

What verification strategies tell us about processing presuppositions

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Recent psycholinguistic research has focused on the status of implicatures in processing—for instance whether inferences can be generated incrementally, influencing subsequent processing (Bott & Noveck 2004, Breheny et al 2001). Similar questions can be asked about processing presuppositions, and how comprehenders handle presupposition failure. Here are two hypotheses about how presuppositional sentences are processed: (1) comprehenders treat asserted and presupposed material separately (i.e. sequentially), and systematically evaluate the asserted component first, then check whether the presupposition is met, and (2) they check the presupposition first, and only proceed to the assertion if it is satisfied. The first option would fit in with a view in which presupposed material is ‘taken for granted’ and therefore not necessarily verified; the second makes sense if presuppositions are really preconditions for truth-evaluability, which are enough to make a comprehender reject an utterance at the outset if not satisfied. Two sets of experimental results are presented which suggest the latter; an additional experiment shows that the relative difficulty of verifying/falsifying different sentence types is straightforwardly predicted by what is minimally required to falsify each sentence type.

Experiment 1. All experiments were truth-value judgment experiments, where participants read a sentence, then indicated its truth value given a visual context displayed on a computer screen. The dependent measure was reaction time to the judgment task. Experiment 1 compared universally quantified sentences (1a), sentences with names (1b), and ‘only’ sentences (1c). For purposes of this study, I assume the meaning of ‘only’ is roughly that in (2).

- (1) a. Every boy has a skateboard
b. Mark has a skateboard
c. Only Mark has a skateboard
- (2) ‘Only Mark has a skateboard’
Assertion: No individual other than Mark has a skateboard
Presupposition: Mark has a skateboard

All types appeared in both True and False conditions (paired with pictures making them True/False), and there was an additional Presupposition Failure condition for the *Only* sentences, where the assertion was True, but the strengthened meaning due to ‘only’—here, that Mark has a skateboard—is not met.

Some assumptions are made about how verification procedures differ based on sentence type. For *Every*, comprehenders must check each person in the scene, stopping upon encountering a falsifier. In contrast, *Name* sentences only require locating and checking the specified person. Based on these assumptions, *Every* should take longer to verify/falsify than *Name* sentences, and *Every-True* should take longer than *Every-False* sentences.

The hypotheses outlined above make different predictions for *Only*. According to the first, subjects check each person to verify the assertion. If the assertion is True, the presupposition is checked (i.e. make sure Mark has a skateboard). In this case, *Only* approximates *Every*. In contrast, comprehenders could check the presupposition first; the presupposition failure condition would then pattern with proper names, while remaining *Only* sentences pattern with *Every*.

The results are consistent with the first hypothesis. ANOVA revealed main effects of sentence type ($F(1,26)=13.2$, $p<.001$) and truth value ($F(1,26)=19.22$, $p<.001$), and an interaction of sentence type and truth value ($F(1,26)=8.6$, $p=.01$). Post-hoc comparisons indicate *Every* ($p=.02$) and *Only* ($p<.001$) took longer than the *Name* condition, while *Every*

and *Only* did not differ from each other. Within *Only* cases, Presupposition failure matched False conditions, indicating that subjects were just as quick and as likely to reject a case of presupposition failure as to reject a false sentence; neither of these differed from *Every* conditions.

Unexpectedly, *Only-True* had longer response times than *Every-True* ($p < .005$), suggesting that verifying *Only* sentences involves more work than verifying *Every*. These sentences differed in that the assertion was positive in an *Every* but negative in an *Only* sentence. I suggest the RT difference is explainable if verifying an item's absence in a scene is harder than verifying its presence, because items in the display could be approximate matches to the NP in the sentence. Similar asymmetries have been well-documented in the visual search literature (Wolfe 2001), and suggest that manipulating lexical properties of the stimuli (e.g. typicality) will yield corresponding effects on verification RTs.

Two additional truth-value judgment experiments are in progress which (1) ask whether the results of the first experiment are replicated even when names are substituted with definite descriptions (e.g. 'Only the girls have skateboards'), and (2) explore differences in how hard sentences are to evaluate based on the polarity of what is asserted, and (depending on whether the sentence ends up True or False) whether a falsifying item is present in the scene.

Experiment 2. In Experiment 1, a plausible superficial explanation for why Presupposition failure conditions were rejected just as quickly as False conditions is that the mention of a name in the sentence made it virtually impossible for subjects not to attend to that referent in the visual scene. Experiment 2 repeats Experiment 1 using definite descriptions instead of names, yielding sentences such as (3a-c).

- (3) a. Every kid has a skateboard
- b. The girls have skateboards
- c. Only the girls have skateboards.

Verifying the presupposition for a sentence like (3c) requires first locating the set of girls in the picture, then checking whether they (all) have skateboards—this is arguably more likely to be deliberate and therefore required, than possibly involuntary looks to the named referent in Experiment 1. As such, a replication of the previous results would really suggest that verifying presuppositional material is a pre-condition for evaluating the truth of an utterance.

Experiment 3. The surprising finding from Experiment 1 that the *Only-True* condition was much harder than the corresponding *Every* condition might be best understood by considering how the subject's task differs based on what is required to falsify different sentence types. In particular, 'only' and 'every' are taken to have universal force, but differ in that 'only' makes a negative assertion while 'every' makes a positive one. This implies that falsifying an *Only* sentence requires the presence of a falsifier (for (3c), the presence of 1 or more boys with skateboards), while an *Every* sentence requires searching for the absence of a falsifier (for (3a), the absence of kids with skateboards—i.e. the presence of a kid without a skateboard). Experiment 3 crosses the Polarity (positive—negative) and Truth value (true—false) of universally quantified sentences in a truth-value judgment task similar to Experiments 1 and 2.

- (4) a. Pos/T: 'All of the mugs are pink' / picture—no non-pink mug
- b. Pos/F: 'All of the mugs are pink' / picture—1 or more non-pink mugs
- c. Neg/T: 'None of the mugs are pink' / picture—no pink mug
- d. Neg/F: 'None of the mugs are pink' / picture—1 or more pink mugs

Preliminary results suggest that the pattern of results in Experiment 1 can be explained by the difficulty of terminating visual search in the absence of a matching target, in addition to the difficulty in maintaining mental representations of restricted sets in a context.