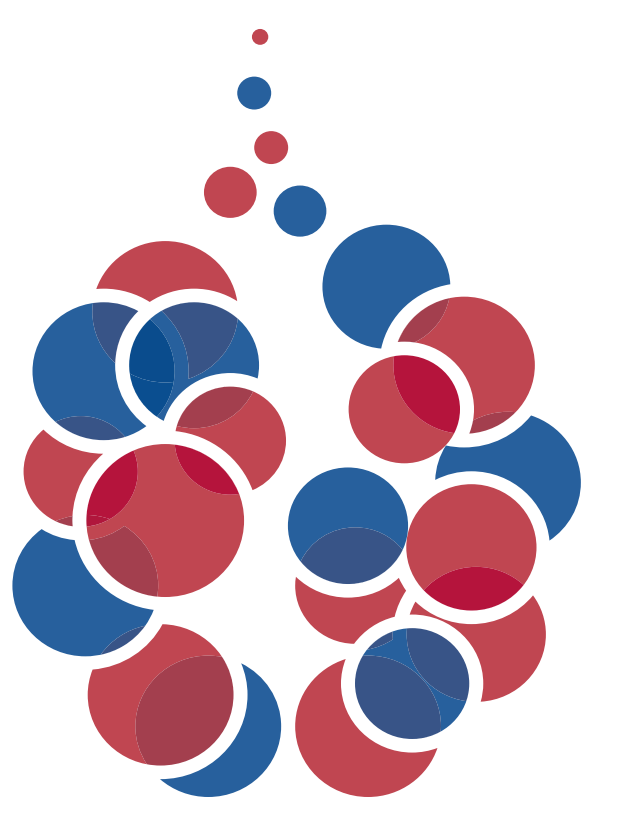


# Dynamic Reweighting of Conceptual Properties during Metaphor Comprehension

Sarah H. Solomon & Sharon L. Thompson-Schill

Department of Psychology, University of Pennsylvania



## BACKGROUND

- ① Object concepts refer to unique ensembles of properties.
- ② Cognitive theories of metaphor comprehension typically involve the matching<sup>1</sup>, transformation<sup>2</sup>, or abstraction<sup>3</sup> of properties.
- ③ Left inferior frontal gyrus (LIFG), which is involved in selecting an appropriate representation amongst alternatives<sup>4,5</sup>, has been widely implicated in metaphor comprehension.<sup>6,7,8,9,10,11</sup>

## HYPOTHESIS

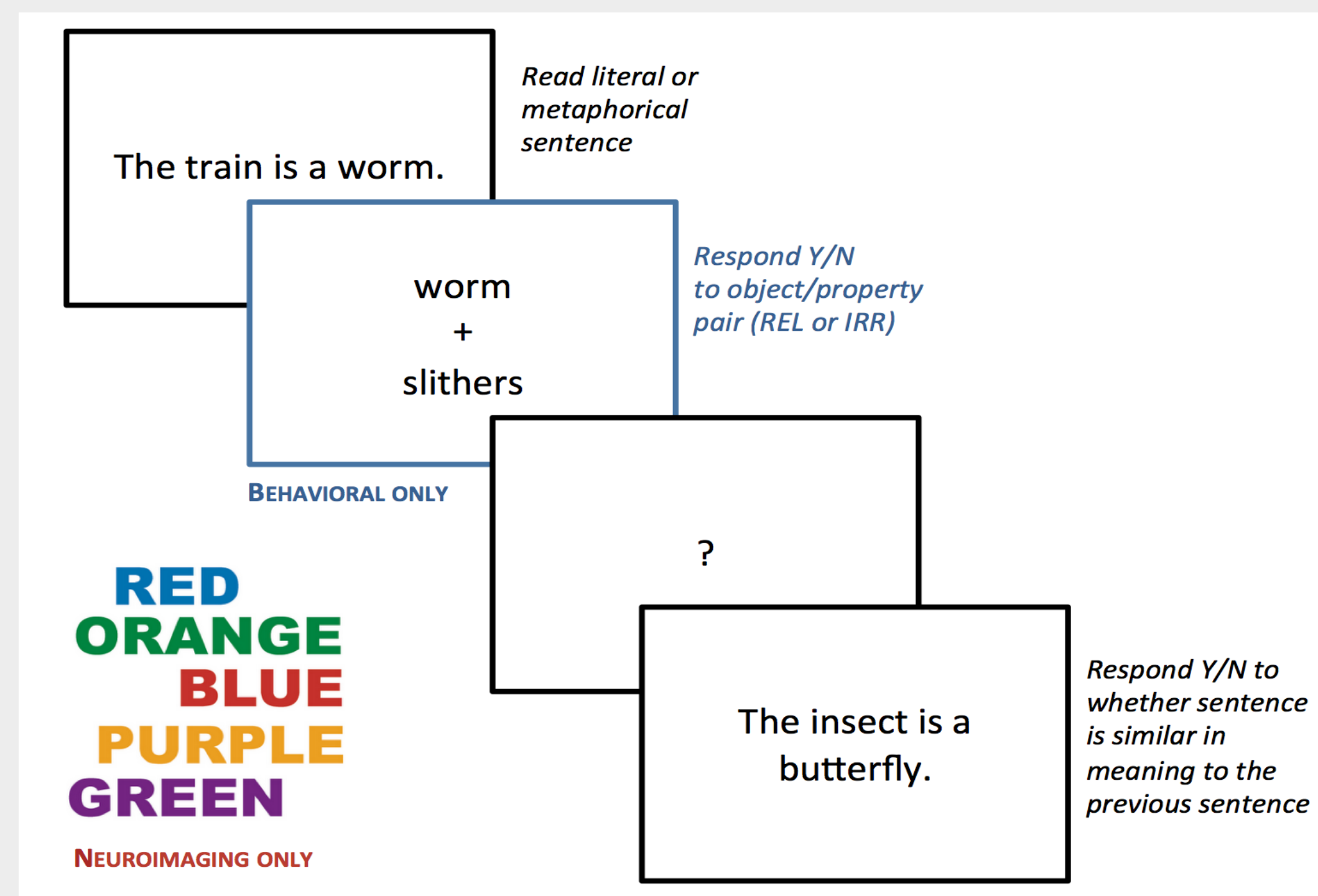
LIFG is involved in the dynamic reweighting of conceptual properties during metaphor comprehension by selecting properties relevant to the metaphor

## METHODS

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

### EXAMPLE

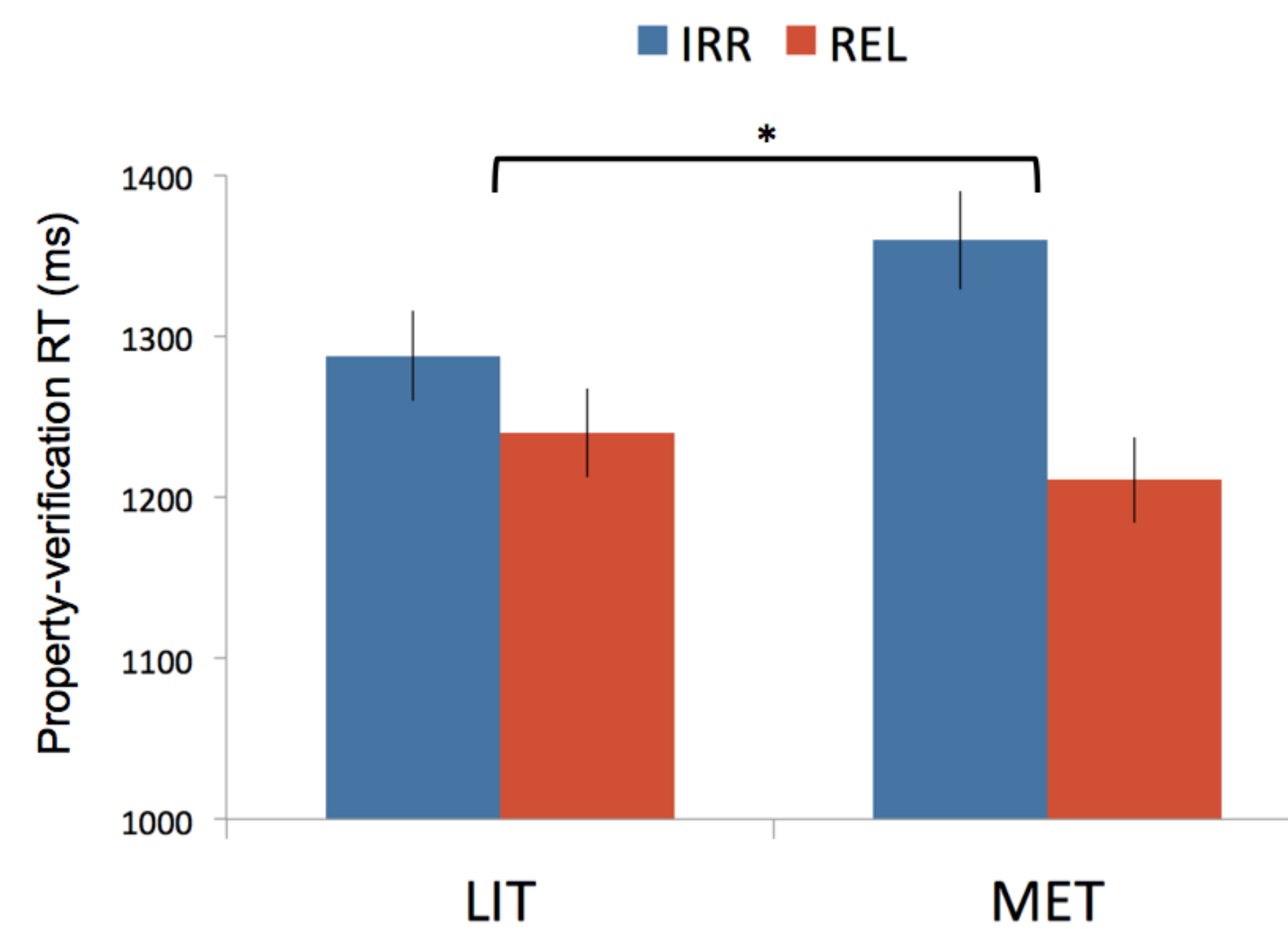
The creature is a worm. (LIT)      slithers (REL)  
 The train is a worm. (MET)      slimy (IRR)



## 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)

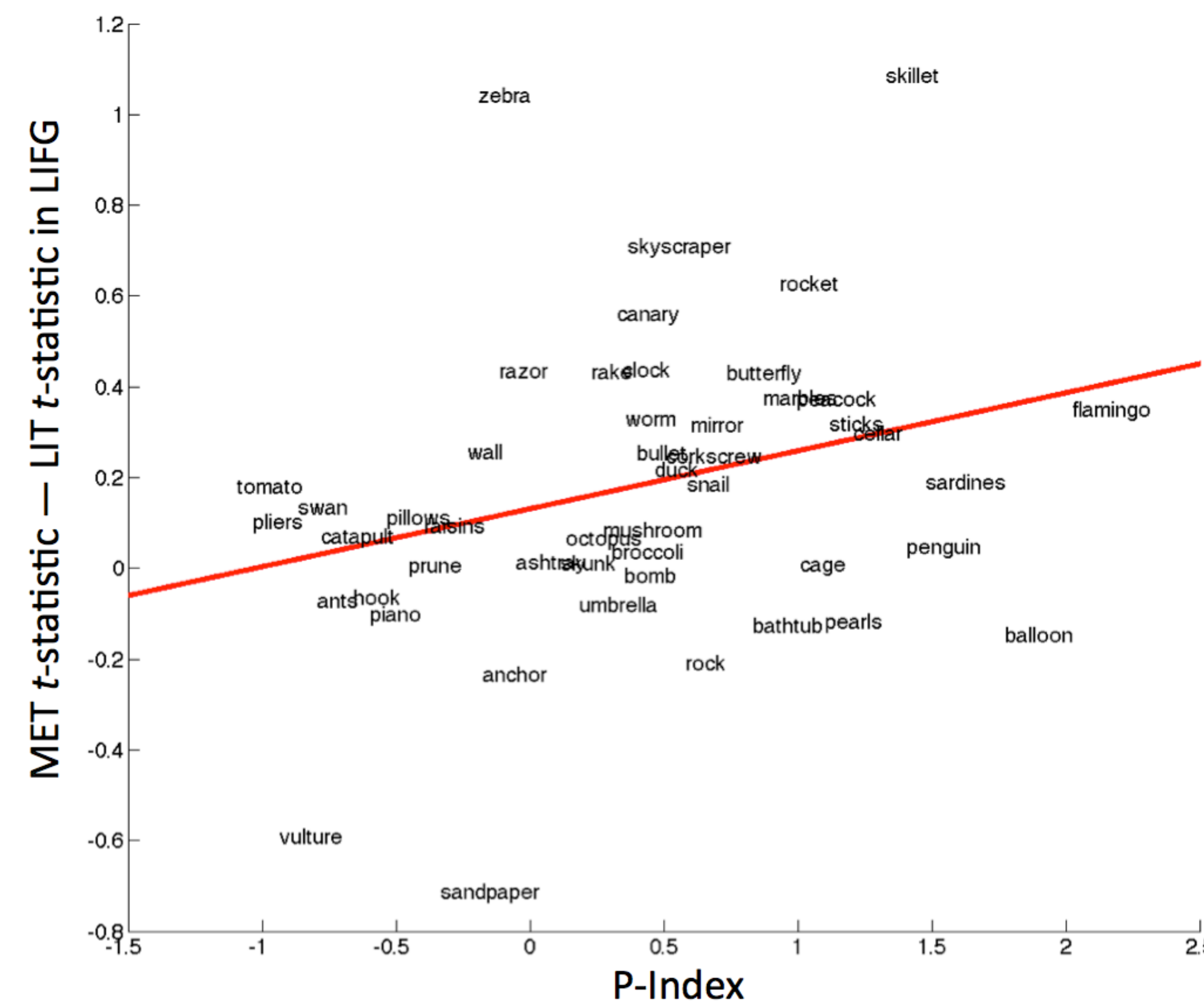


After MET sentences, subjects are faster to verify the REL property, and slower to verify the IRR property ( $p < 0.01$ ). We calculated this interaction effect for each item (P-index), and used it to predict LIFG activity during metaphor comprehension.

$$P\text{-index} = (\text{IRRMET} - \text{RELMET}) - (\text{IRRLIT} - \text{RELLIT})$$

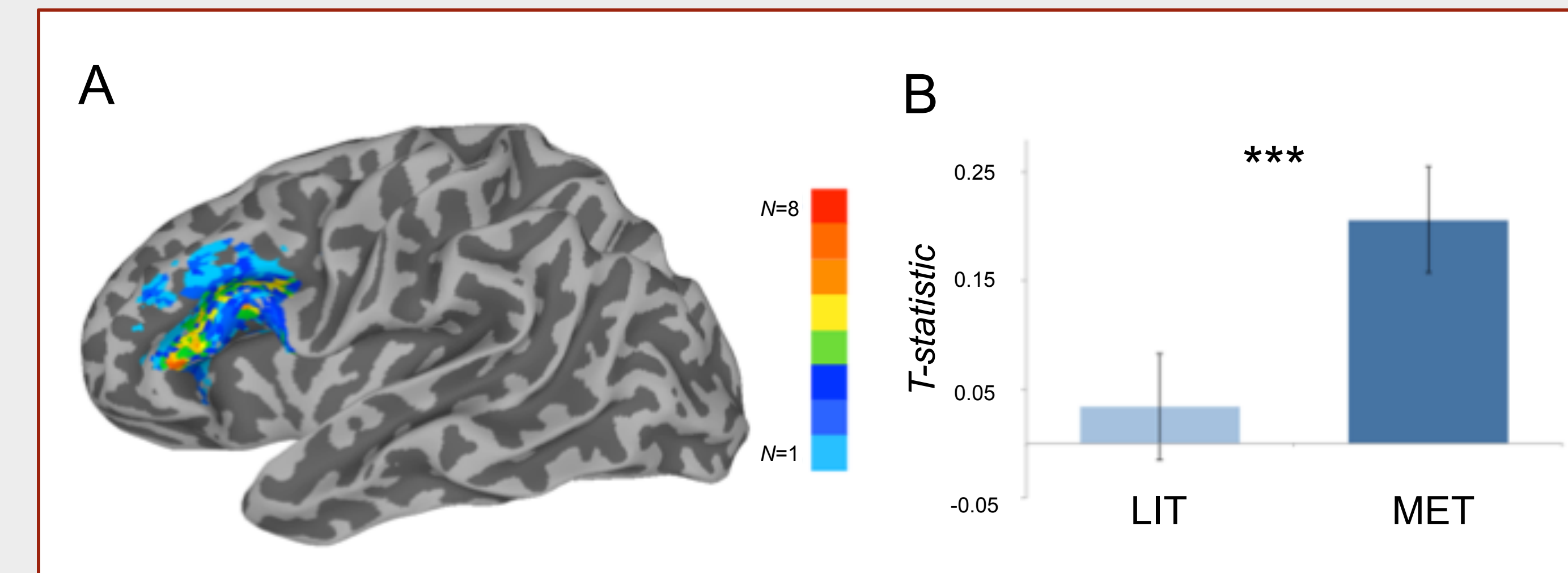
FOR EACH ITEM      METAPHOR RT EFFECT      LITERAL RT EFFECT

## 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.

## REFERENCES

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## CONTACT

sarahsol@sas.upenn.edu  
 Thompson-Schill Lab >>

