Refreshing versus removing information in working memory: Different processes, or two sides of the same coin?

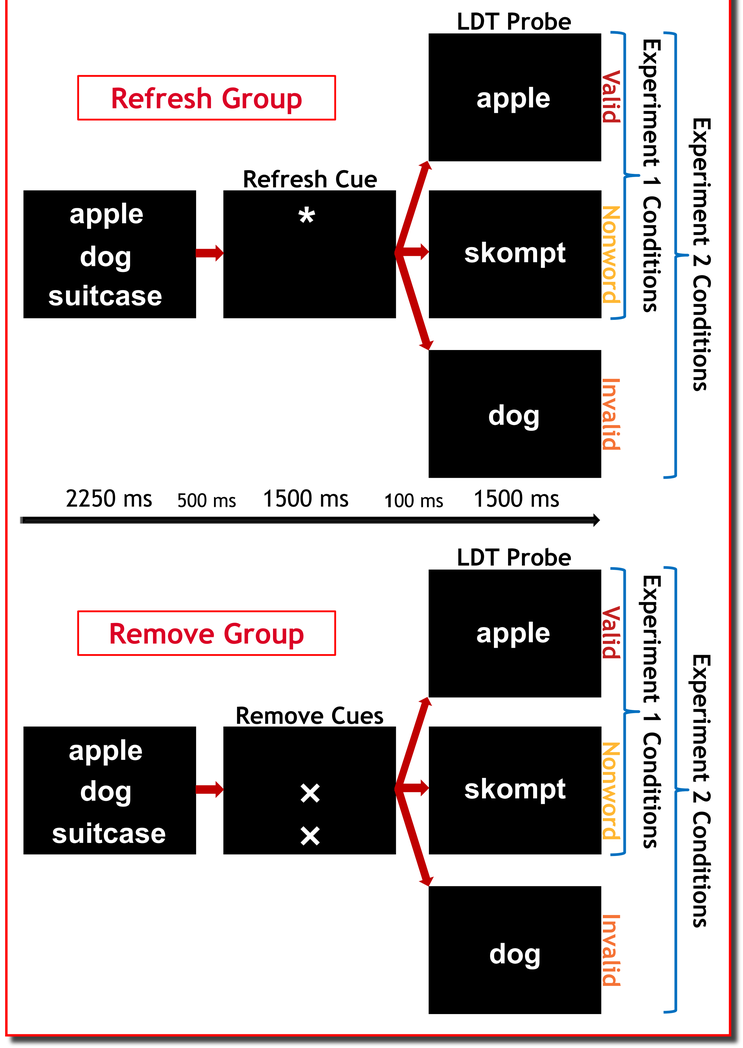
Evan N. Lintz, Arianna N. Dye, & Matthew R. Johnson

Department of Psychology, University of Nebraska - Lincoln

INTRODUCTION

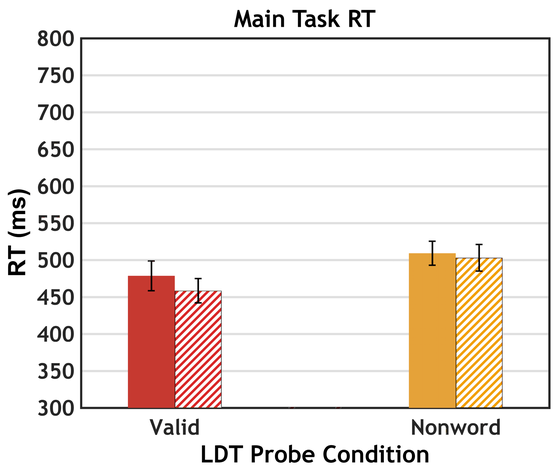
- Removal of current items from working memory (WM) must occur on some level to successfully update WM contents.
- Can we actively remove items from WM in the absence of other incoming items? Is this a distinct cognitive process, or is it accomplished merely by directing mental attention away from items marked for removal?
- Refreshing, the act of focusing mental attention towards a specific item in working memory, results in better recognition memory for refreshed items.[1]
- Thus, directed forgetting and removal effects in WM may be alternatively explained by a refreshing account. Previously these processes have not been explicitly compared; we do so here.

TASK DESIGN

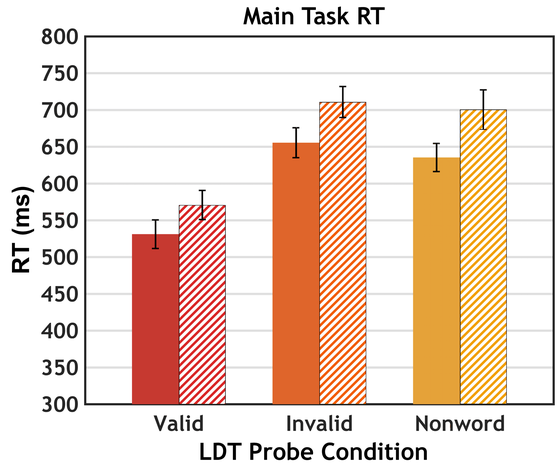


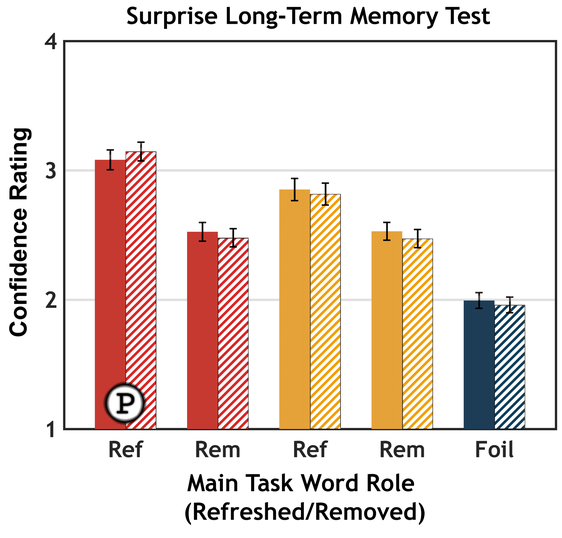
RESULTS

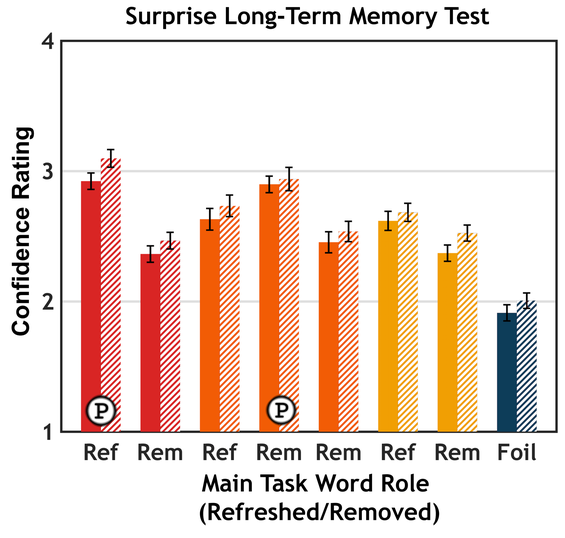
Experiment 1



Experiment 2







- Main task RT: Main effect ($p<.001$) for LDT probe word role in both experiments, with valid probes faster than nonwords.
- LTM test: Main effect for word role ($p<.001$) in both experiments.
- **No significant between-group differences or interactions** in any comparison.

METHODS

Experiment 1

- Participants (N = 72) assigned to refresh or remove group. Refresh cued on one word (the "critical" word) to think back to. Remove cued on two words (the non-critical words) to forget.
- Cues followed by Lexical Decision Task (LDT) probe (word/nonword button press judgment). Word probes were always the critical word. 50% probability of word or nonword probe.
- Fully counterbalanced for critical word, word presentation order, & probe type.

Experiment 2

- As in Exp. 1, except participants (N = 68) randomly assigned to groups, and LDT now includes 20% invalid probes (valid/nonword 40% each).

Experiments 1 & 2

- Completed a 10-minute unrelated working memory task prior to a surprise long-term memory (LTM) recognition task, rating confidence of having seen all 324 words from the main task plus 216 unseen foils.

CONCLUSIONS

- Groups had identical patterns of results for main task RT and LTM test measures in both experiments, despite different Refresh/Remove instructions; suggests no group difference in approach to tasks.
- Lack of between group differences (NHST) confirmed by Bayesian evidence favoring models with no between-group effects or interactions.
- It appears that when participants are instructed to remove items from WM, their strategy is to avoid attending to remove-cued items by refreshing another (uncued) item in the set.
- Though the processes of refreshing and removal showed no behavioral differences, EEG follow-ups are in progress to investigate any potential neural differences between them.

REFERENCES & ACKNOWLEDGEMENTS

[1] Raye, C.L., Johnson, M.K., Mitchell, K.J., Greene, E.J., & Johnson, M.R. (2007). Refreshing: A Minimal Executive Function. *Cortex*, *43*, 135-145.

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Reflection Attention & Perception Lab
http://raplab.rocks
evan.lintz@huskers.unl.edu

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