



# Developmental changes in infants' and mothers' pathways to achieving joint attention episodes

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## ABSTRACT

when infants were 13 and 17 months old. Analyses revealed developmental changes in initiative frequencies and in the origins of JA episodes. At 13 months, although infants' less sophisticated object-only initiatives (IOBj) were most frequent, JA episodes most often originated in maternal combined initiatives (IJA), which focused on both object and partner. By 17 months, however, infants' combined initiatives were most frequent and led to more JA episodes than any other initiative type. Infants with more combined initiatives achieved more JA episodes at both ages and greater 17-month vocabularies.

## 1. Introduction

### 1.1. Joint attention: definition and importance

Joint attention (JA) has been defined as the triadic coordination of attention between oneself, a social partner, and an object, event, or symbol (Bakeman & Adamson, 1984; Seibert, Hogan, & Mundy, 1982; Tomasello & Farrar, 1986). JA episodes are counted when such mutual engagement with an object or activity reaches a criterion duration—at least 3 s according to several researchers (Bakeman & Adamson, 1984; Tomasello & Farrar, 1986; Vaughan et al., 2003). The ability to share an experience by coordinating one's attention with that of a social partner to an object or topic of interest has been deemed vital to the success of interpersonal relationships throughout one's life (Mundy et al., 2007). The ability of infants to coordinate attention with another to a common point of reference and the time spent in joint attention episodes have been considered foundational to multiple aspects of social and communicative development, including theory of mind (Nelson, Adamson, & Bakeman, 2008) and, especially, language development (Baldwin, 1995; Farrant, Mayberry, & Fletcher, 2011; Mundy & Newell, 2007; Salley & Dixon, 2007; Tomasello & Farrar, 1986; Tomasello & Todd, 1983).

Joint attention episodes are an important context for mothers' production and infants' acquisition of object-labeling utterances (Adamson, Bakeman, & Deckner, 2005; Tomasello & Farrar, 1986) and an environment in which deeper levels of language processing take place (Hirotani, Stets, Striano, & Friederici, 2009; Striano, Reid, & Hoehl, 2006). Joint attentional abilities in children with both typical and atypical development, including in children diagnosed with autism whose deficits in joint attention may be severe, are related to and predictive of their language development (Adamson, Bakeman, Deckner, & Ronski, 2009; Kasari, Freeman, & Paparella, 2006; Luyster, Kadlec, Carter, & Tager-Flusberg, 2008; Morales et al., 2006). Because of its fundamental role in crucial

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domains throughout the lifespan, infants' development of joint attentional capacities merits investigation into its growth and change during infancy at time points when much learning, including language learning, is taking place with a caregiver in a social context. The present study traces infants' and mothers' success in achieving joint attentional episodes during naturally occurring interactions during infants' second year of life.

### 1.2. Two approaches to joint attention

Infants' development of joint attention has been approached in two major ways by researchers, leading to different kinds of studies. The first focuses on describing and categorizing the types of joint attention episodes in which mothers and infants engage, as exemplified by the studies of Bakeman and Bakeman and their colleagues (e.g., Adamson et al., 2005, 2009; Adamson, 1984, 1986;). An alternative approach in the research literature has been to examine the discrete joint attentional behaviors infants can demonstrate within a more structured context (Mundy et al., 2003; Seibert, Hogan, & Mundy, 1982).

#### 1.2.1. Bakeman and Adamson's descriptions of joint engagement

The studies of Bakeman, Adamson, and their co-researchers (Adamson et al., 2005, 2009; Adamson, 1984, 1986;) have characterized the developmental progression in dyads' states of shared or joint engagement (their terms for joint attention episodes) during naturalistic mother-child interactions and the emergence of increasingly sophisticated shared engagement states. Although mother-infant face-to-face engagement and mutual gaze occur much earlier, triadic engagement that includes both partner and object begins towards the end of the first year. Within triadic engagement, Adamson et al. (2009) distinguish the less mature *supported* joint engagement, in which the child is focused on a shared object or event with no overt acknowledgement of the partner, from the more advanced *coordinated* joint engagement, in which the child is actively attending to both the object or event and the social partner. In line with their conceptualization of coordinated joint engagement, in the current study mothers' as well as infants' behaviors are examined, and both mothers' and infants' overt behavior in attending to and/or acknowledging the partner is a requirement for an interaction to be judged a joint attention episode. Adamson and Bakeman's analysis of different states of dyadic engagement conveys the qualitative nature of these JA episodes during mother-infant interactions but not the specific behaviors mothers and infants employ over time or the skills infants need to achieve a joint attention episode.

#### 1.2.2. Mundy and colleagues' operational definitions of infants' behaviors in a semi-structured context

Mundy and colleagues (Mundy et al., 2003; Seibert, Hogan, & Mundy, 1982) designed a laboratory-based semi-structured protocol for an experimenter to present infants with opportunities under controlled conditions to display joint attentional behaviors. The infant behaviors they code include initiating joint attention toward an experimenter (IJA) and responding to the experimenter's initiation of joint attention (RJA). However, in contrast to Bakeman and Adamson's focus on engagement states, Mundy and colleagues' procedure does not assess whether a joint attention episode is or can be achieved. Their criteria for scoring both IJA and RJA require the infant's attention to or acknowledgement of the experimenter as well as a focus on the indicated object or event, such as using eye contact or showing gestures to coordinate and share an experience or gaze-following and pointing gestures to follow into the adult's overture. In keeping with their definitions, the present study records infants' combined initiatives to their mothers and infants' combined responses to their mothers' initiations, each of which also requires both acknowledgement of the partner and focus on the relevant object. Although Mundy and colleagues have employed their terms IJA and RJA for specific behaviors exhibited during their procedure, because we consider combined initiatives and responses as essentially equivalent to IJA and RJA and for clarity of continuity with previous research, we have used their terms, IJA and RJA, as shorthand equivalents for the combined initiatives and combined responses recorded in this study of mothers' and infants' behaviors. Extending beyond the scope of Mundy and colleagues, we also include coding of instances of infants' less advanced initiating behaviors towards objects—object initiatives (IObj)—that are without a partner-focused component to determine whether they can also provide an opportunity for entry into interactive joint attention episodes, especially if mothers provide a combined response (cf. Tasker & Schmidt, 2008).

Studies examining the elicited joint attention behaviors specified by Mundy and colleagues have found that individual differences are predictive of developmental outcomes in social competence and language development in children who are developing typically and atypically (Mundy et al., 2007; Nowakowski, Tasker, & Schmidt, 2009; Sheinkopf, Mundy, Claussen, & Willoughby, 2004; Sigman et al., 1999; Vaughan Van Hecke et al., 2007). In particular, infants' skills during their semi-structured procedure in RJA at the beginning of the second year and their abilities in IJA in the middle of the second year predicted their language performance at the end of the second year (Mundy et al., 2007). To extend such findings, the present study assesses relations between infants' initiating and responding behaviors to their mothers during naturalistic interactions and their later vocabulary levels.

### 1.3. Integrating aspects of these two approaches: the current study

The developmental progression of joint attention and its impact on other developmental milestones have generated studies that approach joint attention in contrasting ways. In analyzing naturalistic dyadic interactions, Adamson, Bakeman, and colleagues (Adamson et al., 2005; Bakeman & Adamson, 1986) have described the qualitative states infants and their caregivers engage in together. Mundy and colleagues, on the other hand, have isolated and measured specific infant behaviors that are the building blocks to participating in a state of joint engagement but do not always result in one (Mundy et al., 2003, 2007; Seibert et al., 1982; Vaughan et al., 2003). Our overall goal for the current study is that combining positive aspects of these two perspectives will contribute to providing a comprehensive description of the development of joint attention—both its composite behaviors and the successful

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