When contrast is salient, pragmatic 'some' precedes logical 'some'

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The time course of scalar implicatures

Scalar implicatures arise in pieces of discourse like the following:

(1) A: Was the exam easy?
B: Some of the students failed.
⇝ Not all of the students failed.

Open issue: Is the implicature associated with the partitive *some of the* construction generated by default or only after the logical meaning is computed (Literal-First Hypothesis)?

	Huang & Snedeker, 2009	Grodner et al., in press
Result	delayed pragmatic *some*	no delayed pragmatic *some*
Comparison	*all*, number terms	*all*

Potential explanations for difference in results:

1. pre-coding (no lexical alternatives to *some* for small set sizes in the Grodner study may have led to fast pragmatic *some*)
2. combination of subitizing effect and salience of upper bound: both studies contain stimuli with set sizes in the subitizing range
   - the presence of lexical alternatives (number terms) in the subitizing range intrudes on interpretation of vague terms (Degen et al., 2009, Grodner et al and poster 1.34 from Thursday's session)
   - the intrusion effect is stronger for pragmatic than for semantic responders
3. different response behavior for semantic vs. pragmatic responders: pragmatic responders generally slower (Degen et al., 2009)
   → no independent way of assessing responder type in H&S and Grodner studies

Question we address: Does the presence of a contrast between two set sizes reduce the preference of number terms over pragmatic *some* when pre-coding is implausible? Do responder types (semantic vs. pragmatic) differ in their eye movement patterns?

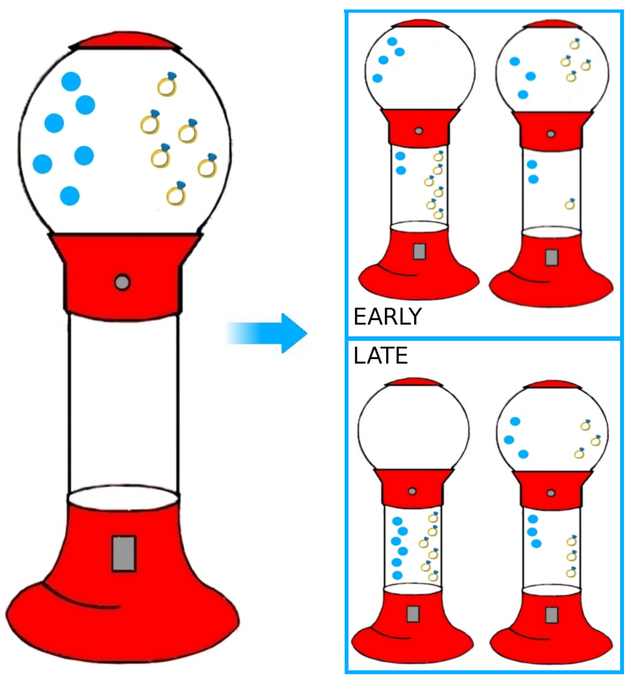
The gumball paradigm

Method

Participants 14 members of the University of Rochester community, paid for participation.

Procedure and Materials

- 76 trials
- each trial began with display 1 (upper chamber with 5/6 rings and gumballs and empty lower chamber)
- KA-CHING sound followed by display 2 (subsets of gumballs and rings move to lower chamber)
- auditory target: *You got quantifier/number term of the rings/gumballs.*
- participants responded by clicking on the set of objects mentioned in the statement if they agreed, and on the button in the center of the machine if they disagreed



- Quantifiers:
  - *some of the* (summa)
  - *all of the* (alla)
  - *two/three of the* (number)
- additional conditions:
  - 12 garden path trials: 8 semantically false (*all* and number terms referring to the wrong set), 4 pragmatically anomalous (*some* referring to the full set)
  - 8 lower-bound summa and number trials
  - 8 number trials that used the summa/alla displays to prevent pre-coding of set

Features of the design

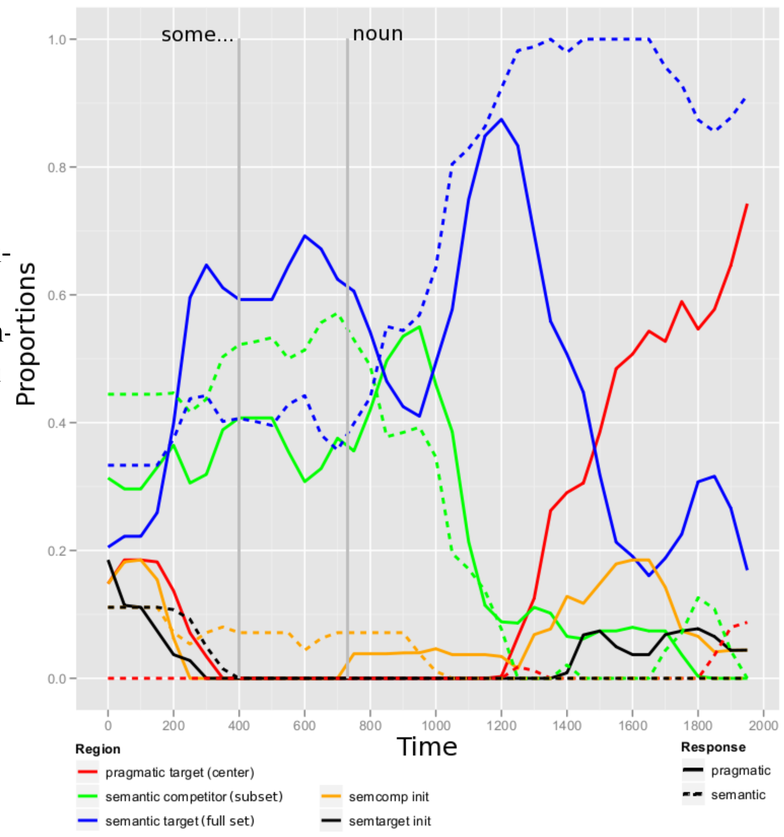
- pre-coding of the implicature is implausible (number alternatives available)
- subsets to be evaluated are within the subitizing range
- there is a salient contrast between set sizes of different objects
- garden path summa condition lets us distinguish between semantic and pragmatic responders depending on participants' responses

Results

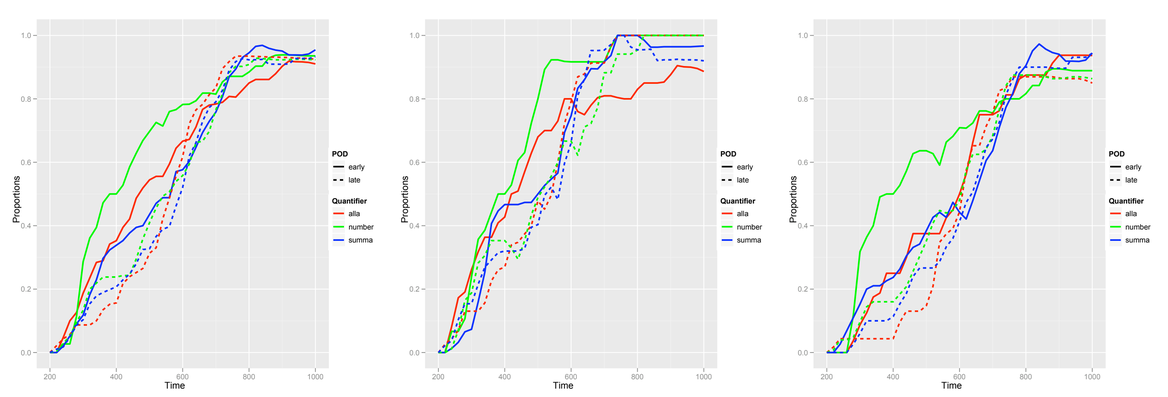
- 52% semantic and 48% pragmatic responses
- participants were divided into two response type groups, dependent on their responses in the garden path summa condition: semantic (7) and pragmatic (7) - consistency within participant was always ≥ 75%

Garden path summa

- pragmatic responders:
  - initial bias towards larger set of objects ($\beta = 1.52$, SE = 0.15, p < .0001)
  - looks to the semantic competitor (subset) start to increase 200ms after quantifier onset → garden path
  - looks to full set increase 200ms after noun onset
  - looks to the center of the machine increase as looks to the big set decrease
- semantic responders:
  - no initial bias towards either set
  - looks to the semantic target start to increase 200ms after noun onset



Semantic vs. pragmatic responders



Looks to target over target and competitor for trials where competitor was fixated at quantifier onset. First plot: all participants, second plot: pragmatic responders, third plot: semantic responders.

- logistic regression: likelihood of looking at target in the 200 - 700ms window following quantifier onset
- fixed effects: point of disambiguation, quantifier, responder type, time, and their interactions
- control variables: state at quantifier onset (looking to target or not), region complexity (other set has more objects)
- random effects: subject and trial
- participants were less likely to switch when POD was late (β=.02, SE=.008, p<.05)
- semantic responders were less likely to shift than pragmatic responders (β = -.05, SE=.008, p<.0001)
- semantic responders in the number (but not in the alla) condition were more likely to switch than in the summa condition (β=.05, SE=.01, p<.0001)

Conclusions

- pragmatic *some* is not delayed relative to logical *some* - in fact, our data suggest that pragmatic responders are faster than semantic responders to assign an interpretation to *some*, even in the absence of pre-coding
- however, the advantage of number terms persists - but over both *some* and *all*
- contrary to findings from behavioral measures (e.g. Bott & Noveck, 2004), the eye movements show that semantic responders are slower than pragmatic responders in assigning interpretations to both *some* and *all*

References

Bott, L., & Noveck, I. A. (2004). Some utterances are underinformative: The onset and time course of scalar inferences. *Journal of Memory and Language*, *51*, 437-457.

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Huang, Y., & Snedeker, J. (2009). On-line interpretation of scalar quantifiers: Insight into the semantics-pragmatics interface. *Cognitive Psychology*, *58*, 376-415.