EURO-XPRAG Short Visit Grant -- Scientific Report
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The project investigates the time course of the processing of different kinds of pragmatic inference in a Gricean framework – Quantity-based implicatures on the one hand and Manner-based reference assignment in referential expressions on the other hand, both of which can be triggered by the weak scalar item "some". Under a Gricean account, the salience of number terms as lexical alternatives to a statement with "some" should affect the processing of the Manner-based, but not the Quantity-based implicature relative to a literal control with "all". This hypothesis is tested in a visual-world "gumball" paradigm, where on each trial subjects rate descriptions of scenes depicting a gumball machine with different numbers of gumballs of different colors in each of two chambers. Subjects' eye movements are tracked.

Purpose of the visit
The goal of the visit was for the involved researchers (R. Breheny and J. Degen) to complete analysis of the data that was collected at the University of Rochester, prepare the research talk that was given at the EURO-XPrag workshop in Pisa in October 2011, and to discuss the structure of the paper to be published as a result of the project.

Description of the work carried out during the visit
In a series of research meetings the results of the conducted eye-tracking study were discussed. Especially where results differed from the predictions, alternative explanations were sought. In addition, the research presentation given at the Pisa EURO-XPrag workshop was developed.

Description of the main results obtained
The results obtained include a) a fully analyzed dataset and b) a research presentation given at the EURO-XPrag workshop, the slides of which can be found on J. Degen's homepage. We describe a) in some more detail.
According to a Gricean account of the inference processes involved in obtaining an inference from *some* to *not all* in sentences like *You got some of the blue gumballs* vs. *Click on the side that has some of the blue gumballs,* the former case involves Quantity implicature, where the statement with *some* competes only with the more informative alternative with *all,* whereas in the latter case where the scalar item is embedded in a referential expression, Manner-based reasoning as to why the speaker used the vague quantifier *some* rather than a better cue to the target set of gumballs. A "better" cue here is a quantifier that allows for direct recognition of the target, such as number terms.
On the other hand, under a two-stage model of implicature processing that assumes no difference between the two types of sentences above, the enrichment from *some* to *not all* occurs only after an initial stage of semantic processing of *some* (Huang & Snedeker 2009) unless the set referred to by *some* can be pre-coded (implicitly labeled) as the set that will always be referred to by *some*.

The Gricean account thus predicts an interaction between presence of number terms as alternatives to refer to sets of gumballs within the experimental context (between-subjects manipulation) with inference type (Quantity or Manner implicature) and quantifier (*some*, *all*).

Both accounts predict that when number terms are absent, no interference with *some* is expected in either type of inference, and no delay in looks to the target set in the *some*-condition relative to the *all*-condition should be observed. The accounts differ in their predictions for the numbers present condition. The two-stage model predicts that looks to the target should be delayed for *some* relative to *all* irrespective of sentence type. On the other hand, the Gricean account predicts no delay for *some* in the Quantity implicature condition, but does predict a delay in the Manner condition where number terms are expected to compete with *some*.

We additionally included a target set subizitability condition to accommodate a finding of Degen & Tanenhaus (2011), who found that number terms interfere with processing of some in the subitizing range, where verification of number terms does not require counting, but not outside the subitizing range. The two-stage model makes no predictions about subitizability, while the Gricean account predicts stronger interference of number terms in the subitizing range and possibly no interference outside the subitizing range.

The results obtained differ from the predictions of both accounts. First, in the numbers absent condition, a preference for *some* to be mapped to the smaller set and *all* to be mapped to the larger set was observed, even though the experimental conditions were balanced and such a mapping would not have been a good strategy for participants to get to the target set more quickly. Whether this bias was learned over the course of the experiment or present from the start will be further investigated.

These same biases were also present in the numbers present condition. However, in line with the result found by Degen and Tanenhaus (2011), there was an overall inhibitory effect of number term presence in the subitizing range and a facilitatory effect outside the subitizing range, reflecting increased interference of number terms where they are good cues to the target set (in the subitizing range) and an increased preference for other quantifiers where counting would be necessary for verifying number terms (outside the subitizing range). This runs counter to the predictions of the two-stage model that predicts a delay for *some* relative to *all* irrespective of subitizability of the target set.

An effect of inference type was found outside the subitizing range for the Manner items, where the disadvantage for *some* disappeared, suggesting a larger facilitatory effect for Manner than Quantity implicature items due to number term presence. This is compatible with the Gricean account sketched above.

The collected data will be further analyzed. The main question of interest is to what extent the observed biases were learned strategically over the course of the experiment.

Projected publications/articles

Results were presented at the EURO-XPrag Workshop at Scuola Normale Superiore in Pisa (Italy) from September 30 to October 2, 2011. In addition, at least one article is projected to result from the project. The article is currently in preparation and projected to be submitted by February 2012.