Probing the properties of priority maps in visual working memory

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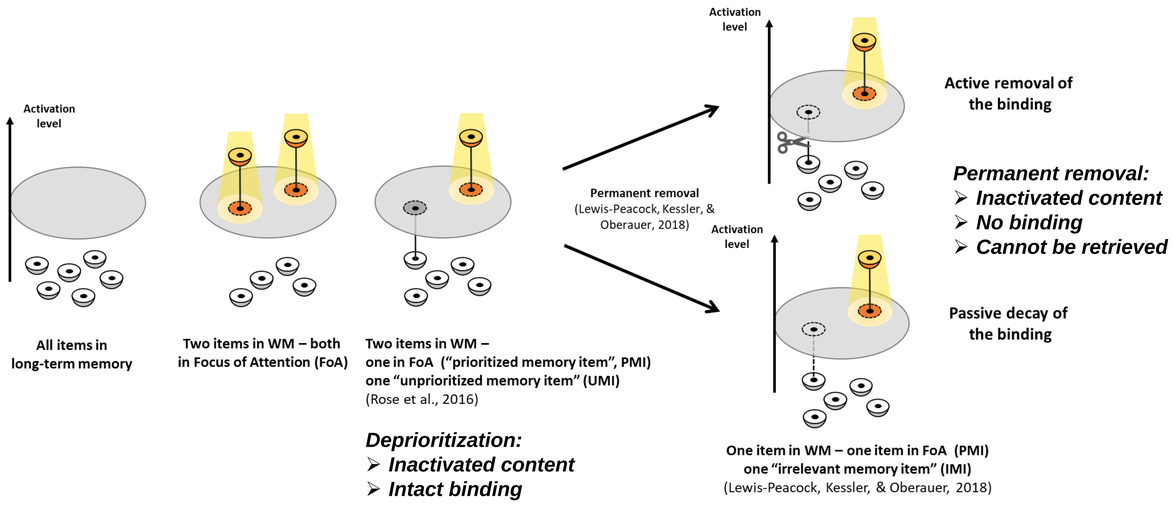
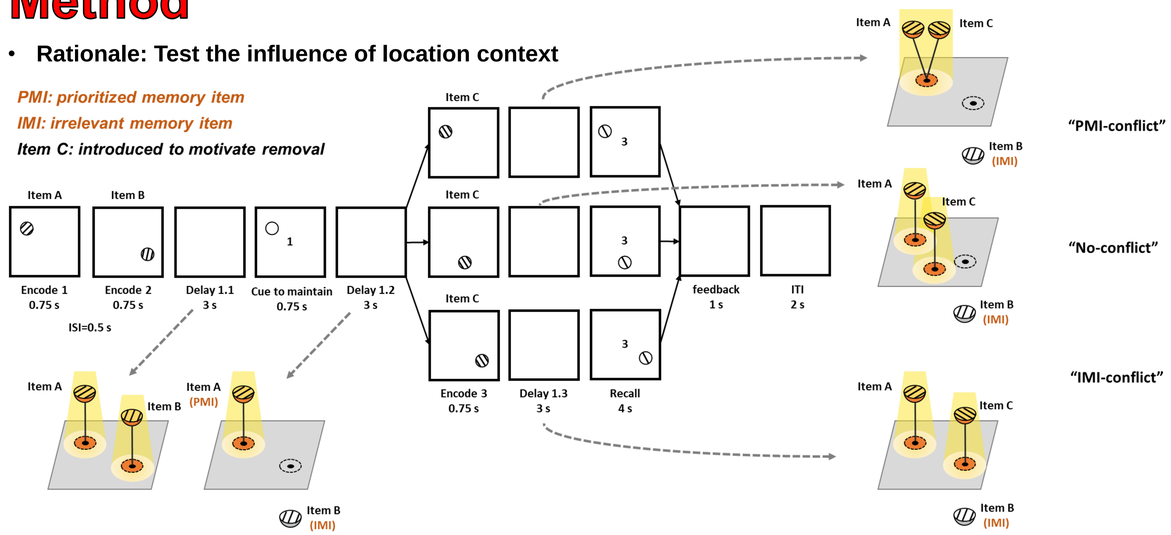
Background

- Binding between the content (e.g. grating orientation) and the context (e.g. the position where it was displayed) of an item is critical for successful working memory. When multiple memory items are bound to and retrieved by similar contexts, interference reduces precision and can lead to misbinding (a.k.a. "swap") errors (Oberauer, & Lin, 2017).



Method

- **Rationale: Test the influence of location context**



- Report the orientation of either item A or item C with equal probability. Analysis focused on trials where item C is reported.

References

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Rose, N. S., LaRocque, J. J., Riggall, A. C., Gosseries, O., Starrett, M. J., Meyering, E. E., & Postle, B. R. (2016). Reactivation of latent working memories with transcranial magnetic stimulation. Science, 354(6316), 1136-1139.

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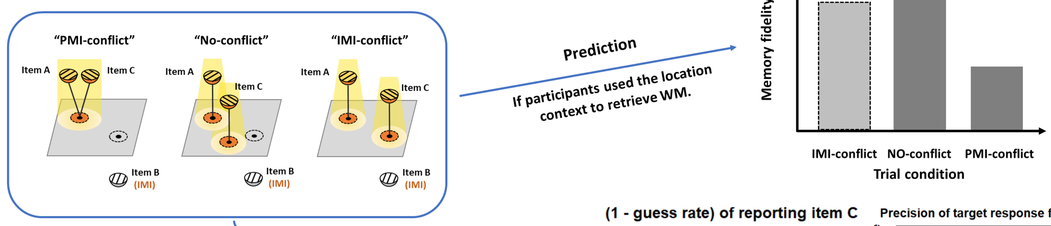
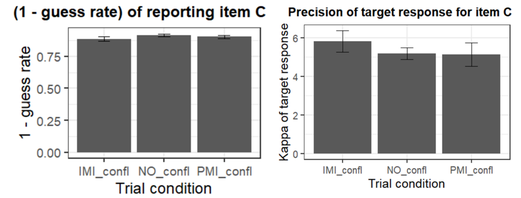
Results

- 19 subjects (age = 21.0±3.0）

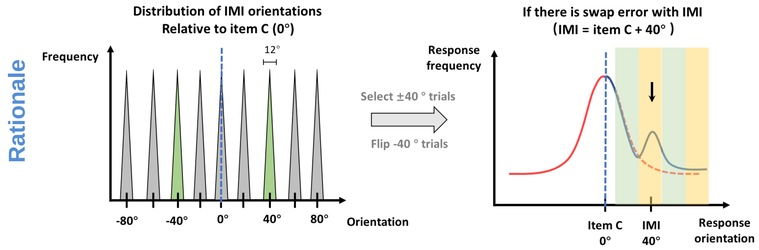
- **Influence of location context**





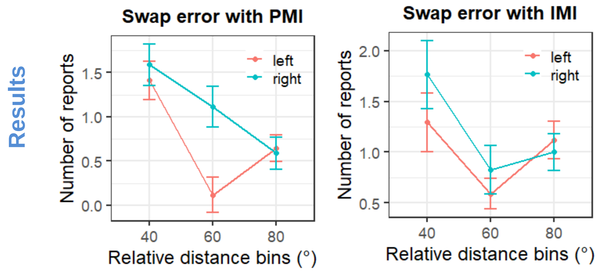
➢ **Participants did NOT use location context to retrieve memory item in this task.**

- **Did they remove IMI?**



Compare the count of reports in the 40±10° bin to the -40±10° bin when IMI is 40° reltive to item C.

Swap errors when IMI is 60 or 80 degrees from item C are tested in a similar way.



PMI: significant main effect of left vs. right
(F(1,16) = 5.685, *p* = 0.03)

IMI: nonsignificant main effect of left vs. right (F(1,16) = 0.611, *p* = 0.446)

➢ **Bayesian repeated measures ANOVA further showed substantial evidence for no swap errors (BF = 0.324).**

➢ **Swap error with PMI but not IMI when reporting item C.**

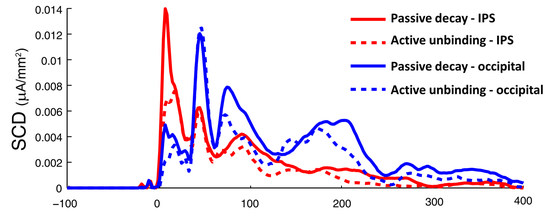
➢ **Reports of item C do not shift systematically away from the target orientation for all relative distances to PMI or IMI (all *ps* > 0.272, after Bonferroni correction).**

Conclusion & Discussion

- **Influence of location context**: Subjects relied on order (1st, 2nd, 3rd) when location was ambiguous, indicating flexible use of most informative context.
- **Did subjects remove IMI**: The procedure is effective in causing removal from WM; However, active vs.. passive remains unclear. Study with neural measure is needed to explore evidence on active removal vs. passive decay.
- **Next step**: TMS-EEG study

➢ Use a location-probe recognition task to motivate using of location context cue.

➢ Test effective connectivity between IPS (the priority map) and occipital cortex after the removal cue in active unbinding vs. passive decay conditions.



Hypothetical result, modified based on Johnson, Kundu, & Postle, 2012