



Numerical expressions,  
implicatures,  
and imagined prior context

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# Quantity implicature

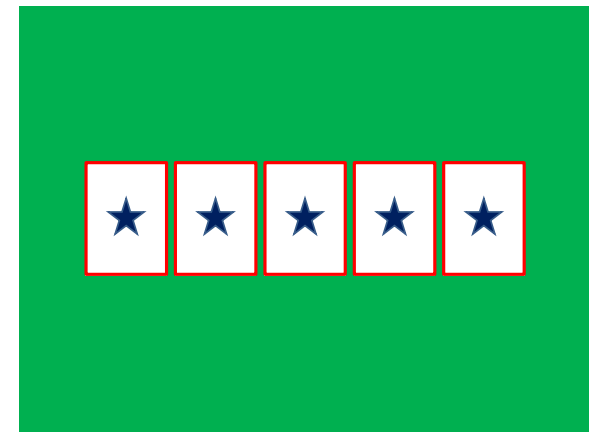
- Major focus in experimental pragmatics
  - Especially “scalar” implicatures, e.g. *some* +> *not all*, *or* +> *not and*
- Admit traditional Gricean analysis
  - Speaker used weak scalar, e.g. *some*
  - Stronger scalar (*all*) would be more informative
  - Assuming cooperativity, speaker must not be able to use stronger scalar
  - Assuming knowledgeability, speaker must know that assertion with stronger scalar would have been false
- Alternatively: enriched meaning is built into weak scalar
  - cf. Levinson (2000), Chierchia (2006)

# Inconsistency of response

- Participants are usually split on their acceptance of underinformative utterances that license implicatures
  - *Some of the clocks are in the boxes*



- *There are stars on some of the cards*



# Inconsistency of response

- Participants are usually split on their acceptance of underinformative utterances that license implicatures
- However
  - given a three-way choice, even young children assign a middle 'score' to these (Katsos & Bishop 2011)
  - adults tend to render judgments like “neither true nor false”, “technically true”, etc.
- Not clear what factors influence the decision (Antoniou et al., under review), but the variability does seem to arise at the decision phase itself

# Variability between triggers

- Potential implicature triggers yield divergent rates of implicature-compliant responses (van Tiel 2014)

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John says:

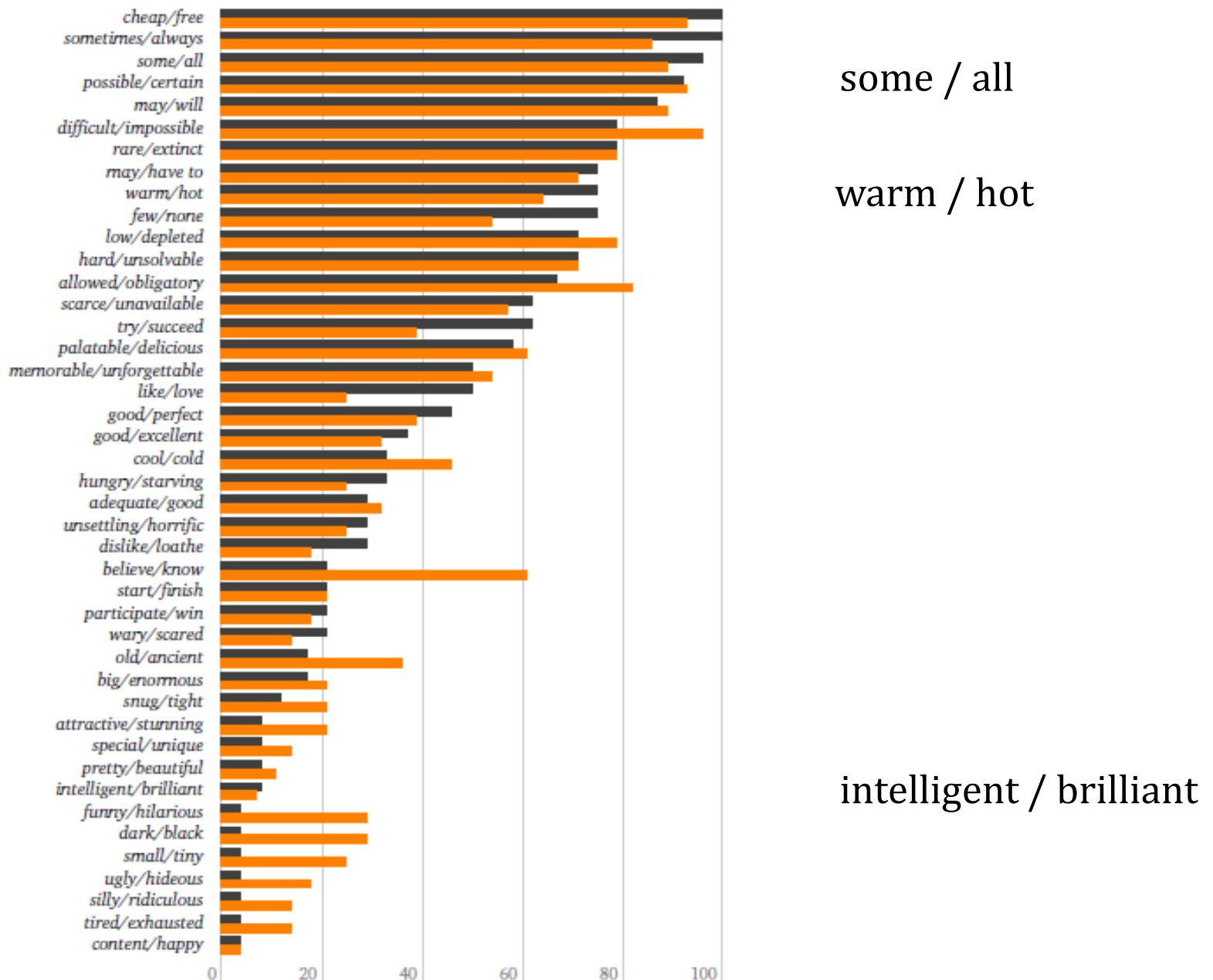
*She is intelligent.*

Would you conclude from this that, according to John, she is not brilliant?

Yes       No

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Figure 4.5: Sample item used in Experiment 1.



**Figure 4.6:** Percentages of positive responses in Experiment 1 (neutral content, dark grey) and Experiment 2 (non-neutral content, orange). The acceptance rates for entailments and unfounded inferences were 92% and 6%.

# Variability between triggers

- Potential implicature triggers yield divergent rates of implicature-compliant responses (van Tiel 2014)
  - Each trigger seems to partition the set of participants differently
- Similarly, variation between participants on the implicature from “more than 100” (Cummins et al. 2012)

# Lack of context?

- Materials presented in simplified/truncated contexts
- Participants may imagine richer contexts (Breheny 2008)
- Might the triggers differ in the kind of contexts they evoke? (Esp. in whether or not stronger alternatives are relevant)

Isn't Chomsky's work terrific?

Can't we just forget about  
Chomsky?

Whose papers should I read?

Some of Chomsky's papers are  
important.



# Variation through different imagined contexts

- Potential variation between scalars in whether they evoke contexts in which stronger alternatives would be relevant
- Potential variation between hearers – several strategies available:
  - “Literal Lucy”
  - Imagine appropriate context and derive implicature
  - Imagine appropriate context but also consider the potential contextual factors that might cancel the implicature

# Numerical expressions as a testbed

- “more than 80” +> “not more than 100” in cardinal contexts
  - Generally, enrichment seems to be conditioned by salience of the numeral, or granularity of the representations
- “more than 67” does not give rise to similar enrichment
  - except in measures (“more than 67m” +> “not more than 68m”)
- “More than 67 people were there”
  - does not convey that not more than 68 people were there
  - may, however, convey that **67** is a critical value for some reason
- Speakers seem able to use this to convey information
  - *Will Tiger Woods win more than 18 majors?*

# Competing “enrichments”?

- Potentially an either/or situation:
  - You can derive something like a quantity implicature, based on the speaker’s refusal to make an abstractly more informative statement
  - You can derive the inference that the particular value uttered is somehow salient
- From a Gricean standpoint, this makes some sense
  - Calculation of a quantity implicature relies on the assumption that the cooperative speaker will be as informative as possible
  - The wish to flag up a particular number as significant might constitute a perfectly sound reason not to be maximally informative
  - Additional assumption here is just that the use of a particular number might have some kind of communicative effect *per se*

# Pilot study: inferring grounds for number use

- Using cardinal expressions of quantity from the BNC
  - “more than one/two/three/four”
  - “more than 60/70/80/90”
  - (“more than 58/77/86/93”)
  - “at least 60/70/80/90”
  - (“at least 58/77/86/93”)
- Two balanced lists, each of 12 items with different numbers
  - All four “more than” + small numbers
  - Two “more than” + round numbers, two “more than” + non-round
  - Two “at least” + round numbers, two “at least” + non-round

# Pilot study: inferring grounds for number use

- For each sentence, participants asked to give judgments on 5-point Likert scales for four independent questions
  - i. whether the utterance licensed a specific quantity implicature (e.g. for “more than 70”, asked “whether not more than 80”)
  - ii. whether the utterance was the most informative possible, from the speaker’s point of view
  - iii. whether the utterance was a convenient approximation
  - iv. whether the specific number used was important for some reason
- Predictions:
  - Negative correlation between (i) and (iv)
  - Round numbers to score higher than others on (iii), lower on (iv)

# Results

- Fielded on MTurk: 17 + 14 participants, pooled here

	(i)	(ii)	(iii)	(iv)
<b>More than</b>				
<b>Round</b>	3.46 (1.30)	3.44 (1.15)	4.08 (1.06)	2.98 (1.09)
<b>Small</b>	2.02 (1.27)	3.43 (1.13)	3.29 (1.20)	3.58 (1.24)
<b>Neither</b>	3.63 (1.12)	3.68 (1.04)	3.29 (1.23)	3.11 (1.27)
<b>At least</b>				
<b>Round</b>	3.37 (1.41)	3.67 (1.04)	3.90 (0.94)	3.10 (1.16)
<b>Neither</b>	3.27 (1.38)	3.87 (1.09)	3.21 (1.33)	3.27 (1.26)

- Small numbers regarded as potentially important
- Strong negative correlation (i)/(iv) across items ( $r = -0.67$ )

# Discussion

- Some support for the either/or story
- Small numbers known not to license implicatures, but judgment of their importance is interesting
  - “John has more than two children” doesn’t yield an implicature (Fox & Hackl 2006) – why not?
  - Semantic account possible, but complex
  - Speaker ignorance? But what about “...in fact, he has five”?
  - Idea: either the speaker is not informed about the precise quantity, or “two” is important for some reason
  - (This idea seems to be acknowledged but its theoretical consequences have perhaps been overlooked)

# Questions remaining

- What about the case of large non-round numbers?
  - Results suggest that participants think that the numbers might be important but they derive implicatures anyway
  - This suggests that this kind of dispreferred form might be used to convey quite complex intentions
  - How precisely these intentions are encoded and decoded is still to be determined



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