

## **Indicating Participants in Actions: From Prelinguistic Gestures to Signed Languages**

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### **0. Introduction**

In signed languages, verb agreement morphology consists of movement, displacement, or orientation of the hands in space to indicate agents, patients, recipients, sources, goals, or locations. Using evidence from prelinguistic gestures and verb agreement morphology produced by deaf children acquiring American Sign Language (ASL), I will argue that directional movement of the hands resembling verb agreement is not unique to signed languages but rather a basic gestural device for indicating participants in actions that has been incorporated and grammaticized into signed languages. Furthermore, I will suggest that grammaticization of directional movement began with its indexical use with present referents and was extended to absent referents.

### **1. Background: ASL verb directionality**

“Directionality” is defined as the use of movement, spatial displacement, and/or palm orientation in the production of a manual action gesture or sign to indicate an additional participant involved in the action. The term “participant” is used here to refer to an agent, patient, recipient, source, goal, or location. Verbs in ASL can show agreement with participants assuming these semantic roles through directionality (Fischer and Gough 1980; Padden 1988, 1990; Supalla 1982:59).<sup>1</sup> If participants are present in the immediate environment, the verb will show directionality with respect to the actual locations of the participants. If participants are absent from the immediate environment, places in space (called loci) can be established for reference to these participants (Friedman 1975:946). For example, if Sandy and Lee are not present, a locus for Sandy can be established on the

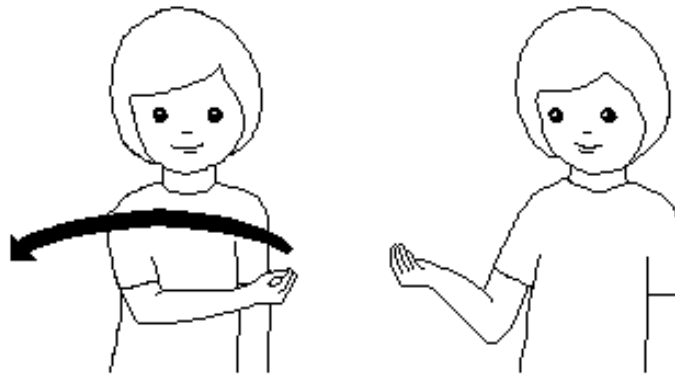
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<sup>1</sup>Agreement in ASL is often described in terms of grammatical relations (e.g. subjects and objects). Semantic roles are used here (following the terminology of Goldin-Meadow and Mylander (1984) with the substitution of “agent” for their “actor”), because this study involves both signs and gestures. I do not want to imply that gestural productions are sentence-like through the use of grammatical relations.

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signer's left and a locus for Lee can be established on the signer's right. To say that Sandy gives something to Lee, the sign GIVE moves from Sandy's locus (the agent) to Lee's locus (the recipient). See (1) below.

(1) SANDY-GIVE-LEE



An **index** refers to an object through a physical connection with that object and depends on the presence of the object for its interpretation (Peirce 1960, vol. 1:195-196, vol. 2:170). Thus, the indication of a participant present in the environment by movement or spatial displacement of a verb in ASL can be said to be indexical, because there is a physical connection between the spatial placement of the sign and the referent.

## 2. Current study

### 2.1. Method

Five deaf children acquiring ASL from their deaf parents were studied longitudinally between the ages of 0;08-2;11 (years;months). The data consisted of 37 videotaped free play and structured sessions with a range of 4-14 sessions for each child. The children's spontaneous action gestures and signs were analyzed for the use of directionality to indicate additional participants.<sup>2</sup> A reliability check between two coders (one of whom is a native Deaf signer) on a portion of the data showed 97.68% agreement on whether a production contained directionality.

Whether an action production was coded as a gesture or sign was determined by the following criteria in the order listed, from most to least important:

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<sup>2</sup> The coding system used for these data was adapted mainly from that of Goldin-Meadow et al. (1995), including features from Liddell and Johnson (1989), Meier (1982), and T. Supalla (1982).

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1. form: What was the handshape, place of articulation, orientation, and movement of the production? Did the production resemble an ASL sign or a commonly occurring gesture, e.g. open handed 'give' or raised arms 'pick (me) up'? When examining the form of a production, Siedlecki and Bonvillian's (1993) finding that handshapes are the least accurate component of ASL signs produced by children aged 0;05-1;06 was taken into consideration.
2. semantic context: If the production looked like an ASL sign, did that meaning fit the context? If the production looked like a common gesture, did that meaning fit the context?
3. linguistic context: If the production followed an adult's utterance, it may have been an imitation of something the adult signed, and therefore a sign. If it was part of an utterance containing other signs, it may also have been a sign.
4. child's age: If the above criteria could not determine whether a production was a gesture or sign, the child's age was taken into consideration. Productions that could be clearly categorized indicated that children under age 1;11 produced more gestures than signs to refer to actions, whereas children aged 1;11 or above produced more signs.
5. native signer intuition: Productions that were still unclassifiable were shown to a native signer. If the signer could confidently determine whether a production was a gesture or sign, that judgment was coded.

A reliability check between the same two coders showed 98.98% agreement on whether a production was a gesture or sign. Although this agreement percentage is high, of the 521 gestures coded, 78% were 'give' and 'pick (me) up', which were often clearly gestures.

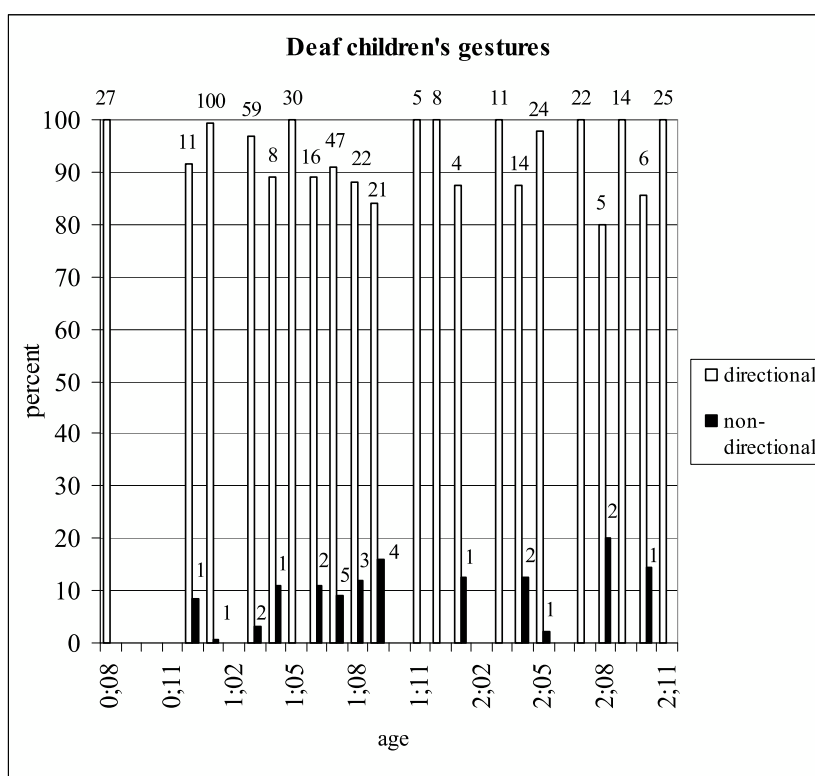
## **2.2. Directionality**

### **2.2.1. Gestures: Directional versus non-directional productions**

Deaf children were found to produce gestures containing directionality to indicate additional participants. Their spontaneous gestures were analyzed for the percentage of directional versus non-directional forms produced at each age. An example of a directional gesture is an open palm 'give' held out near a toy (the patient) to mean 'give toy'. In contrast, a non-directional gesture is an open palm 'give' that is not held near any participant. The use of directionality in gestures was productive in that the same gesture form could be used to indicate participants in various semantic roles. For example, Maggie (1;01) produced a 'give' gesture displaced near the agent ('you give') immediately followed by the same 'give' gesture displaced near the patient, i.e. a pile of toys ('give toys'), when the first gesture was not understood by the agent.

As shown in (2) below, most gesture productions were directional. A non-parametric rank F test for repeated measures<sup>3</sup> found the production of directional gestures (mean = 95%, mean rank = 12.32) to be significantly greater than that of non-directional gestures (mean = 5%, mean rank = 4.44):  $F_R(1,42) = 89.12, p < .0001$ .

(2) *Percentage of spontaneous directional versus non-directional gestures:*  
The numbers above the bars indicate the total productions at that age.



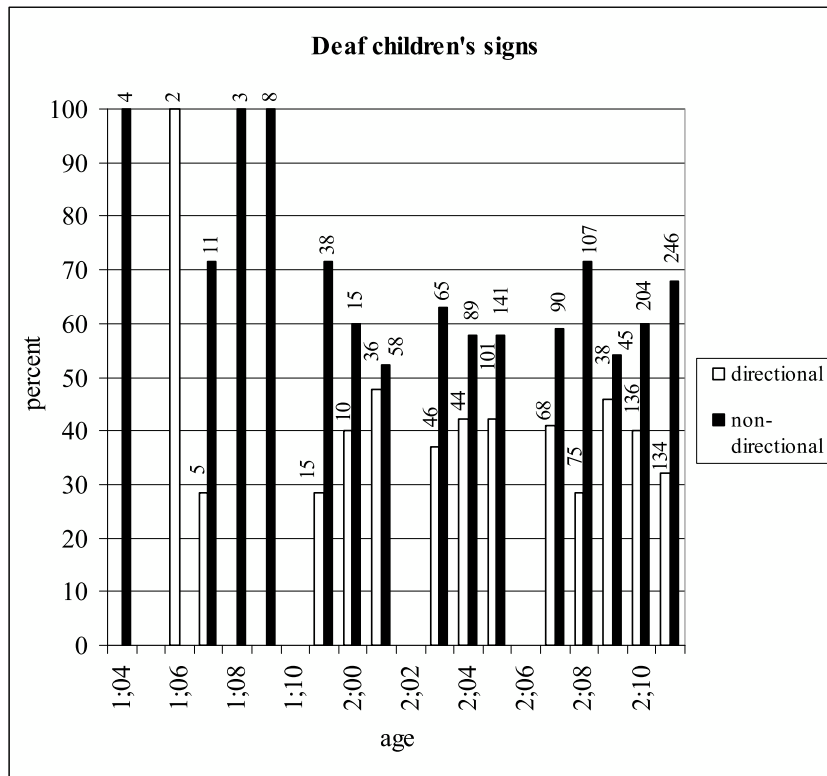
**2.2.2. Signs: Directional versus non-directional productions**

Deaf children’s production of spontaneous ASL verb signs were analyzed for the presence of directionality at each age. For this analysis, ASL verbs that cannot occur with directionality and those produced with directional errors were excluded.

<sup>3</sup> A repeated measures ANOVA was not used because a modified Levene test found that the error terms did not have constant variance.

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- (3) *Percentage of spontaneous directional versus non-directional signs:*  
The numbers above the bars indicate the total productions at that age.



As shown in (3) above,<sup>4</sup> verb signs were more often non-directional than directional. However, at most ages, at least 28% of signs were directional. The greater production of non-directional verb signs contrasts with the greater production of directional gestures. A nonparametric rank F test with repeated measures (cf. fn. 3) found the production of directional gestures (mean = 95%, ranked mean = 11.32) to be significantly greater than the production of directional signs (mean = 35%, ranked mean = 5.10):  $F_R(1,37) = 62.01, p < .0001$ .

This difference in the production of directionality with gestures versus signs may be accounted for by hypotheses concerning the late acquisition of ASL verb agreement morphology (Lillo-Martin 1991; Newport and Meier 1985). Children produced errors related to each of the following hypotheses proposed to account for this late acquisition of verb agreement morphology:

<sup>4</sup> These children did not produce any signs meeting the criteria for this analysis before age 1;04.

1. Not all verbs can occur with agreement (Lillo-Martin 1991:162; Newport and Meier 1985:931-932). Maggie (2;03) signed SLEEP toward a picture of sleeping dogs, however SLEEP cannot show agreement (for similar examples see Bellugi 1988:166-167; Fischer 1973).
2. Verbs differ with respect to the endpoint at which an argument can occur, e.g. some verbs move from the agent to the patient (HELP), whereas others move from the patient to the agent (HIRE) (Lillo-Martin 1991:162). To describe something falling on someone's head, Ben (2;04) signed FALL (with bent 5 classifier handshapes) starting on his head (the goal) and moving off. The movement of FALL should terminate at the goal, not originate at it.
3. Verbs differ in how many arguments they can agree with, i.e. some can agree with two arguments (GIVE), whereas others can only agree with one (WANT) (Lillo-Martin 1991:162). Patty (2;07) signed WANT moving from herself (the agent) toward a piece of paper (the patient) to say that she wanted the paper. WANT can be displaced near an agent (I-WANT) or patient (WANT-PAPER), but cannot traverse space to show agreement with two arguments in the same production (\*I-WANT-PAPER).
4. Verbs differ in the type of semantic roles with which they can agree, e.g. some verbs agree with agents and patients (HELP), whereas others agree with agents and recipients (GIVE) (Lillo-Martin 1991:162). Corinne (2;01) produced the sign FALL starting at her chin and moving off to mean 'fall on chin'. FALL can agree with the source and/or goal of the falling movement, but not with a body part of the intransitive agent (for similar examples see Fischer 1973; Meier 1982:122).
5. The spatial framework can shift (Lillo-Martin 1991:162). For example, a signer can take on the role of a third person by shifting the shoulders toward that referent's locus (Friedman 1975:950). In her description of a story involving a girl and a boy painting each other's faces, Maggie (2;11) ungrammatically used opposite sides of her face to stand for the girl and boy instead of moving her body to take on their roles. She signed PAINT (with an A classifier handshape) on the right side of her face to describe the girl being painted, and on the left side of her face to describe the boy being painted (for similar examples see van Hoek et al. 1987:118-120).
6. The production of pronoun or agreement reversal errors, e.g. use of the sign YOU to mean 'me'. Corinne (2;01) produced GIVE-YOU directed toward her mother to mean 'give me' when she was talking about her father giving her something, i.e. directionality with 'you' to mean 'me'.

Based on evidence from these directionality errors, I hypothesize that children produce less directionality with signs than with gestures because any type of directionality can be used with gestures, whereas directionality with signs is restricted by properties associated with specific ASL verbs. Thus, children may

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opt to use non-directional forms more often due to constraints on the correct usage of directionality in ASL and their incomplete acquisition of these constraints.

The production of reversal errors has been found during the acquisition of pronouns in spoken languages (Charney 1980; Chait 1982; Clark 1978), and Petitto (1986) found pronoun reversal errors during the acquisition of ASL by deaf children between the ages of 1;09-1;11. The agreement reversal errors in the present study are particularly interesting in that this type of error was found in signs but not gestures. For example, the deaf children were not found to move 'give' gestures from a toy to the addressee (i.e. a gesture that seems to express the meaning 'give you toy') to mean 'give me toy'. The occurrence of reversal errors in signs, but not gestures, suggests that directionality has been grammaticized in ASL. If directionality in signed languages is like gestural pointing and contains no grammatical person distinctions, as claimed by Liddell (1995:26-27; 2000:315), the occurrence of reversal errors would not be expected in sign because they are not found in gesture. Gestural pointing is directed toward something to which someone intends to refer, whereas pronoun and agreement reversals are directed toward someone to whom the signer does not intend to refer. I suggest reversal errors occur because children have not learned grammaticized person distinctions in ASL, and that these errors are caused by conflicts between the primarily indexical use of directionality in gesture versus the grammatically constrained use of directionality in ASL.

### **3. Production of directionality when referents are present versus absent**

If referents are present in the immediate environment, children may be more likely to use directionality than if referents are absent, because present referents can be indicated indexically through directionality with the actual referent. On the other hand, to indicate absent referents, directionality must be produced with respect to one of the following:

1. the actual location of the object, but neither the object nor the location is visible: Maggie (1;07) produced a 'give' gesture displaced in the direction of a room that could not be seen to request that someone give her a blanket that was in the room.
2. a similar present object (Butcher et al. 1991:329): Ben (2;08) produced the sign POUR toward his own head while describing a story in which a girl and a boy poured water on each other's heads.
3. a habitual or previous location of the object (Butcher et al. 1991:329): Corinne (2;05) produced a 'give' gesture near a place that her sister had been sitting to mean that her sister would give her something.
4. a classifier or classifier-like use of a handshape to represent the spatial relationship between two entities: Maggie (2;11) produced the sign CLEAN with one hand and a classifier (bent 5 handshape) with the other hand representing holding a turnip to mean 'clean turnip'.

5. an arbitrary area in space (Butcher et al. 1991:329): Corinne (2;05) produced the sign LOOK-AT moving upward to the same area in space that she had previously used to comment on balloons to mean 'look at balloons'.

### 3.1. Gestures: Directionality with present versus absent referents

When the referent was present, children produced an average of 95% of gesture endpoints with directionality, whereas when the referent was absent, they produced an average of 56% with directionality. However, a nonparametric rank F test with repeated measures (cf. fn. 3) did not find a significant difference between the production of directionality with present (mean rank = 4.87) versus absent (mean rank = 4.17) referents:  $F_R(1,11) = .0109, p = .9186$ .

The reason that a significant difference could not be found may be due to the small number of gestures produced with absent referents. Only three children produced gestures to indicate absent referents. Out of a total of 495 gesture endpoints, only 7 were produced when the referent was absent, 5 of which were directional. The two children who produced directional gestures with absent referents produced directional gestures with present referents at earlier ages.

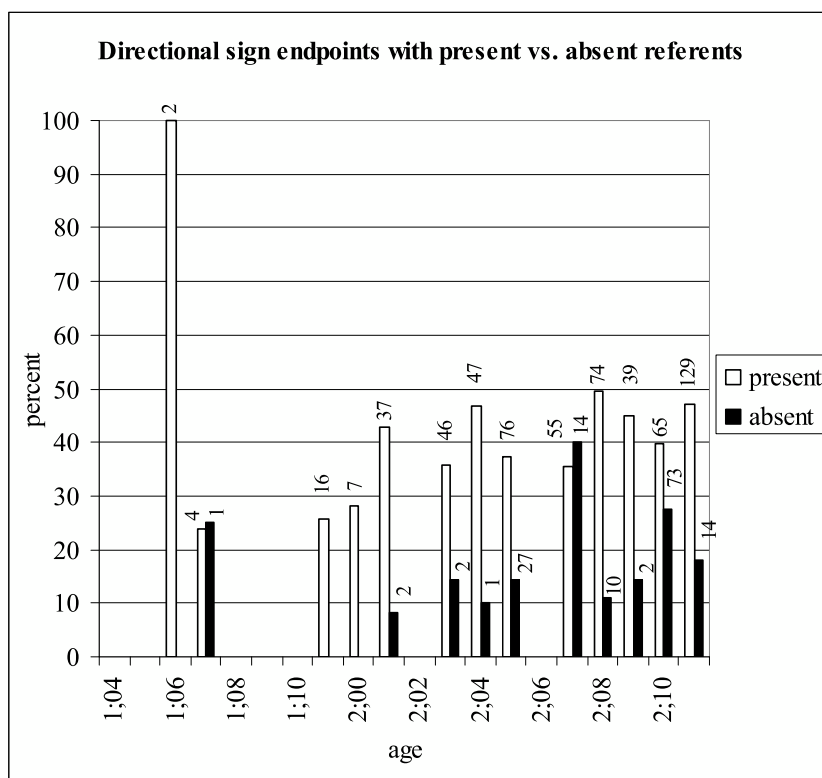
### 3.2. Signs: Directionality with present versus absent referents

As shown in (4) below, children produced an overall higher percentage of directional sign endpoints when the referent was present than when it was absent. For this analysis, verbs that cannot occur with directionality and those containing the types of directional errors discussed in section 2.2.2 above were excluded. A nonparametric rank F test with repeated measures (cf. fn. 3) found that the production of directionality when referents were present (mean = 38%, ranked mean = 9.36) was significantly greater than the production of directionality when referents were absent (mean = 16%, ranked mean = 5.45):  $F_R(1,27) = 15.98, p = .0004$ .

Four of the five children produced directional signs to indicate absent referents. Three of these children produced directional signs to indicate present referents at earlier sessions than their first production of directional signs to indicate absent referents. The fourth child produced her first directional signs to indicate present and absent referents at the same age, i.e. 1;07. These findings suggest that it may be easier for children to direct signs toward physically present referents than to direct signs toward something standing for an absent referent.

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- (4) *Percentage of directional sign endpoints with present versus absent referents: The numbers above the bars indicate the total productions at that age.*



**4. Similarities and differences in directionality with gestures and signs**

Directionality is similar in gestures and signs in that it is used for the same purpose and it is productive. Directionality is used in both gestures and signs to indicate additional participants involved in an action. In gestures, directionality is productive in that the same gesture form can be used with directionality to indicate various semantic roles. Productivity in signs is indicated by children's directionality errors, e.g. the use of directionality with ASL signs that cannot occur with directionality, and the use of directionality to indicate semantic roles with which particular verbs cannot agree. Another similarity between gestures and signs is that some directionality errors in ASL signs resemble directionality use in gestures. For example, Maggie (1;11) produced the sign GIVE held stationary near some stickers (the patient) to mean 'give stickers'. The sign GIVE can traverse space between an agent and a recipient or a patient and a recipient, but it

cannot be held stationary in space. On the other hand, 87-95% (varying by child) of 'give' gestures were stationary and displaced near a participant, and 57-89% of 'give' gestures were stationary and displaced near the patient in particular. Thus, this directionality error of a GIVE sign held near a patient resembles the most common form of directionality with 'give' gestures.

Directionality differences in gestures and signs include a greater use of directionality with gestures compared to signs and a lack of reversal errors in gestures. Furthermore, there is a difference in the age at which directionality was produced with gestures versus signs. The production of directionality in gestures was found at younger ages than in signs for four of the children. The fifth child was found to produce directionality in both gestures and signs in her first session (1;07), but this child was the oldest at her first session.

Directionality use with present referents is greater and earlier in both gestures and signs. The production of directionality was greater with present, as opposed to absent referents, although this difference was found to be statistically significant only for signs. With one exception, children who used directionality to indicate present and absent referents, produced directionality with present referents at a younger age than with absent referents in both gestures and signs.

The similarities in directionality use with gestures and signs, together with the fact that directionality occurs earlier in gestures, suggest that directionality use during sign acquisition is based on its earlier use in gesture. Furthermore, the finding that directionality with present referents is produced earlier and more often suggests that indexical indication of referents is easier for children than indication of a referent that is absent from the immediate environment.

## **5. Conclusion**

Based on similarities in directionality use with gestures and signs, I propose that directionality is a basic gestural phenomenon. Similarities in form, purpose, and productivity suggest that directionality in gestures and signs is related. Thus, directionality may have gestural origins not only in the acquisition of signed languages but also in their historical development. However, the occurrence of directional reversal errors in signs implies that directionality has been grammaticized in signed languages and is no longer purely gestural.

The production of directionality with present versus absent referents also has implications for the origins of signed languages. Children's greater production of directionality when referents are present and their earlier use of directionality with present referents suggest that they had difficulty indicating absent referents through directionality. Similarly, in her study of the emergence of Nicaraguan Sign Language, Senghas (1995:149) found that some older, less-skilled signers brought outsiders into a conversation to represent absent referents, because they had trouble using directionality with abstract places in space. These findings indicate that the grammaticization of directionality during the development of signed languages began with indexical indication of referents present in the environment and was later extended to absent referents.

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