Conveying quantity pragmatically

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Returning to number – why?

- Some unfinished business from PhD etc.
- Interesting new ideas coming into play from other research groups in various subdisciplines
- On sabbatical, and promised to do something about it…

- Theoretically, number as a curiosity in pragmatics

Number as a scale

- Idea that exact number meanings arise by scalar implicature
  - i.e. when the use of weak terms such as *some* is taken to convey the falsity of stronger alternatives, under appropriate conditions
  - *I ate some of the cakes* +> *...not all...*
  - *It's possible...* +> *It's not certain...*
  - *You may...* +> *You don't have to...*, etc.
- Trying to explain why number seems to vacillate between exact and lower-bound readings
  - *Mary owns* [exactly] *two cars*
  - *People who own two* [or more] *cars should pay extra taxes*

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- Trying to explain why number seems to vacillate between exact and lower-bound readings, exact cancellable
  - *Mary owns two cars; in fact, she owns three*.
  - *People who own two* [or more] *cars should pay extra taxes*

Number as a scale

- Idea that exact number meanings arise by scalar implicature
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  - *It's possible…* +> *It's not certain…*
  - *You may…* +> *You don't have to…*
  - *…two…* +> *…not three…*

- Elegant analysis, but perhaps a bit counterintuitive
  - Aren't we just stating exact cardinalities, sometimes?

Semantic or pragmatic number

- Why should we care which analysis is correct?
  - Might wish to know about the precise extent of the speaker's commitments…
  - …particularly if we think that one of the reasons to use number in the first place is to convey precise, unambiguous, contextually stable information (cf. *some*, *few*, *many*…)
- Exemplified in work on cognitive biases, within behavioural psychology
  - In what follows I'll talk mostly about this work, but assume (as its exponents do) that this has broader applicability to real-world decision making (so, implications not purely methodological)

Framing effects: the ADP

- Tversky and Kahneman's (1981) classic and much-replicated example
  - Disease "expected to kill 600 people…"

Program A:
200 people will be saved

72 | 28

Program B:
1/3 probability that 600 will be saved; 2/3 probability none will be

Program C:
400 people will die

22 | 78

Program D:
1/3 probability that no-one will die; 2/3 probability that 600 will

Irrationality in the ADP

- No difference between A-D in expected utility
- Hence, no irrational choice between A and B, or C and D – choice should reflect risk appetite
- However, A is equivalent to C and B to D
- By "irrational" we mean that, among the participants, some are making inconsistent choices between the two frames
  - Specifically, many are apparently choosing the safe option in the gain frame and the risky option in the loss frame

Assumption: extensional equivalence

- Is “200 lives saved” really the same as “400 will die” in this context?
  - Answer: actually, we don’t know!
- Simpler example: Levin (1987)
  - Comparing ground beef described as “25% fat” with that described as “75% lean” (between-participants design, same product)
  - “75% lean” meat gets superior ratings, even to the extent of participants preferring its taste
- But this again assumes extensional equivalence
  - All that is fat is not lean, and vice versa
  - 75% and 25% take exact values (rather than, say, lower bounds)

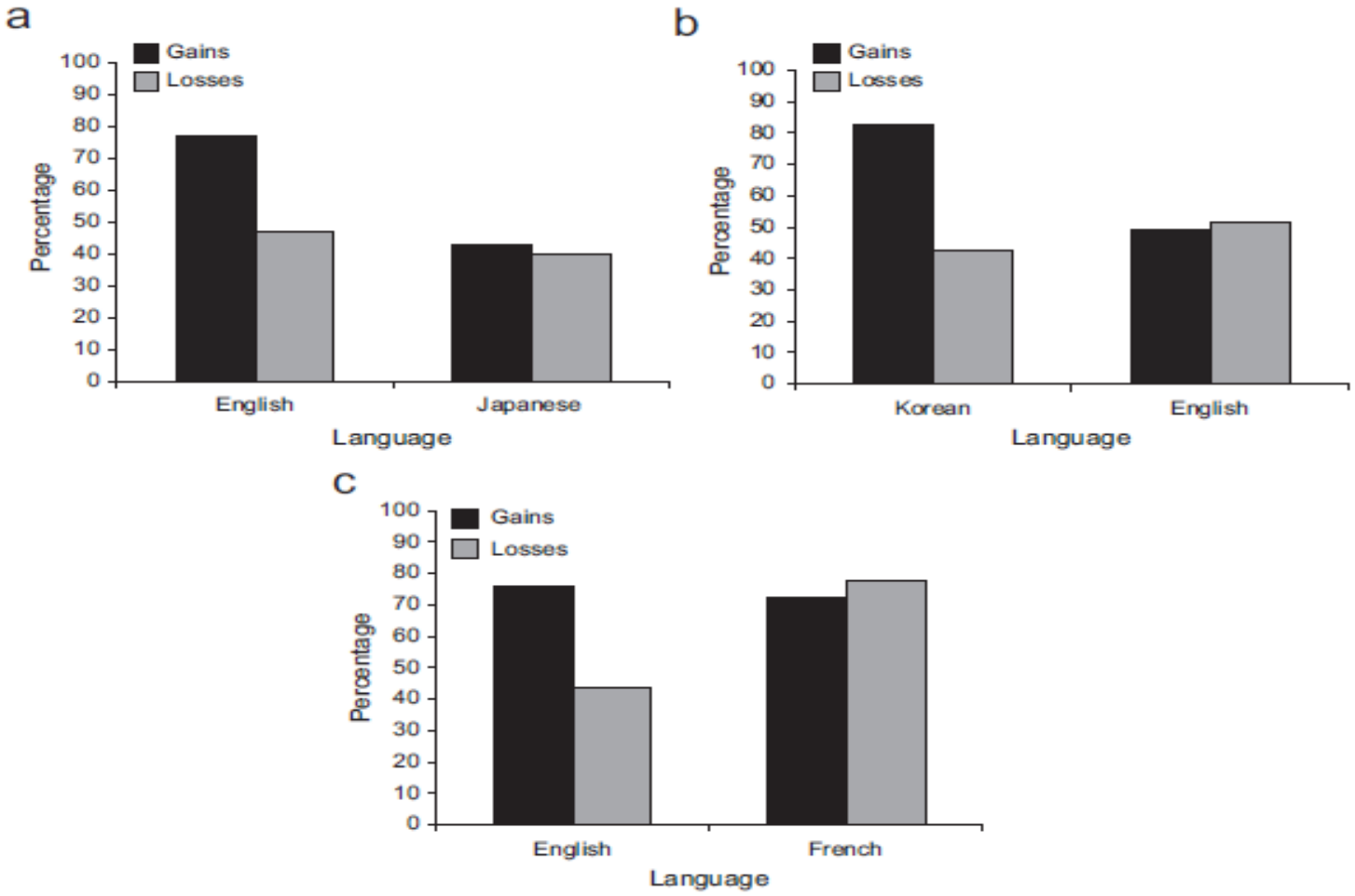
Extensional equivalence in the ADP

- Cognitive bias argument assumes A=C, B=D
- Majority pattern of choice rational if 200 and 400 are attracting lower-bound interpretations, and zero and 600 ("all") punctual interpretations, for instance
  - (and, of course, entirely irrational if the numbers are attracting upper-bound interpretations)
- Mandel (2014) demonstrates that the choice of interpretation influences the framing effect
  - Explicit use of "exactly" attenuates the effect, explicit "at least" replicates the original result
  - Suggests that the original protocol might admit a pragmatic confound that inflates the size of the perceived effect

The "foreign language effect"

- Idea (Costa, Keysar, and colleagues): reasoning in one's L2 might promote rationality
  - One approach to trying to protect ourselves from cognitive bias
- General idea that irrationality of this kind is due to over-reliance on quick and inaccurate reasoning (heuristics)
  - Use of heuristics 'natural', 'intuitive', associated with emotional engagement (see e.g. Kahneman *Thinking, Fast and Slow*)
  - If we always relied on our slower but more accurate reasoning system, we wouldn't succumb to these errors

Results from Keysar et al. (2012)



Implications?

- Keysar et al.: L2 users less prone to certain cognitive biases
- ➢ people should consider using their L2 when making financial decisions etc.
- But
  - 'rationality boost' evident in some tasks and not others
  - behaviour of L2 participants varies considerably across L1/L2 pairs
  - 'rationality boost' means more similar behaviour across the two framings, which could arise for other, less glamorous, reasons
- Could this, for instance, be a matter of subtleties of pragmatic interpretation in L2, in certain tasks, e.g. those involving exact vs. lower-bound number meanings?

Project on L2 pragmatics and rationality

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Zoe Schlueter

Antonella Sorace

Project on L2 pragmatics and rationality

- Schlueter et al. (under review):
  - Susceptibility in L2 to framing effect in ADP-style problems correlated with proficiency in L2
  - Highly proficient L2 users indistinguishable from L1 users in their performance on these tasks
  - No evidence of this being mediated by the emotional connection with the L1 or L2, as measured by the test instrument we used (self-reported emotional connection with entries on a word list)
- Compatible with idea that subtleties of pragmatic interpretation are driving the 'rationality boost' earlier in L2
  - However, so far still lacking direct evidence of a link between the interpretations arrived at and the decisions made

Relating interpretation and decisions

- Two major challenges:
  - Trying to elicit someone's interpretation without influencing their judgement (or vice versa, for post hoc elicitation)
  - Deciding what question to ask – which interpretation out of exact, at least, at most, …?
- Problem here is that (by some consensus) the interpretation of number is more complicated than that
  - *200 people will die* doesn't necessarily mean *exactly 200*, or *at least 200* – it might also mean *about 200*...
  - …where what we mean by *about* itself might depend on the granularity/roundness of number involved (Krifka)

Clarifying the ADP

- Really, to choose between the programmes, we'd need more information, e.g.
  - Do you mean a punctual or lower-bound reading?
  - Do you mean exactly 200, or 200 to the nearest 5/10/50/100?
  - Is the distribution of possible values symmetrical around 200?
- So what should a rational person do?
  - Ideally, associate a probability with every possible state of affairs that might give rise to this linguistic description
  - Good luck with that…
  - As it stands, a preference for the safe choice might just reflect a higher expected value being associated with "200" than with "a one-third probability…of 600" – we just don't know

Difficult to fix

- How do you get around the problem of non-exact interpretations while also choosing numbers that make it clear that the expected utilities match up?
  - Mandel: explicit use of *exactly*, but perhaps at some cost of naturality
  - Schlueter et al. (in prep.): changing 600, 400, 200 to 633, 422, 211 to avoid approximate interpretations, but again with some doubt about whether this is (a) natural or (b) correctly calculated
  - Both attenuated the framing effect, although we'd like to delve further into why

Nature of this meaning

- Subtleties of number meaning in such cases are potentially difficult to capture
- We can get some way with core semantic meaning augmented with an understanding of roundness (and quantity implicature)
- …but there may be more going on (e.g. “this is more likely 201 than 202” as well as “this is somewhere between 190 and 210”)
- Perhaps calls for a more probabilistic approach

Argumentative force

- So far, just talking about extensions and their (non)equivalence
- However, other aspects of meaning may be relevant, e.g. argumentative potential (following Anscombre/Ducrot)
  - *Up to 50% off* vs. *#At most 50% off*

Argumentativity in the ADP

- Geurts (2013): another locus of difference between the framings can be seen by comparing derived premises
  - *It's good that 200 people survived*
  - *?? It's good that 400 people died*
  - *It's good that more than 200 people survived*
  - *It's good that fewer than 400 people died*
  - *It's good that everyone survived*
  - *It's good that no-one died*
  - *?? It's good that only 200 people survived*
  - *It's good that only 400 people died*

Argumentativity in the ADP

- Geurts (2013): another locus of difference between the framings can be seen by comparing derived premises
  - *It's good that 200 people survived*
  - *?? It's good that 400 people died*
- Does this have implications for the claims about cognitive bias?
  - Not necessarily – maybe we're susceptible to framing just because we reason via linguistic premises such as these
  - Would raise doubts about the interpretation of Tversky and Kahneman's original results in terms of general principles of loss aversion, though

Argumentativity in general

- Raises the issue of how to present quantity information in order to cause the hearer to reason a certain way
  - *The Royal Family costs £67 million a year / 2.1p per UK resident per week…*
  - *…so we should abolish it and redistribute that money*

Argumentativity in general

theguardian.com/education/2018/may/23/oxford-faces-anger-over-failure-to-improve-diversity-among-students

University of Oxford

This article is more than 1 year old

Oxford faces anger over failure to improve diversity among students

Figures show one in four of colleges failed to admit a single black British student each year between 2015 and 2017

Richard Adams *and* Caelainn Barr

Wed 23 May 2018 00.01 BST

520

▲ Wadham College, Oxford, which admitted four black British students in the three-year period. Photograph: Alamy Stock Photo

(https://www.theguardian.com/education/2018/may/23/oxford-faces-anger-over-failure-to-improve-diversity-among-students)

‘Fake news’ ≠ ‘Alternative facts’

Making a good argument

- Testing this in some pilot work with Michael Franke and colleagues at Osnabrück
- Scenario: reporting on school test results

Describe these results of **Green Valley** so as to make it appear as if there is a **high** success rate without lying.

Alex	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Susanne	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Theresa	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗
Marie	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗
Johann	✓	✓	✓	✓	✓	✓	✓	✓	✓	✗	✗	✗

Making an argument effective

- Testing this in some pilot work with Michael Franke and colleagues at Osnabrück
- Scenario: reporting on school test results
  - Conditions: make it sound good; make it sound bad; neutral
  - Free text, or filling in *Q of the students got Q of the questions right/wrong*
- Immediate questions arising:
- Are participants effective at manipulating their hearers?
- Are hearers able to counteract that, if they know the speaker's agenda?

Making an argument at all

- More general questions:
  - What are the criteria used by the speaker to determine whether or not their choice of expression is effective, given their aims?
  - What procedures or algorithms are followed?
    - For instance, given three blanks to fill in – two quantifiers and the choice of “right”/”wrong” – in what order are these completed?
  - Do we pick the expression that corresponds to the highest-ranging semantic space, in some sense? Or do we also consider pragmatics?
  - Are we selecting the best argument for some proposition against some alternative proposition, in Bayesian terms?

Summary

- Promising currents of thought converging around the problem of choosing and interpreting quantity expressions
- Increased interest in the real-world implications of providing misleading or partial synopses of data…
- …which seems naturally to place a particular responsibility on us, as researchers who are interested in such questions
- Hopefully we can answer some questions around how meanings are represented and computed, along the way