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Infants' understanding of the definite/indefinite article in a third-party communicative situation

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ABSTRACT

The present study examines how infants use their emergent perspective-taking and language comprehension abilities to make sense of interactions between two human agents. In the study, one agent (Agent1) could see only one of two identical balls on an apparatus because of a screen obstructing her view while the infant and another agent (Agent2) could see both balls. 19-month-old English-learning monolingual infants seemed to expect Agent2 to grasp the ball visible to Agent1 when she said to Agent2 "Give me *the* ball" but not when she said "Give me *a* ball." 14-month-olds appeared to accept that Agent2 could grasp either ball when Agent1 said "Give me *the* ball." Therefore, by 19 months of age, English-learning infants seem to attend to the specific linguistic units used, e.g., the definite article, to identify the referent of others' speech. Possible reasons in connection with language acquisition processes and/or environmental factors for the two age groups' respective failures with the definite and the indefinite articles are discussed.

1. Introduction

When we interact with other people, we use a coherent construct of mental states, including intentions, perceptions, and beliefs, to make sense of each other's behavior. Speech is also a very important, if not ubiquitous, part of social interactions. What we say conveys a great deal of information to our interaction partner, e.g., signals to him or her what we want. In cases in which speech is ambiguous (e.g., there are two potential choices when the speaker's verbal request is unclear), we also use our understanding of others' informational (or epistemic) states and perceptual experiences to determine the referent of the speech (e.g., Clark & Marshall, 1981; Sperber et al., 2011), although not always effectively (e.g., Keysar, Barr, Balin, & Brauner, 2000). Recent developmental research has discovered that even infants possess theory-of-mind understanding and also use it to make sense of social interactions when speech is involved. We review some of the evidence below.

There has been many reports suggesting that the understanding about others' mental states as causes for their behavior originates in infancy (for reviews, see Baillargeon, Scott, & Bian, 2016; Baillargeon et al., 2015). Particularly, infants seem to possess rudimentary perspective-taking skills, for example, they seem to recognize that others' perceptions can be different from their own.[1] For the purpose of the present research, we focus on situations in which others' visual perceptions are less complete than infants' own. Infants seem to consider others' incomplete perceptions when making sense of their intentional actions (for a review, see Luo & Baillargeon, 2010).

Numerous studies show that infants attribute to agents (i.e., entities that can perceive their environment and exert control over their actions, e.g., Luo & Choi, 2013) goals and dispositions (e.g., preferences) to predict and interpret their actions (e.g., Bíró & Leslie, 2007; Gergely, Nádasdy, Csibra, & Bíró, 1995; Hamlin, Ullman, Tenenbaum, Goodman, & Baker, 2013; Hernik & Southgate, 2012; Kuhlmeier, Wynn, & Bloom, 2003; Luo & Baillargeon, 2005; Luo & Beck, 2010; Luo, Hennefield, Mou, vanMarle, & Markson, 2017; Sommerville & Woodward, 2005; Song, Baillargeon, & Fisher, 2005; Woodward, 1998). In a study modeled after Woodward (1998), for example, Luo and Baillargeon (2005) found that 5-month-olds seemed to attribute to a nonhuman agent, a self-propelled box, a preference for object-A over object-B if the box

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[1] If we assume the connections between perceptions and knowledge, that is, seeing leads to knowing, not seeing leads to not knowing and in some cases holding outdated or wrong information, then infants' recognizing others' different perceptions suggests that they may also accept that other people can have perceptions or beliefs (or informational states) that are outdated or false. Recent data, although still controversial (e.g., Heyes, 2014), suggest that infants understand others' false perceptions (e.g., Song & Baillargeon, 2008) and false beliefs (for a review, see Baillargeon, Scott, & He, 2010). In fact, we argue that perspective-taking skills are central to the theory-of-mind understanding about others: we can "put ourselves in others' shoes" and realize that others' mental states such as goals, intentions, emotions, perceptions, and beliefs, can be different from our own.

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repeatedly approached and contacted A but not B. They expected the box agent to continue acting on this preference and responded with heightened interest when the agent changed its "mind" to approach object-B. In addition, if object-B was absent when the agent contacted object-A, infants seemed to realize that the agent did not have a preference. 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, 2011).

Infants also seem to take the agent's "perspectives" when interpreting the agent's actions in terms of goals and preferences. In various studies, Choi, Luo, and colleagues created situations in which one of the two options, e.g., object-B, was hidden from the agent, but not from the infant, while the agent approached object-A (e.g., Choi, Luo, & Baillargeon, 2017; Choi, Mou, & Luo, 2017; Luo & Baillargeon, 2007; Luo & Johnson, 2009). For example, object-B was behind a large screen or behind the agent's back and thus invisible to the agent (Luo & Baillargeon, 2007; Luo & Johnson, 2009). Infants aged 3–12.5 months seemed to view the situations from the agent's point of view; the agent could only see object-A and hence the situation was essentially a one-object condition to her in that A was the only option available. Although the agent approached object-A but not B, infants did not appear to interpret such actions as indicative of a preference, a response different than those from situations in which the agent performed the same actions with both objects A and B visible.

In the studies reviewed above, there is only one agent involved, human or nonhuman. The human agent either does not talk to the infant at all (Luo & Baillargeon, 2007) or talks simply to get the infant's attention (Woodward, 2003) or to indicate her goal object (Phillips & Wellman, 2005; Song, Baillargeon, & Fisher, 2014). Recently, an interesting line of research has found that infants also seem to understand that speech can convey information about agents' intentions, e.g., goals or preferences, in interactions between two agents (Martin, Onishi, & Vouloumanos, 2012; Vouloumanos, Martin, & Onishi, 2014; Vouloumanos, Onishi, & Pogue, 2012). For example, 12-month-olds (Martin et al., 2012) first watched an experimenter (E1) demonstrate her preference between two toys by grasping toy-A but not toy-B three times. During the test trial, the toys became out of the experimenter's reach. She thus turned to her interaction partner (E2), who did not witness her previous choices between toy-A and toy-B, and uttered a pseudo-word "koba." E2 then reached for one of the two toys. Infants looked reliably longer when E2 reached for toy-B than when she reached for toy-A, E1's preferred toy. These positive results were not found when E1 simply coughed, said "ooh," or did not say anything to E2. Together, these and control results suggest that infants realize that E1's speech, but not non-speech vocalization, could signal to E2 what she wanted between the two options, even before they grasped the meaning of the word used by E1. Such results have been extended to younger, 6-month-old infants (Vouloumanos et al., 2014).

Therefore, by the end of the first year of life, infants appear to recognize that others do not always see what they can see, and that speech is indicative of others' intent. In Martin et al. (2012), the research question explored infants' understanding of the communicative function of speech and hence the speaker and the infant held the *same* perceptions of the scene. There has also been ample evidence from action tasks suggesting that when the speaker's perceptual experiences are *different* from the infant's own, infants use their perspective-taking skills to identify what the agent's speech refers to. In one line of research (e.g., Moll, Carpenter, & Tomasello, 2007; Moll & Tomasello, 2007; Tomasello & Haberl, 2003), the referent of the agent's speech remains visible to infants (for similar results with the agent *pointing* to indicate her target, see e.g., Liebal, Behne, Carpenter, & Tomasello, 2009). For example, 14-month-olds first played with two objects with one agent, agent-A. They then played with a third object with another agent, agent-B, when agent-A was absent. Next, agent-B put all three objects in a tray. When agent-A returned, looked at the tray, and requested "Oh, look! Look there! Look at that there! Give it to me, please!" (Moll & Tomasello, 2007, p. 312), infants chose the third object for her, suggesting that they tracked which objects agent-A had and had not seen before and knew what she was asking for.

In another line of research, the referent of the agent's speech is even hidden from view (Ganea & Saylor, 2007; Saylor & Ganea, 2007; Saylor, Ganea, & Vázquez, 2011). For example, 14-month-olds (Saylor & Ganea, 2007) played with agent-A with a red ball for one minute during which the agent claimed it was her ball and mentioned "ball" for the total of seven times. Agent-A then put it in a yellow bucket. The same sequence was repeated with agent-B and her ball, a blue one. During test, one of the agents sat in front of the two buckets and asked "Where is *the* ball?" Infants were able to choose the red ball for agent-A but the blue one for agent-B (counterbalanced). These and control results suggest that infants can keep track of others' experiences to determine the absent referent of their speech. Interestingly, slightly younger, 13-month-old infants failed in similar tasks unless the agent asked, "Where is *my* ball?" (Saylor et al., 2011). This comparison hints at the role specific units of speech play in how infants identify the referent of others' speech.

1.1. The present research

In summary, at least at the beginning of the second year, infants can use both their language comprehension and perspective-taking skills to make sense of social interactions. On the basis of these findings, the present research aimed to examine how refined infants' language comprehension skills could be by introducing into an agent's speech the distinction between the definite article (*the*) and the indefinite article (*a*) in English. In addition, in the studies reviewed above, the two or three objects among which infants have to find the referent of the agent's speech have different features, at least in color. In the present task, the two options to choose from were identical. Specifically, one human agent (Agent1) could only see one of two identical balls on an apparatus because of a large screen obstructing her view while another agent (Agent2) and the infant could see both balls. Agent1 said to Agent2 twice "Give me *the* ball" or "Give me *a* ball." Given that the definite article usually denotes an object that the speaker and the listener both know about (e.g., Ariel, 1988; Chafe, 1976; Gundel, Hedberg, & Zacharski, 1993; Onishi & Murphy, 2002; Schmerse, Lieven, & Tomasello, 2015), Agent1 should be referring to the ball visible to her when she used "*the*" but not "*a*." To succeed, infants not only had to consider the agent's less complete perceptions from their own, they also had to rely on the article the agent used in her speech to make appropriate predictions.

Previous research suggests that English-learning toddlers have some understanding about articles (e.g., Petretic & Tweney, 1977; Shipley, Smith, & Gleitman, 1969). For example, two-year-olds were sensitive to the presence of the definite article "*the*" in a sentence. They performed the best when told to "Find *the* bird" in a picture book than when they heard "Find bird," "Find *was* bird," or "Find *gub* bird" (e.g., Gerken & McIntosh, 1993). Also, 17- to 24-month-olds have been found to respond differently to a novel noun with or without an article in front of it (e.g., Gelman & Taylor, 1984; Katz, Baker, & Macnamara, 1974). If hearing "This is Zav" or "This is *a* zav," 17-month-olds considered "zav" a proper name in the first case but a common noun in the second case (Katz et al., 1974).

Although children are sensitive to the absence or presence of "*the*" and "*a*" in noun phrases, their production and comprehension of these articles are not yet precise. Between 2 and 5.5 years of age, while children correctly use "*the*" to refer to entities already mentioned in discourse, they use both "*a*" and "*the*" to refer to a newly introduced entity (Karmiloff-Smith, 1981; Maratsos, 1974; Rozendaal & Baker, 2008; Schaeffer & Matthewson, 2005; Schafer & De Villiers, 2000; Wexler, 2011). In comprehension tasks, children correctly understand the determinedness of "*the*" but remain uncertain about "*a*." They seem to accept that it can refer to new as well as old entities in discourse (Van

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