From Gestures to Signs in the Acquisition of Sign Language

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In signed languages, both linguistic signs and gestures are executed in the same modality. As a consequence, children acquiring a sign language may produce iconic gestures in that are close to appropriate conventional signs in referential contexts. Nevertheless, the child must master the conventional forms of expression of the language, including both points and signs. Particular problems are posed by the management of gaze and by communicative requirements to distance signs and gestures from referents. Early sign language acquisition can be seen as a gradual movement from gestural indices and icons to linguistic forms.

We begin with a fundamental observation made by David McNeill in his landmark monograph, Hand and Mind, setting the stage for the role of gesture in language acquisition:

As children acquire their language they are also constructing a speech-gesture system. Gesture and speech grow up together. We should speak not of language acquisition, but of language-gesture acquisition. (McNeill, 1992: 295)

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1. Gesture and Modality

McNeill and his followers (McNeill, 2000) have demonstrated how gesture permeates the use of spoken language. Their work has primarily concerned itself with gestures that are performed outside of the vocal modality of speech—that is, movements of hands, arms, body, and face. In the case of signed languages, however, the gestural and the lexical-grammatical components are manifested, to a great extent, in the same modality. Sign language linguists are therefore faced with a more difficult task in attempting to differentiate gestural and linguistic components of signed messages. The problem of delineating a strictly ‘linguistic’ component of the languages of the deaf remains unsolved and is the topic of extended current discussion and debate (see, for example, papers in Emmorey, 2003; Liddell, 2003; Taub, 2001). Our task here is not to solve that problem, but to highlight ways in which gestures can become schematized and conventionalized. There is a continuum from gesture to sign in the development of signed languages, in both historical and ontogenetic time frames. On the historical level, this continuum represents a course of grammaticalization in signed languages that parallels the continuum from lexicon to grammar in spoken languages (Frishberg, 1975). On the level of the individual deaf child, however, processes of language acquisition are at work in ways that seem to be strikingly different from the acquisition of spoken languages.

Before turning to language development in deaf children, consider the possibilities of gesture in the vocal modality. The basic issue in both modalities of expression—vocal and body—is the simultaneous use of communicative devices that are both discrete and graded, both conventional and iconic. Even in the acoustic modality of spoken language, gradient and iconic expressions permeate spoken messages. Consider, for example, the utterance of a preschooler who is attempting to depict the sound and force of a rocket launch:

(1) \[3 \rightarrow 2 \rightarrow 1 \text{ blast off } \text{khkhkh}!\]

The onomatopoeic \text{khkhkh} is a vocal gesture that depicts aspects of the event. It is fully integrated into the acoustic flow of the utterance and it fills a conventional structural slot though it is not an English lexical item and can hardly be classified as one of the traditional parts of speech. Such items can be freely invented; at the same time, each language provides a set of fixed vocal ‘emblems’ such as English \text{crash, boom, pow}, and the like.

Voice quality is also regularly used to enact role shifts in speech, as in the following example in which a preschooler is assigning a role in a play situation by mimicking a teacher’s manner of speaking:

(2) You be the teacher and go: “\text{Now be quiet children!}”

Voice quality can also be used to evaluate other people, as in:
(3) She goes: “You can’t play with MY toys!” [singsong intonation]

The voice can thus be used to integrate ‘gestures’ into utterances. Indeed, it is no more than our ancient tradition of separating the written and spoken components of language that leads to the assumption that only written language is ‘linguistic’. As shown in the above examples of preschool speech, depictions of sounds and the enactments of the vocal productions of speakers can be systematically incorporated into linguistic constructions. The ways in which they are incorporated vary from language to language and can, eventually, be rigorously specified in the terms of an expanded linguistic theory. Clearly, depicting and enacting are universal characteristics of human communicative systems.

When we turn to signed languages, we find sign and gesture in one modality—that is, the visual modality, broadly conceived, including the hands, face, and body. Scott Liddell has pinpointed the role of gradient signals in his important recent book, Grammar, Gesture, and Meaning in American Sign Language (2003). The title makes it clear that grammar and gesture both play key roles in the expression of meaning in ASL (and all signed languages). Liddell provides us with a clear statement with regard to the nature of an integrated linguistic system:

The ASL language signal … includes gradient aspects of the signal, and gestures of various types. All of these coordinated and integrated activities constitute the language signal and contribute to expressing the conceptual structure underlying the utterance. (Liddell, 2003: 362)

We have gathered data on the acquisition of a particular sign language, Sign Language of the Netherlands (SLN), by young deaf children between the ages of 15 and 36 months (Hoiting, 1997, 2006, in press; Hoiting & Slobin, 2002a, 2002b; Slobin, Hoiting et al., 2003). The data show that these children are actively gesturing while acquiring the conventional forms of the language. Because both of these aspects of communication are in what can be called ‘the body modality’ (as opposed to the vocal modality), analysis of sign language development cannot avoid the gesture-to-sign continuum that presents itself as separate tracks of analysis in discussions of hearing children’s acquisition of segmental (phonological, lexical, grammatical) and suprasegmental (pitch, stress, intonation) components of spoken languages.

2. Index, Icon, and Symbol

Central to analyses of gestural and gradient aspects of communication are issues of indexicality and iconicity. In Peirce’s familiar terms, an index bears an intrinsic connection to the object that is indicated; an icon bears a perceptual resemblance to its object; and a symbol represents an object by arbitrary rule.
Applying these distinctions to signed languages, indices point, icons characterize, and symbols designate.

2.1 Indices

An index isolates a referent by pointing to it with the hand and/or gaze direction. In signed languages, manual indices become conventionalized, taking on particular handshapes, prosody, and directionality—both as means of indicating referents and as grammatical elements serving as proforms. (Eye-pointing, which we do not consider in this discussion, also becomes conventionalized.) Note that even here, when we deal with ‘simple’ pointing gestures—either as co-speech gestures or in a signed language—there are constraints of conventionality, such as the index finger point used in some languages, various oriented hand configurations in others, and so forth (e.g., Wilkins, 2003). These conventions must be learned and used appropriately.

2.2 Icons

An icon characterizes a referent or referent situation in two basic ways—depiction or enactment. Some aspects of a situation can be schematically modeled, as in the use of handshapes to indicate size and shape, and some aspects can be schematically enacted, as in demonstrating how an object is manipulated or how a person behaves. (Note, again, that because depicting and enacting are, of necessity, schematic, language-specific conventions must be learned and used.)

2.3 Symbols

A symbol designates its referent by use of a conventional sign. As already indicated, both indices and icons, when integrated into a language, bear features of conventionality. And probably most signs have their origin in indexical and iconic referencing. But the conventional signs and structures of a signed language have to be learned, as do the lexical items and grammatical constructions of spoken languages. Note too that symbols—conventional signs—can have indexical and iconic properties. In adult signing, designating is permeated with pointing and characterizing.

In signed languages, all three types of Peircean signs—indices, icons, and symbols—can be expressed by handshape, movement, location, face, eyes, and posture. That is, all of the resources of the body modality are available for the three types of expression.
3. Acquiring a Signed Language

A hearing child who is acquiring a spoken language has little opportunity to invent lexical and grammatical forms. For example, if a child decides that a pair of scissors should be called a “cutter” he will soon have to accept that this device is called *scissors* in English. And if he then tries to turn this word into a verb, announcing that he is, “scissoring,” he will have to accept that in English one *cuts* with scissors. By contrast, a deaf child acquiring SLN can use the same enacting gesture—moving the index and middle finger together and apart—to refer both to the instrument and the action. He will be close to correct, in this instance, having only to learn the formational constraints that distinguish the symbol for an entity (‘noun’) —a single and precise closing of the fingers, from the symbol for an activity (‘verb’) —repeated and rapid closure. Young children naturally use many means of pointing and characterizing. As a consequence, many signed utterances used by deaf toddlers have a strong gestural component.

When does an iconic gesture become a symbol? We examine this question with regard to several accomplishments in the early acquisition of SLN, looking at the development of pointing, characterizing, and designating. Our developmental research question is: “How do conventional signs (designations) emerge from a matrix of pointing and characterizing (depicting, enacting)?” In broad terms, the acquisition of SLN, like the acquisition of any language, demonstrates increasing levels of generalization and abstraction (as described, for example, by Tomasello, 2003). However, specific to signed languages, these processes are grounded in early uses of gesture.

4. The Development of Pointing in SLN

The children in our sample use the index-finger point in various ways, ranging from less to more sign-like. Figure 1 shows a scene in which a girl of age 2;4 is interacting in doll play with her hearing mother who has learned SLN. In the figure we see a fully outstretched arm and a clear point at the doll, with gaze at the doll. This is the culmination of an interaction in which the pointing gesture becomes precise. The child, code-named ELS, has had difficulty fitting her doll into a toy washtub. The mother places the doll in the bath and signs DOLL. ELS, while looking at the doll, first points at the doll with a lax hand and looks back at her mother. Then, to secure her mother’s attention, she performs the point shown in Figure 1, executed crisply with a clear direction and gaze at the doll. The two points share indexical properties; the difference lies in execution. The first, lax point could refer to the whole event or to a part of it. Her mother does not react;

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2 Longitudinal data were gathered from 30 deaf children in the age range 15–36 months (4 children with deaf parents and 26 with hearing parents). All of the children were exposed to signed communication, but half of the children with hearing parents (13/26) were exposed to a system of simultaneous speech and signing (Sign-Supported Dutch); the remainder received only SLN input. Data were gathered in the northern part of The Netherlands by Nini Hoiting.
then ELS provides a punctual indexical gesture near the doll’s face, looking at the
doll and then back to her mother, who affirms YES DOLL. The second way of
pointing is appropriate according to lexical, phonological, and pragmatic
conventions of SLN: (a) neatly directed toward an object, with accompanying
gaze, affirming that object as the conversational topic; (b) executed in accordance
with sign language prosody: quick, short, forward movement of the index; (c)
followed by a shift in gaze from the object to the interlocutor. Such sign-like
points are typical of 2-year-old communication, playing a conversational role in
turn-taking and the establishment and maintenance of direction. Even such an
apparently simple index as extending the hand toward an object can take on the
quality of sign language.

Deaf 2-year-olds are in the process of mastering the integration of gaze, gaze
shift, and direction and angle of pointing. Figures 2a and 2b show segments of a
long and complex interaction between JES, a girl of 2;8, and her Deaf mother,
who is off camera to the left. JES is upset with her 9-month-old baby brother,
sitting in a highchair off to her right. In these scenes she is accusing him of having
torn a paper crown from her head. She address a firm complaint to her mother. In Figure 2a we see JES with fixed gaze at her mother while pointing straight toward her brother. Her point is an index referring to her brother as the actor in this little drama, but her accusation is addressed to her mother. JES skillfully manipulates two directions of regard: a point at her brother and a gaze at her mother. She begins the point with a brief glance at the brother, immediately shifting her gaze to the mother while continuing to execute a series of sharp points at the brother. Such a rapid shift of gaze while maintaining the direction of pointing is an appropriate linguistic means of indicating reference while holding the floor for subsequent comment.

It is also important to note that the point shown in Figure 2a was embedded in a full utterance: BOY GRAB POINT SHAME. That is, JES is reporting that the boy over there grabbed her hat and he should be ashamed. By age 2;8 she is skillfully integrating point, gaze, and lexical items in a prosodically fluent construction.

In the next segment of the event, shown in Figure 2b, JES is holding the torn paper crown in her left hand and reiterating her accusation. Her gaze is fixed on her mother and she has added stress to her point by curving her wrist and performing very short, rhythmically repeated points directly at the baby. The indirect angle of the point and gaze at the addressee would probably be strange if performed by a hearing 2-year-old. However, this sort of angled point with diverted eye gaze is appropriate SLN usage. Both sorts of points demonstrated in Figure 2 represent a language-specific shaping of a basic indexical gesture.

5. Distancing and the Incorporation of Sign and Gesture into Utterances

In Hand and Mind, McNeill summarizes the important early work of Werner and Kaplan (1963) on the processes of symbol formation in child development. On the basis of study of early language development in several spoken languages, Werner and Kaplan proposed, in McNeill’s summary: “At an early stage of
development the signifier and signified have little distance between them” (McNeill, 1992, p. 298). McNeill discusses distancing with regard to the co-speech gestures of hearing children, where there is a distance between action and symbol. He concludes that children’s early gestures are, “burdened with characteristics that arise from their being actions but that are not needed for them to be symbols” (ibid.).

For the deaf child, by contrast, gestures have characteristics that can be used as symbols. One such characteristic is the literal physical distancing of a gesture/sign from its referent object or event. As a first example, consider the situation depicted in Figure 3. We have already encountered this child, JES, with regard to pointing gestures. In Figure 3 (still age 2;8) we see a pointing gesture again, but in this instance it is part of an interesting distancing scenario. JES has been drawing on a magic slate with her index finger and tells her mother (seated opposite) about what she has done. She traces a circle above the slate and then points at the slate—but without contact—and then, without a prosodic break, signs EASY (a 5-hand 5 brushed down the chin) while looking at her mother. The gesture of drawing has thus coalesced into a point which is a kind of distanced symbol. JES is pointing now at an event—the completed action of drawing a circle—which then becomes the topic of a comment, that is, a sort of predication in which EASY is predicated of the action on the slate, which is pointed to. JES’s point in Figure 3 is smoothly incorporated into an utterance (the equivalent of something like ‘That was easy’). It is, at one and the same time, a gesture, an index, and a budding linguistic symbol. In a signed language, elements of the physical space can be integrated into the linguistic space.

Figures 4a and 4b present two segments of a complex scene, again with JES at 2;8. As described above, she had been wearing a paper crown that she had made and was proud of. Her 9-month-old baby brother reached for it when JES came
close to his high-chair; when JES pulled away, the crown tore. Her rage knew no bounds. She repeatedly pointed at the baby (as we have seen in Figures 2a and 2b), telling her mother that he was NAUGHTY. In Figures 4a and 4b we see JES, with torn paper crown in hand, looking at her mother. She signs BREAK appropriately (rotating two fists outward) while holding onto the crown in her left hand. This is a conventional SLN sign, produced with no distancing from the referent object, which, in fact, forms an object-incorporated component of the sign.

Signing upon an object or with an object in hand is possible in adult SLN as well—a kind of compact indexing of a topic while commenting on it. JES can do more, however. In a later segment of the same dramatic event, the torn crown lies on the floor and JES, still angry, glares at her mother and repeats that her bad baby brother has broken her crown. Now she has both hands free, and first signs BOY and then BREAK—a nice topic/comment or subject/predicate construction. The same BREAK sign is now produced at a distance from its object—which now lies on the floor—showing that JES can produce the sign independently. Note, too that this is fully a symbol, probably making past time reference to the completed event. The two rotating fists of BREAK are a conventional lexical item in SLN. The sign in no way corresponds to the actual way in which the crown was broken. In fact, it tore off of JES’s head when the baby grasped at it. At the same time, the production of BREAK first with the object in hand, and later above the object, constitutes both an index and a symbol. JES is on the way toward producing complex linguistic constructions, smoothly incorporating reference to real world objects and events in the immediate environment. This is a necessary preparatory phase for later expanded distancing in the reporting of non-present events.

6. Iconic Enactment or SLN Sign?

In attempting to transcribe and analyze child signing, one is often faced with the dilemma of whether a production is an invented gesture or an attempt at a conventional sign. This problem does not arise in transcribing children’s speech.
When an English-speaking child, for example, describes an event by saying, “push,” we can be certain that this is a form of an English word and not a form invented by the child. And when an English-speaking or SLN-signing child acts out a pushing situation with full motor mimicry of the act, we can be sure that this is a sort of iconic enactment. But what about iconic enactments by deaf toddlers that include what look like conventional signs?

Consider the situation depicted in Figure 5. A girl of age 2;6 is looking at a book of family photographs with her (hearing) mother. They are discussing a picture in which the girl is seated in a baby buggy and is being pushed by her father. The child signs FATHER ME PUSH. There is no question that FATHER is a conventional sign: a laterally-placed index finger moves in an arc from the girl's forehead to her chin. And ME is clearly an index—but an index that takes on conventional form: the child points to the center of her chest with her index finger. It is the verb, or action depiction, that sharply raises the central question of this chapter: Is it a gesture or an SLN sign or something in between? It is produced by thrusting two laterally-placed fists in a pushing motion away from the body. This is, of course, depictive of an act of pushing. It is also depictive of a particular sort of pushing act, namely one in which the two hands grasp a horizontal bar that is parallel to the front of the body. It is thus both a gesture that acts out the pushing of a baby buggy and an SLN sign for pushing a horizontal bar-shaped entity forward. Has the girl happened upon an SLN sign by accident, or has she learned the sign from others?

Here, indeed, we face a situation that is unique to the acquisition of signed languages. English-speaking children don’t stumble upon phonological forms that happen to correspond to the correct words in context. Deaf children thus seem to have a way into their language that deserves more careful psycholinguistic attention. We have made this point earlier with regard to deaf children’s acquisition of classifier constructions—that is, the incorporation of depictive and manipulative handshapes into polycomponential verbs such as PUSH (which
really means, in this instance, something like ‘move a horizontal bar forward by grasping it with two hands’): 

Transient innovations may be close enough to a conventional ‘classifier’ to pass unnoticed, or to be easily shaped into the conventional form. The capacity to represent objects and their movements/locations by means of arm and hand is given from the start. The deaf child, therefore, follows a special developmental path, in that normal gesture can be ‘seamlessly’ incorporated into the flow of signing. As a consequence, the deaf child—in contrast to the hearing child—has the task of ‘paring down’ the gesture system to those elements that are conventionalized in the exposure language. (Slobin, Hoiting et al., 2003: 277)

Gesture/signs like the form shown in Figure 5 can be characterized as SLN lexical items when they begin to fit into systematic sets of contrasts. For example, two flat hands with palms extended away from the body might be used to refer to pushing a box; or the two-fist configuration of Figure 5 might also move toward the body to designate an act of pulling a baby buggy. And so forth. As a system emerges it becomes possible to describe the child’s signing in a set of paradigmatic contrasts, including number of hands, handshapes, orientation, direction and type of movement, and so forth. The heart of SLN—like all signed languages that have been described in detail—lies in the construction and use of such polycomponential verbs (see, e.g., Engberg-Pedersen, 1993; Slobin, Hoiting et al., 2003). Deaf toddlers, we propose, are already at work in beginning to produce such constructions, drawing upon their own motor productions and imaginations, along with the linguistic forms of the sign language that they are exposed to.

7. The Developmental Path into Sign Language

In this brief presentation we have made several developmental claims, emphasizing both a gestural way into the acquisition of a sign language and the continuing task of adjusting gesture to language-specific conventions. The claims can be summarized in five points:

• From early on in the development of SLN, pointing is performed “in a sign language way.”
• Linguistic signs only gradually become distanced from their referents.
• Pointing and characterizing acts are smoothly incorporated into syntactic constructions.
• What appear to be conventional signs of SLN often begin as characterizations—both enactments and depictions.
• With further development, points and gestures will be modified to adhere to SLN conventions of form, eventually fitting into systematic sets of linguistic contrasts.
In sum, the transition from gesture to sign, from iconic enactment to conventional symbols, is gradual. There is no clear line at which one can say: now, and only now, has the child begun to use an established sign language.

Both deaf and hearing infants exploit their bodily resources in early communicative gestures, while acquiring conventional language forms. However, sign-acquiring children seem to explore the components and possibilities of gesture over a longer developmental period than do hearing children acquiring a spoken language. As a consequence, there may well be different developmental timetables and patterns for the acquisition of morphosyntax, depending on the modality of the language. These considerations require a renewed focus on definitions of ‘linguistic’, ‘extralinguistic’, and ‘nonlinguistic’ components of communication.

8. The Gesture-to-Sign Continuum and the Boundaries of Language

In conclusion, attention to the gesture-to-sign continuum in child signing raises questions for the limits of linguistic analysis of both signed and spoken languages. Increasingly, current work on signed languages using the tools of cognitive grammar and mental space theory make it clear that gesture and sign interpenetrate each other (e.g., Dudis, 2004a, 2004b; Liddell, 2003; Taub, 2001). Scott Liddell (2003: 362) has recently taken issue with, “the predominant views of what constitutes language.” He concludes that although signed languages might be organized in different fashion from spoken languages:

It is much more likely that spoken and signed languages both make use of multiple types of semiotic elements in the language signal, but that our understanding of what constitutes language has been much too narrow.

An examination of signing toddlers illuminates the emergence of conventional language from gestural indices and icons. As more detailed attention is paid to the use of vocal indices and icons, we expect that the traditional borders between ‘linguistic’ and ‘extralinguistic’ will also prove to be permeable. David McNeill has pointed the way for a long time, and it is fitting to end this chapter by citing his vision:

[A] true psychology of language requires us to broaden our concept of language to include what seems, in the traditional linguistic view, the opposite of language—the imagistic, instantaneous, nonsegmented, and holistic. Images and speech are equal and simultaneously present processes in the mind. (McNeill, 1992: 2)

References


