

# When Mothers Do Not Lead Their Children by the Hand

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## 1. Introduction

A communicative act is typically composed of a blend of verbal and non-verbal ways of conveying information. When faced with the need to convey an idea, tell a story, or explain a particular phenomenon, speakers not only produce streams of sounds but they also combine this verbal output with a variety of spontaneous hand gestures. The production of gesture is very much like the production of language in the sense that both are unconscious and automatic. However, unlike language, gestures do not form a codified system; they are idiosyncratic and formed at the moment of speaking (McNeill, 1992). This gives gesture the possibility of taking on forms and meanings that speech cannot accommodate. Gesture allows speakers to convey thoughts that are not easily expressed using the categorical structures of language (Goldin-Meadow, 2003; Goldin-Meadow & McNeill, 1999; McNeill, 1992). At the same time, in adult communications, gesture and speech form an integrated whole both temporally and semantically in spite of the fact that each modality represents meaning in different ways (McNeill, 1992). Children achieve the temporal and semantic integration between their gesture and speech relatively early in their development (Butcher & Goldin-Meadow, 2000).

### 1.1. Development of gesture and speech as an integrated system

Children initially produce gestures without speech (Bates, 1976; Bates, Benigni, Bretherton, Camanioni, & Volterra, 1979; Goldin-Meadow & Butcher, 2003). This phase corresponds to a time period where children have both the desire and the ability to communicate, but do not have any language to do so (Bates, 1976). Children begin to produce their first gestures around 10 months. These early gestures are primarily *deictic* (e.g., pointing at a toy train or holding up a doll to bring the object to the adult's attention); their meanings

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\* We thank Jana Iverson for her input in the gesture coding, Kristi Schoendube for her administrative help, and the project research assistants, Karyn Brasky, Kristin Duboc, Molly Nikolas, Jana Oberholt, Lillia Rissman, Becky Seibel, and Julie Wallman for their diligent work in the collection and transcription of the data. The research presented in this paper is supported by a grant from NIH (PO1 HD406-05) to Susan Goldin-Meadow.

are entirely dependent on the context within which they are produced and are not conveyed by the form of the gesture (Goldin-Meadow, 1998). At these early ages, children also use another type of gesture, *iconics*. These gestures are more abstract than *deictics* in the sense that their meaning is not dependent on the context in which they are produced, but rather is conveyed by the form of the gesture which captures the features of its intended referent (e.g., flapping hands with the arms out to represent BIRD, holding hands formed as circles in front of the eyes as BINOCULARS) (Acredolo & Goodwyn, 1985, 1989, 1998; Iverson, Capirci, Longobardi, & Caselli, 1999). *Iconic* gestures are less frequent than *deictic* gestures in children's early productions (Iverson et al., 1999).

The temporal and semantic coordination of speech and gesture develops around 14- to 22-months of age (Butcher & Goldin-Meadow, 2000). In children's early gesture-speech combinations, gesture typically conveys the same information as the speech it accompanies. That is, gesture primarily performs a complementary referential function where, for instance, the child points at a cookie and says, "cookie" (Goldin-Meadow & Butcher, 2003). As the child grows older, the semantic relation between speech and gesture becomes more complex so that the information conveyed in speech need not be identical to the information conveyed in gesture. For example, later in the one-word stage, a child may say *daddy* while pointing at her father's chair, combining gesture and speech into a proposition, *the chair is daddy's* or *daddy is in the chair* (Goldin-Meadow & Butcher, 2003). Thus, by combining gesture and speech, the child can communicate a more complex idea than would be possible in a single word alone. At this age, gesture serves as a tool for children to convey information when they do not yet have the linguistic skill to convey that information in speech (Goldin-Meadow, 2003). In their longitudinal analysis of 6 children from 12 to 27.5 months, Goldin-Meadow and Butcher (2003) found that the onset of a particular kind of gesture-speech combination—where gesture and speech convey different components of a single proposition—predicts with great precision the onset of the child's ability to express those components in a single spoken utterance. The relation between gesture and speech thus predicts the onset of two-word speech.

What might underlie this phenomenon? One possibility is that the changes in children's gesture-speech combinations reflect internal development, namely cognitive and communicative growth within the child. An equally plausible alternative, however, is that the changes in the child's gesture system reflect parallel changes in the child's external environment—that is, increasingly sophisticated use of gesture by the child's parents.

## 1.2. Do changes in children's early gestures relate to changes in their caregivers' gestures?

Research on the nature of children's communicative input in the early stages of language development has focused almost exclusively on speech

(e.g., Hart & Risley, 1995; Snow, 1995; Snow & Ferguson, 1977). The overarching result across a variety of studies is that adults modify their speech when they interact with their young children. Mothers use shorter phrases with relatively simple words, talk more slowly, and use more variable patterns of intonation with children. In contrast, there is relatively little known about the nonverbal aspects of adults' communications with young children (but see Bekken, 1989; Iverson, Capirci, Longobardi, & Caselli, 1999; Shatz, 1982). Bekken (1989) examined how maternal speech and gesture vary as a function of communicative partner by comparing mother's gestures with her 18-month-old daughter to her gestures with an adult. She found that mothers gestured less frequently and used conceptually simpler gestures (i.e., more *deictic* gestures indicating concrete referents) when they addressed their children than when they addressed the adult. These results hint at a *motherese* in gesture comparable to *motherese* in speech. Iverson and her colleagues (1999) extended these findings by analyzing maternal gestures at two age points (when the child was 16 and 20 months) in Italian-speaking mother-child dyads. They found that Italian mothers often produced *deictic* and *conventional* gestures but produced few *iconic* gestures when interacting with their young children. These studies suggest that caregivers modify not only their speech but also their gestures to accommodate the communicative needs of their children.

The question remains whether there is a link between the gestures that parents produce and the gestures that their children produce. A strong relation has been found between certain aspects of maternal speech and child speech (e.g., Hampson & Nelson, 1993; Huttenlocher, Haight, Bryk, Seltzer, & Lyons, 1991). Can similar relations be found between maternal gesture and child gesture? To begin to address this question, we examined the gestures that a relatively large sample (N=40) of children and their parents produced when interacting in a natural setting at home. The dyads were observed at two time periods during the early stages of language learning (when the children were 14 and 18 months). We ask, first, whether there are changes in the children's gestures during this time period. If so, we ask whether those changes can be traced back to changes in their parents' gestures. If they cannot, it becomes more likely that whatever changes we find in the children's gestures reflect changes in the cognitive/communicative skills within the children themselves.

## 2. Sample

The sample included 40 English-speaking child-caregiver dyads living in Chicago, and was representative of the population distribution of the broader Chicago area in terms of both ethnic composition and income distribution (see Table 1). All child participants were exposed only to English as their native language from birth, and were being raised as monolingual English speakers. Of the 40 children, 21 were females and 19 were males. The mother was the

primary caregiver in 35 of the 40 families; the father was primary caregiver in 2 families, and both parents shared the caregiver role in another 3 families.

**Table 1: Sample distribution by ethnicity and income**

Ethnicity Income	AA	Asian	Caucasian	Hispanic	Mixed	Total
Less than \$15,000	1	0	1	0	0	2
\$15,000-\$34,999	2	1	2	2	1	8
\$35,000-\$49,999	2	0	3	0	1	6
\$50,000-\$74,999	2	1	6	0	0	9
\$75,000-\$99,999	2	0	5	1	0	8
\$100,000 or more	2	0	7	0	1	9
Total	8	2	24	3	3	40

AA: African American, Mixed: two or more ethnicities.

### 3. Procedure

#### 3.1. Data collection

Data collection involved naturalistic observations of spontaneous interaction between child and caregiver in their homes by a female experimenter. Two video recorded observations were made for each dyad, one when the child was 14 months of age and the other at 18 months. Each session lasted approximately 90 minutes, and caregivers were told to interact with their children as they normally would and ignore the presence of the experimenter. The sessions typically involved free play with toys, book reading, and a meal or snack time, but varied according to the preferences of the caregivers. The families were paid for their participation in the study.

#### 3.2. Data analysis

All communicative gestures and meaningful sounds (i.e., sound patterns used reliably to refer to specific referents, events) in the videorecorded interactions were transcribed for both caregiver and child. Transcripts were divided into utterances, following the guidelines outlined in Huttenlocher and Smiley (1987). An utterance is defined as any sequence of words and/or gestures that is preceded and followed by a pause, a change in conversational turn, or a change in intonational pattern. The utterances were further divided into three categories: *gesture only* (utterances in which gestures were produced without speech, e.g., pointing at a dog); *speech only* (utterances in which speech was produced without gesture, e.g., "dog"); or *gesture+speech combinations* (utterances in which a gesture was produced along with speech, e.g., pointing at a dog while saying "dog").



**Analysis of speech.** Utterances that contained speech were coded for complexity and were assigned to one of three categories: (1) *Simple clauses* are speech strings containing a single verb (e.g., *look, come up, give me the ball*). (2) *Complex clauses* are speech strings containing two or more verbs (e.g., *let me wipe your face, sit down and play with your toys, hear the birds chirping on the trees*). (3) *Non-clausal utterances* are speech strings that lack verbs; these included nouns and noun phrases (e.g., *cookie, the doggie, nice baby*), particles and prepositional phrases (e.g., *up, down, over there, on the table*), fillers (e.g., *yeah, no, bye bye, hello*) and various evaluative and onomatopoeic sounds (e.g., *wow, oopsie, uh-oh, peek-a-boo, meow, oink oink, choo choo*).

**Analysis of gesture.** Each gesture was classified according to *type* into one of three categories: (1) *Conventional gestures* are gestures that have conventional meanings associated with conventional gesture forms (e.g., nodding the head to mean *yes*, turning and raising the palms upward to mean *I don't know*). (2) *Deictic gestures* are gestures that indicate concrete objects or locations in order to refer to those objects/locations (e.g., pointing to a dog to indicate *dog*, pointing downward to indicate *down*, holding up a bottle to indicate *bottle*). (3) *Representational gestures* are gestures that depict attributes or actions of concrete or abstract referents via hand or body movements (e.g., holding a fist-shaped hand next to the ear for *telephone*, moving the index finger in circles to convey a ball's *rolling*).

**Analysis of gesture-speech relation.** All utterances containing both speech and gesture were coded for the informational contribution of the gestured part of the utterance to the spoken part of the utterance into one of three categories: (1) *Reinforcing* relation occurs when gesture conveys the same information as conveyed by speech (e.g., pointing at a dog while saying "dog," shaking the head sideways while saying "no", holding hands formed as a fist by the ear while saying "telephone"). (2) *Disambiguating* relation occurs when gesture clarifies information conveyed in speech (e.g., pointing to the table while saying "there", pointing at a doll while saying "that one"). Disambiguating gestures are typically used to clarify pronominal (e.g., *he, she*), demonstrative (e.g., *this, that*) or deictic (e.g., *here, there*) references in speech. (3) *Elaborating* relation occurs when gesture adds further information to the message conveyed in speech (e.g., pointing at father's car while saying "daddy" to convey the car is daddy's, holding up an empty milk bottle while saying "all gone" to convey that the milk is all gone).

## 4. Results

### 4.1. Speech

Children showed considerable growth in vocabulary size and speech production across the two observations. As can be seen in Table 2, at 14-

months, children produced an average of 10 different words, with a range of 0 to 36 word types across individual children. The size of children's vocabulary tripled by 18-months, reaching an average of 33 word types (range 3 to 83). Children's average speech production increased as well, from a mean number of 38 spoken utterances at 14-months to 150 utterances at 18-months. Most of the children were already producing one-word speech at 14-months (35/40), and more than half of the children were producing two-word combinations by 18-months (23/40).

**Table 2. Summary of children's speech utterances**

	14-months	18-months
Mean # of word types	10	33
Mean # speech utterances	38	150
# subjects with one-word speech	35/40 (88%)	40/40 (100%)
# subjects with two-word speech	9/40 (23%)	23/40 (58%)

At both time periods, children's speech mainly consisted of nouns (e.g., *mommy, doggie*), fillers (e.g., *yeah, bye, thank you*), and various evaluative and onomatopoeic sounds (e.g., *oopsie! uh-oh! meow, ruff ruff, choo choo*). Clausal constructions were rare, but were slightly more frequent at 18-months than at 14-months. Nonetheless, as can be seen in Table 3, the children's overall use of clausal constructions was quite low at both time periods. Moreover, the few clausal constructions that the children did produce were simple, typically involving single verbs (e.g., *look, go, hop*) or verbs with single arguments (e.g., *I want, daddy go, roll it*).

The caregivers, on the other hand, remained relatively stable in their speech production across the two observations, with a mean number of 903 and 969 speech utterances at 14- and 18-months, respectively. As can be seen in Table 3, the majority of caregivers' speech included simple clauses (53%) and non-clausal constructions (42%), both of which were used at comparable rates at the 14- and the 18-month time periods. Complex clauses were rarely used by the caregivers. At both time periods, only 6% of the caregivers' speech involved complex clauses, and most of these occurred while the parents were reading books to their children.

**Table 3: Types of speech utterances produced by caregivers and their children**

	Caregiver		Child	
	14 month	18 month	14 month	18 month
Non-clausal	41%	42%	98%	94%
Simple clause	53%	52%	2%	6%
Complex clause	6%	6%	0%	0%
Total	100%	100%	100%	100%

The results of the speech analysis clearly show that children undergo considerable changes in their speech production from 14- to 18-months, whereas their caregivers' speech remains essentially unchanged. However, it is possible that there is some other source of variation in the caregivers' input besides speech. Caregivers may use the same speech at 14- and 18-months, but they may vary the amount and types of gesture they add to that speech. The next section addresses this possibility.

#### 4.2. Gesture

One way to assess variation in the amount of gesture production at the two time periods is to look at the distribution of utterance types and determine whether there is a change in the percentage of utterances containing gesture. Surprisingly, 90% of caregiver utterances contained no gesture at all (see Figure 1). *Only gesture* utterances were extremely rare, constituting about 1% of the communications addressed to children. But utterances containing both gesture and speech were also infrequent, constituting less than 10% of caregiver utterances. These patterns remained unchanged from 14- to 18-months.

In contrast to their caregivers, the children used gesture frequently; 72% of their communications contained gesture at 14-months, as did 45% at 18-months. Again, unlike the caregivers' gestures, the children's gestures changed during this period. As seen in Figure 1, children's *only gesture* utterances decreased from 66% at 14-months to 33% at 18-months while their *speech only* utterances increased from 28% to 55% and their *gesture+speech* utterances increased from 6% to 12%. The children were indeed learning to speak, as do most children during this period (e.g., Bloom, 1973), and their gesture alone utterances decreased accordingly.

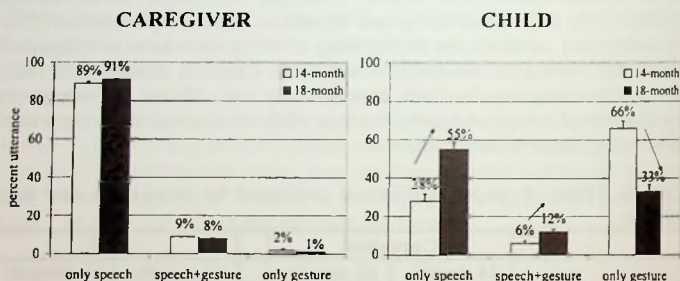


Figure 1. Types of utterances produced by children and their caregivers

Is there a difference in the *types* of gestures children and their caretakers produced during this time period? Figure 2 presents the data which again

show little change in gesture use for caregivers. Deictic gestures were the most commonly used gesture type for caregivers at both time periods (65%, 67%, respectively), followed by conventional gestures (33%, 31%), and representational gestures (2%, 2%).

The children used the same three types of gestures as their caregivers during both time periods, but they did show some change in the distribution of types used. As can be seen in Figure 2, children showed a decline in conventional gestures from 42% to 32%, and an increase in deictic gestures from 57% to 67%. Representational gestures were infrequent at both time periods. Thus, by 18-months, the children resembled the caretakers in the distribution of the types of gestures they used.

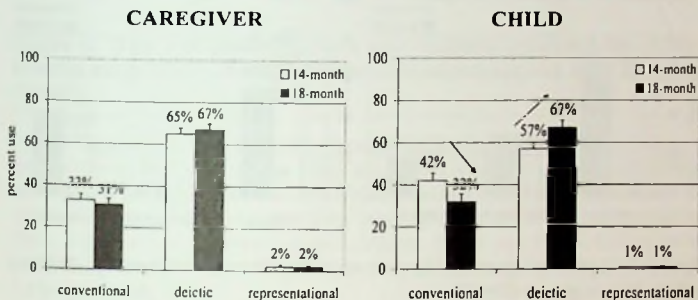


Figure 2. Types of gestures produced by children and their caregivers

In summary, the caregivers did not change the amount or types of gestures they produced during this time period, while their children did. The children became more like their caregivers with respect to types of gestures, producing the different types at the same rates as their caregivers by 18-months. However, although the children decreased the amount of gesture they produced over time, they still produced considerably higher proportions of gesture than their caregivers at both time periods (see Figure 1).

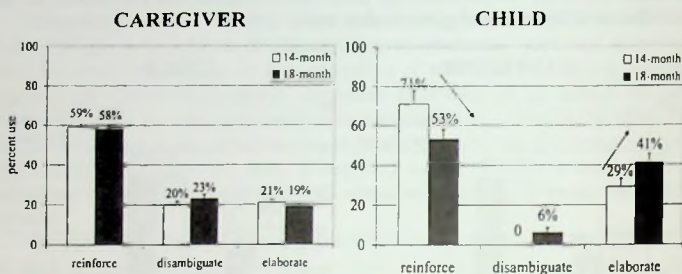
#### 4.3. Gesture-speech relation

We ask next whether the children displayed a change in the types of gesture+speech combinations they produced and, if so, whether those changes reflected similar changes in the gesture+speech combinations that their caregivers produced. As shown in Figure 3, the caregivers remained fairly stable in the types of gesture+speech combinations they produced over the two time periods. They produced primarily *reinforcing* gesture+speech combinations (e.g., pointing at a table while saying "table"), and equal



numbers of *disambiguating* combinations (e.g., pointing at a toy while saying "give it to me") and *elaborating* combinations (e.g., pointing at an empty bottle while saying "all gone").

In contrast to their caregivers' combinations, the children's gesture+speech combinations showed dramatic changes from 14- to 18-months. As can be seen in Figure 3, children's *reinforcing* combinations showed a sharp decline from 71% to 53%, and their *elaborating* combinations showed an increase from 29% to 41%. *Disambiguating* combinations emerged for the first time at 18-months.



**Figure 3.** Types of gesture+speech combinations produced by children and their caregivers (N=40)

Many of the children included in Figure 3 had already begun producing two-word combinations at 14-months. They had passed the transitional time period during which elaborating gesture+speech combinations signal the onset of two-word utterances. In order to examine the phenomenon for children who might still be at this transitional point, we reanalyzed the data in Figure 3 excluding all children who produced two-word utterances at 14-months. Figure 4 displays the data for the 12 children who had not yet produced two-word utterances at 14-months, and were producing gesture-speech combinations. Not surprisingly, the caregivers of these 12 children remained relatively stable in the types of gesture+speech combinations they produced over the two time periods. The children, on the other hand, showed even more change than the group as a whole. Their reinforcing combinations dropped from 73% to 44%, and their elaborating combinations increased from 27% to 45%.

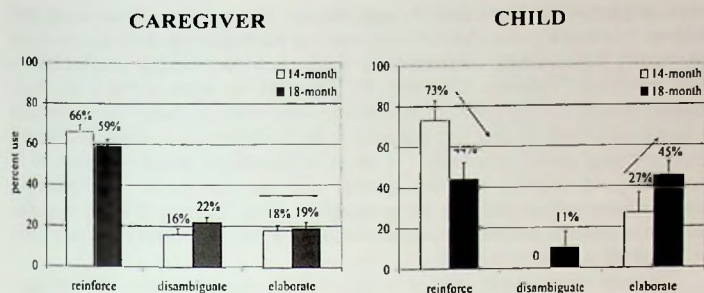


Figure 4. Types of gesture+speech combinations produced by children who did not produce 2-word utterances at 14-months and their caregivers (N=12)

In summary, the caregivers remained fairly stable in the types of gesture+speech combinations they produced over the two time periods, whereas the children did not. The children increasingly used gesture to add information to their speech, a pattern that was not observed in the caregivers. Thus, the changes observed in the children could not be attributed to the gestural input they received and might instead reflect the children's readiness for propositional thought.

## 5. Conclusions

We have found that parents gesture surprisingly little when they talk to their young children. Approximately 90% of the parents' utterances were produced without any gesture at all. Their children, in contrast, produced gestures in the vast majority of their communications at 14-months, and continued to produce gesture in half of their communications even after a significant increase in their speech at 18-months.

Nevertheless, parents may be providing a model for the types of gestures that their children produce. Both the parents and children produced *deictic* gestures, *conventional* gestures, and *representational* gestures, in that order. Indeed, by 18-months, the children's distribution of these three types of gestures exactly mirrored their parents'.

It is less clear, however, what kind of impact parents have on their children's gesture+speech combinations. Both the parents and children produced all three types of gesture+speech combinations—*reinforcing*, *disambiguating*, and *elaborating*. The children may have learned to relate their gestures to speech in these ways from their parents. However, the function that the gesture+speech combinations served differed for parent and child, as reflected in their frequency of use. The parents produced elaborating

combinations at the same rate throughout our observations. In contrast, the children (particularly the children who had not yet begun producing two-word utterances) dramatically increased the number of elaborating combinations they produced between 14- and 18- months to almost half of their gesture+speech combinations. The children were thus routinely using gesture to convey information that was different from the information conveyed in the accompanying speech ("mommy" + move a fist-shaped hand up down as if hammering an object). Together gesture and speech created a proposition (*mommy hammer*) not found in either modality alone. Gesture thus allowed the children to express propositional information at a time when they did not have the linguistic resources to do so.

This use of gesture in relation to speech at the earliest stages of language-learning is reminiscent of the way gesture functions for novice learners at later stages in development. When children are asked to explain how they solved a task, those who produce one idea in gesture and a different idea in the accompanying speech turn out to be just the children who are ready to profit from instruction in the task and learn it—more ready than children who produce the same information in gesture and speech in their explanations (Goldin-Meadow, 2003). Gesture is thus a harbinger of conceptual change for learners at a variety of ages and in a variety of tasks. Indeed, gesture may even be playing a role in helping learners make the conceptual changes (Goldin-Meadow, 2001).

We can now understand why parents might not produce many *elaborating* gesture+speech combinations. Parents have the linguistic resources necessary to produce single proposition sentences, and they do not need gesture to help them. Their children, however, do need gesture to fill their communicative gaps. Our observations suggest that, although parents may model the different types of gestures for their children, the way in which children use those gestures reflects the child's own cognitive and communicative needs. In this sense, mothers are not leading their children by the hand.

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