INTRODUCTION

• Variation in working memory capacity (WMC) is predictive of higher-order cognition in a variety of situations requiring cognitive control. ¹
• One prominent theory of WMC states that both goal maintenance within primary memory and retrieval from secondary memory are critical to success in many cognitive activities. ²
• More recently, we have argued that variation in WMC is related to the likelihood that an individual will engage in maintenance versus retrieval. ³
• Specifically, high-WMC individuals are more likely to look forward for upcoming stimuli by actively maintaining relevant information. ⁴
• In contrast, low-WMC individuals are more likely to wait until a stimulus has occurred and then look backward to retrieve the necessary information. ⁴
• The current study sought additional fMRI evidence to confirm the inferences based on the behavioral data alone.

WMC SCREENING

• 12 high and 12 low span young adults were previously identified via a composite of two WMC tasks (FIGURE 1).

BEHAVIORAL TASK

• Participants completed a conditional go/no-go task in the scanner in which they were instructed to make button responses to targets and withhold responses to nontargets and lures ⁵ (FIGURE 2).
• In addition to examining accuracy as a function of trial type, lures were divided into trials in which the X or Y occurred immediately following a target (zero-lag) or if nontarget items intervened between the previous target and the current X or Y (nonzero-lag).

FMRI METHOD AND ANALYSIS

• Siemens Trio 3T MR scanner
• Scanning parameters: 36 slices, 3 mm voxels, TR = 1920 ms, TE = 30 ms
• Each of the 6 fMRI runs contained 5 blocks of 40 trials each, interleaved with 15 sec fixation periods
• For second-level analyses, uncorrected threshold of \( p = .001 \) and minimum cluster size of 5 contiguous voxels used to evaluate contrasts
• SPM8 used for preprocessing and analyses

FMRI RESULTS

• Low spans made more errors than high spans on target and lure trials, but they did not differ on nontarget accuracy, \( F(2, 44) = 3.61, p < .05, \) replicating previous work ⁶ (FIGURE 3).
• The span groups did not differ on zero-lag lures (\( p = .26 \)), but low spans did commit more errors on nonzero-lag lures (\( p = .04 \)), replicating previous work ³

CONCLUSIONS

• Low spans made more errors on targets and lures, specifically the trials where updating the contents of working memory is important.
• Low spans made more lure errors as more time and the number of intervening items increased.
• Compared to high spans, low spans had more activity in left ACC and bilateral hippocampus ⁶,⁷ areas during correct target trials.
• The behavioral and fMRI results support the hypothesis that low spans rely more upon retrieval-based control processes, whereas high spans are more likely to actively maintain goal information.
• Working memory capacity is important when task success requires updating and maintaining information to guide behavior, specifically when interference is present.

REFERENCES


TABLE 1: Targets > Nontargets, Low > High WMC

<table>
<thead>
<tr>
<th>Region</th>
<th>MNI</th>
<th>BA</th>
<th>T-score</th>
<th>Cluster</th>
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<tbody>
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<td>L anterior cingulate</td>
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<td>30</td>
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