Working Memory Consolidation Improves Long-Term Memory Recognition in Words and Non-Words

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Introduction

**Working memory influences long-term memory.**
- Covert retrieval effects demonstrate how working memory can improve subsequent long-term memory (McCabe, 2008).

**Attention is insufficient to create memory traces.**
- Recent findings suggest that attention is insufficient to form stable memory traces (Chen & Wyble 2015).
- Working memory consolidation is necessary to form durable working memory representations (Chen & Wyble 2016).

**It remains unclear how working memory consolidation influences long-term memory performance.**
- Inducing working memory consolidation should lead to improved long-term memory.
- This effect should be stronger when prior representations exist for stimuli in long-term memory.

**Predictions**
- Inducing working memory consolidation should lead to improved long-term memory.
- This effect should be stronger when prior representations exist for stimuli in long-term memory.

Results

**Stimulus identification.**
- Very high accuracy for both cue types across experiments

**Delayed recognition.**
- Clear effect of cue type in all experiments
- No effect of stimuli type in Experiment 3

<table>
<thead>
<tr>
<th>Experiment</th>
<th>SI Difference</th>
<th>SI BF10</th>
<th>DR Difference</th>
<th>DR BF10</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>-0.5%</td>
<td>2.8</td>
<td>3.8%</td>
<td>3.7</td>
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<tr>
<td>2</td>
<td>-0.3%</td>
<td>.18</td>
<td>7.6%</td>
<td>3214</td>
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<tr>
<td>3 (Cue)</td>
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<td>9</td>
<td>7.5%</td>
<td>2174</td>
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<tr>
<td>3 (Stimuli)</td>
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<td>.13</td>
<td>1.9%</td>
<td>.20</td>
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<tr>
<td>3 (Interaction)</td>
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<td>.33</td>
<td>N/A</td>
<td>.25</td>
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</tbody>
</table>

**Table 1. Summary of results. Differences are Before-During, except for Experiment 3 Stimuli, which is Nonword-Word.**

SI = Stimulus Identification, DR = Delayed Recognition, BF10 = Bayes factor alternative hypothesis/null hypothesis.

Method

**Participants.**
- Experiment 1 N = 46, Experiment 2 N = 44, Experiment 3 N = 40

**Procedure.**
- Stimulus identification, two possible conditions:
  - **During-cue:** blank screen preceded response set and target item
  - **Before-cue:** target item briefly presented and removed, followed immediately by response set
- Delayed recognition: one item from previous task and novel item
- Participants indicated level of confidence that they had seen item during stimulus identification

**Changes in Experiment 2**
- Brief blank screen inserted between target presentation and response set during stimulus identification

**Changes in Experiment 3**
- Same procedure as Experiment 2
- Included both words and nonwords as stimuli

Conclusion

**Working memory consolidation improves delayed recognition.**
- Better performance on delayed recognition for words originally presented in Before-cue condition compared to During-Cue condition in all experiments
  - Only before-cue conditions required working memory consolidation
  - Experiments 2 and 3 used a brief delay between cue and search
  - Ensures that working memory consolidation occurs

**Words and non-words show similar effects.**
- No effect of stimuli type (Words/Nonwords) in Experiment 3
- No interaction between Cue and Stimulus Type in Experiment 3
- Suggests that the existence of pre-existing representations are not needed for the cue effect