

CROSSING
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P8: Implicit Understanding of Epistemic State Language in 27-month-olds An Eye-tracking Paradigm



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Background & Aims

The acquisition of mental state terms in the third year of life is a developmental milestone in the transition from an implicit to an explicit Theory of Mind. Previous studies showed an explicit distinction between epistemic terms only later than 4 years of age (Moore, Bryant, & Furrow, 1989), but evidence of spontaneous production of factive and non-factive verbs (*know* vs. *don't know*, see Harris, Bartz, & Rowe, 2017) as well as implicit sensitivity to epistemic states in communication was found much earlier in infancy (Liszkowski, Carpenter, & Tomasello, 2008).

Here, we studied whether 27-month-olds already show evidence for **implicit understanding of epistemic verbs**. We developed an **eye tracking task** to investigate the differentiation between the **mental verbs *know* and *think***, using an adapted version of the paradigm by Moore et al. (1989).

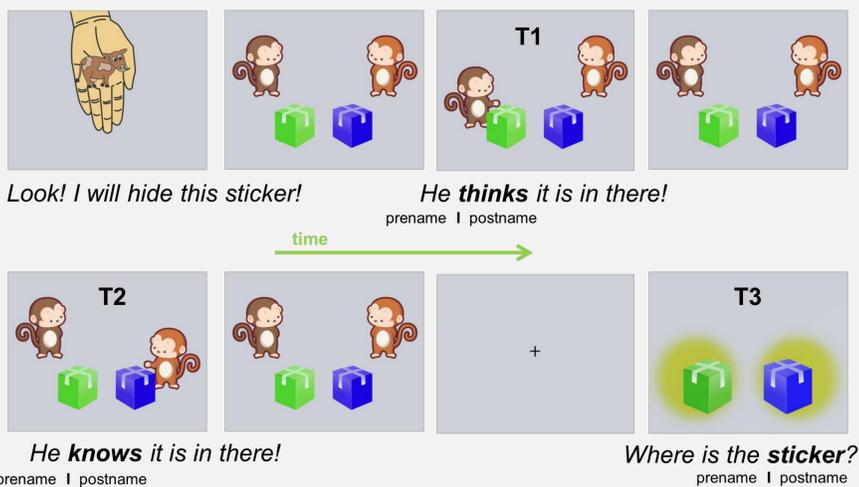
Participants

136 children took part in the study. 10 were excluded because of being too low in their language competence (measured with SETK, standardized battery for German speakers). Children were included only if they watched a minimum of 2 trials per test phase.

The final sample consisted of **126 kids** in T1, 125 in T2, and 117 in T3. All children ($M = 27$ months and 7 days, $SD = 9.6$ days, 77 female) were German monolinguals or German was the main language spoken in the family.

Epistemic Language Task

After a behavioral familiarization, children saw animated cartoons in which two monkeys sequentially gave conflicting pointing messages about the location of a sticker, following the paradigm by Moore et al. (1989).



Looking times were recorded for relevant AOIs at two seconds before and after the onset of the first (T1) and second (T2) mental verb, as well as at the onset of the salient word "sticker" (T3). Proportional looking time to target was calculated with a difference score (PTL = $T / D+T$, see Mani & Plunkett, 2008), where a value close to 1 means looking more to the target (i.e. the monkey that *knows*) and to 0 to the distractor (i.e. the monkey that *thinks*). Children looked on average at 6.2 trials in T1, 5.4 in T2, and 4.7 in T3, with a range from 2 to 8.

Discussion

Our results suggest that 27-month-old children show an **initial implicit sensitivity** to the degrees of certainty of the mental verbs *know* and *think*. The preference for the agent that *knew* was not driven by contextual saliency but by the **higher degree of knowledge** of the agent itself. While we did not expect any effect from T1, the lack of a predictive pattern in T3 can be attributed to task specific features, such as decrease in motivation due to the absence of monkeys and the overall trial length.

Research questions for second funding period

Can implicit understanding of epistemic state language be modulated by a mental state language training or a syntax comprehension training?

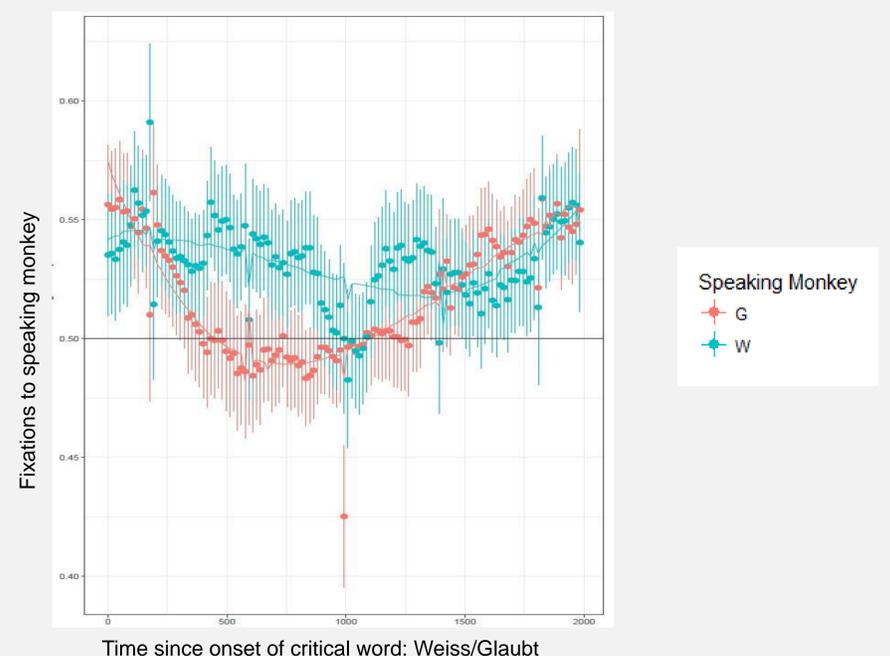
What is the predictive relation between implicit understanding of epistemic state language and implicit and explicit Theory of Mind after the fourth year of age?

Results

To analyze gaze behavior, we computed children's looking time at the speaking agent (i.e. prename and postname phases), depending on whether the monkey *knew* or *thought* that the sticker was there.

This yielded a **significant preference for the monkey that *knew*** in the postname phase of T2.

PTLs were input in a growth curve model through time in relevant test phases. Compared to a reduced model with participants and condition (speaking monkey *knows/thinks*) as random factors, adding condition as a fixed effect (speaking monkey *knows/thinks*) improved model fit significantly, ($c^2(5) = 41.306, p < .001$).



Children looked more to the speaking monkey when it *knew* the sticker was there (Estimate = .01, $t = 4.866, p < .001$). That children had a preference for the monkey that *knew* held true not only when the speaking monkey was the one that *knew* (Estimate = .07, $t = 5.72, p < .001$), but also when the speaking monkey was the one that only *thought* the sticker was there (Estimate = -.10, $t = -8.81, p < .001$).

References

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