

## Ambiguous Pronoun Processing Development: Probably Not U-Shaped

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Pronouns typically refer to the most prominent entity in the preceding discourse.<sup>1-5</sup> Cues to discourse prominence include being mentioned first and being mentioned repeatedly. If such cues are acquired through statistical learning, children should acquire cues in order of their validity.<sup>3</sup> Alternatively, if discourse prominence derives from early-emerging linguistic or conceptual abilities, even young children should exhibit adult-like sensitivity to discourse-salience cues.<sup>5-7</sup>

Though neither of these stories predicts U-shaped development, that is what the existing data may suggest. While Arnold et al. found that 4yos and 5yos cannot use first-mention alone to resolve pronouns (1), Song & Fisher found that 2.5yos and 3yos can use first-mention, both alone (2) and in conjunction with other cues to prominence.

(1) Puppy<sub>1</sub> is having lunch with Froggy<sub>2</sub>. *He*<sub>1</sub> wants some milk.

(2) See the deer<sub>1</sub> and the cat<sub>2</sub>. The deer<sub>1</sub> walks with the cat<sub>2</sub> in the park. What does the *he*<sub>1</sub> have? Look, *he*<sub>1</sub> has a kite.

This divergence, however, could reflect differences in methodology or stimuli rather than U-shaped development. To further explore these questions, 18 5yos (5;0-5;11) listened to ambiguous pronouns within three different discourse prominence conditions as they viewed related illustrations and their eye movements were tracked. In the *Two-Cue-Condition*, one character was both first-mentioned and repeatedly mentioned (3). The *Two-Cue-Delay-Condition* was identical, but with two additional sentences (4) inserted before the pronoun. In the *One-Cue Condition*, the only cue was first-mention (5).

(3) Michael and Jacob are going to eat ice cream. Michael hardly ever gets ice cream. *He* is going to eat chocolate marshmallow ice cream. Can you point to him?

(4) ...The ice cream store has fifty different flavors. There are ten kinds of chocolate....

(5) Michael had lunch with Jacob. *He* ate a chicken sandwich. Can you point to him?

In all conditions, children pointed to the prominent character (Figure 1,  $ps < .05$ ). Because of baseline looking preferences, we split the eyetracking data according to whether, at pronoun onset, the participants were looking at the prominent or non-prominent entity. Resolution to the prominent character was evidenced by participants being more likely to switch to the prominent entity than away from it. In all three conditions, they did so significantly: by 800-1000ms after pronoun onset in the *Two-Cue-Condition*, by 1200-1400ms in the *Two-Cue-Delay-Condition*, and by 1400-1600ms in the *One-Cue-Condition* (Figures 2-4,  $ps < .05$ ).

Thus, 5yos can use both first-mention and repeated-mention as cues to discourse prominence to rapidly resolve pronominal reference. The effect of repeated mention persists even when a considerable delay intervenes between last mention and the pronoun (*Two-Cue-Delay-Condition*). Furthermore, first-mention cues alone are sufficient for pronoun resolution. Taken together with the Song & Fisher studies, this suggests that these skills depend on early-acquired linguistic or conceptual abilities.<sup>5-7</sup> The relatively slow and noisy performance in the *One-Cue-Condition* may explain why Arnold et al. did not detect a first-mention effect. Nonetheless, our participants were slightly older than theirs, and thus further research on 4yos is needed to fully establish whether development is continuous or U-shaped.

496 words

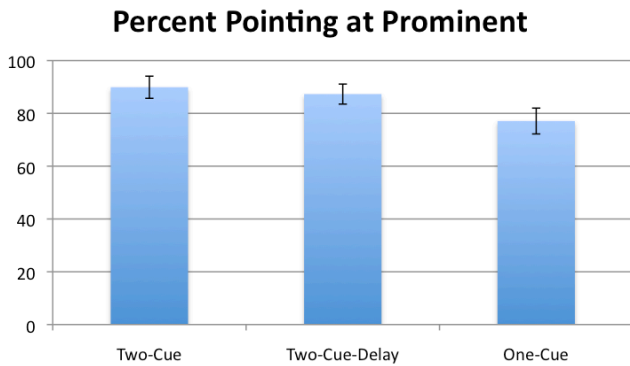


Figure 1

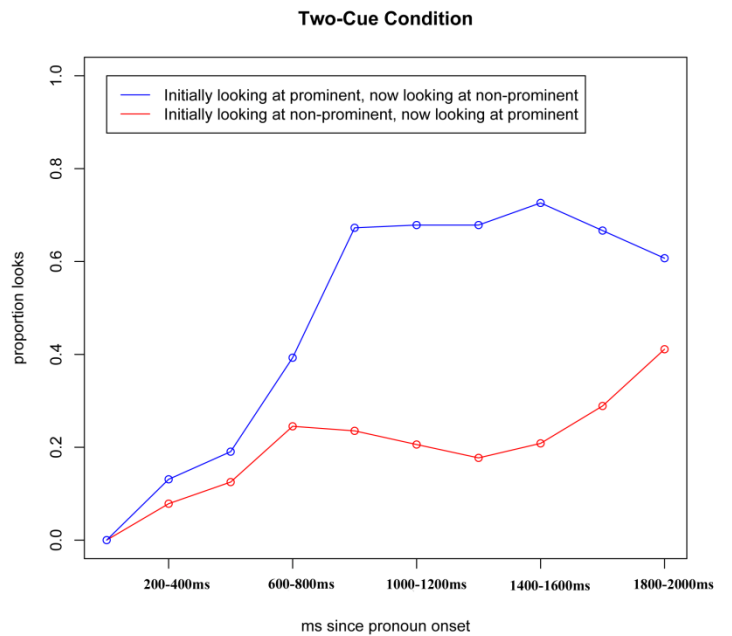


Figure 2

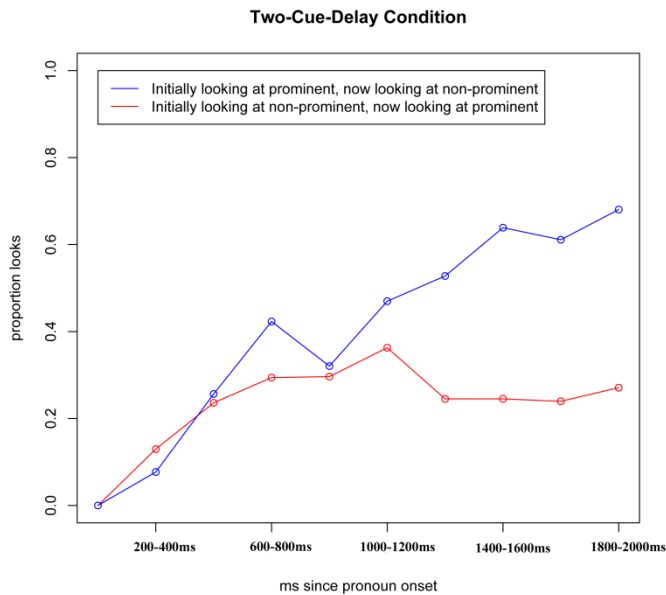


Figure 3.

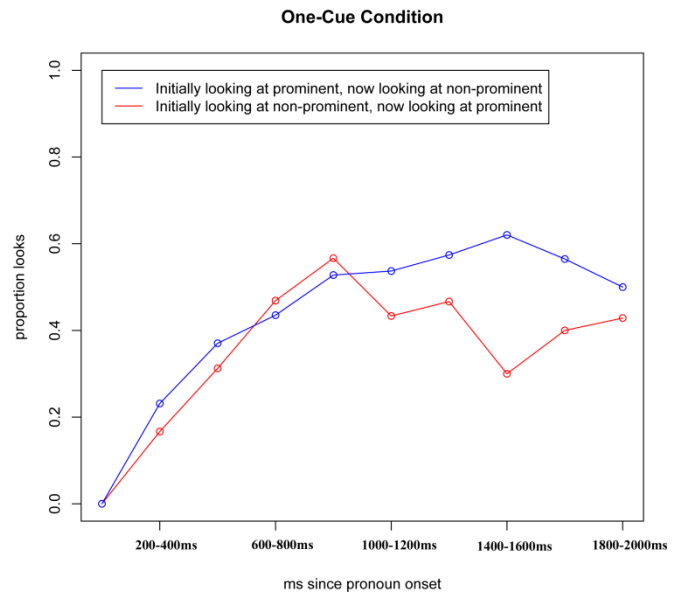


Figure 4.

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