Fast mapping versus explicit learning: neural tuning after ten minutes

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Introduction

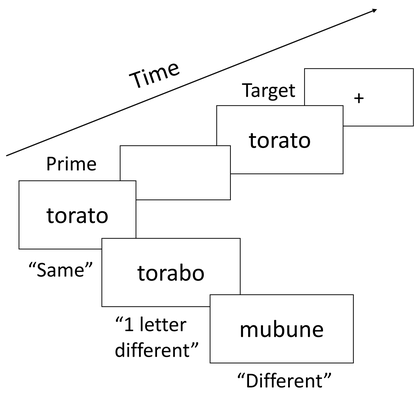
Fast mapping involves implicitly encoding novel concepts in contrast with a known concept. While explicit learning gradually consolidates from the hippocampus to the neocortex[1], evidence of rapid lexical integration suggests fast-mapped words consolidate directly to the neocortex within minutes[2].

The present study tests if fast mapped concepts consolidate directly to the neocortex after 10 minutes.

Methods

Learning: Subjects learn names of 16 unfamiliar animals via fast mapping followed by 10 min wait.

Are the antennae of the Torato pointing up?

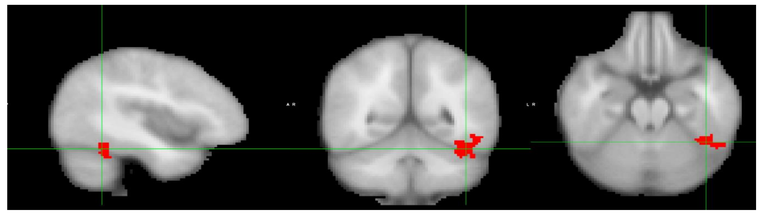


fMRI task: Subjects exposure to word pairs of learned words, unlearned pseudo-words, and real words; rapid adaptation paradigm determines neural tuning

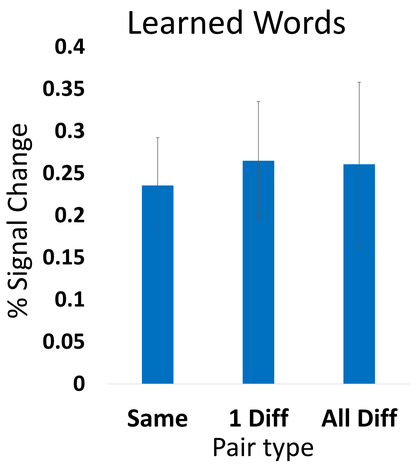
Lexical integration task: Subjects make lexical decisions about orthographic neighbors of learned words and to words without interfering orthographic neighbors.

Results

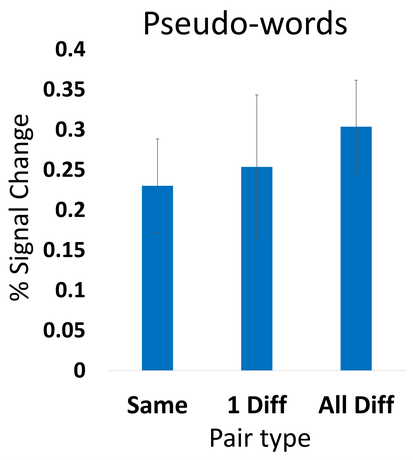
N=9

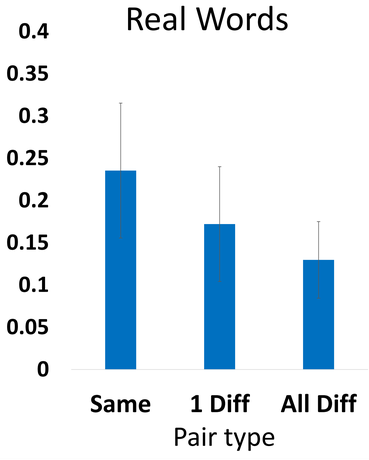


ROI: Functionally-defined Visual Word Form Area (VWFA) (selective for lexically-integrated wordforms[3]); peak coordinates: -41 -52 -22 (MNI152)



Neural Tuning: Repeated measures ANOVA with Greenhouse-Geisser correction determined % signal change significantly differed between word types ($F(1.221, 9.771) = 7.367$, $p < .05$) but no interaction between word and pair types.





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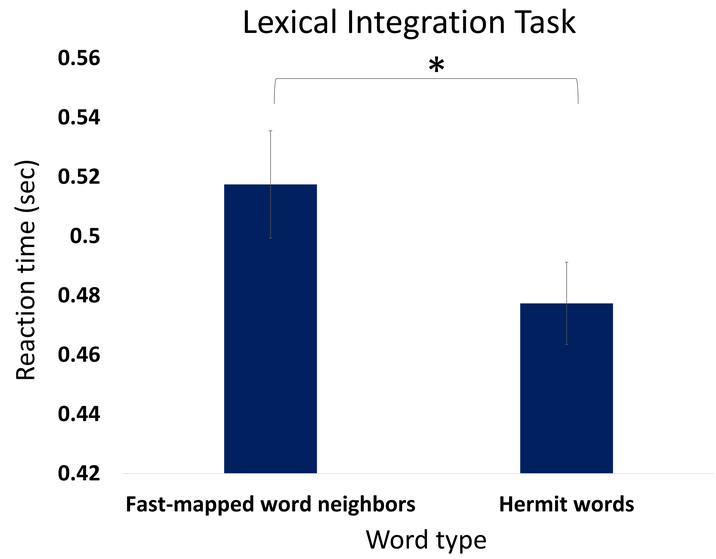

Lexical integration: Slower reaction times to orthographic neighbors of fast-mapped words than to orthographic hermits indicate lexical integration 60 minutes post-learning ($p < .05$)

Conclusions

- Preliminary results yield no significant neural tuning in the VWFA for fast-mapped words after 10 minutes
- Behaviorally, fast-mapped words show lexical integration after 60 minutes
- Further whole-brain analyses will determine if lexical integration of fast-mapped words is due to rapid consolidation in other neocortical regions

References

1. McClelland, J. L. *et al.* (1995) Why there are complementary learning systems in the hippocampus and neocortex: insights from the successes and failures of connectionist models of learning and memory. *Psychol. Rev/.* 102, 419-457.
2. Coutanche, M.N and Thompson-Schill, S.L. (2014) Fast mapping rapidly integrates information into existing memory networks. *J. Exp. Psychol. Gen.* 143, 2296-2303
3. Glezer L.S., Jiang X., Riesenhuber M. (2009) Evidence for highly selective neuronal tuning to whole words in the "visual word form area." Neuron 62:199-204.

Acknowledgements

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Poster: https://web.sas.upenn.edu/stslab/publications/posters