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## Infants' online perception of give-and-take interactions



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### ABSTRACT

This research investigated infants' online perception of give-me gestures during observation of a social interaction. In the first experiment, goal-directed eye movements of 12-month-olds were recorded as they observed a give-and-take interaction in which an object is passed from one individual to another. Infants' gaze shifts from the passing hand to the receiving hand were significantly faster when the receiving hand formed a give-me gesture relative to when it was presented as an inverted hand shape. Experiment 2 revealed that infants' goal-directed gaze shifts were not based on different affordances of the two receiving hands. Two additional control experiments further demonstrated that differences in infants' online gaze behavior were not mediated by an attentional preference for the give-me gesture. Together, our findings provide evidence that properties of social action goals influence infants' online gaze during action observation. The current studies demonstrate that infants have expectations about well-formed object transfer actions between social agents. We suggest that 12-month-olds are sensitive to social goals within the context of give-and-take interactions while observing from a third-party perspective.

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### Introduction

From birth, human infants are sensitive to social information, and they begin to communicate before becoming verbal (Bruner, 1977; Tomasello, 2008). Even newborns show sensitivity to different

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communicative cues such as preference for face-like patterns (e.g., Valenza, Simion, Cassia, & Umiltà, 1996) and sensitivity for mutual and direct gaze (Farroni, Csibra, Simion, & Johnson, 2002). From early on, infants are receptive to turn-taking structures and signals in mother–infant (Kozak-Mayer & Tronick, 1985; Nadel, Prepin, & Okanda, 2005; Trevarthen, 1979, 1993) and stranger–infant (Melinder, Forbes, Tronick, Fikke, & Gredebäck, 2010) face-to-face interactions during both dyadic and triadic interactions (Brooks & Meltzoff, 2005; Bruner, 1983; Carpendale & Lewis, 2004; Gredebäck, Fikke, & Melinder, 2010; Moore & Dunham, 1995). Such early experiences in interpersonal communication are seen as a foundation for social communication skills later in life (Brownell & Carriger, 1990; Mundy & Newell, 2007; Tomasello, 1999).

Besides referential cues from faces (e.g., gaze directions, facial expressions), observing other people's actions plays a crucial role in communication and cultural learning. It also facilitates understanding and prediction of other people's goals during social interactions (Baldwin, 2000; Sebanz, Bekkering, & Knoblich, 2006). However, one limitation of prior studies on infants' action understanding is their focus on manual actions performed by a single individual (e.g., Daum, Prinz, & Aschersleben, 2008; Falck-Ytter, Gredebäck, & von Hofsten, 2006; Woodward & Sommerville, 2000). Consequently, it is not well understood how infants perceive manual actions in a social context. One exception is a study by Gredebäck and Melinder (2010), who presented infants with two actors feeding each other (for a recent exception, see also Thorgrimsson, Fawcett, & Liszkowski, 2014). The current study aimed to address this gap by focusing on infants' understanding of a simple social interaction. In the following, we refer to a specific type of social interaction that consists of an exchange of an object between two individuals (see also Fawcett & Gredebäck, 2013).

In the current study, goal-directed eye movements of 12-month-olds were recorded as the infants observed a give-and-take interaction in which an object is passed from one individual to another. We investigated whether infants are able to exhibit goal-directed gaze shifts toward the action goal of an observed social interaction. More specifically, the current study examined whether there is a difference in the latencies of infants' goal-directed gaze shifts that are directed toward a give-me gesture – an extended hand with palm up formed when requesting and receiving an object (Mundy, Sigman, Ungerer, & Sherman, 1986) – compared with an inverted hand shape that was identical in shape but different in orientation (a downward-facing palm, hereafter labeled as inverted hand shape). This research topic is new to the field of developmental psychology in that it combines knowledge from studies targeting both the development of gestural communication and online action understanding. Even though it is still unclear how social properties of observed action goals influence infants' early action understanding from a third-party perspective, they play an important role in our social world where we constantly observe and encode social interactions. Because gestures are a key component of human social communication, the current study focused on infants' online perception of a give-me gesture as a part and goal of an observed interaction.

Gestural communication can be found across many contexts, cultures, and species (Call & Tomasello, 2007; Cartmill & Byrne, 2010; Goldin-Meadow, 2011). In essence, gestures are perceived as conveying specific meanings, intentions, goals, interpersonal information, and emotions from one individual to another, typically with fingers, hands, and arms (Crais, Douglas, & Campbell, 2004). On a theoretical level, researchers have made a distinction between deictic and representational gestures (Goldin-Meadow, 1999; Iverson & Thal, 1998; McNeill, 1992). The former are gestures that refer to objects or events, for example, through pointing or showing (Bates, Benigni, Bretherton, Camaioni, & Volterra, 1979). The latter can stand on their own (i.e., without speech) because its form or motion conveys a specific semantic meaning that can be either object related or convention based (Crais et al., 2004). The give-me gesture, which is the target of the current experiments, is referential because it often involves an invitation to collaborate or a request to comply.

Prior studies investigating give-me gestures have primarily relied on observational paradigms, focusing on infants' ability to produce give-me gestures during give-and-take interactions (Carpenter, Nagell, & Tomasello, 1998; Crais et al., 2004; Messinger & Fogel, 1998). For instance, Messinger and Fogel (1998) examined infants' gesturing and corresponding communicative behaviors (e.g., vocalization, gazing at the mother) during mother–infant play sessions from 9 to 15 months of age using a longitudinal design. Over the investigated time range, the proportions of infants both offering and requesting objects increased. These changes were accompanied by increasing communicative

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