

classificatory criteria all utterances composed of only one deictic element were classified as DG, not as DS.

The information summarized above is clearly insufficient to draw definite conclusions about the development of deictic expressions in deaf and hearing children: the evidence on deaf children is in fact limited to the data on one subject reported in the present work, and data on another subject studied by Petitto (1980) (see also Bellugi & Klima, 1982a). More accurate information on the use of all types of pointing gestures by hearing children is also needed.

Although certainly further research is necessary, the comparative data in Table 2 provide a few major indications. These can be summarized as follows: neither the appearance of DG nor the development of DS and DW seems to be significantly influenced by the modality in which communication and language take place. In particular, with respect to the development of DS and DW, the similarities in the acquisition patterns seem to indicate the presence of a common perceptual and cognitive background and suggest that, in the deaf-signing as in the hearing-speaking child, this may be a major factor which overrides the formal differences distinguishing DS from DW. These results corroborate and extend those provided by Bellugi and Klima (1982a, 1982b), Petitto (1980), Pizzuto (1980a, 1980b, 1980c, 1982b, 1983), Pizzuto and Williams (1980) and support the theoretical points of view previously expressed by the author (Pizzuto, 1978, 1980a).

It is of particular interest that first person DS are virtually identical to self-referential gestures that seem to be universally known across cultures. It could have been plausible therefore to assume that the use of first person DS would not require symbolic-linguistic skills. On the contrary, it was found that first person DS are not used until stage III, just as are first person DW. It was also noted that, according to some recent observations, self-referential pointing gestures appear considerably late in hearing children's gestural repertoires. These considerations suggest that even signs (or gestures) which might superficially appear simple and nonarbitrary, and very different from spoken words, may possess the same underlying formal properties that characterize their corresponding spoken forms.

CHAPTER 12

The Transition from Gesture to Symbol in American Sign Language

L. A. PETITTO

Introduction

Research on sign languages over the past 20 years has revealed that they exhibit formal linguistic organization at the same levels found in spoken languages (e.g., phonological, morphological, syntactic, discourse). The structure of one sign language, American Sign Language (ASL), which is used by most deaf people in the United States, has been most thoroughly studied (e.g., Klima & Bellugi, 1979; Padden, 1981; Stokoe, 1960; Supalla, 1982; Wilbur, 1979; Wilbur & Petitto, 1983). This research yields the surprising conclusion that human languages are not restricted to the speech channel.

While signed and spoken languages share fundamental properties, it is also clear that they differ in important respects. First, space and movement (including facial expressions) are the key means for conveying morphological and syntactic information in signed languages, while in spoken language they are not. The continuous, analogue, nondiscrete properties of space and movement are used in ASL in systematic, rule-governed ways. These abstract spatial and movement units are analogous in function to discrete morphemes found in spoken language. In addition, the forms of some signs bear nonarbitrary relations to their meanings. In particular, indexical signs point to their referents while the forms of iconic signs physically resemble aspects of their meanings. The greater potential for nonarbitrary form-meaning correspondences afforded by the visual-gestural modality is in fact exploited in sign languages.

These modality differences allow us to address fundamental issues in language acquisition. Studies of ASL provide a way to resolve a major theoretical controversy concerning the role of prelinguistic gestures in the acquisition of linguistic symbols. Both deaf and hearing children rely upon gestural communication prior to language. For the hearing child, the transition from prelinguistic communication to spoken language involves a change in modality, while for the deaf child, the transition to signed language does not. That is, for the deaf child, gestures and symbols reside in the same modality. In evaluating the

This research was funded by a fellowship from the John D. and Catherine MacArthur Foundation's Network on the "Transition from Zero to Three," San Diego Node (Dr. Elizabeth Bates, Director), and grants from the Natural Sciences and Engineering Research Council of Canada, and FCAR, Quebec, Canada; I am extremely grateful for this support. Some of this material appears in somewhat different form in Petitto, 1983a.

importance of prelinguistic gestures in early language acquisition, sign languages provide a unique methodological advantage. With a single modality, and external articulators, certain developmental processes in language can be observed directly over time. In spoken language, of course, this is not the case; there appears to be a transition from the primary use of prelinguistic manual gestures to the primary use of linguistic (vis-à-vis spoken) communication; however, this could be an artifactual consequence of the shift in modality, rather than reflecting a deeper discontinuity between prelinguistic and linguistic knowledge. The basic questions, then, are whether the acquisition of linguistic forms will (a) be facilitated by; (b) be continuous with; or (c) share important symbolic properties with the deaf child's knowledge of their extralinguistic communicative functions?

The study described in this chapter is concerned with the young child's transition from prelinguistic gestural communication to linguistic expression. Specifically, I examined the young deaf child's use of deictic pointing gestures and comprehension and production of personal pronouns. Two central assumptions of current models of language acquisition were addressed: (a) knowledge of linguistic structure is "mapped onto" earlier forms of nonlinguistic knowledge; and (b) acquiring a language involves a continuous learning sequence from early gestural communication to linguistic expression.

Background

Personal pronouns are found in all languages and have both a lexical and deictic (or indexical) function. Lexically, they can be marked for case and have other morphological and syntactic functions; deictically, they point to actual relations in the speech context (Ingram, 1971). In this respect, personal pronouns differ from most words because their meanings are generally interpreted with regard to the speech event. That is, the meanings of the pronouns *I* and *you* shift depending upon who is actually speaking at a given time. The same holds for other deictic terms denoting, for example, time (*now* or *yesterday*), and place (*here* or *there*), which can be understood by the listener only by understanding the perspective of the speaker at the time of the utterance. In contrast, the meanings of most other words do not shift with a change in speaker. For example, proper names such as *Sara*, or category names, such as *table*, do not change their meaning within a particular context with every change in speaker turn. For this reason, personal pronouns have been said to have "unstable" or "shifting" referencing properties, while most other words are "stable" (Jakobson, 1957; Jespersen, 1924; Lyons, 1977).

Three noteworthy features characterize the hearing child's acquisition of pronouns. First, they are acquired in a particular order. Beginning around 16–20 months the pronoun *me* enters, followed by *you* around 22 months, and then third person pronouns (e.g., Charney, 1978; Macnamara, 1982). Secondly, prior to this process children use full proper nouns (e.g., "Jane do X" instead of "I do X"), rather than use the pronoun *me*. Thirdly, around the time when *you* enters the

lexicon, all children exhibit some form of unstable knowledge and use of pronouns (i.e., inconsistent and partial pronoun reversal errors), with some children engaging in systematic pronoun reversal errors. For example, mother might say to the child, "Do *you* want to go to the store?" and the child's reply would be, "Yes, *you* want go store." Here the child uses *you* incorrectly to refer to him- or herself rather than to mother. Similarly, the child may understand and produce *me* to refer to the adult rather than to him- or herself, although it is uncommon for symmetrical *you-me* error pairs to co-occur.

Two related proposals have been offered to account for the hearing child's knowledge underlying pronoun reversal errors. Pronoun-reversing children have been thought to regard pronouns as having fixed or stable referents like names (i.e., *you* = child's name, or *me* = adult's name) rather than having changing or "unstable" referents depending upon the speaker role (Chiat, 1981, 1982; E.V. Clark, 1978). In a similar vein, pronoun-reversing children have been regarded as being "egocentric," failing to shift pronouns because they are not yet able to take on the perspective of another person (i.e., errors are due to a cognitively based perspective-shifting problem; e.g., Charney, 1978; E.V. Clark, 1978; Piaget, 1955).

Although personal pronouns in ASL are constrained by the grammar of the language, they are not formed by arbitrary symbols. Rather, they are represented by pointing directly to the addressee (to intend YOU), or self (to intend I or ME) (cf., Lillo-Martin, 1985b, 1986a; Lillo-Martin & Klima, 1986). Thus, the formational aspects of these personal pronouns in ASL resemble extralinguistic pointing gestures which commonly accompany speech and are used prelinguistically by hearing and deaf children. This provides a means for investigating the deaf child's transition from prelinguistic gestural communication to linguistic-symbolic communication where both gestures and symbols are virtually identical in form.

Discussions of the role of pointing in language development have received considerable attention. E.V. Clark (1978) has proposed that the child's knowledge of the meanings of verbal deictic words, or context-bound indicating terms such as *here* and *there* and *you* and *me*, emerges directly out of early deictic pointing gestures in a natural and continuous progression (see also Bates, 1976a; Bates, Camaioni, & Volterra, 1975; Bruner, 1975b; Leopold, 1939–1949; Werner & Kaplan, 1963). A hallmark of human development is said to be the onset of pointing gestures at around 9 months. Pointing is thought to be a complex behavior, itself built up from earlier gestures in roughly the following manner: the child reaches and grasps (taking objects "inward"), "shows off" (e.g., imitative clapping in the pat-a-cake game), shows objects, gives objects (extending objects "outward"), points to objects without communicative intention (i.e., exploratory "pointing-for-self", does not visually seek adult to share gaze), and finally points to objects with communicative intention (i.e., visually seeks adult to share gaze and involves checks for feedback; Bates et al., 1975; Werner & Kaplan, 1963). That pointing develops in this way has been used to infer changes in the organization of internal mental "schemes" (Bates et al., 1975). For example, early noncommunicative pointing is said to represent the child's emerging ability to recognize and distinguish self from external, distant objects (Werner and

Kaplan's Gestalt-based concepts of emergence and distancing). By contrast, the later-emerging communicative pointing serves as the foundation for referential behavior and the concept of reciprocity arising from mother and child's joint actions and shared visual regard (Werner & Kaplan, 1963). Bates et al. (1975) further analyze the illocutionary (intentional) function of pointing gestures as protodeclaratives and protoimperatives because they function to direct the adult's attention to objects, events, or people, and to convey requests. Finally, E&V. Clark (1978) analyzes pointing gestures as nascent markers of definite and indefinite reference (i.e., the precursors of "the" and "a").

Given that the forms of personal pronouns in ASL are of the same form as prelinguistic pointing gesture common to hearing and deaf children, the following questions arise:

1. How does the deaf child move from the early biologically given, unconstrained, and communicative use of pointing gestures to the use of pronominal pointing constrained by the grammatical conventions of the language?
2. Is the acquisition of linguistically governed pointing facilitated by the child's knowledge of its extralinguistic communicative functions?
3. Finally, given the seemingly transparent meaning of YOU and ME pronouns in ASL, will deaf children learn these relations at an accelerated rate and in a relatively error-free manner?

Methods

The subjects were two, third-generation profoundly and congenitally deaf girls (called Child 1 and Child 2). The children were learning ASL as a first language from their deaf parents; they were of normal intelligence and free of other neurological or physical handicaps. Two types of data were obtained in this study: naturalistic and experimental. For Child 1, naturalistic data were obtained from ages 6 months to 3;7 and experimental data from two pronoun elicitation tasks — one at age 1;11 and one at 2;11 (for a detailed description of the elicitation tasks and overall procedures see Petitto, 1983a). Data between 6 months and 2;3 are summarized in this chapter. For Child 2, naturalistic data were obtained from ages 8 months to 4;9. Data between ages 8 months and 2;3 are summarized here.

One-hour videotaping sessions occurred approximately once a month for each child within the time period specified above (6 and 8 months to 2;3). The tapes were transcribed for adult and child signing with special attention to contextual information. Reliability checks on the transcriptions of four videotapes were done by two native deaf signers; their judgement showed 95% agreement with my own.

Results

The results indicated that deaf children acquire knowledge of personal pronouns over a period of time, displaying errors similar to those of hearing children despite the transparency of the pointing gestures. Although deaf children first begin using the deictic pointing gesture to objects and locations in a rich and varied way around 9 months, they do not use the pointing form to express the pronouns YOU and ME until around 17–20 months, within the precise age range that hearing children first begin to use verbal pronouns systematically. Soon after ME has been established, deaf children gain productive control over the YOU pronoun (around 22–23 months), followed by third person pronouns (see also Bellugi & Klima, 1982a, 1982b; Hoffmeister, 1978a; Kantor, 1982a; Lillo-Martin, 1986a, 1986b; Loew, 1983; Meier, 1982; Petitto, 1977, 1980, 1981, 1983a, 1988; Pizzuto, 1982a). Like hearing children they, too, use full proper nouns prior to the productive use of pronouns despite the fact that they use the pointing form in a fully communicative fashion. Surprisingly, the children used the pointing form to refer to aspects of their care giver's body, but seemed to avoid the use of the pointing form to indicate the adult, per se. For example, Child 1 (age 1;11) used the pointing form to refer to a spot on her mother's bathing suit, but did not use it to indicate her mother as in YOU, not even in an experimental task that was specifically designed to elicit this and other pronouns. Instead, the children used full proper names to refer to people around them. A critical fact is that the children were able to articulate the pointing form; they appeared to *avoid* a particular function of its use because of, I will argue, the complex role points play in the grammar of ASL.

Although the phenomenon of "avoidance" has been noted previously in child language literature (e.g., Ferguson & Farwell, 1975), this case is especially intriguing because the children avoided a particular function of a form rather than the form itself. Slobin (1982), for example, suggests that hearing children are biased towards relating one meaning (or concept) to one word-like surface form. In ASL, pointing enters into the language in a number of ways: (a) as a primary phonological unit; (b) as a primary component of the anaphoric referencing system; (c) as comprising one subset of the class of morphological forms called classifiers; (d) as personal pronouns; (e) as full deictic terms within the grammatical system of ASL, and (f) as paralinguistic gestures. Thus, pointing in ASL represents a single surface form with complex underlying grammatical functions and can be viewed as similar to linguistic forms in languages with fusional morphological units

On this basis, one might expect the child to avoid the use of the pointing form entirely, until its various meanings and functions can be understood. The obvious explanation for the selective avoidance, however, is simply that pointing has such a pervasive function in the language that its use cannot be avoided entirely (especially in light of its paralinguistic functions). But why, among the various linguistic functions of pointing, does the child specifically avoid first and second person pronominal pointing? In contrast to the other lexical items in the child's vocabulary, the referent of a pronoun shifts depending upon the speaker. In

addition, the use of pronouns is constrained by other grammatical processes (e.g., strict co-referencing rules). Finally, the child has an alternate means for communicating the same information, namely through the use of full lexical nouns. Thus, when confronted with the grammatical pluri-functionality of pointing in the language, and the conceptual complexity of pronominal referencing, the child avoids YOU and ME pointing in favor of simpler lexical items. In this sense, the child can be said to be "avoiding" indexical pointing in favor of forms which remove any ambiguity.

Finally, like hearing children, the deaf children initially exhibited confusion over which pronouns were appropriate given a particular linguistic context, and both children produced pronoun reversal errors. The single noteworthy difference between the two girls' performance was that Child 1's pronoun reversal errors were consistent while Child 2's errors were not. Given the seemingly transparent meaning of personal pronouns in ASL, Child 1's error is especially intriguing and warrants further discussion.

Pronoun Reversals and the Nontransparent Point

Between ages 1;10-1;11 one child (Child 1) pointed to people occupying second person role as in YOU, but the sense of the pointing sign appeared to mean ME. After conducting several extensive analyses of the child's comprehension and production of pronouns, it soon appeared as if she regarded this form not as YOU, but as a nonreciprocal, nondeictic, "frozen" lexical sign that stood for her, and her alone. In short, she appeared to regard the form as her NAME. Other indices of this child's language development appeared quite normal: measures of her vocabulary growth (MLU), discourse skills, and even her symbolic play were all comparable to that of other age-matched hearing and deaf children. Moreover, the error was not attributable to imitation of adults' utterances. Surprisingly, the child's error was totally impervious to mother's modelling and especially resistant to mother's explicit correction. During the period when the child was producing the YOU pointing form to intend ME, the mother attempted to correct her daughter's error by molding her child's hand into the correct ME configuration. Such physical manipulation of the language articulators in spoken language is, of course, impossible. Consequently, it might be thought that deaf children would be at a distinct advantage over hearing children in this regard. However, the young girl's error persisted despite mother's physical manipulations.

Discussion

Child 1's pronoun reversal errors present an immediate question: given that the form of the linguistic symbol for expressing pronouns in ASL is very transparent relative to its meaning, why does the child make consistent pronoun errors?

The Basis of the Pronoun Reversal Error

I suggest that the child regarded the YOU form as a symbol which represented herself. Further, she did not have pronouns in her productive lexicon at the time of this error. This analysis shares with E.V. Clark (1978) the notion that the child has formed the erroneous hypothesis that the YOU pronoun is her name. Recall that Clark also suggests that children produce these errors because they fail to take on the perspective of the adult. From this view the hearing child's difficulties in learning the pronominal system of a language are seen as derived from a general problem in learning to distinguish self from other, a problem that is manifested in language and in other, nonlinguistic domains. The case of deaf children acquiring sign languages provides the basis for a stronger test of this perspective-shifting hypothesis than is possible in spoken language. In spoken language, a relatively small class of words requires perspective shifting, whereas in ASL, the specific nature of its transmission requires that all signs be acquired by first taking on the perspective of the signer.

The fact is that the mirror-image transformation required in order to learn signs presupposes that the child is nonegocentric. If the child's problem derives from a failure to shift perspective as a consequence of egocentrism, the child should exhibit pervasive reversals, with errors occurring for a wide range of lexical items; essentially, the child should sign backwards. In fact, this kind of pervasive reversal error does occur in the sign imitations, sign babbling, and "baby signs" of very young deaf children (ages 8-12 months) but rapidly disappears. The error seen in this study is selective, however, in that it is specific to a particular lexical item in a particular grammatical class. I propose that the child had to shift to the adults' perspective to have produced the YOU = ME error.

Moreover, on the perspective shifting hypothesis we would expect symmetrical errors (i.e., both YOU = ME and ME = YOU), but this did not occur as the child never signed ME. It appears, then, that the incorrect meaning that the child attached to the YOU form was a specific problem related to learning the structural properties of the lexicon, not the by-product of a general cognitive deficit.

The derivation of this error appears to be the following: the child's error occurs at a time when she has clearly begun to understand the symbolic relationship between a sign and its referent, when her vocabulary is growing rapidly and her MLU is steadily increasing. At the same time, the frequency and distribution of her deictic points have begun to decline, replaced by full lexical nouns. The child observes other people using the YOU form to refer to her. Regardless of who is signing, the referent is the same (i.e., her). Thus, drawing upon her knowledge of sign-symbol correspondences, she hypothesizes that the YOU point is a symbol referring to herself, that is, a name sign. In effect, she is applying the sign-symbol schema that works for other nouns to the YOU point. That is, she has over-symbolized the indexical YOU point, treating it as a frozen lexical item with a stable referent, herself.

This analysis makes clear the fundamentally linguistic nature of the error. Child 1 has grasped a basic fact about linguistic systems, namely the abstract relation between linguistic forms and their meanings. Rather than indexing

particular objects in the world, these linguistic forms have intentional content; that is, they denote meanings or concepts rather than particular objects. The sign CUP, for example, does not index a particular object, but rather stands in an abstract relation to a class of items. The child's initial hypothesis about the meaning of YOU is that it is a symbol of this type: YOU refers to herself in the manner that CUP refers to cups. She consistently observes people using this form to refer to herself. Unfortunately, the correct, adult use of the sign in ASL, is in fact indexical. In hypothesizing that YOU is the lexical item referring to herself, the child ignores the indexical information provided by the form of the sign. Thus, the symbolization principle takes precedence, resulting in an error when applied to indexical signs.

Rather than reflecting a general cognitive deficit related to perspective-shifting, the YOU = ME error derives from the overapplication of an abstract linguistic principle. The error is striking because the child ignores transparent, perceptually salient information which she used to communicate prelinguistically, and which she continued to use deictically. This information is ignored in favor of a symbolization process that increases the abstractness of the relationship between form and meaning.

Two facts would count as evidence against the hypothesis that the child regards YOU as her name for the reasons specified above: (a) if during the error period the child produced the YOU form to refer to someone other than herself; or (b) if she comprehended the YOU form as referring to another person when she was not the addressee but an onlooker in a conversation between two adults. Both of these points cannot be supported by these data.

A final puzzle concerns the asymmetrical nature of the child's production error. The explanation appears to be as follows: when the child signs YOU to intend ME, YOU always has a single referent, the child. She does not sign ME, because she already has a form to represent this — the YOU sign. In addition, ME always means other people (but not their names). Since her YOU sign seems to function as a noun denoting herself, it might be expected that she would fail to use ME simply because pronouns are not part of her productive lexicon at this time.

Conclusions

In summary, the deaf children's performance was strikingly similar to that reported for hearing children acquiring pronouns. The major milestones in the deaf children's acquisition occurred at times that correspond closely to those reported for hearing children: (a) the early occurrence of proper nouns to refer to people; (b) the first occurrence of pronouns around 18–22 months; (c) a period of unstable knowledge and use of pronouns; and (d) correct use of pronouns by around 27 months. Between the ages of 12 and 18 months, both deaf children used only proper nouns to refer to people. Pronouns first appeared around 21–22 months, and correct usage was accomplished by 25 months for Child 2 and 27

months for Child 1. As with hearing children, the deaf children's initial production and comprehension of pronouns was not error free.

Thus, the study indicates that despite differences between the modalities that might be relevant to acquisition, both deaf and hearing children showed remarkably similar performance. Although it has been suggested by some that the transparent nature of the pointing gesture might make it possible for deaf children to acquire the use of these pronouns earlier than hearing children, this was clearly not the case. Such similarities between hearing and deaf children are strongly suggestive of the existence of universal processes in language acquisition, those that hold despite radical difference in modality that would otherwise be expected to facilitate the sign process compared to spoken language.

With respect to language acquisition models which propose a "direct mapping" and a strong continuity between the child's cognitive and linguistic representations, this study demonstrates that the deaf child's transition from gestural pointing to the linguistic use of YOU and ME pointing symbols is not smooth and effortless. The assumption that linguistic capacity is built up from (or mapped onto) pre-existing cognitive and communicative competence in a direct and continuous fashion cannot be supported by these data. On the contrary, the present study provides evidence for a discontinuity in the child's transition from prelinguistic to linguistic communicative systems, even when they share a single channel of expression and the forms are transparent. Further, the data from this study (including both the phenomenon of "avoidance" and the existence of pronoun-reversing errors) compel us to consider aspects of grammatical structure and its acquisition process to involve a relatively specific — linguistic — rather than general — cognitive — type of knowledge which the child brings to the language acquisition process, whose structure and organization may be biologically endowed.

The present study demonstrates how experimental research on sign language acquisition can provide a source of information bearing on theoretical issues in human cognition. The unique properties of sign languages (e.g., the fact that they make use of visual-gestural information expressed using external articulators, the hands) were exploited to provide a clear test of a current hypothesis concerning language learning. The results clarified aspects of the acquisition process that were obscured by the nature of speech.