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Beyond the pre-communicative medium: A cross-behavioral prospective study on the role of gesture in language and play development

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ABSTRACT

This study prospectively explored the role of declarative and imperative gestures in the development of language and symbolic play milestones using a multi-measure micro-analytic approach. Nine infants were observed in their natural home environments once a month for a one hour session between the ages of 8–16 months by recording their spontaneous pre-lingual and lingual form usages and symbolic play acts. This framework enabled the coding of object- and human-directed vocalization, babbling, speech, declarative and imperative gestures, and four types of symbolic play acts: single-object play, single-object sequences, multi-object play, and multi-object sequences. The relative degree of usage of each type of behavior was examined. The results showed that declarative and imperative gestures frequency of usage are related to all language milestones for the short and long term. The infants' gestures were related to symbolic play for the long term; their declarative gestures supported most of the levels of symbolic acts and their imperative gestures supported multi-object sequences. The results are explained in terms of the structural building blocks and contextual framework of gestures, which may scaffold infants' preliminary symbolic behavior.

1. Introduction

1.1. Language milestones in early infancy

The ability to articulate one word is a long process that begins before birth while fetuses pay attention to lingual patterns and tonality (Parish-Morris, Golinkoff, Hirsh-Pasek, & Zelazo, 2013). Directly after birth, infants begin to take an active role in their language acquisition by producing multiple types of vocalization, such as grunts and speech sounds (Oller & Eilers, 1988). Infants practice a variety of different consonant-like and vowel-like sounds (m; n; d) until they reach their first birthday (Hoff, 2014) and their vocalization may be directed toward object and human entities alike (Goldstein, Schwade, Briesch, & Syal, 2010; Wu & Gros-Louis, 2015). Around 6–9 months of age, the quality of infants' vocalization changes and they start babbling. This type of behavior is well known as reduplicate babbling (vocalizations consisting of syllable repetition, e.g., bababa; dadada) (Iverson, 2010; Iverson, Hall, Nickel, & Wozniak, 2007). Babbling is considered to be a major milestone in early language development as it corresponds between vocal and motor information, which is a key skill in language acquisition (Iverson & Fagan, 2004). Babbling, in most typically developing infants, emerges before the ability to talk, generally before 10 months of age (Molemans, Van Den Berg, Van Severen, & Gillis, 2012; Orr & Geva, 2015).

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Babbling and vocalization are limited tools for infants to express themselves; this limitation declines between 8 and 12 months, when infants start to use gestures that offer an additional tool for communication (Goldin-Meadow & Alibali, 2013). Gestures are actions produced with the intent to communicate and are typically expressed by using fingers, hands, and arms. Infants use pointing or holding up an object while gesturing and vocalizing to convey meaning that relies entirely on the context (Esteve-Gibert & Prieto, 2014). This “deictic gesture” (pointing and reaching), according to Esteve-Gibert and Prieto (2014), resembles the pronouns “this” or “that” (Goldin-Meadow & Alibali, 2013; McCune, 2008) and an infant may use it to draw an adult’s attention to the object (declarative communicative purpose) or to ask for help or an object (imperative communicative purpose) (Crais, Douglas, & Campbell, 2004; Esteve-Gibert & Prieto, 2014; Tomasello, Carpenter, & Liszkowski, 2007; Tomasello, 2009).

Even though infants use multiple ways to communicate, neither gesture nor vocalization are words. Evoking one word utterances (e.g., Mommy, Daddy, Doll, etc.) that typically occur between 10–15 months (Orr & Geva, 2015) is the first time that infants use symbols to stand for something else (Hoff, 2014).

1.2. Symbolic milestones in early infancy

The ability to demonstrate signifier-signified relationships appears in infant behavior during symbolic play (e.g., jar as a hat; stick as a telephone) (McCune, 2010). Symbolic play is well known as salient in children’s activity, and it begins early in infancy when an infant produces a symbolic play act with one or more objects (Fein, 1981; McCune, 2010; Orr & Geva, 2015). The first symbolic play milestones occur around 8 months of age, when the infant is capable of holding a single object and altering its familiar role to a novel one (Orr & Geva, 2015). The enhancement of motor and cognitive skills over the course of several months allows changes in the level of complexity of symbolic play, consequently, around 11–12 months of age infants are already capable of using several objects and combining them in a sequence of action accompanied with sound effects or gestures that indicate referent behaviors (e.g., placing several objects into a pot, mixing them, and tossing the head back to drink while evoking an exaggerated drinking sound) (Lillard & Witherington, 2004; McCune, 1995; Orr, 2017).

1.3. The role of gesture in symbolic behavior development

The research literature provides a vast body of evidence indicating that gesture is tightly linked to symbolic behavior (speech and symbolic play) (Cartmill & Goldin-Meadow, 2016; McEachern & Haynes, 2004; Murillo & Capilla, 2016; Volterra, Caselli, Capirci, & Pizzuto, 2015). The linkage between gesture and speech has been widely addressed and recent studies have strengthened this trajectory by demonstrating that the gestural representation of a referent preceded the symbolic representation of the same referent in chimpanzees, bonobos, and human children (Gillespie-Lynch, Greenfield, Feng, Savage-Rumbaugh, & Lyn, 2013). A gesture’s cross-species path exhibits its embodied linkage within a semiotic system.

The tight linkage of gesture to speech stems from its semiotic and pragmatic role (Cartmill & Goldin-Meadow, 2016). Gesture is the first pre-lingual form that trains the ability to represent one referent by another and simultaneously convey meaning through this act. This twofold trajectory is a benchmark for later speech production. The tight temporal concurrence between gesture and speech is a significant indicator of the link between both behaviors (Esteve-Gibert & Prieto, 2014). Further, beyond the semiotic similarity, the pointing gesture is a key joint-attention behavior. Gesture is likely used to convey meaning and express intention. The communicative act takes place during gesturing if in real time one can get another person’s attention and the entire social interaction is monitored appropriately (Colonnesi, Stams, Koster, & Noom, 2010; Mundy et al., 2007). This socio-cognitive function that gesture bears is the foundation for the later use of words to convey meaning and receive attention. The tight link between gesture comprehension and production and later linguistic level strengthens the concurrence between gesture and speech (Colonnesi et al., 2010).

Beyond speech, gesture interacts with symbolic play (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Hall, Rumney, Holler, & Kidd, 2013). Symbolic play is a vehicle for the child to learn novel ways that objects, actions, and events can represent in the world. The child first uses an action schema to represent his or her intention during play, which is replaced later by iconic gestures, mainly through interaction with caregivers during play activities.

1.4. The current study

Studies that have explored the nature of the relationship between gesture, speech, and symbolic play refer to an advanced phase in this tripartite relationship, namely, a phase when the child has already attained speech and symbolic play is performed in a full action schema (Cartmill, Hunsicker, & Goldin-Meadow, 2014; de Villiers Rader & Zukow-Goldring, 2015). Contextual and pragmatic factors have been found that are supportive of this tripartite linkage (Esteve-Gibert & Prieto, 2014; Hall et al., 2013). Little is known regarding the role of gesture in language and symbolic play milestones. Gestures have a considerable structural framework that may support pre-lingual forms and symbolic play milestones. Children have to coordinate gesture with visual and motor information and monitor available social cues, such as face scanning, gaze following, attention to the mouth, and body direction (Lewkowicz & Hansen-Tift, 2012; Matthews, Behne, Lieven, & Tomasello, 2012; Tenenbaum et al., 2015). This high level of information integration enhances the control mechanism that most pre-lingual forms rely on (Iverson & Fagan, 2004). It seems that gesture, with its advance control mechanism that integrates multiple channels (social, vocal, motor, and cognitive), may have significant potential to support symbolic behaviors in their preliminary phase. In light of the fact that infants maintain the production of their preliminary lingual milestones until speech is initiated (Esteve-Gibert & Prieto, 2014), examining this trajectory may be a substantial way to understand the role of gesture in infants’ development. Furthermore, understanding the role of gesture in the mechanism that underlie symbolic

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