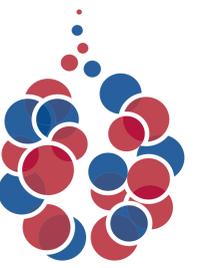


Dynamic Reweighting of Conceptual Properties during Metaphor Comprehension

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BACKGROUND

- ① Object concepts refer to unique ensembles of properties.
- ② Cognitive theories of metaphor comprehension typically involve the matching¹, transformation², or abstraction³ of properties.
- ③ Left inferior frontal gyrus (LIFG), which is involved in selecting an appropriate representation amongst alternatives^{4,5}, has been widely implicated in metaphor comprehension.^{6,7,8,9,10,11}

HYPOTHESIS

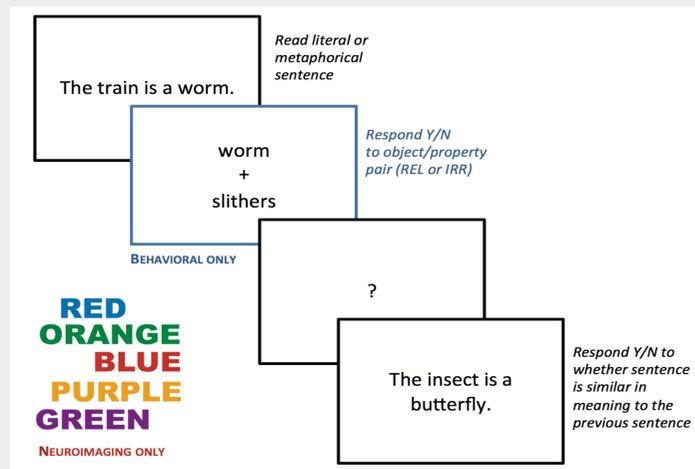
LIFG is involved in the dynamic reweighting of conceptual properties during metaphor comprehension by selecting properties relevant to the metaphor

METHODS

Stimuli were 48 pairs of literal & metaphorical sentences. For each item¹², we chose a metaphor-relevant (REL)¹² and metaphor-irrelevant (IRR) property.

EXAMPLE

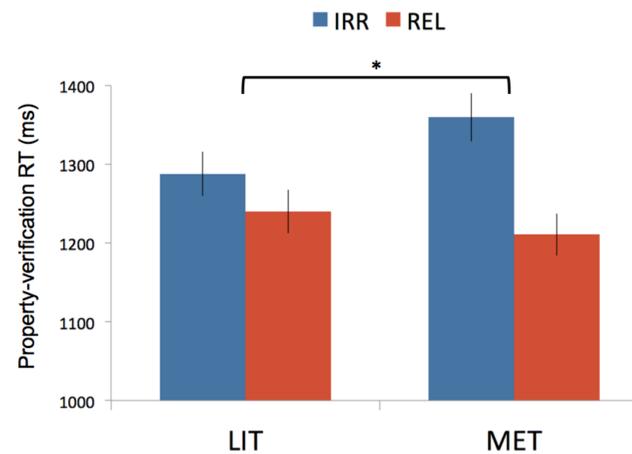
The creature is a worm. (LIT) slithers (REL)
 The train is a worm. (MET) slimy (IRR)



ANALYSIS

- ① Reaction time data were used to create a “P-index” for each item, which reflects the extent to which metaphor comprehension resulted in the activation or suppression of properties for that item.
- ② We explored whether P-index and other variables (saliency, frequency, distinctiveness, and pairwise distance of each property to its object) predicted increased LIFG response to metaphors.

PROPERTY SELECTION (RT)

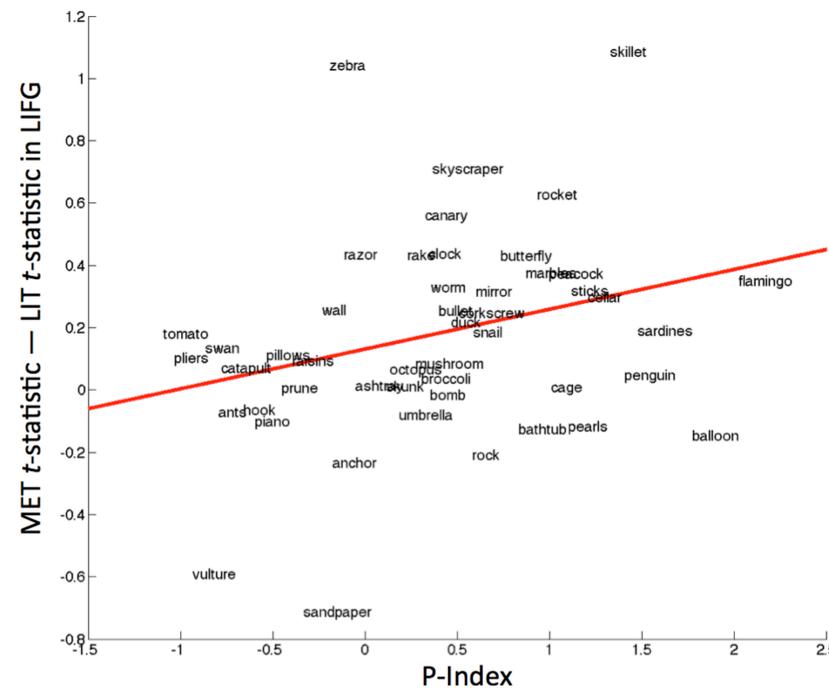


After MET sentences, subjects are faster to verify the REL property, and slower to verify the IRR property ($p < 0.01$). We calculated this interaction effect for each item (P-index), and used it to predict LIFG activity during metaphor comprehension.

$$P\text{-index} = \frac{(\text{IRRMET} - \text{RELMET}) - (\text{IRRLIT} - \text{RELLIT})}{\text{FOR EACH ITEM}}$$

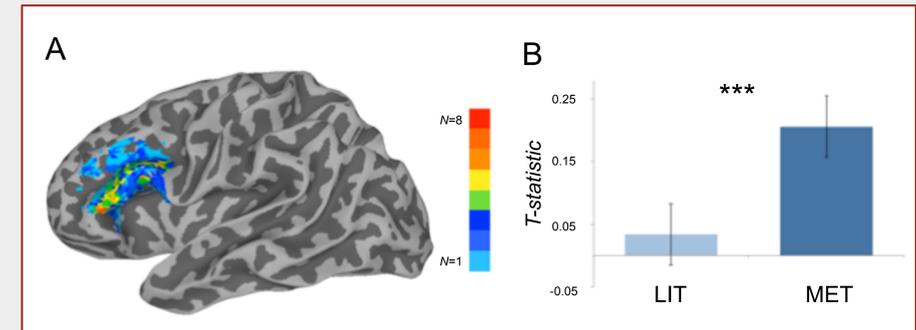
METAPHOR RT EFFECT LITERAL RT EFFECT

PROPERTY SELECTION IN LIFG



P-index predicted increased LIFG response to metaphors versus literal sentences while controlling for property saliency, frequency, distinctiveness, and pairwise distance from object concept ($p = 0.026$).

MET > LIT



We selected the top 100 voxels in LIFG sensitive to sentences overall, on a subject-specific basis. (A) Overlap of subject-specific ROIs. (B) In these ROIs, MET resulted in more activation than LIT ($p < 0.001$). These voxels were also sensitive to stroop conflict ($p = 0.02$).

CONCLUSIONS

- ① In order to comprehend metaphors, conceptual properties relevant to the metaphor are activated and those that are irrelevant are suppressed.
- ② Response in LIFG during metaphor comprehension corresponds to the extent to which conceptual properties are activated or suppressed by metaphors.
- ③ LIFG is involved in the dynamic reweighting of conceptual properties during novel metaphor comprehension.

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ACKNOWLEDGEMENT

This research was supported by NIH Grant R01-DC009209 awarded to STS.

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