

RELATIONSHIP BETWEEN NONVERBAL SOCIAL SKILLS AND LANGUAGE DEVELOPMENT: COMMUNICATIVE GESTURES AND ATTENTIONAL SKILLS

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Studying the development of communication in infants and children provides information that may help better understand the evolution of human language. Here we focus on some infants' communicative skills such as joint attention and imitation, which have been argued to have a central role in language acquisition, as they offer an effective way to engage in social interactions. Gestural communication may have a particularly important role to play in allowing children to express meanings they are not yet able to verbalize (e.g., Colonnaesi, Stams, Koster, & Nool, 2010; Rowe & Goldin-Meadow, 2009). The association between gestures and language has also been highlighted in adults through the description of common neural networks in left-lateralized inferior frontal and posterior temporal regions of the brain (e.g., He et al., 2015; Xu, Gannon, Emmorey, Smith, & Braun, 2009).

However, the relationship between non-verbal communication abilities and language development is far from being fully understood, in part due to the difficulty of considering several characteristics of communication all at once, including various functions of children's gestures and both language comprehension and production. Our general objective in the present study was therefore to describe the relationships between early socio-cognitive abilities and

language, and especially to determine whether some gestures might play a stronger role than others in language acquisition. We used semi-structured situations based on the early social communication scale (ESCS: Guidetti & Tourrette, 2009; Mundy et al., 2003) to assess children's communicative profile between 11 and 41 months of age. We described the role played by children in the interactions (i.e., initiation vs. response) and analyzed more specifically the development of gestural communication by recording the number of gestures produced by children, including giving, showing, pointing and symbolic gestures. We also assessed the form (hand shape) and the function of pointing.

Positive correlations were found between language level and scores of joint attention, imitation and gestural communication. In particular, language was strongly correlated to gaze alternation between the communicative partner and the object referred to ($r = .72^{**}$ for language comprehension; $r = .78^{**}$ for language production). Moreover, our results suggest that the role played by children in the interactions influences language development: initiation of joint attention was correlated with both language comprehension ($r = .79^{**}$) and language production ($r = .82^{***}$), whereas response to joint attention was not correlated with either language comprehension or production. This study has also shown that the use of declarative expressive pointing (produced to share some interest with the partner about a specific referent), symbolic gestures and head nods (expressing agreement) was significantly related to language production ($r = .57^*$, $r = .59^*$, and $r = .72^{**}$, respectively), while the use of declarative informative pointing (produced to give helpful information to the partner) was strongly correlated with both language comprehension ($r = .84^{***}$) and language production ($r = .77^{**}$). The production of other gestures such as imperative pointing was not correlated with either language comprehension or production.

We believe that this work can have important implications for researchers studying the development and the evolution of communication, as it may help understand the dynamic processes involved in the emergence of language. Exploring the function of gestures and the role of individuals during the interactions may shed some light on the pressures that might have affected the evolution of communication (e.g., Grosse, Call, Carpenter, & Tomasello, 2015). Finally, this research could also improve language evaluation and intervention programs, especially for children who present communication disorders.

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