Semantic priming is mostly driven by local associations

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Background

Despite **access to word meaning** has been attested with subliminal stimuli, it is unclear what type of semantic information is grasped **unconsciously** [1].

According to **distributional semantics**, meaning similarity between linguistic units can be described in terms of **statistical patterns** detectable over large textual database [2].

- At the **local** level, words may be used together more often than would be expected by chance. Through **Pointwise Mutual Information** (PMI) is it possible to assess how the presence of one word informs about the likelihood that the other one will follow closely.

$$\mathrm{PMI}(w_1,w_2) = \log_2 \frac{p(w_1,w_2)}{p(w_1)p(w_2)}$$

- At the **distributed** level, words may share contextual similarity. Words are modeled as co-occurrence vectors and **cosine proximity** indexes the similarity between word vectors.

$$\cos(\theta) = \frac{\vec{a}\cdot\vec{b}}{||a||\cdot||b||}$$

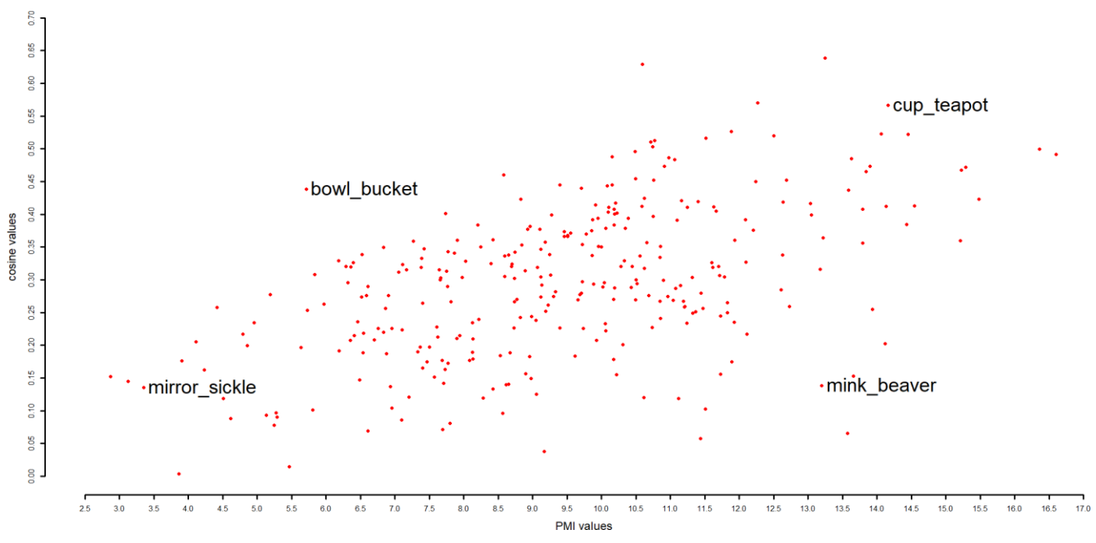
Our study

- **Research Questions**

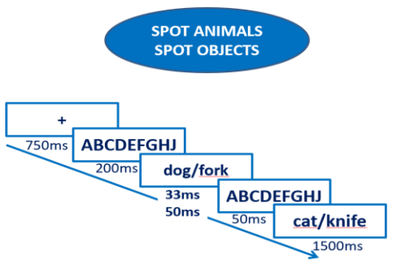
  What kind of semantic information is processed out of awareness?
  Are conscious and unconscious semantic processing based on the same principles?

M&M

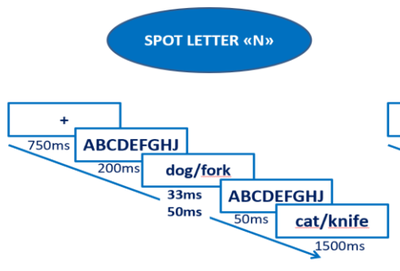
- 300 unique prime-target pairs (150 animal-animal, 150 tool-tool)
- Frequency counts extracted from the ItWac corpus [3].
- Word vectors obtained training a word2vec model [4] on ItWac.



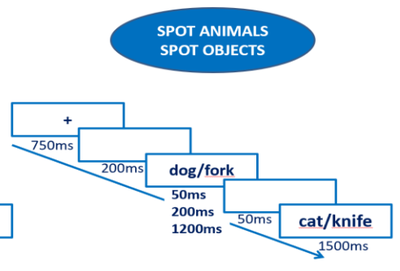
Experiment 1a & 2a
Target Semantic Categorization



Experiments 1b & 2b
Prime Visibility Task



Experiments 3:5
Target Semantic Categorization



Results

Masked Semantic Priming

- No effect of semantic similarity

  pmi: $F(1, 9744)=1.08$, $p= .298$

  cos: $F(1, 9747)=2.61$, $p= .106$

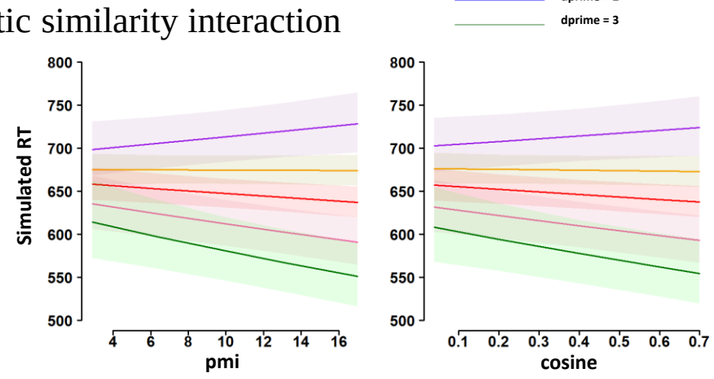
- Prime visibility*semantic similarity interaction

pmi*dprime

$F(1,9774)=13.74$, $p= .0002$

cos*dprime

$F(1,9774)=11.78$, $p= .0006$



Unmasked Semantic Priming

- Main effect of pmi across experiments

50ms prime

pmi: $F(1,9769)= 10.36$, $p= .001$

cos: $F(1, 9769)= 0.60$, $p= .438$

200ms prime

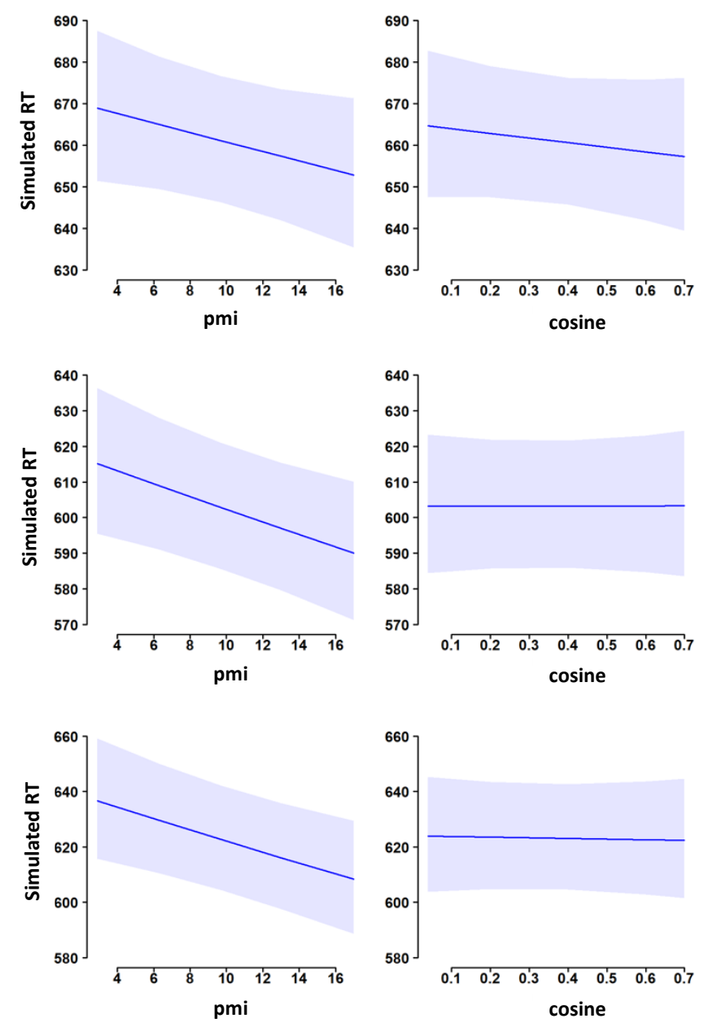
pmi: $F(1,8499)= 15.04$, $p= .001$

cos: $F(1, 8499)= 1.23$, $p= .215$

1200ms prime

pmi: $F(1,8487)= 8.87$, $p= .003$

cos: $F(1, 8487)= 1.27$, $p= .259$



Conclusions

- No semantic priming at the **subliminal level?**

1. None of the predictors has a main effect on RTs
2. All predictors interact with prime visibility, in a way that priming increases with participants' ability to detect the prime

- The **supraliminal effect** is mostly driven by **local association strength**

Reference

- [1] de Wit, B., & Kinoshita, S. (2015). The masked semantic priming effect is task dependent: Reconsidering the automatic spreading activation process. *Journal of Experimental Psychology: Learning, Memory, and Cognition*, 41(4), 1062.
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- [4] Mikolov, T., Chen, K., Corrado, G., & Dean, J. (2013). Efficient estimation of word representations in vector space, *arXiv*:1301.3781

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