How relational language promotes relational representation: The role of visual attention

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Motivation

- Language can support relational encoding in young children (e.g., Dessalegn & Landau, 2008; 2013).
- In adults, relational processing is also guided by shifts in attention: adults are more efficient at processing relational stimuli when their attentional shifts are congruent with linguistic encoding (Roth & Franocneri, 2012).
- In the current study, we investigate the visual strategies that underlie relational encoding in 4-year-old children.

Research questions/goals:

1) Does relational language (right, left, top, bottom) support encoding in 4-year-old children? (Replication of Dessalegn & Landau, 2008; 2013)

2) What are the short-term effects of hearing relational language? Does the benefit persist when language is taken away?

3) *How* does relational language support encoding? What are the effects of relational language on visual attention?

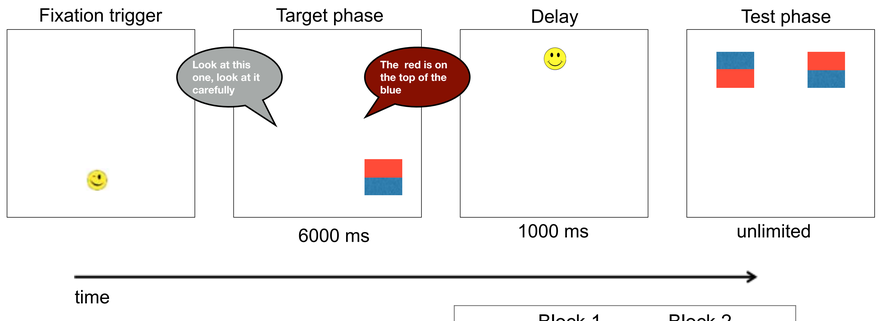
Methods

Participants: 47 four-year-old children (*M* age = 54.77 months, 27 female)

Order A: n=23 (*M* age = 54.99 months, 15 female), n=22 contribute to both blocks
Order B: n=24 (*M* age = 54.57 months, 12 female), n=22 contribute to both blocks

- Dependent Measures:
  - Accuracy (Test phase)
  - Fixation data, collected on EyeLink 1000 plus (Target phase)

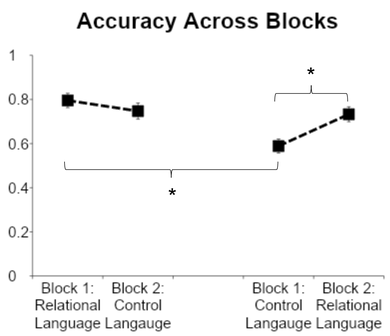
Trial Design:

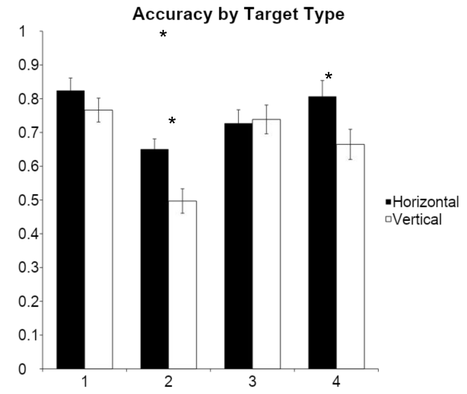


Target Types

	Block 1	Block 2
Order A	Relational Langauge 16 trials	Control Language 16 trials
Order B	Control Language 16 trials	Relational Language 16 trials

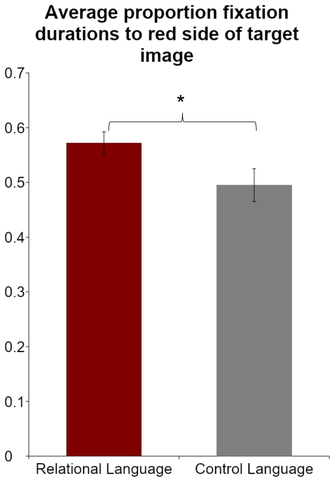
Results

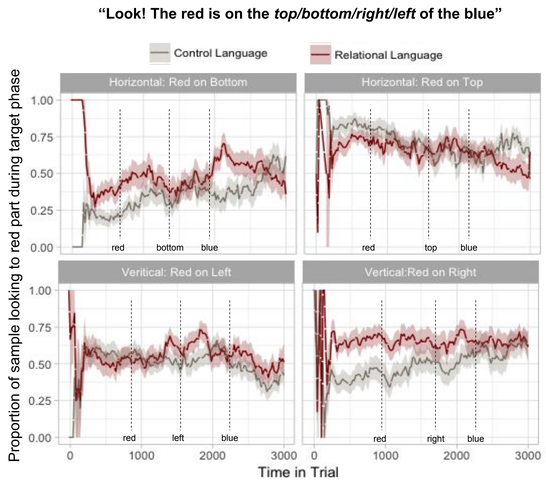




- Main effect of condition F(1,42) = 7.20, *p*= .01: Children who hear relational language are more likely to remember the image they were shown after a 1-second delay, compared to children who heard control language
- Main effect of target type F(1,42) = 15.16, *p*<.001: Children do better on horizontal (top, down) trials than vertical (left, right) trials
- Interaction of condition and target type F (1,42) = 8.34, *p*<.01: Effect of target type is significant in control condition *t*(43) = 4.6, *p*<.001, but not relational language condition *t*(43) = .75, *p*=.45
- Interaction of block and condition (F(1, 46) = 14.76, =<.001: Children in Order A (relational language followed by control language) show no decline in performance during the control block t(21) = 1.44, p=.16. Children in Order B (control language followed by relational language) show significant boost in performance across blocks t(21) = 3.95, p<.001

Eye-Tracking Results (Block 1 only)





- Children in the relational language condition are more likely to fixate on the red portion of the target *t*(21) = 6.26, *p*<.001, significantly more than children in the control language condition *t*(43) = 2.32, *p*= .02.
- Timecourse graphs show changes in attention to the two sides of the target image during the target phase, as well as how attention in the relational language condition maps to language heard

Discussion

1. Hearing relational language during an encoding task helps four-year-old children bind feature and color information (Replication of Dessalegn & Landau, 2008; 2013).

2. Relational language has immediate sustained carry-over effects: children who receive control language *after* relational language show no deficit in performance.

3. The effects of relational language are supported by changes in visual attention: hearing relational language helps children focus their attention in systematic ways that support successful relational encoding. Relational language helped children focus their visual attention in patterns that were congruent with the information heard in speech.

Together, these results suggest that relational language may support binding of feature and color information by guiding visual attention in systematic ways.

Future work will consider whether guiding visual attention in the absence of language similarly supports encoding, or whether the two must occur together for success.

References

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