Naturalness of lexical alternatives predicts time course of scalar implicatures

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Speakers using a weak expression on a partially ordered scale are taken to implicate the negation of a stronger alternative. For example, (1) is standardly taken to implicate (2). Alternatives for scalar implicatures are assumed to be invariant across contexts. In real-world language use, however, salient and natural alternatives might vary with context. Considering the naturalness and availability of lexical alternatives to "some" may unify the conflicting literature on the real-time processing of scalar implicatures ([1,3,6] vs. [2,5]). We find that the availability of more natural lexical alternatives like number terms reduces the naturalness of "some" for subitizable sets (1-4 objects), but not for non-subitizable sets (Experiments 1 and 2) and reduced naturalness affects the time course of real-time implicature generation (Experiment 3).

Experiment 1 (n=120) collected naturalness ratings. Participants saw a gumball machine with an empty lower and full upper chamber (13 gumballs). After 1.5s a new display appeared in which 0-13 gumballs moved to the lower chamber. Participants heard a statement of the form "You got X of the gumballs" and on a 7-point scale rated the statement's naturalness as a description of the scene. They clicked a FALSE button if they thought the statement did not describe the scene. We used the quantifiers "some", "all", and "none". Mean ratings for "none" and "all" were almost at ceiling for 0 and 13 gumballs, respectively, but close to zero for all other set sizes. Mean ratings for "some" were 4.9 in the subitizing range, highest at 6 gumballs (mean 6.4), and gradually dropped to 3.0 as the full set was approached.

Experiment 2 (n=240), which used the same paradigm, included the number terms "one" through "twelve". Including number decreased the naturalness of "some" only for subitizable sets.

Experiment 3 (n=37). Participants' eye movements were monitored as they viewed displays of gumball machines that contained gumballs of contrasting colors (blue, orange). Target trials contained a contrast between a subitizable and a non-subitizable set (e.g. two orange gumballs and six blue gumballs) in the lower chamber, one of which was a partitioned. Participants heard statements of the form "You got *some/all/two/six* of the *blue/orange* gumballs"). Identifying the "some"-target required generating a scalar implicature. Subitizability of the target set for "some" and "all" was manipulated. Looks to the target set were delayed for "some" relative to "all" for the subitizable set (2 gumballs, replicating the effect found by [6]). In contrast, for the non-subitizable set there was no delay for "some" relative to "all".

We conclude that scalar implicatures from "some" to "not all" are delayed when there are more natural alternatives that the speaker could have used to convey her intended meaning, but can be computed as rapidly as literal content when relative naturalness of "some" is high. These results reconcile the conflicting results between studies finding delayed effects of implicature computation, which have been interpreted as supporting logical/semantic-first models, and studies finding immediate effects, which have been interpreted as evidence for default implicatures.

(1) Some of the students were at the party.
(2) Not all of the students were at the party.

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