Effects of Working Memory Capacity in a Directed Suppression Task
Whitney Hansen and Stephen D. Goldinger, Arizona State University

ABSTRACT

Much recent research on working memory (WM) has focused on individual variations in core capacities, especially in tasks involving controlled attention. We have been collecting data using a directed suppression task, which requires both controlled attention and mental agility. In versions tested thus far, people see words printed in blue, green, or red on a computer screen. When blue or green words appear, the participants must pronounce them as quickly as possible. As conditions change, however, the appropriate response to the word changes. When red words also change. When words appear in red, participants must suppress the prepotent naming response and instead generate some novel response (push a button, say an unrelated word, or a related word). We have observed certain conditions that disrupt mental agility, including generating unrelated words and holding memory loads. Individual differences in WM capacity predicted performance on several indices including RT, error, and memory for experienced words.

Experiment 1 Summary

• Basic Reading: Quickly pronounce all words (blue, red, and green).
• No Red Words: Quickly pronounce blue and green words. Do not read red words, press button instead.
• Unrelated Word: Quickly pronounce blue and green words. When red word is shown, say an unrelated word.
• Related Word: Quickly pronounce blue and green words. When red word is shown, presented, say any semantically related word.

Experiment 2 Summary

• Related, not previously seen.
• Related, not taboo.

Experiment 3: Mental Load

Two Conditions:
• Related, not previously seen.
• Related, not taboo.

These were identical to Experiment 2, but people had to memorize sets of 5 words, holding them in mind for later recall.

Experiment 1 Baseline

<table>
<thead>
<tr>
<th>Condition</th>
<th>Words in Blue</th>
<th>Words in Green</th>
<th>Words in Red</th>
</tr>
</thead>
<tbody>
<tr>
<td>All Words</td>
<td>0.000</td>
<td>0.000</td>
<td>0.000</td>
</tr>
<tr>
<td>No Red</td>
<td>0.005</td>
<td>0.010</td>
<td>0.015</td>
</tr>
<tr>
<td>Unrelated</td>
<td>0.020</td>
<td>0.025</td>
<td>0.030</td>
</tr>
<tr>
<td>Related</td>
<td>0.035</td>
<td>0.030</td>
<td>0.035</td>
</tr>
</tbody>
</table>

Error Rates

- All participants responded slower to all words in more challenging conditions.
- Across conditions, high-spans were faster (to all words) than low-spans.
- Given critical red words, span effects were largest in the no red and related conditions.

Experiment 2: Semantic Priming

Two Conditions:
• Related, not previously seen: Quickly pronounce blue and green words. When you see a red word, say a related but not previously seen word.
• Related, not taboo: Quickly pronounce blue and green words. When you see a red word, say a related word that was not previously seen, and that is not on a "taboo" list.

Experiment 3: Mental Load

Two Conditions:
• Related, not previously seen.
• Related, not taboo.

These were identical to Experiment 2, but people had to memorize sets of 5 words, holding them in mind for later recall.

Overall Summary of Results

• As constraints for the critical red trials grew more strict (e.g., produce a new, unrelated word), RTs in all trials increased.
• When a memory load was added prior to word-naming (Exp. 3), RTs and errors were again increased.

Directed Suppression Task

• General paradigm for testing mental control.
• Immediate Plans: Examining the content of errors (e.g., taboo, perseveration, etc.).
• Easily extended to ask other questions:
  - Example: "When you are a red word, produce an unrelated word that is NOT an animal."

If that restriction were dropped in later trials, would people "rebound" to use more animal names (cf. Wegner)?

Can also be easily used in developing, aging, or neurologically impaired populations.