

Preschoolers' sensitivity to knowledge differences about object existence and object identity in real-time language processing

Successful communication requires children to both appreciate another's perspectives and integrate that perspective information rapidly. To date, most experimental studies that have examined children's real-time inferences in perspective-taking contexts have used an experimental paradigm involving information that is visually shared or not shared between the child and a speaker. These studies create a discrepancy between the speaker and listener's perspectives using a physical setup where, in the critical test condition, the child listener can see objects hidden from the speaker by opaque panels. Evidence from this paradigm has shown that preschoolers can integrate another's perspective information in the early moments of language processing (Khu, Chambers, & Graham, 2019; Nadig & Sedivy, 2002). It is important to note, however, that measures of listeners' sensitivity to visual perspective may not capture the many other ways in which information about another person's knowledge state is acquired in real-world communicative interactions (e.g., via other sensory information, verbal testimony, inference, etc.). As a result, there are outstanding questions regarding how successfully children mentalize others' perspectives in situations involving greater representational complexity (which are part of everyday communication), and how this affects the efficiency with which children apply perspective information during real-time language processing.

Here, we examined whether preschoolers' sensitivity to another's perspective extends to a distinct type of knowledge discrepancy: namely, privileged knowledge about the *identity of an object*. In Experiment 1, we examined preschool children's ability to manage knowledge differences about an object's identity between themselves and their partner. We compared a condition in which both children and their partner know the object's identity to a condition in which only children have that knowledge. In Experiment 2, we set up a traditional experimental scenario where the knowledge discrepancy involves awareness of certain objects' "existence" in the array and compared it to the condition in Experiment 1 where the knowledge discrepancy involves the object's true identity. This allowed us to directly contrast the ability to ignore privileged visual information with the ability to ignore privileged knowledge about how a (mutually-visible) object should be conceptualized.

We used a referential communication task where children were presented with displays containing a target object (e.g., a candy), a competitor object, and two unrelated objects. Three different types of competitors were included; a **regular phonological competitor** (e.g., a regular candle), a **"knowledge-based" phonological competitor** (e.g., a candle that looked like an apple), and a **visual control object** (e.g., a regular apple). In Experiment 1, 60 5-year-olds were tested in either the *shared-knowledge condition* or the *privileged-identity condition*. In the *shared-knowledge condition*, both the child and the speaker knew the identity of the visually-deceptive competitor object (the knowledge-based phonological competitor; e.g., that the apparent apple was in fact a candle), and this object was mutually visible to both partners. In the *privileged-identity condition*, the competitor was again visible to both partners, but only the child knew the identity of the deceptive object. In Experiment 2, 30 5-year-old children were tested in the *privileged-existence condition* where an occluder panel entailed that only children could see the competitor object. Across both experiments, the potential for the knowledge-based phonological competitor to compete with the target name (candy) varied by the speaker's knowledge state. We examined patterns of fixations as the speaker instructed the child to find a particular object.

For statistical analyses, we focused on children’s fixations launched 200 ms after the target noun onset. We calculated target advantage scores (the average proportion of fixations to the target - the competitor) during a 800 ms interval beginning 200 ms after noun onset and then transformed using an empirical logit transformation. These measures were analyzed using a linear mixed effects model. Target advantage scores by knowledge state conditions in Experiment 1 and Experiment 2 are shown in Figure 1. The overall model included knowledge state, competitor type, and their interaction as fixed effects with participants and items as random effects. In Experiment 1, the analysis revealed a significant main effect of competitor type ($p < .001$). The main effect of knowledge state and the interaction between the variables were not significant. Follow-up pairwise comparisons revealed overall higher fixations to the target object relative to the competitor object when the competitor was the visual control object compared to the knowledge-based phonological competitor ($p = .021$). When we compared *privileged-identity condition* to *privileged-existence condition* in Experiment 2, there was a significant interaction between knowledge state and competitor type ($p = .029$). Further analysis revealed no differences in the target advantage scores between the three different types of competitors in the *privileged-identity condition*. In the *privileged-existence condition*, however, there was a higher tendency to look at the target object in trials involving the knowledge-based competitor than the visual control object ($p = .004$).

Across two experiments, we found evidence that the type of mental representation affects how children use perspective information during referential processing in different ways. Preschool children in Experiment 1 did not consider the speaker’s limited knowledge about the identity of the deceptive object (i.e., *privileged identity condition*). That is, they had difficulty suppressing their own knowledge about the true identity of a deceptive object when the speaker was unaware of this information, consistent with findings from adults (Mozuraitis et al., 2015). Given that children in the *privileged-identity condition* successfully understood that another person who has not seen the deceptive object before would conceptualize it based on its appearance, it is surprising that they preferred to look at the knowledge-based phonological competitor while hearing the speaker’s instruction. In contrast, when we compare the *privileged-identity condition* to the *privileged-existence condition* in Experiment 2, children rapidly integrated the speaker’s visual perspective in on-line language processing when it was marked by a visual cue (i.e., in the *privileged existence condition*, where the competitor was not visible for the speaker), consistent with previous research (e.g., Khu et al., 2019; Nilsen & Graham, 2009). Overall, the current results suggest that the efficiency with which children integrate perspective inferences in online language processing hinges on the complexity of mental representation.

Figure 1. Target advantage scores during a critical interval in Experiment 1 and Experiment 2

