Processing presupposition: verifying vs. falsifying sentences with 'only'

A long-standing debate about the meaning of sentences like 'Only A are B' has to do with the nature of the inference that 'A are B' (for Horn 1969, Geurts & van der Sandt 2004 it is a presupposition; for Atlas 1991 an entailment; for Horn 1996, conversational implicature). This work assumes (for the moment) that the inference is a presupposition, and investigates a different aspect of the interpretation of 'only', along the lines of recent psycholinguistic research focusing on the realtime processing of implicatures (e.g. Bott & Noveck 2004, Breheny et al 2006). With respect to how comprehenders process presupposition and handle presupposition failure, two hypotheses seem plausible: (1) comprehenders treat asserted and presupposed material 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 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 different sentence types is straightforwardly predicted by the kind of evidence—and in turn the kind of visual search strategy—required to verify or falsify a sentence.

Experiments 1-2. 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). 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 verification procedures for each 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. 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 ($F1(1,26)=13.2$, $p<.001$) and truth value ($F1(1,26)=19.22$, $p<.001$), and an interaction of sentence type and truth value ($F1(1,26)=8.6$, $p=.01$). Post-hoc comparisons indicate Every ($p=.02$) and Only ($p<.001$) took longer than the Name condition, while they did not differ from each other. Within Only cases, Presupposition failure matched False conditions, indicating subjects were as quick and as likely to reject presupposition failure as to reject a false sentence; neither of these differed from Every conditions. A second in-progress experiment asks whether these results are replicated when names are substituted with definite descriptions (e.g. 'Only the girls have skateboards').

Experiment 3. Unexpectedly in Experiment 1, Only-True had longer response times than Every-True ($p<.005$), suggesting that verifying Only sentences involves more work than verifying Every. This might be best understood by considering how the subject's task differs based on what is required to falsify each sentence type. In particular, 'only' and 'every' 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 (T/F) of universally quantified sentences in another truth-value judgment task. 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 cost associated with maintaining mental representations of restricted sets in a context.

Examples:

(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

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

(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

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