



Original Articles

The social-cognitive basis of infants' reference to absent entities

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ARTICLE INFO

Keywords:

Communication
Displacement
Common ground
Pointing
Social cognition

ABSTRACT

Recent evidence suggests that infants as young as 12 month of age use pointing to communicate about absent entities. The tacit assumption underlying these studies is that infants do so based on tracking what their interlocutor experienced in a previous shared interaction. The present study addresses this assumption empirically. In three experiments, 12-month-old infants could request additional desired objects by pointing to the location in which these objects were previously located. We systematically varied whether the adult from whom infants were requesting had previously experienced the former content of the location with the infant. Infants systematically adjusted their pointing to the now empty location to what they experienced with the adult previously. These results suggest that infants' ability to communicate about absent referents is based on an incipient form of common ground.

1. Introduction

Language is inherently ambiguous. When interpreting others' utterances, it is not sufficient to focus on what is said, but one also needs to consider the context in which something is said. A crucial aspect of context is the common ground shared between speaker and listener (Bohn & Köymen, 2017; Clark, 1996; Sperber & Wilson, 2001; Tomasello, 2008). Part of the common ground between two individuals is what they mutually know about a certain state of affairs. As an example for how common ground can be used to disambiguate utterances consider the following: A speaker may communicate to a listener that she desires another piece of cake by pointing to an empty plate if it is part of common ground that this plate previously contained pieces of cake. For a person not sharing this common ground, the point to the empty plate would fail to denote the absent cake. To use common ground, speakers and listeners therefore have to keep track of what they experience with whom. Utterances produced *and* interpreted in light of common ground quickly lose their ambiguity.

Common ground is not only vital for adult communication, but arguably even more so for young children in the process of learning language. This is for at least two reasons: On the one hand, children's earliest forms of intentional communication (e.g. pointing gestures or one-word utterances) are considerably more ambiguous compared to

fully formed adult speech. Successful communication based on these signals heavily relies on common ground. By considering whether something is part of common ground, children can actively help their partner figure out what they mean. On the other hand, when on the receiving end, children are faced with more ambiguity compared to an adult listener because oftentimes they do not know the conventional meaning of words. Again, considering common ground when interpreting utterances greatly facilitates disambiguation and learning. For example, when engaged with someone in naming things by their color, the novel word "zeleny" most likely refers to yet another object's color instead of e.g. its name. In this spirit, a number of theoretical accounts have emphasized the importance of common ground for early communication and language acquisition (Bohn & Köymen, 2017; Bruner, 1974; Clark, 2015; Tomasello, 2008; Tomasello, Carpenter, & Liszkowski, 2007).

From a psychological perspective, common ground is traditionally conceptualized as involving recursive mindreading on both ends: Speaker and listener reason about each other's mental states to determine what is part of common ground and what not. If recursive mindreading was a pre-requisite for using common ground, it would be unlikely that infants are able to do so because these abilities do not emerge until around six years of age (Miller, 2009). Recently, Bohn and Köymen (2017) proposed a developmental perspective on common

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ground, arguing that recursive mindreading might be an outcome of communication based on common ground rather than a prerequisite. The developmental primitive of common ground is the expectation that others act rationally in light of shared experience. While preserving the idea of ambiguity reduction, this view does not put recursive mindreading at the core of common ground. When reviewing the literature and discussing our results, we do so in light of this perspective.

There is a solid body of empirical evidence supporting the claim that even very young children (below age 2) rely on common ground when interpreting ambiguous utterances. Tomasello and Haberl (2003) showed that 12- and 18-month-old children consider what is new to a speaker (i.e. what is not part of common ground) when interpreting ambiguous requests (see also Moll, Carpenter, & Tomasello, 2007; Moll & Tomasello, 2007). In a study by Ganea and Saylor (2007), 15- and 18-month-olds interpreted an ambiguous request (“Can you get it for me?”) as referring to an object that was part of a previous interaction (see also Saylor & Ganea, 2007; Saylor, Ganea, & Vázquez, 2011). Liebal, Behne, Carpenter, and Tomasello (2009) had infants play different games with two experimenters. Later, 18-month-olds (and to some extent also 14-month-olds) interpreted and ambiguous point to an object by one of the experimenters as referring to the game they previously played with that particular individual.

There is considerably less evidence that young children adjust their own communicative acts to common ground. In a study by Liebal, Carpenter, and Tomasello (2010), participants played with different toys with two different experimenters. When later confronted with a photograph of these toys, 18-month-old infants pointed more often to the toy they previously shared with the experimenter that was now with them. In this study, 14-month-olds did not show a consistent pattern of pointing. More recently, a number of studies claimed that already 12-month-olds rely on common ground when communicating about absent entities (Bohn, Call, & Tomasello, 2015; Liszkowski, Schäfer, Carpenter, & Tomasello, 2009).

Studies looking at children's comprehension of words referring to absent entities find first signs of comprehension at around 12 months of age (Ganea & Saylor, 2013; Osina, Saylor, & Ganea, 2013, 2014; Saylor, 2004) and fairly solid comprehension abilities in place around 16 months (Osina, Saylor, & Ganea, 2017). On the other hand, children do not produce their first words referring to absent entities until around 18 months (Veneziano & Sinclair, 1995). The studies reporting early use of common ground therefore looked at children's pointing behavior. When pointing, reference to the absent entity is not grounded in the conventional semantics of words but in shared experience. In the corresponding studies, children pointed to the previous location of an object in order to request another one of that kind (Bohn et al., 2015; Liszkowski et al., 2009; see also Liszkowski, Carpenter, & Tomasello, 2007). Presumably, infants did so in appreciation of the shared interaction with their interlocutor around this location while it still contained objects. However, this assumption and with it the role of common ground was not addressed empirically.

The present study aimed at filling this gap by investigating whether 12-month-old infants adjust their communicative acts to previous interactions with an interlocutor. In particular, we focused on whether they take into account what their interlocutor experienced in an earlier interaction. To this end, we adopted the methodology developed by Bohn et al. (2015). Participants played a game in which they requested visible objects, placed on two plates, from an experimenter in order to throw them into a container. Following Bohn et al. (2015), we manipulated the content of the two plates. The plates either contained objects of the same quality (both high or both low quality) or of a different quality (one high quality and the other low quality). Importantly, the low quality objects were nevertheless desirable to infants when presented on their own. During the warm-up phase, whenever one option was depleted, the experimenter (E1) left the room and brought new objects of that kind. In the test phase, after the participant had again requested all objects from one of the plates, E1 left the room

again. In this situation, one plate was empty and the other still contained visible objects. Bohn et al. (2015) argued and presented evidence that a desirable and visible alternative is necessary to interpret infants' requests as intended to obtain a specific object. Furthermore, without a desirable alternative option, participants might simply point to the empty plate because no other way to continue the game in general is available. This would make it difficult to investigate whether infants take into account previous interactions with the respective experimenter. However, presenting a valuable alternative option decreases the number of points to the empty plate in the test phase. The focus of the study was therefore not whether infants at 12 month of age request absent objects more often than visible objects but how requests for absent objects were distributed across conditions.

We then manipulated who would return to the test room. In the case that E1 returned to the test room, E1 had previously seen the former content of the plate. If E2 returned to the test room, she had not seen it. During the test phase, we coded whether infants would point to the empty plate to request additional objects. For E1, who previously saw the former content of the plate, we expected infants to point to the empty plate only if its previous content was of a higher quality compared to the visible option (specific requests). For E2, who never saw the former content of the empty plate, we expected infants to ignore the previous content of the empty plate. In a second experiment, we specified which aspects of the previous interaction drives infants' pointing. A third experiment replicated experiment 2.

2. Experiment 1

2.1. Participants

We tested 64 twelve-month-old infants ($M = 382.9$ days, $SD = 7.0$ days, 32 girls). Participants came from mixed socioeconomic backgrounds, lived in a middle-sized German city and were recruited from a database of children whose parents volunteered for studies on child development. Parents were asked prior to the study whether their child already pointed and only infants who pointed were included in the study. Additional infants were invited but had to be excluded because they completed only one experimental session (12) lost interest or became uncomfortable in the first experimental session (nine), their parents interfered (one) or the experimenter made a mistake (one).

2.2. Setup

Infants were tested in a separate room within a child laboratory. They were seated on their parents lap facing the experimenter's chair (distance: 140 cm), flanked by two platforms ($55 \times 28 \times 69$ cm; distance between platforms 50 cm) with a ceramic plate ($\emptyset 20$ cm) on top. In front of the infant stood a cylindrical container ($\emptyset 24$ cm, height 47 cm) with a funnel on top (see Fig. 1). The container was close enough to the infant to insert objects into the funnel. Inserting an object produced a rattling sound and made the object disappear. The two platforms were located closer to the experimenter so that she could easily reach for the objects placed on the plates while the objects were out of reach for the infant. The objects used throughout the study were colorful balls (red and blue, $\emptyset 5$ cm) as well as wooden cubes (side length 2.5 cm). Pilot testing showed that infants generally preferred the balls to the blocks, although the blocks were nevertheless desirable when presented on their own. Additional objects were stored outside the test room and were never visible to the infant.

2.3. Procedure

For a schematic overview of the procedure see Fig. 1. Infants and their parents arrived in a playroom within the laboratory where they met the experimenters E1 and E2. Together they played until the infant was comfortable with the situation. Within the test room, the

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