A Repetition Paradigm With Figure-ground Stimuli Reveals that Both Semantic and Shape Representations Can Be Accessed Outside of Awareness

J.L. Sanguinetti, John J.B .Allen, and Mary A. Peterson, Department of Psychology, University of Arizona

675.16 / MM12

Introduction

Figure-ground perception

Two regions share border:
Region with definite shape = **figure.**
Shapeless region that continues behind the figure = **background**.

Mechanism: Inhibitory competition between potential objects on opposite sides of shared borders [1].

Evidence: Even in brief exposures, familiar objects suggested in the region perceived as the shapeless ground are accessed and suppressed *at least at the basic shape level* [1].

Question

Are conceptual representations accessed during f/g assignment?
Approach: Test for conceptual access in repetition priming design.

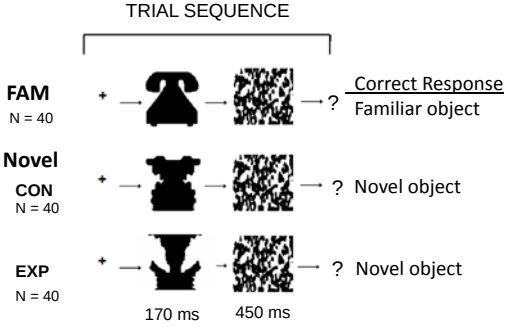
Repetition Priming

- The initial presentation of a stimulus facilitates later processing.
- With repetition, neural responses are **suppressed** for **familiar** stimuli **and enhanced** for **novel** stimuli [2] – P100 ERP effects [3, 4].
- FN400 ERP indexes **conceptual priming**: Repeated meaningful items attenuates FN400 responses [5].

Stimuli and Design

Task: Is silhouette a familiar (real world) or a novel object?
Silhouette figures biased toward center as figure.
Familiar and Novel intermixed.
Two types of Novel (luminance, contour length, Gestalt properties matched)
CONTROL: no competing familiar object on outside -- ground side.
EXPERIMENTAL: competing familiar object on **shapeless** ground side

TRIAL SEQUENCE



Experiment 1: Methods

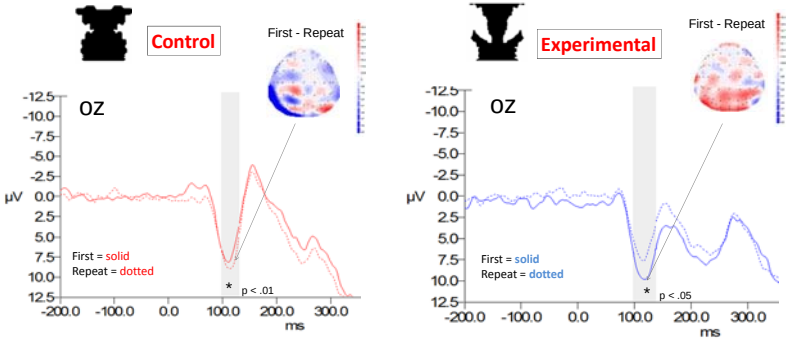
- N = 52 (31 female)
- 2 Repetition lag groups: Short (5-9 intervening stimuli); Long (17-21 intervening stimuli)
- "Seers" (of familiar shape on outside of EXP silhouettes) excluded by extensive post exp. questions. Data are from **Non-Seers** (N = 22, Short lag: N = 10).
- 64 channel EEG, 500X amplification, 500 Hz sampling, band passed .01-100 Hz
- EMG removed by visual inspection; eyeblinks corrected; Impedances < 10 KΩ.
- ERPs computed by averaging trials separately for 1st & 2nd presentations of EXP & CON.
- Analysis: Non-parametric permutation t-tests using EEGLab toolbox [5].

Results

➢ No repetition effects found at long lags.

Short Lag Repetition Effects

P100 First vs Repeat



CON: Repetition enhancement

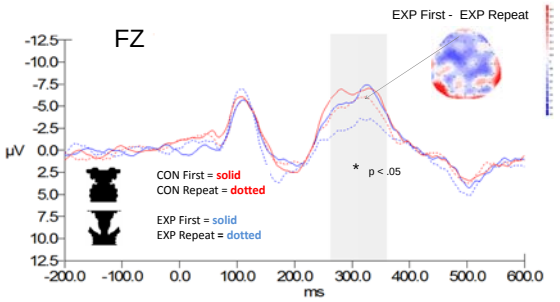
EXP: Repetition suppression

Early repetition suppression at P100 reveal access to representations of familiar objects that are suggested, but not perceived, on the ground side of EXP silhouettes.
First demonstration of repetition suppression under these conditions.

Question: What levels of the representational hierarchy are accessed?

Contact: J.L. Sanguinetti; sanguine@email.arizona.edu

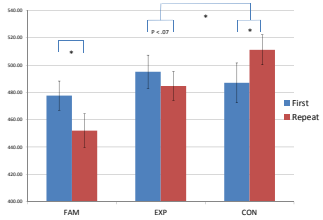
FN400 Conceptual Priming



Attenuation of FN400 for repeated meaningful objects in area of visual field perceived as the ground reveals they were processed semantically (conceptually).

Experiment II: Object Decision RTs

- N = 28
- Balanced design (50% FAM, 50% NOV)
- Measure object decision RTs
- No response interference for EXP vs. CON



Discussion

1) First demonstration of repetition suppression and conceptual priming for familiar shapes that are not perceived as figures.

2) Consistent with view that familiar configurations that are suggested, but not perceived, on the ground side of EXP silhouettes are processed at conceptual levels.

3) RT results: More efficient access to representations of familiar objects suggested on ground side of repeated EXP silhouettes may reduce time needed to resolve cross border competition.

Support: MAP: NSF BCS 0960529

Handouts available: www.psychofizz.org

References

[1] Peterson M.A., Skow E (2008). JEP:HPP , 34 (2), 251-267.
[2] Grill-Spector K., Henson R., Martin A., (2006). *Trends in Cognitive Science*, 10(1), 14-23.
[3] Huber D., Tian X., Curran T., (2008). *J Exp Psych*, 34 (6), 1389–1416.
[4]Trujillo L.T., Allen J.J.B., Schnyer D.M. Peterson M.A, (2010). *Journal of Vision*, 10(2):5, 1–21.
[5] Voss J., Schendan H., Paller K., (2010). *Neuroimage*. 49, 2879–2889.
[6] Delorme A., Makeig S., (2004). *J Neurosci Methods*, 134:9-21, 2004.