Sentences, Centers, and Sets: Set Selection and the Meanings of *More* and *Most*

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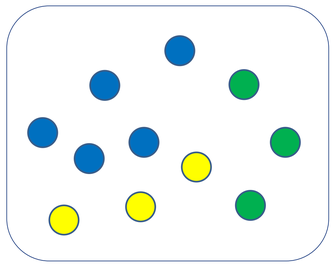
Overview: Meaning & Verification

- The forms of quantifiers' meanings influence verification strategies and memory representations
- Differences in quantifier meaning are reflected in sub-optimal set-selection strategy in adults
- And in memory for incidentally encoded properties of sets (e.g., center of mass) in kids

Linking hypothesis: Interface Transparency

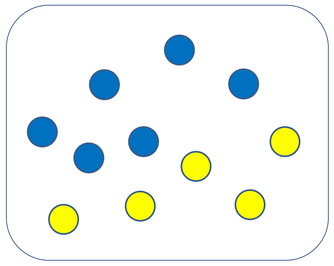
- People are biased toward verification strategies that transparently reflect the meaning under evaluation [1]
  - e.g., A 1-to-1 strategy isn't used to evaluate *most*-statements even when it would be more accurate [2]
- **Methodological strategy**: Variation in verification that can't be otherwise explained is due to the meaning



✗ Most of the dots are blue (5/11)

✔ More dots are blue than any other color (5v3v3)

- ***Most***: proportional meaning
  - Comparison b/t focused-set (e.g., blue) and **superset**
- ***More***: comparative meaning
  - Comparison b/t focused-set (e.g., blue) and **non-focused set(s)** (e.g., yellow, green)



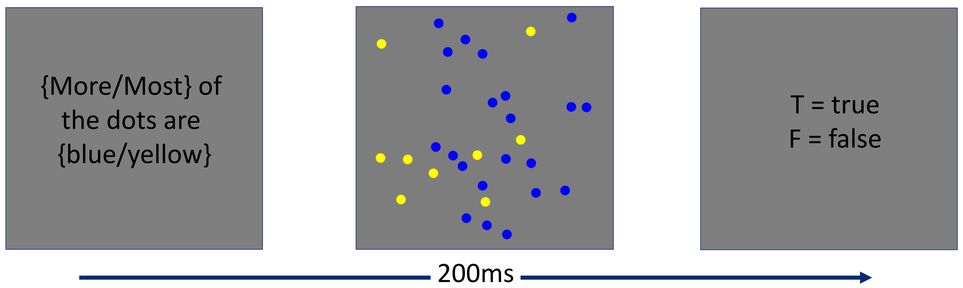
✔ Most of the dots are blue (6/11)

✔ More of the dots are blue (6 v 5)

Cases of interest: the psychology offers a superior alternative, but the meaning pushes toward a sub-optimal strategy

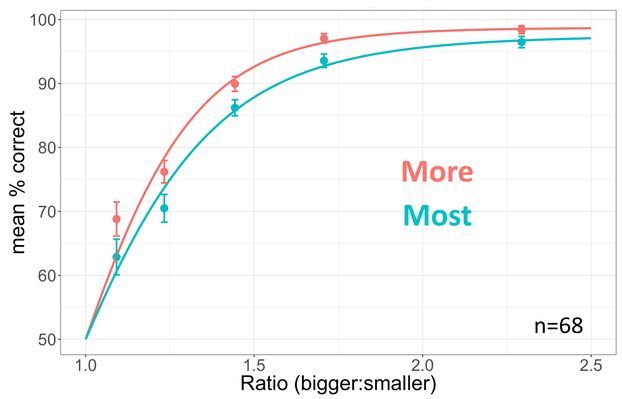
Meaning highlights certain sets →
Psychological instruction to attend to & represent those sets →
Encode properties of those sets (e.g., #, center, …) in memory [3-5]

Experiment 1: Adults Speeded Verification Task



How will adults process the same scene given distinct but truth-conditionally equivalent meanings?

- Task: 100 trials of speeded evaluation (between subjects: ***more*** or ***most***)
- Participants have to rely on Approximate Number System representations [3]
- Across all ratios, adults are better at ***more*** – even though the info determining the answer is the same for ***more*** and ***most***!



What explains adults' sub-optimal *most* performance?

- *Most*'s meaning biases comparing blue & **total**
- *More*'s meaning biases comparing blue & **yellow**
- #(total) is always greater than #(yellow)
- More noise in estimates of the total leads to inferior performance evaluating *most*-statements

- Although adults clearly *can* use a direct comparison strategy, to evaluate *most*-statements they instead use an inferior proportional strategy

- Currently running within-subjects follow-up; so far same result, but with interesting carryover effects

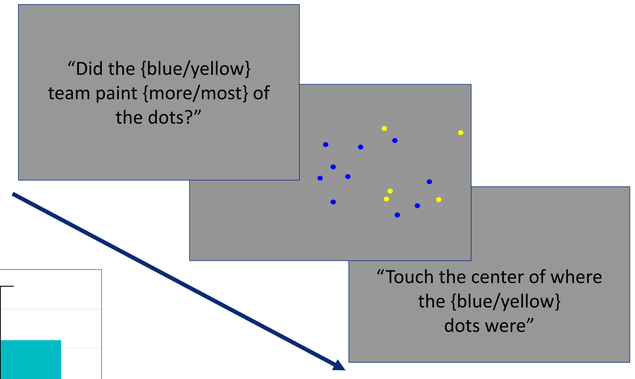
Experiment 2: Kids Centroid Selection Task

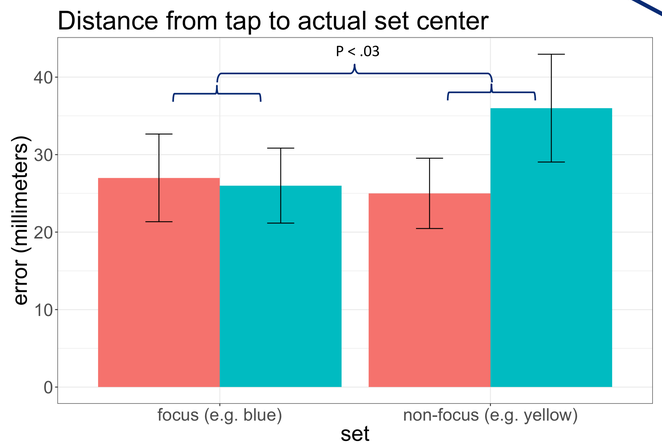
Learning to verify or learning the meaning?

- If the biases come from the meaning, they should be present as soon as the meaning is acquired
- Task (iPad): One-trial evaluation (between subjects: ***more*** or ***most***); Follow-up question about a set's center
- Ages: 3;11 – 8;3; Mean: 6.6; n=178

Results:

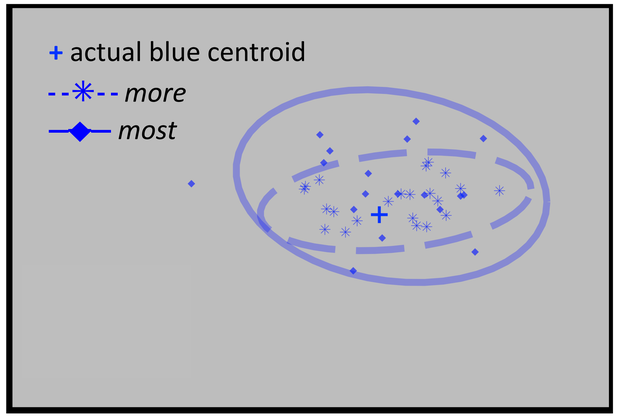
- Always know the center of the focused set
- Know the center of the non-focused set after evaluating a ***more***-statement
- Worse memory representation for the non-focused set after evaluating a ***most***-statement



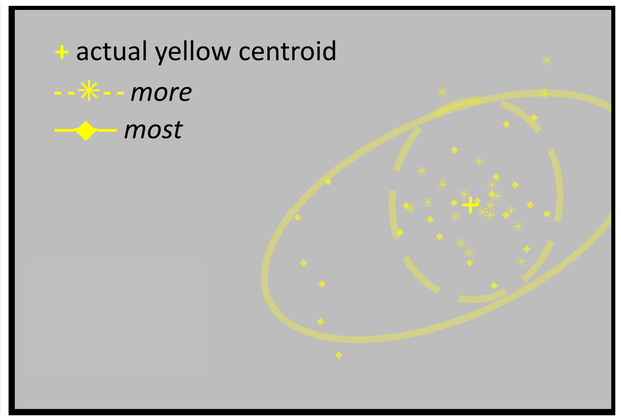


- Although kids clearly *can* represent the non-focused set in memory, they only do when evaluating a *more*-statement
- When evaluating a *most*-statement, they don't perform a direct comparison, so they don't hold the non-focused set in memory
- No effect of age on error from center

Did the **yellow** team paint {more / most} of the dots?
Touch the center of the **blue** dots



Did the **blue** team paint {more / most} of the dots?
Touch the center of the **yellow** dots



Upshot:

- There are linguistic & experimental reasons for thinking *more* and *most* are psychologically distinct
- These differences bias different verification strategies, even controlling for informational significance (i.e., in 2-color displays, the same information determines *more* and *most*'s truth or falsity)
- **These biases are detectible in memory for incidentally encoded information (e.g., set centers)**
- **And they show up early in development, shortly after the meanings are acquired**

References: [1] Lidz et al. 2011, *Nat. Language Semantics* [2] Pietroski et al. 2009, *Mind & Language* [3] Feigenson et al. 2004, *TICS,* [4] Alvarez & Oliva 2008, *Psych. Sci.* [5] Halberda et al. 2006, *Psych. Sci.*

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