Infant Behavior & Development 39 (2015) 42–52

Contents lists available at ScienceDirect

Infant Behavior and Development

Language development at 18 months is related to multimodal communicative strategies at 12 months

Alfonso Igualada[a], Laura Bosch[b,d], Pilar Prieto[c,a,*]

[a] Universitat Pompeu Fabra, Spain
[b] Universitat de Barcelona, Spain
[c] Institució Catalana de Recerca i Estudis Avançats, ICREA, Spain
[d] Institute for Brain, Cognition and Behaviour, UB, Spain

ARTICLE INFO

Article history:
Received 23 July 2014
Received in revised form
23 December 2014
Accepted 10 February 2015
Available online 7 March 2015

Keywords:
Multimodal communication
Joint attention
12-month-old infants
Language measures
Pointing task

ABSTRACT

The present study investigated the degree to which an infants' use of simultaneous gesture–speech combinations during controlled social interactions predicts later language development. Nineteen infants participated in a declarative pointing task involving three different social conditions: two experimental conditions (a) available, when the adult was visually attending to the infant but did not attend to the object of reference jointly with the child, and (b) unavailable, when the adult was not visually attending to neither the infant nor the object; and (c) a baseline condition, when the adult jointly engaged with the infant's object of reference. At 12 months of age measures related to infants' speech-only productions, pointing-only gestures, and simultaneous pointing–speech combinations were obtained in each of the three social conditions. Each child's lexical and grammatical output was assessed at 18 months of age through parental report. Results revealed a significant interaction between social condition and type of communicative production. Specifically, only simultaneous pointing–speech combinations increased in frequency during the available condition compared to baseline, while no differences were found for speech-only and pointing-only productions. Moreover, simultaneous pointing–speech combinations in the available condition at 12 months positively correlated with lexical and grammatical development at 18 months of age. The ability to selectively use this multimodal communicative strategy to engage the adult in joint attention by drawing his attention toward an unseen event or object reveals 12-month-olds' clear understanding of referential cues that are relevant for language development. This strategy to successfully initiate and maintain joint attention is related to language development as it increases learning opportunities from social interactions.

1. Introduction

Gesture–speech integration is an important feature of human communication. As McNeill (1992) noted, in human languages gesture and speech modalities are coordinated not only at the temporal and phonological levels (i.e., the most prominent part of the gesture is typically aligned with the most prominent part of speech), but also at the semantic

* Corresponding author at: Department of Translation and Language Sciences, Universitat Pompeu Fabra, Roc Boronat, 138, 08018 Barcelona, Spain. Tel.: +34 935421114; fax: +34 93 93 542 16 17.
E-mail addresses: alfonso.igualada@upf.edu (A. Igualada), laurabosch@ub.edu (L. Bosch), pilar.prieto@upf.edu (P. Prieto).

http://dx.doi.org/10.1016/j.infbeh.2015.02.004
0163-6383/

and pragmatic levels (i.e., the two components can share similar semantic functions). Infants begin to use simultaneous gesture–speech combinations intentionally near the end of the first year of life, a few months after the onset of canonical babbling and typically preceding the beginning of the one-word production stage (Butcher & Goldin-Meadow, 2000; Carpenter, Mastergeorge & Coggins, 1983; Esteve-Gibert & Prieto, 2014). The presence of these combined, multimodal communicative behaviors have been taken as an indicator of intentional communication, representing a step further on the way toward linguistic communication (Bates, Camaioni, & Volterra, 1975; Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979; Wetherby & Prizant, 1989). But research is still needed concerning the prevalence and pragmatic function of simultaneous gesture–speech combinations in specific socio-communicative contexts and their potential predictive value for later language development.

The developmental pathway of simultaneous gesture–speech combinations was studied in Esteve-Gibert and Prieto (2014). The study showed that at 11 months infants already produced simultaneous gesture–speech combinations, but pointing without speech still occurred more frequently. In their longitudinal sample they also found a significant increase in gesture–speech productions by 15 months of age. These multimodal productions mostly involved pointing and reaching gestures with a declarative communicative purpose, and when combined with speech, the two modalities were temporally coordinated in an adult-like way. The use of simultaneous gesture–speech combinations may serve to provide redundant information about the same referent through multimodal means, thereby highlighting a particular piece of information and minimizing joint effort in a communicative context (see Wagner, Malisz, & Kopp, 2014, for a review). In other words, infants may intentionally use multimodal strategies to mark a prominence in their communicative productions, a behavior that favors joint attention processes.

There is a considerable body of evidence that infants' joint attention abilities are linked to later language development (Kristen, Sodian, Thoermer, & Perst, 2011; Laakso, Poikkeus, Katajamäki, & Lyytinen, 1999; Mundy & Gomes, 1998; Tomasello & Farrar, 1986; Tomasello, 1988). Studies have provided evidence that caregivers' contingent interactions (e.g., those that follow on the infant's focus of attention) tend to elicit more pointing and speech combinations by infants (e.g., Miller & Gros-Louis, 2013; Miller & Lossia, 2013) and also lead to better language abilities later in development (McGillion et al., 2013; Rollins, 2003; Tamis-LeMonda, Bornstein, & Baumwell, 2001; Tomasello & Farrar, 1986). These results provide indirect evidence about the potential relationship between an infant's multimodal communicative ability to initiate joint attention (i.e., to communicate and influence an adult's attention regarding an intended referent) on the one hand and the infant's later language abilities on the other.

Literature addressing early infants' communication abilities has typically focused on separate analyses of either gestures (and mainly pointing gestures) or speech modality but not both. For example, the ability to use pointing gestures has been regarded as a clear and powerful non-verbal strategy to also initiate joint attention between the infant and the adult with regard to an object or event (Tomasello, Carpenter, & Liszkowski, 2007). Likewise, research on infants' gesture production has shown that communicative gestures (e.g., iconic and pointing gestures) signal intentional communication (Bates et al., 1979; Bavin et al., 2008; Caselli, Rinaldi, Stefanini, & Volterra, 2012) and that pointing gestures with a declarative intention are a good predictor of the emergence of verbal language (Colonnesi, Stams, Koster, & Noom, 2010). On the other hand, literature on speech development has also documented that acoustic measures of early infants' vocalizations vary depending according to their communicative intentionality (Esteve-Gibert & Prieto, 2014) and that vocalizations coordinated with gaze directed at the referent affect adult-infant social interactions and support language learning (Goldstein, Schwade, Briesch, & Syal, 2010; Gros-Louis, West, & King, 2014). While some studies with slightly older infants have shown that one particular use of supplementary gesture–speech combinations – that in which the gesture modality conveys a different meaning than the one conveyed by speech – predicts the onset of grammatical development (Capirci, Iverson, Pizzuto, & Volterra, 1996; Iverson & Goldin-Meadow, 2005; Özçaliskan & Goldin-Meadow, 2005; Pizzuto, Capobianco, & Devescovi, 2005; Rowe & Goldin-Meadow, 2009), the emergence of simultaneous gesture–speech combinations (i.e., gesture co-occurring with speech to express the same meaning) and their relation to later language development has not been analyzed in detail.

In this study we are interested in exploring the link between the early ability to intentionally produce simultaneous pointing–speech combinations in specific communicative contexts and later language development. To our knowledge only two studies have explored the predictive role of early simultaneous gesture–speech combinations on later language development. In Murillo and Belinchón (2012), a sample of eleven parent-infant dyads were recorded interacting in a semi-structured play context at three longitudinal moments, namely at 9, 12, and 15 months. The results showed that the use of pointing gestures at 12 months, especially when accompanied by vocalizations and directed gaze on the part of the infant, correlated positively with vocabulary development at 15 months of age. In a recent study, Wu and Gros-Louis (2014) analyzed the spontaneous interactions of 10- to 13-month-old infants with their mothers in fifty-one dyads and showed that the infants' combinations of vocalization and pointing, and especially those produced when mothers were not attending to the target event, were related to the infants' subsequent comprehension skills at 15 months. It should be noted that both of the studies mentioned above are based on the analysis of spontaneous interactions, where it is difficult to behaviorally control for two important aspects of early communicative patterns, namely, (a) the pragmatic intention or motive behind children's use of pointing gestures to comment on an event or object; and (b) the social interaction gaze patterns used by the adult during the communication. In this study we will attempt to address this issue by controlling for these two factors. To do so, we will examine pointing gestures that express a declarative intention (i.e., the communicator engages with the recipient to share information with him/her about something) by using a task that was specifically designed to elicit this behavior in infants, namely the declarative pointing task (Carpenter, Nagell, & Tomasello, 1998).