Masked Repetition Priming with Event-related Potentials Reveals Semantic Access for Grounds

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Background

Traditional hierarchical, "feedforward" models of vision assume that semantic access occurs only for objects.

But how does object perception occur?

A contemporary view is that properties of objects that might be perceived on opposite sides of a border (*proto-objects*) **compete** for perception:

- winner is perceived as the object.
- loser is perceived as a shapeless ground.

On this view**, it is possible that semantic access occurs for proto-objects that are never perceived** because they lose the competition for perception and are perceived as grounds**.**

Methods

EEG in human participants.
N400 Event Related Potential

- related to semantic access.
- reduced when meaningful (but not novel meaningless) stimuli are repeated (Voss & Paller, 2010).

EEG Methods (Exp 1 & 2)

64 Channel Neuroscan Synamps 2
0.5 to 15 Hz bandpass filter
Non-parametric permutation statistics
FDR corrected
256 Hz sample rate

Acknowledgments: NSF BCS-0960529 to MAP
Handouts: www.psychofizz.org
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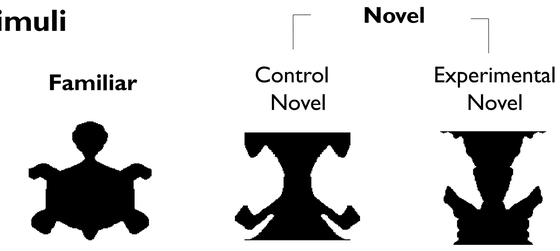
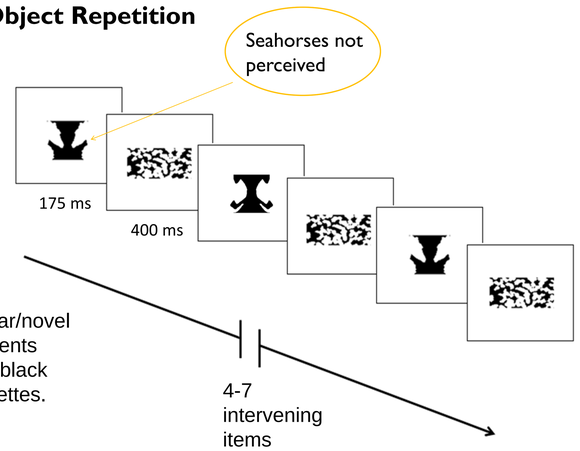
Stimuli



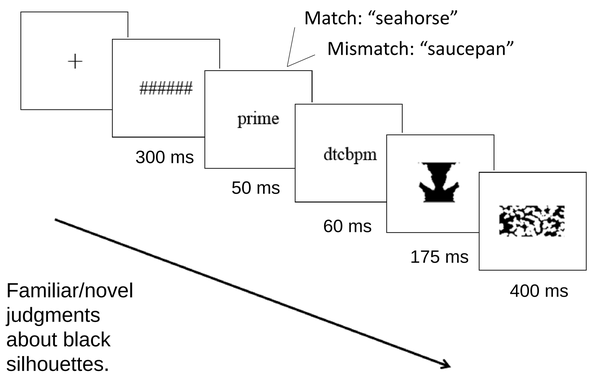
Participants perceived both types of novel silhouettes as novel shapes *only*. They were unaware of the familiar shapes ("proto-objects") suggested in the ground regions of the *Experimental Novel* silhouettes.

Exp. 1: Object Repetition



- Familiar/novel judgments about black silhouettes.

Exp 2: Cross-Modal Repetition



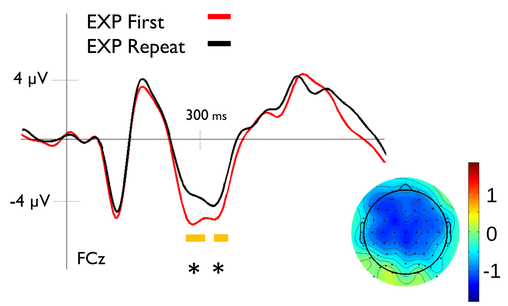
- Familiar/novel judgments about black silhouettes.

Results\Discussion

Exp. 1: Reduced N400 for repeated displays with *unperceived* meaningful proto-objects on ground side. **Exp 2**: This finding was replicated in a cross-modal repetition experiment, showing access is to an abstract semantic system (Holcomb et al., 2006). These N400 repetition effects demonstrate semantic access for meaningful proto-objects present in regions ultimately perceived as grounds. Thus, semantic access is not limited to perceived objects. Semantic access may occur in a fast feedforward pass of processing, prior to competition for object perception (Lamme & Roelfsema, 2002)**.**

Exp. 1: Object Repetition

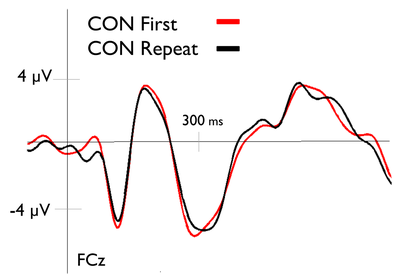
Experimental Novel



N400 reduction for repeated unseen meaningful proto-objects.

Repeat - First

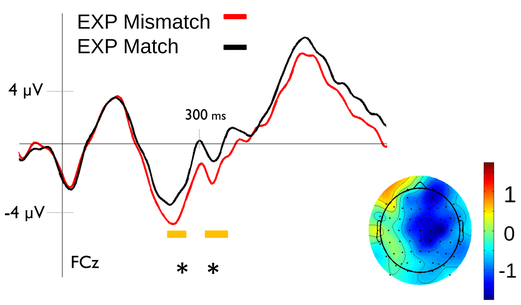
Control Novel



N400 reduction *absent* for repeated novel (meaningless) stimuli.

Exp. 2: Cross Modal Repetition

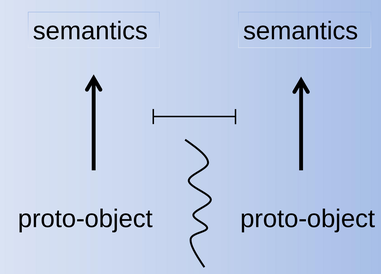
Experimental Novel



N400 reduction when words name the unseen meaningful proto-objects.

Mismatch - Match

First Pass of Processing
(for all borders)



Subsequently, only one side is perceived as figure, whereas the other side is perceived as ground.