

# Using Gesture To Identify and Address Early Concerns About Language and Pragmatics

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## abstract

Speakers and signers naturally and spontaneously gesture when they use language to communicate. These gestures not only play a central role in how language is used in social situations but also offer insight into speakers' and signers' cognitive processes. The goals of this article are twofold: (1) to document how gesture can be used to identify concerns in language development and (2) to illustrate how gesture can be used to address those concerns, particularly with respect to pragmatic development. These goals are explored in this article, with a focus on deaf and/or hard of hearing (DHH) children. Medical providers and allied health professionals, as well as educators and parents, can use the information gleaned from the gestures of DHH children to determine if intervention is needed. Gesture can also be used to design interventions, including interventions in which children who are DHH are presented gestures in combination with speech or signs and interventions in which they are encouraged to gesture themselves. Children's gestures not only increase their learning potential but also create opportunities for medical and health professionals, as well as educators and parents, to gain access to a DHH child's unspoken and unsigned ideas, capitalizing on the opportunity to provide intervention when it is likely to be effective.



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When people talk, they gesture. Even those blind from birth, having never seen others gesture, move their hands as they speak.<sup>1</sup> Signers gesture too; people who are deaf and native users of a signed language use their hands not only for linguistic functions but also for the functions served by co-speech gesture.<sup>2-4</sup> These gestures play a central role in how language is used in pragmatic social situations while also offering insight into speakers' and signers' emerging thoughts.

Gestures are empty-handed movements used in communicative situations. People are not taught to gesture. Gesture spontaneously arises with speech or sign. These gestures can reinforce, clarify, or add to a speaker's or signer's message and can therefore be used to learn about their thoughts. When gestural development does not occur, either in the general population or in deaf and/or hard of hearing (DHH) children, its absence should raise a clinical red flag. The overarching goal of this article is to bring awareness to medical care providers and allied health professionals of how children use gesture during the early language-learning years. Armed with this awareness, clinicians can recognize developmental problems when they first begin and thus provide early access to effective interventions.

#### **GESTURES ENHANCE COMMUNICATION AND BUILD PRAGMATIC ASPECTS OF LANGUAGE**

The gestures children produce offer an early window into their cognition and language understanding. As a result, language screening tools include gestural communication at young ages.<sup>5</sup> For example, at first, young children simply reach for an object they want. Over time, they extend a grasping hand, but not far enough to reach the object, and look to an adult for help. The reach with

the intent to grab is not a gesture, but the extended grasping hand, accompanied by the look at the adult, is; it communicates to the adult that the child wants the object. Children typically point at objects before they learn the words for those objects and combine gestures with words before they combine words with other words. These behaviors are milestones and are important to monitor.

DHH children often have difficulty with the pragmatic aspects of language, or how language should be used in different situations.<sup>6,7</sup> Because gesture can highlight information that speakers or signers want to draw attention to, paying attention to their gestures can make it easier to grasp their pragmatic intentions. As a result, practices that improve DHH children's comprehension of gesture could have a positive impact on their pragmatic understanding, and practices that improve their production of gesture could help them make their own meanings clear, thus reducing the pragmatic difficulties DHH children frequently face.

#### **MISMATCHING GESTURES**

As this discussion implies, gestures are more than handwaving; they can convey substantive information and provide insight into speakers' or signers' thoughts. More strikingly, gestures can convey information that goes beyond speech or sign. For example, a child says, "I ran all the way upstairs" while gesturing an upward spiral. The child's gestures (and only her gestures) indicate that the staircase she climbed was a spiral. Noticing how gestures align with speech or sign, as well as noticing when gestures add information not found in the spoken or signed message, provides critical windows into language development.

The preceding example, in which gesture tells us that the stairwell is

a spiral, is an instance of mismatching gesture. Mismatching gestures convey information not found in the speech or sign they accompany and have been found to predict openness to instruction and learning. For example, consider a child who says that 2 rows containing the same number of checkers are no longer the same after the checkers in 1 row have been moved ("they're different because you spread them out"). At the same time, the child uses gesture to pair the checkers in the spread-out row with the checkers in the unchanged row; that is, he uses gesture to highlight the one-to-one correspondence between the 2 rows (an important component of conservation of number). This child, whose gestures convey different (mismatching) information from speech, is more likely to improve after instruction in conservation of number than a child whose gestures convey the same (matching) information as speech, that is, a child who says that the checkers in one row are spread out and uses gesture to display the spreading-out movement performed on the checkers.<sup>8-10</sup> Mismatching gestures have also been found in the spontaneous gestures signers produce when explaining math problems, and these gestures tell us which signers are likely to profit from instruction on that type of math problem.<sup>2</sup>

Gestures in a mismatch express a child's unspoken or unsigned thoughts. These gestures set the stage for exploring how gesture can be recruited by allied health clinicians and medical professionals to recognize and diagnose language-learning difficulties. Because the gestures children produce can offer the first window into their cognitive understanding,<sup>11</sup> children who do not display that understanding in their gestures may be at risk not only for being misunderstood but also for having subsequent linguistic difficulties.

## **GESTURE IS A BELLWETHER FOR LINGUISTIC MILESTONES**

### **Gestures and Vocabulary Development**

Children's ability to look toward an object indicated by a pointing gesture and their ability to point at the object are both developmental milestones tracked by pediatricians during well-child visits (see Mood et al,<sup>5</sup> in this supplement, for information about medical care providers' monitoring for development of gestures as a part of typical developmental screenings). Indeed, early gesture can act as a bellwether for subsequent language development. For example, in a study of children from varying socioeconomic home environments, the number of different types of objects the children indicated with their pointing gestures at 14 months predicted the size of their spoken vocabularies 3.5 years later.<sup>12</sup>

Gesture can also be used to diagnose future difficulties with word learning. For example, word learning in 53 typically developing (TD) children was used as a backdrop against which to assess word learning in 11 children with unilateral focal brain injury (BI).<sup>13</sup> At 18 months, word production in all 11 children with BI was below the range for the TD children. But 6 children with BI produced gestures that were within the TD children's gesture range at 18 months. At 30 months, these 6 children were no longer delayed in word learning; their receptive and expressive vocabularies were within the TD children's range. In contrast, 5 children with BI produced gestures that were below the TD children's gesture range at 18 months. At 30 months, these 5 children continued to lag behind the TD group in both receptive and expressive vocabularies. The children's low gesture use at 18 months pointed to their low word use a year later. Understanding the importance of gesture use in the first years of life

thus has the potential to provide medical professionals and allied health clinicians with a way to determine which children will and which children will not require language intervention.

Gesture can provide an early window into risks for delayed word learning in DHH children, whether they are learning spoken language, sign language, or both. By attending to a DHH child's early gestures, medical and health professionals can help families recognize the important role that gesture plays in social communication and can guide them in seeking the right level and kind of support for the child (see Mood et al,<sup>5</sup> in this supplement, for suggestions that medical care providers may make for referrals and interventions and strategies that allied health providers may employ in working with families to address differences or delays in gesturing).

### **Gestures and Early Sentences**

In addition to predicting vocabulary development, gesture predicts the onset of children's first sentences. The gestures that young children produce, in combination with speech, are a bellwether for 2-word speech. Children between the ages of 10 and 24 months were observed in interactions at home with their parents.<sup>14</sup> Children who were first to produce gesture-plus-word combinations conveying 2 semantic elements in a proposition (eg, point at bird + "nap") were also first to produce 2-word combinations ("bird nap"). Importantly, parents responded to children's mismatched combinations, in which gesture conveyed different information from speech (point at bird + "nap"), with longer utterances than when responding to gesture-speech combinations conveying the same information (point at bird + "bird"). Parents often translated the child's gestures into speech and combined that information with the child's

words, providing a more complex model of language back to the child ("the bird's taking a nap"). Higher numbers of parental translation responses were associated with earlier production of 2-word utterances by the child. Parental responses to child gesture may help children take their first steps into multiword combinations.

These findings are relevant to medical and allied health professionals in 2 important ways. First, the absence of gesture-plus-speech (or gesture-plus-sign) productions conveying 2 semantic elements in a DHH child's repertoire is a signal that the child might be delayed in the onset of 2-word (or 2-sign) sentences. Second, the way in which parents respond to their children's gesture-plus-speech (or gesture-plus-sign) combinations can be used as the basis for developing a substantive plan for DHH children who need intervention, a plan that makes use of the fact that gesture is part of the context that determines meaning (ie, a part of the pragmatic context).

## **THEORETICAL APPROACHES FOR INTERVENTION**

### **Learning From Others' Gestures**

The gestures that children see others produce can help them learn new words. This effect has been shown in studies that present children with an object or action, along with a gesture for that object or action, and a novel word. Seeing the gestures helped children assign meaning to and learn the new word.<sup>15,16</sup>

Including gesture in word-learning contexts also makes it more likely that children will generalize the learned word.<sup>17</sup> In a laboratory-based language study, children were shown an iconic squeezing gesture, produced near (but not on) an object while listening to a novel word (eg, "This is called 'ratching'") and were asked to produce the word ("Can you say, 'ratching'?"). In a second condition,

children were shown the squeezing action on the object, again while hearing and producing the word "ratching." After seeing the gesture or action and repeating the word 5 times, children saw 2 actions and were asked to point to "ratching." They correctly pointed to "ratching" when it was performed on the object, whether they learned via gesture or action. However, they were more likely to correctly identify "ratching" when it was performed on a new object if they had learned via gesture than via action.<sup>18</sup> In other words, seeing gesture (in this case, an iconic gesture that portrays an aspect of the word's meaning) increases the likelihood that a child will be able to generalize a newly learned word to a novel context.

### Learning From One's Own Gestures

In another study, families with toddlers participated in an 8-week at-home intervention in which all children were exposed to object words but only some children were told to point at the named objects. Before each training session, the children interacted naturally with parents to establish a baseline against which changes in communication could be measured. The children who were encouraged to point increased the number of meaningful gestures they conveyed (not only during training but also during their interactions with parents).

Importantly, these experimentally induced increases in gesture led to larger spoken repertoires at the end of the study.<sup>19</sup> Thus, in addition to learning through developing understanding of other peoples' gestures, children can also learn from producing their own gestures.

Young children will naturally point at objects without being encouraged to do so. Yet by telling children to produce pointing gestures, we have manipulated their behavior, which provides causal evidence that doing one's own gestures can change

thinking (as opposed to merely reflecting thinking).

### NEUROCOGNITIVE UNDERPINNINGS AND THEORY

Gesture may promote learning because it is an action. Support for this hypothesis comes from a study in which functional MRI was used to examine neural correlates underlying how children solve math problems learned with the help of a problem-solving strategy produced either in speech + gesture or speech alone. Children who learned through speech + gesture were more likely to recruit motor regions when subsequently solving problems than children who learned through speech alone.<sup>20</sup> Future work is needed to explore whether children who learned through speech + gesture also show activation in regions associated with abstraction. If so, this would corroborate behavioral evidence<sup>18,21</sup> revealing that learning through gesture supports generalization better than learning through action on objects.

### IMPLICATIONS FOR DHH CHILDREN

In a large number of studies, researchers have explored the spontaneous gestures that hearing children produce during the earliest stages of language learning. In TD children, being told to gesture in a particular way improves learning, retention, and generalization. Yet even telling learners to move their hands the next time they talk can have an impact on learning. In a laboratory study, children were encouraged to gesture when explaining their solutions to math problems.<sup>22</sup> These children expressed new ideas in gesture not found in their speech (ie, mismatches), and, surprisingly, the new ideas in gesture were often correct, even when their words were not. Moreover, children who produced new ideas in gesture after being told to gesture showed

greater improvement when later given instruction than either children who did not produce new ideas in gesture or children who were not told to gesture.

Given the insights that gesture offers into children's language and communicative skills and their potential for growth, it is important to observe and manipulate gesturing in DHH children. However, there are few studies that are focused on gestural skills in DHH children.

We cannot easily tell DHH children who sign to gesture because the line between gesture and sign is not obvious.<sup>23</sup> Nevertheless, reinforcing gesture in DHH children who use a sign language (eg, American Sign Language, used across much of the United States and Canada<sup>24</sup>) could contribute positively to their development. Moreover, we can encourage DHH children who use speech to gesture as they talk. We can then determine if encouraging them to gesture affects their learning. The answer to this question would not only have theoretical implications for our understanding of how gesture affects learning but also have practical applications for deaf education.

The following are gestural diagnostic approaches for DHH children:

- spontaneous gestures that speakers and signers produce provide insight into emerging thoughts;
- the absence of gestures can be considered a red flag for potential risks to language learning; and
- gestures can be "read" by parents, educators, allied health clinicians, and medical providers (indeed, all individuals who interact with children) and can be used to decide who needs further intervention.

The following are gestural intervention approaches for DHH children:

- Gestures can be used to design interventions, either by presenting

children with gestures along with speech or sign or by encouraging children themselves to gesture.<sup>25</sup> Gesturing increases a child's own learning potential and creates more opportunities for adults to gain access to the unspoken or unsigned ideas of the child, providing an additional window into their social communication intentions.<sup>26</sup>

- Parental responses to child gestures can support early vocabulary and sentence learning.
- Parents and therapists should be encouraged to point during interactions with DHH children and should encourage the children themselves to point during these interactions.
- Parents and therapists can be coached to incorporate gesture into their interactions with DHH children. They should be encouraged to produce iconic gestures (a gesture that portrays an aspect of a word's meaning) when teaching DHH children new words not only to improve word learning but also to encourage the type of deep learning that helps children extend newly learned words to relevant contexts.

## CONCLUSIONS

Gesture can play an important role in conveying ideas and improving social communication in children for whom communication is difficult, including DHH children. If understanding gesture helps us grasp what others are thinking, then fostering comprehension of gestures in DHH children could improve their ability to understand the messages others send. This type of understanding begins early. Gesture works hand in hand with prosody to highlight elements that speakers want to draw attention to,<sup>27,28</sup> thereby making it easier to grasp the speaker's message and pragmatic intentions. Improving DHH children's comprehension of

gestures thus has the potential to improve their pragmatic understanding. In addition, fostering production of gestures in DHH children could make it easier for them to make their own meanings and pragmatic intentions clear to their communication partners, thereby reducing the pragmatic challenges that many DHH children encounter in communicative exchanges.

The value of looking at gesture use in relation to language use for medical care providers is to be able to assess whether a child is on track with respect to gestural development and, if not, to refer the child to the appropriate allied health professionals. These professionals can work with the child and with the family to impart strategies that can be used to foster gestural and language development as well as to impart the appropriate use of gesture in social communication. Distinguishing between children whose language is deficient but who have good gestural skills and children who have deficiencies in both language and gesture has great clinical potential. Children whose gestures are within the typical range are, at the least, on target for communicative intent. An important task for allied health professionals may be helping these children to better understand how conventional words and signs map onto their gestural communications.

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I dedicate the article to the memory of William L. Meadow, MD, PhD, the most thoughtful and caring pediatrician I know.

## ABBREVIATIONS

BI: brain injury  
DHH: deaf and/or hard of hearing  
TD: typically developing

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