting ('The book is mine'), nominations ('This is a dog'), directives ('Give me that'), and stative questions ('Want that'), with scattered examples of locating ('The house is there'), attribution ('This ball is blue'), and Wh- type questions ('What is that?'). A wider range of functions is used after the time of tape 14.

Tables 8 and 9 showing the mothers' pragmatic functions display similar trends. In early sessions Mich's mother used a restricted range of pragmatic functions; directives, nominations, facts, and stative questions constituted the bulk of her utterances, with some scatter. Increase in use of other functions comes after tape 5. Erin's mother uses almost the entire range of pragmatic functions, but there is heavier concentration in the first four categories.

	Report Fact	Request Emphatic	Report Nomination	Quest. Stative	Report Locate	Quest WH	Report Attribute	Report Confirm	Report Negate	Quest. Action	Report Non-Conf.	Quest. Clarification
T_9	15%	36%	5%	14%	7%	5%	5%			3%		2%
T_{10}	32%	14%	25%	1%	7%	7%	7%		4%	1%		
T_{11}	29%	23%	23%	6%	6%		9%			3%		
T_{12}	29%	15%	32%	15%	5%	5%						
T_{13}	6%	6%	77%	1%		4%						
T_{14}	33%	28%	11%	13%	3%	4%	2%	2%	2%		1%	1%
T_{15}	21%	23%	4%	21%	9%	6%	8%		4%			
T_{16}	18%	29%	18%	4%	13%	4%	5%			1%		
T_{17}	25%	23%	4%	17%	6%	5%	4%	8%	1%	1%	1%	6%
T_{18}	21%	29%	10%	15%	10%	5%	3%		3%	1%		

Table 7. Percentages of pragmatic functions in Erin's utterances over time.

	Request Emphatic	Report Nomin.	Report Fact	Quest. Stative	Quest. WH	Report Locate	Report Attribute	Report Negate	Report Confirm	Quest. Action	Quest Clarif.
T_1	24%	45%	39%		2%			9%			
T_2	57%	24%	5%	10%	5%	5%					
T_3	10%		4%	26%	5%	10%					
T_4	48%	38%	5%	5%	2%	3%					
T_5	28%	22%	8%	12%	3%		16%		11%		
T_6	43%	4%	27%	8%		2%	4%	6%	2%	3%	
T_7	35%	24%	7%	4%		14%	2%	6%	7%	1%	
T_8	38%	22%	26%	9%	1%		1%	1%	1%		2%

Table 8. Percentages of pragmatic functions in Mich's mother's utterances over time.

	Request Emphatic	Report Fact	Report Nomination	Quest Stative	Report Confirm	Report Attribute	Quest WH	Report Non-Conf.	Report Negate	Report Locate	Quest. Action	Quest Clarif.	Quest Indirect
T_9	20%	15%	5%	14%	14%	7%	5%	3%	5%		6%	7%	
T_{10}	22%	11%	14%	14%	14%	4%	6%		8%	1%	3%	1%	
T_{11}	26%	14%	19%	8%	15%	1%	10%	3%		1%	3%		
T_{12}	26%	19%	27%	3%	8%	1%	10%	2%	2%		2%		
T_{13}	23%	17%	16%	6%	16%	5%	8%	8%	1%				
T_{14}	23%	24%	9%	9%	13%	6%	5%	3%	1%	2%	2%	4%	
T_{15}	19%	24%	17%	8%	2%	11%	2%	2%	1%	4%	5%	1%	
T_{16}	2%	12%	9%	16%	3%	10%	8%	8%	2%	1%	3%		
T_{17}	24%	19%	5%	12%	8%	11%	8%	2%	4%	3%	2%	1%	1%
T_{18}	21%	38%	6%	9%	2%	6%	10%		3%		3%		

Table 9. Percentages of pragmatic functions in Erin's mother's utterances over time.

Development of linguistic functions. Table 10 shows the distribution over time of linguistic functions of POINTs in the utterances of the children as percentages of POINT use. As noted before (p. 258), Mich is using POINTs as his first signs to communicate about or refer to a number of objects and events in his environment. This use is characterized linguistically as a demonstrative "specific object." There is some scatter in Mich's later sessions (at 16 months to 20 months of age); POINTs there are used to indicate location, as handshape substitutes in lexical items, and as the personal pronoun for addressee.

Erin uses POINTs for more linguistic functions than does Mich, and her use expands to include still more functions as she grows older. In her early sessions there is still a heavy concentration of POINTs in the specific object category as well as a high frequency of POINTing to specify location. The use of 1st, 2nd, and 3rd person pronominals increases steadily over time but in the order: Pro_2, Pro_1, Pro_3. Possessives emerge first in the possessive-1st person —'mine'— category, followed later by possessives for second or third person. No instances of classifier use or use of a POINT to establish an arbitrary spatial location as index for a non-present referent occurred during the period of the observations. Erin's POINT often substitutes its handshape for the handshapes of other lexical items she uses.

In Table 11 the mothers' utterances containing POINTs are similarly classified by linguistic function. There is the same general trend for both mothers to use as the time passes a greater variety of functions. In general, the specific object function (left column) decreases steadily over time as the use of all other categories increases. The mothers' use of pronominal categories parallels the children's in the order of emergence of personal pronouns: Pro_2, Pro_1, Pro_3. This is not true of the possessive categories, which the mothers use in the order $Poss_2$, $Poss_3$, $Poss_1$; the children's order here is $Poss_1$, $Poss_2$, $Poss_3$. Also like the children, the mothers do not use POINTs in classifier function or to index a non-present referent. These last linguistic functions were used with less than 1 % frequency and are therefore not included in Tables 10 and 11.

An index referred to by a modulated verb in its modulation may be actual or "established;" i.e. the referent may actually occupy its position in the signing context, or it may have been referred to by signs only and been given an

Tape no.	1	2	3	4	5	6	7	8
Spec. object	100		100	100	69	25	100	88
Spec. location						25		
Lexical item					23	50		12
Pers Pro_1								
Pers Pro_2					8			
Pers Pro_3								
Poss Pro_1								
Poss Pro_2								
Poss Pro_3								

Table 10. Percentages of Mich's POINTs serving specific linguistic functions.

Tape no.	9	10	11	12	13	14	15	16	17	18
Spec. object	57	44	51	49	67	46	57	32	35	43
Spec. location	12	6	14	18	3	23	22	12	17	11
Lexical item	9	31	14	12	13	11		10	10	19
Pers Pro_1	2	4	5	8	11	6	11	16	20	
Pers Pro_2	7	10	14	6	5	6	5	19	12	16
Pers Pro_3	7	3	4		4	1	2			8
Poss Pro_1		4				1	2	1	4	
Poss Pro_2								1	1	
Poss Pro_3	6									1
Plural				2		2	1			1

Table 10 (continued). Percentages of Erin's POINTs serving specific linguistic functions.

arbitrary location (index). The children in this study used only actual referents; those verbs they did modulate were altered in production on, over, or toward only actual objects. Any index so incorporated in an ASL verb complex may of course have a particular linguistic function. It can be used to refer to a specific object, a specific location, to first, second, or third person of the discourse, and it may be used as classifier (object categorized third person), or as an index for a non-present referent. Table 12 shows the linguistic functions performed by indexing in those verbs modulated by the children.

Mich's use of modulated verbs was consistent with his use of POINTs; i.e. objects were referred to before locations and people. The few modulated verbs Mich did use were altered from citation form in relation to objects in his environment. Erin was also in the beginning stage of modulating verbs and therefore began by referring with verb action mostly to objects. She was also able to indicate a few locations in the environment with modulated verbs and to refer to addressee with the verb modulation for 'you'. This last, use of a verb modulation for Pro_2, occurred before she began to use Pro_1 and Pro_3.

Mich's mother used modulated verbs in a very restricted way, referring mainly to objects and a few locations in the dyadic environment. Erin's mother used modulated verbs with more linguistic functions, including expression of personal pronouns, in the order Pro_3, Pro_2, Pro_1. However, she also did not make use of classifiers or arbitrarily established locations for non-present referents. The majority of her verbs were still being used to refer to objects and locations (Table 13).

Tape no.	Specific object	Specific location	Pers Pro_1	Pers Pro_2	Pers Pro_3	
2	100%					
4	100%					Mich
6	100%					
9		100%				
10	50%			50%		
11	100%					Erin
15	100%					
17	59%	23%	12%	6%		

Table 12. Index linguistic function in modulated verbs.

	Specific Object	Specific Location	Lexical Item	Pers Pro1	Pers Pro2	Pers Pro3	Poss Pro1	Poss Pro2	Poss Pro3	Plural
T1	68%	12%	14%	2%		2%				2%
T2	69%	8%	8%		8%			8%		
T3	45%	30%	10%		5%	5%				5%
T4	57%	16%	15%		8%	3%				
T5	69%	8%	17%		2%					4%
T6	57%	18%	18%	2%	5%					
T7	51%	42%	6%							
T8	64%	9%	9%	1%	14%	1%		1%		1%
T9	49%	9%	7%	7%	14%	13%		3%	3%	
T10	37%	9%	18%	6%	18%	4%		3%	1%	
T11	49%	13%	6%	6%	11%	8%		1%	1%	3%
T12	55%	5%	12%	5%	16%	1%		1%	1%	1%
T13	49%	11%	4%	6%	10%	9%	1%	6%		3%
T14	47%	10%	5%	6%	16%	9%	1%			1%
T15	51%	7%	9%	6%	18%	1%	1%	2%	2%	1%
T16	27%	13%	5%	15%	26%	14%	1%	3%	1%	
T17	34%	10%	4%	12%	26%	8%	1%			
T18	39%	8%	4%	7%	23%	9%				1%

Table 11. Percentage of mothers' POINTs serving specific linguistic functions. Tapes 1-8 Mich's mother; tapes 9-18 Erin's mother.

Tape no.	Specific object	Specific location	Pers Pro_1	Pers Pro_2	Pers Pro_3
1	50				
2	60	20	20		
3					
4	28	71			
5	100				
6	67	33			
7	80	20			
8	50			36	14
	Mich's Mother				
9		58	8	17	17
10	17	67		17	
11	42	17			42
12	10	20	10	20	30
13	9	73		8	
14	41	3		21	27
15	100				
16	50	46			
17	45	24	1	5	8
18	63	16	2	19	
	Erin's Mother				

Table 13. Percentages of specific linguistic functions served by index incorporated in mothers' modulated verbs.

Adult signers (conversing with others) use the 'B' handshape for the expression of possession in personal reference Young children learning ASL substitute the G-hand of POINTing for the B-hand as for others they have not yet mastered. Mich and his mother used too few B handshapes to analyze; Erin and her mother, however, did use possessive pronominal functions as Table 14 shows.

Erin used the G-hand of POINT almost exclusively in the period under study for the possessive pronouns translated 'mine', 'yours', 'his', and 'hers'. Her mother also used POINT to express these possessives in early sessions but

introduced the 'B' handshape, before Erin began to use it, at tape 14, when Erin was twenty-five months old.

Tape no.	Use of 'B' handshape		Use of 'G' (POINT) handshape	
	Erin	Mother	Erin	Mother
9	0	0	100	0
10	50	0	50	100
11	0	0	0	100
12	0	100	0	0
13	0	0	0	0
14	0	50	0	50
15	0	20	100	80
16	0	33	0	66
17	0	0	100	100
18	0	93	0	7

Table 14. Handshape choice by percentage in the production of ASL utterances by Erin (20-32 mos.) and her mother in their conversations.

The children also freely substituted the handshape of POINT for the handshape of various other ASL lexical items.* These substitutions were made both in signs in which the active hand moves freely and in those in which it makes a single contact with the face or non-active hand—the tip of the index being used for contact when POINT hand is used. Many of these signs were among the first other than POINT signs the children attempted. During the period of the study several of them were observed to evolve from the infantile form with POINT-hand to the adult form. For example: WATER was first made with POINT-hand, correctly held in front of the mouth; at later sessions, with 5-hand; and still later with the citation-form W-hand.

---

* Handshapes substituted for included: A, Â, B, 5, (bent) 5, C, H, (bent) L, V, W, X, and Y; signs in which the POINT-hand was substituted included: FATHER, MOTHER, DRINK (from bottle), LISTEN, EAT, WATER, HORSE, WAIT, NO, PIG, COOKIE, PUZZLE, BAD, BOTTLE, COW, GIRL, LOOK, MOON.

Conclusion

Mothers' language. In summary, the language of the two mothers in this study did show modification from adult forms in their interactions with Mich (from 12 to 20 months) and Erin (from 20 to 30 months old):

1. Mich's mother brought referent-objects themselves into the conversational space in the earliest observed interactions, when the child's first words (signs) were emerging.
2. Direct importation of referent-objects decreased, but both mothers maintained explicitness of reference by pointing on or over objects in the context. Citation form verbs with POINTs to their arguments were used much more by the mothers than modulated verbs.
3. Verb modulation emerged in later sessions and increased in frequency over time, but verbs were modulated for two arguments at most (though three were possible in some contexts). Location verbs were the first to be modulated, then some of the directional verbs. Redundant POINTs (to arguments) increased in frequency along with modulated verbs.
4. The mothers' use of semantic relations parallelled that of the children—first a few semantic relations, later a considerable expansion. The same development was true of pragmatic and linguistic functions.
5. Both mothers, apparently following the child's example, substituted the handshape of POINT for others in signing lexical items and for the B-hand of possessive pronouns; but neither mother used POINT-hand in introducing a new lexical item.

Children's language. The language of the children developed in the following ways:

1. The POINT first emerged in single-POINT utterances (the majority of the younger child's early utterances) used to indicate and signal, as has been noted of the pointing behavior of hearing children.
2. In two-sign utterances, appearing next, POINTing still predominates, the usual pattern being POINT-POINT, POINT-Sign, or Sign-POINT.
3. From early use as demonstrative and to indicate a few semantic relations, POINTing grew to indicate more semantic relations and pragmatic and linguistic functions: locatives, pronominals, and indexing referents present in the context.

4. Verb modulation by indexic reference emerged late in the study (older child only at approximately 30 months of age) and was first used with locational verbs and to refer to present referents only in action-locative and action-patient constructions.
5. POINT has a simpler handshape than many signs, one acquired early (McIntire 1977), and this handshape was substituted for many handshapes in lexical items the children used as it was also for the B-hand of possessives.

From birth a child is engaged in the process of analyzing, interacting with, and learning how to communicate about the environment. The research studies reviewed above have sought patterns of behavior during the "pre-linguistic/symbolic" stages of communication acquisition that relate to the later development of linguistic structures, and each researcher postulates a somewhat different developmental scheme.

Bullowa (1977) sees development in the ability to indicate a referent proceeding from directed eye gaze at three months to reaching and pointing at nine months of age. At fourteen months, according to Bullowa, mother and child can be observed making sophisticated use of nonverbal behaviors in carefully synchronized communicative sequences.

Bruner began his investigations (1975a,b) to find predictive pre-speech behaviors in mother-child interaction when the child was three and four months of age. His scheme and Bullowa's are similar, but he describes routines between mother and child with greater detail and suggests that these routines are related to indication, later signification, and specific linguistic structures.

The model of Bates et al. (1977, 1979) emphasizes the relationship of these pre-speech gestural behaviors to later naming rather than shared reference with a conversational partner, although they acknowledge the relationship of these behaviors to both systems. Their study follows the use of pointing from the pre-speech period of development through its use with one-word utterances.

Regardless of the specifics of these models, they all ascribe significance to the use of pointing during the development of indication and naming. While pointing functions as a communicative structure during this early period of development for hearing children, it is not a grammatical structure of a spoken language. In American Sign Language, however, the POINT is a grammatical structure in its use conforming

to the linguistic rules of the language. The deaf child, like the hearing child, during the early stages of development is learning the structure of indication and signification—symbolizing and naming; to these should be added the need to learn the grammatical and the morpho-syntactic parameters of POINTing. While POINTing eventually gives way to vocal means of signalling and naming in hearing children, it remains an essential part of the verbal communicative, linguistic system of deaf children and acquires more and more semantic and linguistic functions as they grow older.

The semantic and linguistic analyses made in this study suggest that initially deaf children use POINTing just as hearing children do, to indicate specific referents in the immediate environment, and not as POINTing relates to indexic reference and verb modulation. In fact, verb modulation was found in this, as in previous studies, to be late emerging, well into the third year of life.

When verb modulation does begin to emerge, it shows in the present body of data the same modifications and constraints found by earlier researchers. Indexes are established and incorporated in verb action only for present referents, and locational verbs (those non-directional and non-reversing) were the first to be modulated (See Fischer's study[2]). This process of modulating a verb to refer to an argument in the context in actuality by signing in its direction or on or over it seems to be a transition to the more abstract process of indexic reference proper, which requires previously establishing arbitrary spatial locations for non-present referents.

The extent to which the deaf mothers in this study modified their language to suit their children's language level can be seen first in the earliest production of Mich's mother. In this phase, dominated by Mich's POINTS to signal existence of objects, we find a parallel strategy used by his mother. She also used often the strategy of bringing a referent object directly into the dyadic space to focus her child's attention on it. This is used less frequently over time, and Erin's mother used it less with this older child. There seems implicit in this strategy a concern (not necessarily conscious on the mother's part) for specificity of reference. Bullowa has articulated the child's need for such specificity thus:

> I suggest that an individual's language, as distinct from the more general behavior, communication, derives from the need to deal with desires arising in a complex human environment. I am referring to ontogeny, not phylogeny. At first the best means an infant has for being specific is to direct his gaze, perhaps augmented by the action of sucking. His dependency on more developed beings for control of his position in space vis-a-vis others may augment or impede his development of visually directed reach, but in any case, hand-arm action, as it becomes free from early reflex patterns, develops a variety of useful ways of specifying his wishes....
>
> In this view, elements that contribute to the emergence of language in the ontogeny of human communication are: (1) interaction with caretaking adults; (2) shared focal attention; (3) specificity of reference. (Bullowa 1977: 209)

The mothers' considerable or complete suppression of the process of verb modulation—substituting POINTing to referents before or after production of citation form verbs—appears also an accommodation to the child's limited mastery of ASL production. As with the children, verb modulation by the mothers began with referents present in the actual context, and then only with locational and a few directional verbs. Only a restricted set of semantic expressions (i.e. action-locative and action-patient) were thus used. Other areas of mothers' language accommodated to child capability appeared in the semantic and pragmatic domains. In a study of semantic case relations expressed by mothers in conversation with their young children, Snow (1972) found that the content of the mothers' speech is largely limited to semantic constructions that the child has already mastered. This is true of the mothers' language in the present study, taking signing as equivalent to speech. The deaf mothers, like their deaf children, talked mostly about the existence of objects and their locations in early conversations; later both members of the dyad expanded the range of expressions they used to include more types of verb relations.

In progressing from a very specific use of the object referent, to a somewhat less specific use of POINTs with unmodulated verbs, to an even less specific (but redundant) use of modulated verbs with redundant POINTs, and finally to modulated verbs (but still only with present referents),

there is an effect of "stringing out" what is usually very much compacted information. In ASL, a language that tends to be highly inflected and more three-dimensional than linear, this might be a real "baby talk" phenomenon. Perhaps the mothers are analyzing the language into its potentially discrete units to present a system into which the child may enter "one unit at a time." In making the signed verb complex more linear, more specific, and more redundant for their young children, the mothers are also limiting and simplifying and clarifying their language and making their own productions more similar to those of the children.

Unfortunately this study ended before the mothers and children integrated the use of POINTs (and other deictic markers to establish indexes) with modulated verbs in an indexing situation with absent referents. Doing this requires the use of a "trace" POINT, found in adult converation; it is also more abstract than real world indexing[1] and involves higher order rules. It is not surprising that such indexing did not occur in this study, as it is the nature of mother-child conversation to deal with the "here and now" so that topics not related to the immediate environment are rarely included. Future research, however, could continue the observation of mother-child interaction over the course of development from verb modulation indexing present referents to indexing mechanisms for non-present referents. It is also important to extend the present line of research to earlier stages of interaction than 12 months, to look for precursors of the behavior found in this study (cf Maestas y Moores 1980).

The study of communicative processes in children who are deaf and acquiring ASL naturally has been recognized in other studies for the contributions it can make to understanding the language acquisition process. This study suggests that both hearing and deaf children, and their mothers, make use of similar, non-vocal mechanisms in their early communicative interactions, and it adds to a growing body of information that documents the many similarities in the organization of the acquisition process, regardless of language modality.

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Editorial Note

This article is an abridgment of the author's dissertation for the Doctor of Education degree at Boston University's School of Education. The original dissertation on file at Boston University (January 1982) bears the title: "Communicative interaction in American Sign Language between deaf mothers and their deaf children: A psycholinguistic analysis."

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