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A conference on language development *and* sign language combines two essential areas in the study of human cognition today. Both domains of study are vitally important to current concerns in Cognitive Science and both are certain to assume an important role in the history of scientific thought. In this paper, I hope to demonstrate how sign language studies can be used as a research tool, one that can help us constrain our theories of language representation and its acquisition. To illustrate this point, I will provide data from young deaf and hearing children's earliest entry into the language acquisition process; in particular, I will discuss young children's transition from prelinguistic gestural to linguistic communication. Based on analyses of the children's use of prelinguistic gestures and their use of signs/words, it will be argued that language-specific knowledge (rather than general cognitive knowledge) is necessarily involved in language acquisition. I will also suggest that studies of sign language can provide key insights into universal processes in language acquisition in ways that would be virtually impossible to discover through the study of spoken language alone.

Sign Language and its Acquisition

Sign language research has been largely responsible for changing our conception of human language in this century. Intensive analyses of sign languages from a variety of countries (see especially papers in this volume) have revealed that they exhibit formal organisation at the same levels found in spoken languages, including a sublexical level of structuring internal to the sign (analogous to the phoneme level; e.g. Battison, 1987; Stokoe, 1960), and a level that specifies the precise ways that linguistic units must be bound to form signs and signs to form sentences (analogous to the morphological, syntactic and discourse levels; e.g., Klima and Bellugi, 1979; Padden, 1981; Supalla, 1982; Wilbur, 1979; Wilbur and Petitto, 1983; Kyle and Woll, 1985).

The basic similarities between signed and spoken languages having been established, it is now possible to use studies of sign language as a research tool to address deeper questions concerning human cognitive and linguistic capacities. While signed and spoken languages share fundamental properties, they also differ in important respects. For example, the greater potential for non-arbitrary form-meaning correspondences afforded by the visual-gestural modality is exploited in sign languages. In particular, indexical signs point to their referents while the forms of iconic signs physically resemble aspects of their referents.

These modality differences allow us to address important issues in language acquisition. In particular, studies of, for example, American Sign Language (ASL; the sign language used by most deaf persons in the United States and parts of Canada) 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 importance of prelinguistic gestures in early language acquisition, sign languages provide a unique methodological advantage, since, given a single modality, and external articulators, certain developmental processes in language can be directly observed over time. In spoken language, of course, this is not the case; there appears to be an abrupt transition from the use of prelinguistic manual gestures to linguistic (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. Important questions, are, then, as follows: Will deaf children differentiate gestural versus linguistic units when both reside in the same modality?; in particular, the form of some ASL signs resembles actions associated with a target referent, as well as the conventional, extra-linguistic gestures (i.e. the pantomime) associated with it (for example, the sign BRUSH in ASL resembles the activity one would do with an actual brush in hand, as well as the extra-linguistic gesture for brushing one's hair). Will this close relationship between some sign/referent/gestural units facilitate the deaf child's acquisition of sign language? In sum, this research provides a unique way to examine whether language derives from general cognitive capacities to think and learn, or whether it involves a domain-specific type of knowledge or faculty.

Gestural Production in Deaf and Hearing Children

One of the most compelling aspects of hearing infants' behaviour is their spontaneous use of gestures well before the onset of speech. As young as 9 months, infants appear to use pointing, showing and giving gestures in a wide variety of contexts, performing various communicative functions, including requesting and denoting. Infants will also use these indexical gestures even when they are alone or when they are unaware that they are being observed by adults. Another class of gestures - non-indexical, manual ones - has also received a great deal of attention (e.g. see Bates, Bretherton, Shore, McNew, 1983). For example, upon noticing a hairbrush, most hearing children (around 12-13 months) will pick it up and make brushing motions, or, if presented with an empty cup, they will bring it up to their mouths as if to take a drink. Unlike indexical pointing gestures, which can refer to a potentially infinite class of referents, non-indexical manual gestures appear to stand in a specific relation to particular referents. That is, a child can point to a variety of objects, using a single gesture, but the drinking behaviour is only relevant to cups. Many researchers have concluded that these gestures assume an important role in the child's acquisition of language. Several different models have been proposed; all emphasize the relationship between gestures and a particular linguistic function, naming.

One view is that children's gestures and motoric activity are both the precursors of and prerequisites to language development. Knowledge of linguistic forms is said to be built-up from this prelinguistic foundation in a direct and continuous manner (e.g. Bruner, 1975; Clark, 1978; Lock, 1979; Greenfield and Smith, 1976).

According to a second view, gesture and language are two examples of symbolic behaviour resulting from the prior growth of a common underlying cognitive competence (Piaget, 1962; Werner and Kaplan, 1963). Bates (1976) and Bates et al. (1983) have presented the most articulate and thorough view of this position. Because Bates and her colleagues find that the functional properties of children's use of verbal naming are positively correlated with the functional properties of children's use of gestures (and with other cognitive measures) they conclude that verbal naming and gesturing must be generated by the same underlying cognitive "naming mechanism". On this view, the 13 month old child's prelinguistic gestures with objects are not pre-linguistic at all. To the contrary, gestures of this type are said to be names. For them, naming is outside of the linguistic system (and the "vocal channel"), and exists as part of the child's general cognitive capacities to symbolize.

Are gestures names?

The research I summarise here raises the following questions (1): Is the child's use of prelinguistic gestures fundamentally similar to their use of words or signs?; do gestures mean the same thing as words/signs?; is the knowledge that guides the use of gestures and words/signs similar or distinct?

It is not my intention here to propose a general theory of naming (see, for example, Barwise and Perry, 1983; Frege, 1960; Macnamara, 1982; 1986; see also Petitto, in press, a, for a fuller

description of the features of names listed below). My goal instead is to identify briefly some basic characteristics of names that any comprehensive theory of naming must explain, and then to determine whether these characteristics also hold for children's early gestures. Such characteristics involve three different aspects of names:

Forms

A critical characteristic of names is that they are physically distinct from the objects or actions to which they refer. That is, a behaviour cannot simultaneously be a referent and its name. For example, the act of coughing cannot function as the noun cough. Names refer, designate, describe, and categorize classes of objects or actions, but they are not themselves the objects or actions in question. Thus, names are physically independent of that to which they refer. This implies that the use of names will not be tied to presence of the referent object or enactment of the referent action; speaking about a cough, for example, does not require enacting the actual behaviour. An important empirical question, then, is whether children's early communicative gestures exhibit this independence of form and referent. (2)

Scope of referring relations.

Names refer to kinds of objects or actions, but the scope of this referring relation is of a particular sort.(3) It can be roughly characterized as follows: (i) a single form is used consistently to designate a class or related referents or kind; (ii) the form itself must be consistent, rather than changing across occurrences; (iii) the form is not restricted to particular exemplars of a kind; (iv) if multiple forms are used to refer to a particular referent, each must independently meet conditions (i-iii).

(i) reflects the fact that names designate different types of referents (4); (ii) underlines the fact that names have stable forms, although these may undergo limited modification as the child's articulation improves; (iii) reflects the fact that while names can be used to refer to particular objects or actions, their use is not restricted to individual objects or actions. In regard to (iv), it is obviously the case that several different names can refer to the same object or action; canary, bird, and animal could all be used for a particular small yellow organism that flies. However, if multiple names are used to index the same referent, each of the names must exhibit characteristics (i-iii).

Gestures, such as pointing, could differ from names, then, by violating one or more of these conditions. For example, a single gesture could be used for objects or actions of different kinds; similarly, many different gestures could be used with reference to a single object or action even though none of these gestures is used with reference to a particular kind.

Functions.

In evaluating children's early communicative behaviour, it is necessary to consider the semantic and communicative functions of names. Names serve several semantic functions including identifying, recognising, describing and categorising referents as belonging to a known kind. In effect, to name an object is to assign it to a category; naming involves an implicit assertion that the referent has the properties thought to be true of members of the category. If gestures are used as names, then, they should exhibit these referring, describing, recognizing and categorizing functions.

Names have important grammatical functions in language. Names belong to grammatical categories. These are important for syntax, since syntactic rules are defined over grammatical categories. Some common nouns take the plural form as well as the indefinite and definite articles a and the respectively. Such grammatical variations are accompanied by semantic variations as well (Macnamara, 1982, p.5)

In addition to their semantic and grammatical functions, names are used for a very wide variety of communicative functions and are not used exclusively in "private cognition". Importantly, names are used to make requests, comments on the world, etc. It might be expected, then, that naming gestures would be used in similar ways. Moreover, names are generally used in combination with other linguistic forms. The extent to which children combine gestures with other gestures (and the relationship this shares with their capacity to combine words, if any) will be of special interest.

Finally, names are not restricted to imitated or routinized contexts.

Clearly, naming is a complex linguistic function. In order to evaluate whether early gestures function as names, what is required is detailed evaluation of children's gestures along all of the dimensions specified above: only then will we be able to make direct comparisons between the child's use of gestures and their use of verbal names and signs.

Methods and Procedures

This study focused on three hearing children - two acquiring spoken French and one acquiring English - and three deaf children of deaf parents - two acquiring Langue des Signes Québécoise (LSQ) (5) and one acquiring ASL. Monthly, one-hour videotapes of the children and a parent were collected from ages 10 through 20 months. A controlled elicitation procedure consisting of four tasks was used during each taping session, in order to elicit either indexical or non-indexical manual gestures.

Detailed transcriptions of the video tapes were prepared and the forms, functions and contexts of hearing and deaf children's gestures were coded to determine their indexical, referential, symbolic and linguistic status. The data were coded by two independent raters in order to determine whether prelinguistic gestures had the same lexical status as names and the extent to which they facilitated the acquisition process.

Results

The overall gesture types - including their frequency and use - were strikingly similar for deaf and hearing children throughout development. Both deaf and hearing children produced indexical (pointing) and non-indexical manual gestures. While indexical gestures occurred throughout the period under investigation, three distinct types of non-indexical manual gestures occurred within particular time periods: "natural" gestures (around 9 to 15 months, with a peak frequency around 12 months) instrumental gestures around 12 to 18 months, with a peak frequency around 16 months), and iconic ("symbolic") gestures (around 16 to 20 months). Most of the children's non-indexical gestures were produced with objects in hand (around 88% of approximately 3,500 non-indexical gestural tokens). Empty-handed gestures were produced less frequently (10% of all tokens). Of the empty-handed gestures that were produced, the natural and instrumental gesture types occurred most frequently. Empty-handed iconic ("symbolic") gestures were exceedingly rare in both hearing and deaf children (around 2% of all tokens); iconic gesturing with objects in hand did not occur. Most of the children's gestures with objects were used in play (and "private cognition"), or used in requests; the class of empty-handed gestures were used almost exclusively as requests.

There is little question that some of the children's gesturing was communicative. They appeared to use particular gestural forms (e.g. pointing) with the intent to denote objects in the environment, or to achieve an instrumental goal with regard to these objects. The purpose of the following analysis, then, is not to dispute the claim that prelinguistic gestures have communicative functions. Rather, it addresses the extent to which such gestures are isomorphic with linguistic

symbols. Because the strongest claims about naming have been made regarding children's use of non-indexical gestures (rather than indexical, pointing gestures) this class of manual gestures will be evaluated below. For an in-depth discussion of young deaf and hearing children's use of pointing gestures see Petitto (1983; in press, a and b).

Non-indexical manual gestures

Non-indexical manual gestures were produced with and without objects in hand. The three types of empty-handed non-indexical manual gestures ("natural", instrumental, and iconic) will be discussed according to their age (and peak frequency) of occurrence. (6)

Ages 9 through 12 months.

"Natural" gestures occurred during this period; one form, called the "open-close gesture", occurred frequently. Deaf children also produced babbling in sign language. These will be discussed in turn.

- (i) "Natural" gestures. The children produced a range of gestures that were drawn from their natural activities. These are natural in the sense that they are unlearned and time-locked to on-going activities. They are not abstract forms used to refer to or classify activities, rather they are the actual enactment of an activity. These natural gestures include reaching, grasping, grabbing, waving hand(s), throwing, flapping arms, banging, mouthing objects, shaking objects, shaking head, pulling or turning head away, holding or raising hands above head and pushing and pulling. These natural gestures neither have a "representational component" nor stand in a specific relation to specific objects; rather, they occur frequently across multiple contexts for a very wide variety of objects.

Most often the children's gestures occurred as reactions to events rather than serving to encode the actions symbolically. At times, the children produced them with apparent intention to communicate (e.g. one hearing child banged the table-top of his highchair to get mother's attention; one deaf child tugged on mother's skirt to be picked up.) What is important here is that the children did not appear to understand that gestures referred. They appear to know only that gestures had an effect - caused some reaction or change in their environment.

In addition, children are highly adept at this age at imitating social and routinised gestures such as waving good bye, clapping hands, smacking lips, playing peek-a-boo and the like. because these gestures occur across many contexts and are not referential, the young child will inevitably produce both appropriate and inappropriate pairings of actions and objects. Thus, sometimes the child mouths an object "appropriately" (e.g. a toy apple), but other times she mouths inappropriately (e.g. a mirror); sometimes she produces a banging motion with a hammer and sometimes she "hammers" with a sneaker; sometimes the child throw the ball, other times a cupful of milk.

The power of these gestures derives from the fact that adults freely attribute a variety of complex desires, intentions and knowledge to children based upon their interpretation of the context in which the gestures occur. Adults do not interpret children's gestures by how they were used in the past or whether there are consistent correlations between particular gestural forms and their references; the children's gestures appeared across many contexts, with many different objects. Rather, the context itself was used as the basis for interpreting the gestures. Two types of context-based interpretations were noted

by observing the adults' response to children's gestures over many trials. First, parents attribute a single, specific meaning to a child's gesture even if the child used a variety of different forms in the same context at different times.

- (ii) Form and function of the open-close gesture. One ubiquitous gesture that begins during the 9 to 12 month period warrants special attention, both deaf and hearing children produced this type of gesture in nearly identical ways. It involved a repeated opening and closing of the fingers from an open or curved hand. At times the children moved their arms up and down while opening and closing their hands; at other times the gesture occurred with the hands raised slightly above eye level. Occasionally the children looked at the own hands while producing the form, but usually they looked at the object, event, or person that stimulated the occurrence of this behaviour. Variations included the use of one hand rather than two, or producing the open-close hand gesture with bent elbows at waist level. Finally, during this period the form was very often accompanied by an interesting and amusing behaviour: the young children tended to open and close their feet in conjunction with the opening and closing motions of their hands and fingers.

Detailed analysis of the longitudinal data revealed that this open-close gesture initially had no communicative function. Instead, it appeared to be a general excitatory, motoric response to diverse stimuli, another example of a "natural" behaviour that was part of the child's behavioural repertoire. Strong evidence for this claim comes from a close examination of the contexts in which the form occurred. The behaviour did not occur in a systematic or principled fashion; there was no relation between the occurrence of the form and a specific referent or class of referents; nor was there a relationship between the form and a particular function - except as a behavioural indicator of the child's general excitement vis-a-vis some object or event that was occurring in her immediate environment.

As both deaf and hearing children produced it in a variety of contexts and for a wide variety of referents, it cannot be said that the open-close gesture was an early "sign". Although it has been claimed that deaf children acquire signs earlier than hearing children acquire words (e.g. Bonvillian, Orlansky, and Novack, 1983), the current data do not support such claims. Instead, I have argued elsewhere that these claims result largely from methodological problems, whereby the researchers attribute meaning to deaf children's gestures based on forms highly similar to the type described above (as well as their interpretation of the context; see Pettito, in press, a). More importantly, the communicative function of this form could not be said to be a "natural" begging or requesting gesture to receive objects, as young hearing and deaf children would produce the form both before and after desirable objects were already in hand.

However, as time progressed, children began using this form as a begging gesture to receive a desired object (i.e. the form was used as an instrumental gesture to request); discussion of this development appears below.

- (iii) Linguistically relevant sign "babbling" in deaf children. There is one important difference between deaf and hearing children's hand gesturing. At around seven to eleven months of age deaf children engage in linguistically relevant sign babbling, in much the same way that hearing children begin to babble vocally. Although deaf children's production of unmodulated vocal babbling has been noted previously in the literature (e.g. Lenneberg, 1967), little attention has been given to their sign babbling. My analysis of the forms, use, and contexts in which sign babbling occurred for the deaf children suggests that these hand movements are not attempts to sign, and are wholly unlike the forms and functions of their "natural" and indexical gestures. Rather, they are hand movements that specifically reflect

the formational (phonological) features of ASL, especially hand configuration and movement parameters (Pettito, in preparation, b). Interestingly, deaf mothers consistently responded with language to their infants' sign babbling and action to their gestures.

Ages 12 through 16 months. Beginning around 12 or 13 months the children's use of gestures became more focused on objects, events and people in their environment. Two types of non-indexical gestures were observed: gestures with objects in hand and empty-handed instrumental gestures.

- (i) Gestures with objects: Are they names? By 13 months the children displayed a striking ability to produce a variety of non-indexical manual gestures with particular objects ("drinking" from an empty cup, "talking" on a toy phone). It is gestures of this sort that have been viewed as functioning in a manner similar to common nouns or names.

At first, it might appear appropriate to regard such object-related gestures as names for things, albeit gestural in form. However, a close examination of the form, function and content of these gestures suggest that even they do not have the same symbolic status as verbal names. First, not only must an object be present in order for children to produce these gestures, apparently it must be physically in their hands. For this reason alone we can reject entirely the claim that these gestures are symbolic in the same way as verbal/sign names. Second, the children gave no evidence of using these forms to identify and categorise objects as being a member of a known class. The gestures often did not appear to be communicative, the children failing to make eye contact with adults while producing them. Thus, the children seemed to be executing complex actions associated with the objects rather than providing names for things - an insight of Piaget's which I believe to be fundamentally correct. Further, these gestures appear to be indexical in the sense of Peirce (1932) because the motion of each gesture is actually part of its referent. In raising a comb to her head and combing her hair, the child cannot be regarded as explicitly symbolizing the comb. Nor are we justified in regarding this action as "standing for" the comb (or combing) - no more than we would want to label the child's inhaling of air the noun breath (or the verb, breathe).

Nonetheless, researchers have argued that the child's solitary and "object-dependent" (non empty-handed) gestures should be considered as names because they function as names. The argument is as follows. When the child gestures with a cup by bringing it to her mouth, she is in a sense representing her knowledge of what is done with cups (the cup being that which holds liquid and is drunk from). On this view, the child is recognising and categorising the cup and identifying it as belonging to a known class, hence naming. This view predicts the following. If children's gestures reflect their knowledge of the functions of objects, thereby exhibiting a kind of gestural naming, then we should not observe children performing these actions with inappropriate objects; there should be little or no function violations. Just as we would expect a particular gestural form to stand in a systematic relation with a particular referent or a class or related referents, we would also expect the function of referents to stand in a principled relationship with a particular gestural form. Thus, to represent the "stirring" function we would expect the actual objects used to stir to be in some principled relationship to each other: hence, we would expect a pairing between big and small spoons and the stirring gesture, but not pencils and the stirring gesture.

However, this is not what occurred. Young children routinely made object-related function violations. Function errors began around 13 months and continued until around 18-20 months, suggesting that object functions must be learned. Although the children would pick up a spoon, place it in an empty cup and "stir", they were also likely to pick up other objects that shared certain critical physical dimensions with spoons and use them as

well (e.g. hammer, comb, mirror). Note that the child produced many of the words for objects prior to their learning the correct functions associated with the objects. Thus, it appears that the young children's gestures do not necessarily reflect their knowledge of the function of objects, but rather more clearly reflect their knowledge of actions associated with them.

In summary, the children do not produce empty-handed manual gestures to stand for referents but produce such gestures - really actions - with the actual objects present and in hand. In addition, the meaning of the gestures can be understood without special knowledge about the relationship between symbolic forms and their referents; i.e., unlike words, there is a literal, physical resemblance between the action of the gesture and what it is ostensibly referring to. A third critical difference was that the children used objects in ways that did not always reflect their literal, intended functions. Finally, the range of communicative functions that these gestures serve is severely restricted. For example, the child does not use the brush gesture to describe (or comment about) someone brushing her hair; the child does not use the cup gesture to request a drink from mother. Children do not describe, request of use gestures for the myriad of functions that words serve from their onset.

- (ii) Instrumental empty-handed gestures. Instrumental gestures account for nearly all of the children's empty-handed non-indexical gestures throughout this period and beyond. Like natural gestures, their form is unlearned, context-bound, and part of the child's natural behavioural repertoire (e.g. reaching, raising arms, open-close hand movements). Unlike natural gestures, the forms now appear to assume general meanings. For example, hearing and deaf children will reliably raise their arms to be picked up and reach (with open-close hand movements) to be given an object. Further, like the natural gestures, instrumental gestures have a very powerful effect upon adults, who respond with attention and/or desired actions.

Instrumental gestures differed from the children's first words and signs in important ways. The begging or "give-me" gesture, for example, is literally the behaviour used in the act of receiving (or taking), rather than a schematic representation of it (the child enacts rather than depicts). Moreover, the forms were used exclusively in requests; they were communicative "tools".

Ages 16 through 20 months. Beginning around 16 months the children were observed to produce a small class of formationally (and referentially) iconic gestures; these gestures preserved partial information about actions that are associated with objects (e.g., "twisting" motions of the wrist as in opening a jar), but they are not literally the enactment of the designated activity (e.g. the child does not actually open a jar). In short, these gestures contain a representational component. If iconic forms are referential, communicative and representational, why are we not justified in viewing them as similar to linguistic names for things?

- (i) The nature of empty-handed iconic ("symbolic") gestures. Briefly, the critical difference between the child's use of iconic gestures versus their early use of words and signs is that they are used in reference to objects from different natural categories; that is, they do not pick out natural kinds (Macnamara, 1986). This is wholly unlike even the child's very first notions of word meanings. While children's early word meanings are not the same as adult's, they are constrained in systematic ways. For example, the child will not initially use a word such as table to refer to the same class of objects as the adult. The child's initial hypothesis as to the meaning of table is only partially correct; they will sometimes over- or under- extend the range of referents for a particular word. However, this process is not arbitrary. As Carey (1982) notes, "The child would never judge table to mean something like 'table and meal' because table is an object and mean is an event: A

concept's including just a specific object and a specific event violates certain conceptual naturalness" (p.381). Several other factors distinguish iconic gestures from words and signs. The use of iconic gestures is a relatively late development (around 16-20 months) compared with children's first words and signs (around 12 months). Importantly, iconic gestures typically do not occur until after the child has acquired the corresponding word or sign. Further, they occur with low frequency and nearly always to supplement a verbal/sign message during requests.

Summary and Conclusions

In summary, then, several findings characterise this second study. Beginning around 9 months, the children produced indexical and non-indexical manual gestures. A detailed analysis of the forms, functions and contents of the children's early gestural forms and the parent's responses to them revealed that they appear to have radically different properties than words (or signs). Deaf children's gestures are not more elaborated and advanced than hearing children. Even though deaf children are being exposed to a language where both linguistic and gestural information are transmitted in a single channel and are produced with identical units (hands moving in space), the manner in which they acquire this system compels the surprising conclusion that they differentiate between linguistic and non-linguistic uses of gesture; thus, these forms of expression appear to be constrained by distinct domains of knowledge. Finally, the modality of language transmission does not seem to facilitate the language acquisition process, nor does the child seem to be aided by the iconic (non-arbitrary) form of some signs. With the exception of sign babbling, the deaf children produced gestures that were nearly identical in form and function to those of hearing children and they were not more advanced despite the fact that sign languages are constructed in such a way so as to lend themselves to this unique type of iconic (non-arbitrary, pictorial) gestural elaboration. Thus, the present data provides evidence that the capacity to engage in prelinguistic gestural communication is distinct from the capacity to engage in linguistic expression.

If this conclusion is correct, it suggests that the important issue is not the role of gesture in language acquisition, but rather why children gesture at all and why the use of gestures eventually declines. If this behaviour does not represent the early expression of linguistic competence, why does it occur?

One possibility is that gestures are an early means to stimulate communicative interactions between the child and adults. Children's gestures generally attract adults' attention and response; adults respond by supplying linguistic information as, for example, when the child points and adults supply names or engage in a variety of other child-focussed activities. Use of many gestures entails a highly social exchange between parents and their infants; this is most often seen in the rituals that parents and children engage in such as peek-a-boo, patty-cake and the like. Gesturing with objects may also help the child learn general perceptual and cognitive information regarding proximal-distal, visual-spatial relations, weight and mass relations, and to acquire functional information about what one does with objects. Rather than providing the basis for communicating about objects through naming, the child obtains information by using gestures. Shatz (1985) suggests that because hearing children's attention shifts around 20 months to inter-word relations during the multi-word phase of language development, their production of gestures consequently drops dramatically (page 18). She thus analyses children's early use of gestures as only "an intermediary interaction device" in development. My findings corroborate Shatz's general observation.

Regardless of the modality, children seem to isolate and separately analyse just those units - be they visual or aural - that will ultimately be significant to their language. This division between what is in their language and what is outside of it begins surprisingly early and is especially apparent when the language in question is externally articulated and resides in the same channel

as gestures; in this way, the study of sign languages has provided unique insights into the representation and nature of human language. The way deaf infants enter this process and begin differentiating among types of information within the single channel implies that a priori domain-specific (e.g. Chomsky, 1965, 1975; Fodor, 1983; Pinker, 1979, 1984) - but not channel-specific - constraints must be at work during language acquisition.

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FOOTNOTES

1. For a more detailed discussion of naming, as well as a more complete description of this study, see Petitto, in press (a) and Petitto, in preparation (a).
2. This point in no way excludes iconic signs in ASL.
3. In this text when I speak of "names" I am referring only to common nouns. Whereas proper names refer to an individual, common nouns refer to a class of objects or actions. The strongest claims about the linguistic status of children's early gestures have been made with regard to this latter type of names. According to some theories (e.g. Macnamara, 1982), common nouns do not actually "refer" to objects. Rather, they "refer" to kinds, which specify sets of which it is either true or false of a particular object that it is a member of that set. The term "referring" is reserved for other linguistic expressions (proper nouns, indexicals, definite descriptions and function expressions) which are used with respect to particular objects or individuals. On this view, "book" is not a referring expression, because it does not itself refer to a particular book; "Roger Brown" is a referring expression because it picks out a particular individual. There are also several other accounts of naming, in which technical terms such as "refer" and "referring" are used in theory-dependent ways. For example, Barwise and Perry (1983), state that "We think that, in fact, the ordinary English word REFERS captures rather well an important semantical notion. Through utterances people refer to people, things, times, and places, and the reference of these acts is relevant to the interpretation of the utterances (page 21)." These technical disputes, however, have no bearing on my analysis of childrens' gestures, and the data I will discuss do not mediate between different theories of naming. In the text, the term "referring" is used in a theoretically neutral sense as a cover term for the two types of naming Macnamara has distinguished. Thus, I will say that a word such as book "refers" to objects even though this usage is not sanctioned by some theories.
4. This argument is not refuted by Wittgenstein's well-known observation that there cannot be necessary and sufficient conditions for class membership. The merits of his argument aside, it is nonetheless the case that names are used to differentiate among classes. Questions as to whether there can be strict criteria for class membership are separate from questions as to whether names for such classes are used systematically to differentiate among classes.
5. LSQ is the native sign language used among French deaf persons in Canada, and especially in Quebec. It is fundamentally distinct from ASL (e.g. lexically, morphologically, syntactically, semantically).
6. Highly routinized gestural games, social gestures (e.g. Hello and Bye waving), imitated forms, and one-time-only gestures were excluded from this analysis. The status of these gestures is relatively non-controversial: most researchers would not attribute lexical status to them.

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