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Early gesture, early vocabulary, and risk of language impairment in preschoolers

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ABSTRACT

Background: Gesture precedes vocabulary development and may be an early marker of later language impairment.
Aims: Using data from the National Institute of Child Health and Human Development Study of Early Child Care and Youth Development, this study examined the contribution of children's ($N = 1064$) early gestures and early vocabularies to their risk of language impairment in preschool years.
Methods and procedures: At age 15 months, maternal reports on children's use of gestures and vocabulary comprehension and production skills were measured using the MacArthur Communicative Development Inventories. At age 3 and 4.5 years, children's language skills were assessed using the Reynell Developmental Language Scale and Preschool Language Scale-3, respectively.
Outcomes and results: After controlling for child, maternal, and family sociodemographic factors, children at later risk for language impairment were found to exhibit significantly less early gesture use and vocabulary skills relative to their typically developing peers. Early use of gestures was also significantly correlated with early vocabulary skills.
Conclusions and implications: The effect of early gesture on children's later risk of language impairment was indirect and mediated by early vocabulary production. Early gesture may have the potential to serve as an early diagnostic tool and play a role in early intervention.

What this paper adds?

This study makes several new contributions to the literature. The most unique aspect of this study was the test of a developmental pathway model linking early gesture use, to early vocabulary skills, and to the risk of language impairment (LI) at preschool ages. Researchers have separately examined the contribution of early gesture to early vocabulary, early vocabulary to later LI, and early gesture to later LI, but have not examined the combined contributions of early gesture and early vocabulary to later LI. Empirical testing of a mediation model was also a novel approach. The finding that the contribution of early gesture use to the risk of preschool language impairment was mediated by early vocabulary production is a new finding. No previous study has investigated the role of early gesture in preschoolers with LI but with no significant concomitant deficits. In addition, previous research on early gesture has been limited by small sample sizes and convenient middle-class samples. The present study used data from a large-scale, longitudinal dataset and examined children from a

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wide range of sociodemographic backgrounds. We found relationships between early gesture, early vocabularies, and later LI even after child, maternal, and family sociodemographic risk factors were controlled.

1. Introduction

Children with specific language impairment are those who exhibit significant language difficulties relative to normative age-based performance without concomitant sensory, structural, neurological, or intellectual deficits (e.g., Leonard, 1998). In this paper, we refer to children at risk for language impairment (LI) as those who show significant language difficulties (i.e., ≤10th percentile) at preschool ages, but other concomitant deficits (e.g., sensory, structural, neurological, or intellectual) are not significant enough to warrant these as a primary diagnosis (Justice, Bowles, Turnbull, & Skibbe, 2009). LI affects approximately 7% to 14% of children (e.g., Beitchman et al., 1989; Tomblin et al., 1997). Children with LI are vulnerable to a number of negative consequences, including poor reading skills (Skibbe et al., 2008), reduced school readiness (Justice et al., 2009), deficits in social competence (Stanton-Chapman, Justice, Skibbe, & Grant, 2007), and increased behavior problems (Rescorla, Ross, & McClure, 2007; St. Clair, Pickles, Durkin, & Conti-Ramsden, 2011; Van Daal et al., 2007; Yew & O'Kearney, 2013). Given its developmental significance, discerning developmental pathways to LI would be theoretically and clinically important.

Gesture, one key component of prelinguistic communication and an early marker of intentionality (Crais, Watson, & Baranek, 2009), has been theorized to closely relate to language use (Bernardis & Gentilucci, 2006; Gentilucci & Corballis, 2006). Gesture and language have been speculated to share common underlying brain mechanisms (Bates & Dick, 2002; Capirci, Contaldo, Caselli, & Volterra, 2005). Little is known, however, whether early gesture is associated with later LI in children otherwise developing typically. Despite the well-documented developmental transition from gesture to language, the role of early vocabulary in the association between early gesture and later LI is also largely unknown. This study, thus, tested a developmental cascade linking early gesture, to early vocabulary, and to the risk of LI at preschool ages.

1.1. Early gesture and vocabulary

Gestures are actions typically expressed with fingers, hands, arms (e.g., pointing), facial movements (e.g., lip smacking for "yummy"), and body movements (e.g., head nodding for "yes"). Typically learned through routines in social interaction, gestures in infancy are communicative in nature and used to establish reference to objects, events, or persons in the immediate environment (Bates, Bretherton, Shore, & McNew, 1983). Broadly speaking, there are two primary categories of communicative gestures: deictic and representational (Crais, Douglas, & Campbell, 2004; Iverson & Tbal, 1998). Deictic gestures emerge at around 8–10 months before the onset of speech. The four most commonly studied deictic gestures include pointing, reaching, showing, and giving (Crais et al., 2004). These gestures are used to refer to an object or an event in the immediate surrounding. Given that the referent can be a wide variety of objects and events, these gestures can only be interpreted by their context. Representational gestures are typically seen after the emergence of deictic gestures (Crais et al., 2004). Emerging from familiar games or social routines, representational gestures are used to establish reference or indicate particular semantic content. Representational gestures can be symbolic ones signifying some feature of the object-related referent (e.g., cupped hand to mouth for "drinking") (Acredolo & Goodwyn, 1988). They can also be conventional gestures used socially with a form and/or meaning that are culturally defined (e.g., finger to lips for "hush") without involving a specific object (Iverson, Capirci, & Caselli, 1994; Iverson, Capirci, Longobardi, & Caselli, 1999).

Developmental progression in communication is marked by a transition from gesture to speech at around one year of age. Early gesture precedes subsequent vocabulary development and also predicts subsequent vocabulary production and comprehension from infancy through preschool. For example, early gesture use was positively correlated with vocabulary production and comprehension at age 1 and 2 years (e.g., Acredolo & Goodwyn, 1988; Bavin et al., 2008). Greater variations in meanings a child conveyed in gesture (i.e., gesture vocabulary) at 14 months predicted greater spoken vocabulary sizes at 54 months (Rowe & Goldin-Meadow, 2009b). Gesture vocabulary at 18 months predicted greater vocabulary comprehension at 42 months (Rowe & Goldin-Meadow, 2009a). A training study further showed that increased gesture use at 17 months led to an increase in spoken vocabularies (LeBarton, Goldin-Meadow, & Raudenbush, 2013). Taken together, these findings suggest that early gestures may play a facilitative role in vocabulary development (Iverson & Goldin-Meadow, 2005) and that vocabulary skills, specifically, vocabulary comprehension, may bridge the transition from gesture to spoken language (Caselli et al., 2012).

1.2. Gesture and language impairment

Toddlers with language delay (i.e., late talkers) as well as preschoolers and school-aged children with LI have difficulties generating and imitating gestures as compared to typically developing peers (Hill, 1998; Marton, 2009; Thal & Bates, 1988; Thal & Tobias, 1992; Thal, Tobias, & Morrison, 1991). The links between early gesture and preschool LI have, however, been studied in very few populations. Among late talkers identified at 18–29 months of age, gesture use predicted those who did or did not catch up eventually to their typically developing peers by age 3 years (Thal & Bates, 1988; Thal & Tobias, 1992; Thal et al., 1991). In children with brain injury, Sauer, Levine, and Goldin-Meadow (2010) found that children with high gesture use at 18 months had typical vocabulary production at age 22 and 26 months and vocabulary comprehension at