Presupposition Satisfaction Preserves Discourse Constituency

Christina S. Kim, Christine Gunlogson, Michael K. Tanenhaus & Jeffrey T. Runner

Sentences with *also* are standardly assumed to entail their propositional content φ and presuppose a distinct proposition ψ, which differs from φ in the value of the focused constituent (Horn 1969; Karttunen & Peters 1979; Rooth 1985; Atlas 1991). Thus, the final sentence of (1) entails that Peter's mom bought Twizzlers and presupposes that she bought something other than Twizzlers. If not already contextually entailed, presuppositions must be accommodated (Lewis 1979) as background. From the point of view of processing, readers have been shown to experience processing difficulty at the presupposition trigger if the presupposed information has not been processed earlier in the discourse (Schwartz 2007; Moulton 2008). The trigger *also* can be viewed as forming a dependency with the discourse content that satisfies the presupposition, analogous to filler-gap or anaphoric dependencies (see e.g. van der Sandt 1992). In two questionnaire studies and one visual world eye-tracking study, we examined whether processing trigger-dependencies is constrained by locality (Hawkins 1994; Gibson 2000) and whether the relevant sense of locality is linear distance or distance relative to hierarchically-structured constituents (Webber & Joshi 1998; Kehler 2000).

Two offline studies asked whether comprehenders are sensitive to locality for presupposition-satisfying dependencies. Since *also* presupposes only that some other alternative (of the form *Peter has x*) is true, it might not matter to comprehenders where the content satisfying this presupposition occurs in the preceding discourse. If locality does matter to comprehenders, we can ask whether linear distance matters, or distance measured with respect to hierarchically-structured constituents. (For purposes of this study, we make the simplifying assumptions that sentences are atomic discourse units—i.e. they are not further decomposed, and that they are related to each other by a finite set of discourse connectives, which often but not always correspond to natural language connectives.) In discourses like (1), both linear and hierarchical locality predict the final sentence is most easily interpreted as *"Peter's mom gets Twizzlers and MnMs,"* where *"Sometimes she gets MnMs"* is linearly closest to, and in the smallest discourse constituent containing the trigger *also*. If dependencies minimize linear distance, the final sentence in (1) should show the same interpretive bias as in (2), yielding an interpretation where Peter has Twizzlers and Jawbreakers (and possibly MnMs and Lemonheads). However, if locality is defined hierarchically, the difference in discourse structure between (1) and (2) should yield different interpretations: the closest dominating discourse node is the Topic in (1), but Contrast2 in (2). This is indeed what we found: for both discourse types, comprehenders interpret the material introduced in the smallest discourse unit dominating the sentence with the trigger as the presupposed content; for (1), this corresponded to the interpretation where Peter is presupposed to have all the types of candy mentioned in the discourse. Within that discourse constituent, 'exhaustive' interpretations were preferred to 'restrictive' ones: comprehenders resisted distinguishing among discourse units with the same hierarchical status. That is, they preferred to interpret the final sentence in (1) as presupposing that Peter's mom bought all the items mentioned in the discourse, as opposed to e.g. MnMs, Lemonheads, and Jawbreakers (but not Jolly Ranchers).

Do these biases influence real-time discourse processing? In a visual world eye-tracking study (Tanenhaus, et al. 1995), comprehenders heard discourses like (1) (excluding continuation of *Contrast2*; no-*also* controls were also included). A display appeared with the final sentence, and participants' eye movements were recorded as they clicked on e.g. "what Peter has." All displays contained at least one subset of mentioned items (3a)-(3b) and one set of all discourse-new items (3c). In addition, the displays included one of the following: a superset of locally-mentioned items (*LocalOnly:* (3d)), a superset of all discourse-mentioned items (*NonlocalOnly:* (3e)), or both local and nonlocal supersets (*LocalNonlocal:* (3d)-(3e)). If comprehenders construct and use hierarchical constituent structures online to constrain presupposition satisfaction, we expect a preference for the nonlocal superset, which respects discourse constituency but violates linear locality, over the local superset, which minimizes linear distance, but breaks up a discourse constituent.

For *LocalOnly* displays, looks to discourse-new items exceed looks to mentioned items 400-800ms after direct object onset (replicating the novelty bias found for *also* by Kim, et al. 2010), but looks do not converge on the superset until 1600-2000ms. With *NonlocalOnly* displays, superset looks exceed all other looks early, 0-400ms after the onset of *also*. Additionally, in *LocalNonlocal* displays, there was minimal evidence for competition from the local superset. Thus the local superset is dispreferred relative to the nonlocal superset, even when it is the only display item that satisfies the presupposition of *also*. Since the local and nonlocal supersets force the comprehender to interpret the immediately preceding sentence and the entire discourse, respectively, as the presupposed material, this amounts to a preference for satisfying the presupposition at the level of the smallest discourse unit containing the presupposition trigger, regardless of linear distance.

These findings show that, as in other domains of processing, comprehenders favor local dependencies. However, the relevant notion of locality is defined over hierarchical discourse structures, not linear proximity.

EXAMPLES
(1) **Topic:** The kids are at the candy store with their moms to buy Halloween candy.
   Contrast1: Beth's mom bought some Jolly Ranchers.
   Contrast2: Chris's mom bought some MnMs and Lemonheads.
      Narrative: He's always begging her to get some Jawbreakers.
   Contrast3: Peter's mom also bought some TWIZZLERS.

(2) **Topic:** The kids go to the candy store with their moms every year to buy Halloween candy.
   Contrast1: Peter's mom usually gets Jolly Ranchers.
      Elaboration: Peter's favorite flavor is sour apple.
   Contrast2: Sometimes she gets MnMs.
      Narrative: She also gets some TWIZZLERS.

(3)   a. subset of mentioned (*MnMs, Lemonheads*)
      b. subset of mentioned (*MnMs*)
      c. all discourse-new (*Twizzlers, Tootsie Rolls, Pixy Stix*)
      d. superset of mentioned (local) (*Twizzlers, MnMs, Lemonheads*)
      e. superset of mentioned (nonloc) (*Twizzlers, MnMs, Lemonheads, Jolly Ranchers*)