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How do 3-month-old infants attribute preferences to a human agent?

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ABSTRACT

The current study showed that 3-month-old infants attributed a preference to a human agent, with her face and upper body visible, when she consistently reached for and grasped one of two objects with her bare hand. In contrast, infants did not appear to interpret the agent's same actions of grasping the object as indicative of her preference when it was the only object present or when it hid the other object from her but not from the infants. These results suggest that even from an early age, infants interpret human agents' actions in terms of mental states such as goals and preferences. In light of the current results, mechanisms for early psychological understanding are discussed.

Introduction

As adults, we use a coherent construct of mental states—including goals (e.g., to grasp a toy), dispositions (e.g., preferences; an individual likes Toy A more than Toy B), perceptions, beliefs, and false beliefs—to make sense of each other's behavior. A crucial aspect of such psychological understanding is perspective taking—that is, to realize that others view the world differently from us and to "put ourselves in others' shoes" to understand their behavior—which facilitates our interactions and relations with others. Developmental research reveals that the origins of such psychological understanding emerge during infancy (e.g., Bíró & Leslie, 2007; Gergely, Nádasdy, Csibra, & Bíró, 1995; Hamlin,

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Ullman, Tenenbaum, Goodman, & Baker, 2013; Hernik & Southgate, 2012; Kuhlmeier, Wynn, & Bloom, 2003; Luo & Beck, 2010; Onishi & Baillargeon, 2005; Sommerville & Woodward, 2005; Southgate & Vernetti, 2014; for reviews, see Baillargeon, Scott, & Bian, 2016; Baillargeon et al., 2015; Luo & Baillargeon, 2010).

For example, in Woodward's (1998) groundbreaking study, after watching a human agent's arm and hand repeatedly reach for and grasp Object A but not Object B, 5-month-old infants seemed to have interpreted her actions as directed by a goal of choosing Object A. Therefore, they responded with prolonged looking when the hand reached for Object B. Luo and Baillargeon (2005) extended these results to situations involving a self-propelled box agent (agents are entities that can detect their environment and control their actions, whether human or nonhuman; e.g., Luo & Choi, 2013). Importantly, they suggested that if the box agent consistently moved to contact A when both Objects A and B were present (two-object condition), infants seemed to have attributed to the agent a *preference* for A over B and, therefore, responded with heightened interest when the agent acted inconsistently with this preference and contacted B (a preference denotes a disposition for why an agent makes choices between two options; e.g., Luo, Hennefield, Mou, vanMarle, & Markson, 2017). In addition, if Object B was absent when the agent contacted A (one-object condition), infants failed to attribute a preference to the agent. They no longer responded with heightened interest when the box agent contacted B after it was introduced. These results have been extended to younger 3-month-old infants (Luo, 2011b).

Such evidence that young infants engage in intentional interpretation about nonhuman agents supports a *system-based view* of early psychological understanding. According to this view, an early emerging psychological reasoning system affords a skeletal causal framework that enables infants to make sense of the actions of any entity they identify as an agent, whether human or nonhuman (e.g., Baillargeon et al., 2015; Gergely & Csibra, 2003; Johnson, 2005; Leslie, 1995). In support of this view, infants are also found to consider the agent's *perceptions* or *representations* when interpreting the agent's actions in terms of goals and preferences. Various studies used situations in which Object B was hidden from the agent, but not from infants, while the agent approached Object A (e.g., Choi, Luo, & Baillargeon, 2018; Kampis, Somogyi, Itakura, & Király, 2013; Kim & Song, 2015; Luo, 2011a; Luo & Baillargeon, 2007; Luo & Johnson, 2009). For example, Object B was behind a large screen or behind a human agent's back and, thus, was invisible to the agent. Infants as young as 6 months seemed to view the situations from the agent's perspective and realized that although they themselves could see both Objects A and B, this experimental context was essentially a one-object condition to the agent because she could not see Object B when she grasped Object A. Therefore, the agent's actions toward A did not warrant the attribution of a preference.

Naturally, learning and experiences (e.g., learning to act on objects by grasping, pointing, or merely looking; experiences with self and others) are vastly important in infants' understanding about agents (for reviews, see Meltzoff, 2005; Tomasello, Carpenter, Call, Behne, & Moll, 2005; Woodward, 2005). For instance, over development, infants become more and more adept at producing various goal-directed actions and come to understand intentions underlying others' similar actions, partly through innate capacities to align own actions and mental states with those of others (Meltzoff, 1995, 2005; Tomasello, 1999; Woodward, Sommerville, & Guajardo, 2001). A study with 3-month-olds illustrates this point (Sommerville, Woodward, & Needham, 2005). When tested with a procedure similar to that in Woodward (1998), these young infants, who generally cannot yet grasp objects (Needham, Barrett, & Peterman, 2002), failed to "read" the intention behind the human agent's arm and hand reaching for Object A, but not Object B, and hence did not respond to the change of goal object from A to B (the agent's arm and hand either had a mitten on or was bare). However, they responded positively, as did the 5-month-olds in Woodward (1998), if they first participated in an action task where they wore Velcro mittens to manipulate the two objects. The "sticky mittens" allowed young infants to contact and even pick up the objects, similar to grasping. They then encoded the intention underlying the agent's grasping one of two objects with her arm and hand, also wearing the mitten. These results point to the importance of firsthand action experiences—even those acquired in a laboratory setting—in infants' understanding about agents' goals and preferences.

Therefore, the psychological reasoning system provides a blueprint for infants' understanding about agents. Infants identify certain entities as agents and use mental states, such as goals,