The role of prior discourse in the context of action: Insights from pronoun resolution

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The comprehension of a pronoun (*she*, *they*…) involves using linguistic and non-linguistic cues to select an intended candidate from entities in a comprehender's mental model of the discourse or situational context. These entities have often been previously mentioned, giving rise to the notion of a "linguistic antecedent". But what kind of information in a mental model is needed for resolving coreference? Given their status as deep anaphors [1], pronouns do not need to "match" linguistic antecedents with the same surface form (i.e., agreement or constituency: "I need a knife, where do you keep them?", "Jo ran into Sue while shopping. They…"), yet the notion of *retrieval processes* is evoked in many theoretical accounts [2, 3, 4, 5, 6]. Here, we explore the role of the antecedent term's *semantics* by using novel situations where the content of this expression is no longer viable when pronoun interpretation occurs. Fig. 1 shows a visual environment where objects are located within a grid with numbered squares. Critically, in this context, the outcome of an instruction like “Move the house on the left to area 12” entails that the unmoved/unmentioned house is now the leftmost one. If a subsequent instruction contains a pronoun (e.g., "Now move it…"), the key point is that the antecedent expression in memory no longer accurately describes the intended referent. Thus, if retrieving the antecedent term's semantics is a fundamental part of the process, some measurable processing cost should be observed relative to when the semantics are still valid, despite the intuition that the previously-mentioned object is ultimately the intended referent. **Expt 1** (production, *N*=56) was conducted to confirm certain background assumptions. After encountering the first instruction and viewing its outcome (Fig. 1, version *a*/*b*), speakers were prompted to describe various objects in the display. When prompted to describe the previously-moved object, results showed that, when speakers used a spatial description, the content reflected the updated visual scene (i.e., speakers did not treat the NP in the initial sentence as a "linguistic precedent" [7]). This tendency was stable regardless of whether the past action required a switch (e.g., from "on the left" to "on the right": 96% of descriptions reflecting updated scene) or not (97%). This behavior was largely expected but the findings validate the idea that the original description is no longer adequate following the action, and thus should cause difficulty if relied upon in some subsequent process. Results also showed modifiers like "on the left" are readily produced alongside other modifier types (10.25% overall), suggesting expressions of this type would be perfectly adequate as antecedents in a pronoun interpretation task. Our key evidence comes from **Expt 2** (Visual World, *N*=24), where participants also heard a second instruction (S2), and the earlier semantic viability manipulation was retained. In control conditions, S2 contained a full NP (“Now move the same/other house to area 4”). For fixations to the previously-moved house, the control conditions showed the expected unambiguously distinct patterns (Fig. 2). Critically, when S2 contained a pronoun ("Now move it to area 4"), mouse clicks on the intended referent showed no differences in reaction times, regardless of whether the antecedent term’s semantics were still relevant or not (Fig. 3). Further, fixation patterns were strikingly similar for the two pronoun conditions (Fig. 2). Notably, there was no momentary consideration of the referent that now matched the antecedent term's semantics. The similarity across pronoun conditions was corroborated by analyses using bootstrapped group mean curves (Fig. 4), where strong overlap was still found. Together the data suggest a pronoun is effortlessly linked to an intended referent regardless of whether the semantics of its linguistic antecedent are still relevant. We then ask, if neither antecedent form nor semantics are relevant, what is “retrieved” on a retrieval account? Instead, real-world referents seem to be linked to mental variables via attentional bindings [8] that are indifferent to information in the linguistic record that can change or become irrelevant downstream [9]. Among other things, this helps explain cases where there is a shift in precisely what is being referred to in antecedent-pronoun sequences (A: “Speaking of pets, Ty got a capybara”, B: "Huh? How do you spell it?”, where the antecedent denotes a conceptual kind, yet the pronoun denotes an orthographic pattern).

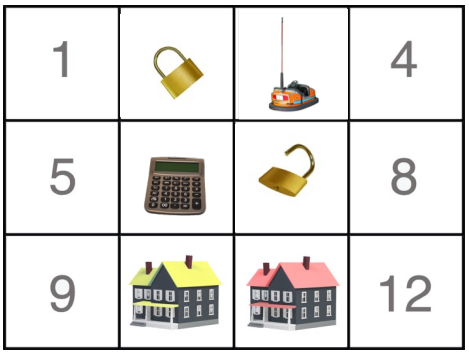

***Figure 1**: Display before first sentence is heard.*
"Move the house on the left to…
a. …area 9" (original desc. remains viable)
b. …area 12" (original desc. no longer viable)
(Display is updated accordingly)

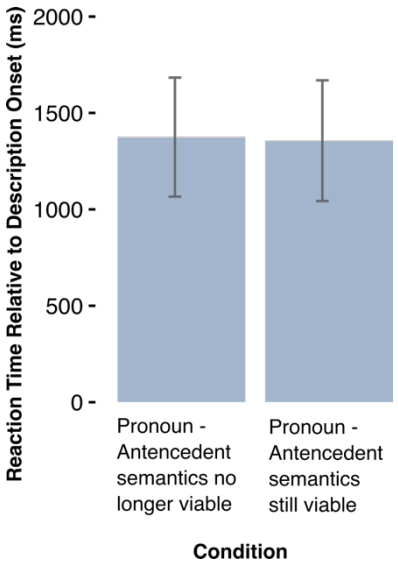

***Figure 3**: Mean reaction times for pronoun conditions in Expt 2.*

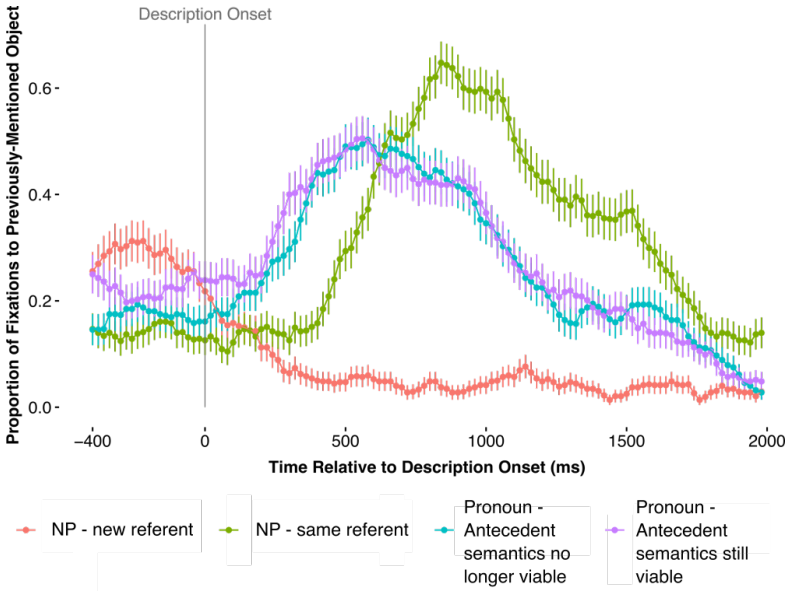

***Figure 2**: Proportion of fixations over time relative to pronoun onset (experiment conditions) or ADJ onset (controls) as indicated by grey line.*

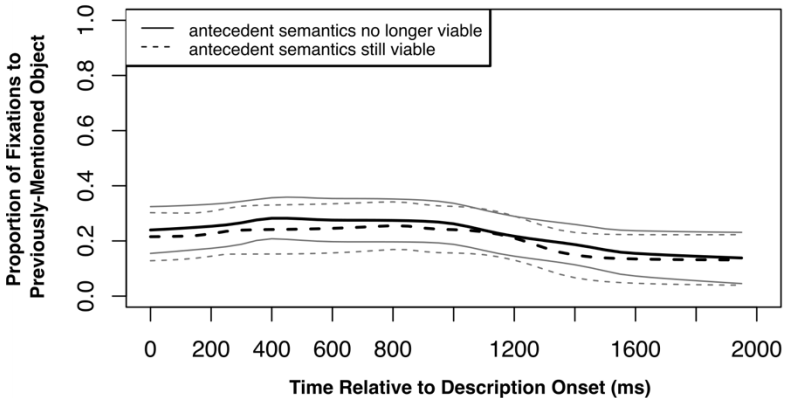

***Figure 4**: Difference between bootstrapped group mean fixations over time for pronoun conditions.*

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