Eye movements during visual search under memory load

Grayden Solman[1], Daniel Smilek[1] & John Eastwood[2]

[1]University of Waterloo, ON, Canada, [2]York University, ON, Canada

BACKGROUND

Visual working memory loads have been shown to adversely impact concurrent visual search performance, and the nature of this impact may vary depending on the type of load:

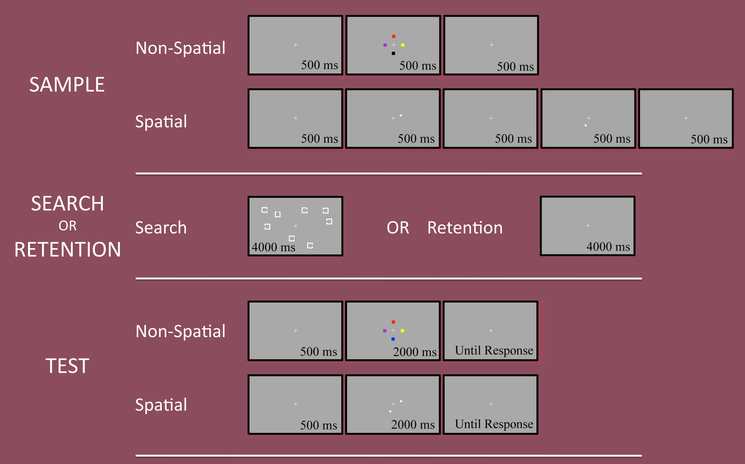
- **Non-spatial** load impacts intercepts but not set size slopes (Woodman, Vogel, & Luck, 2001)
- **Spatial** load impacts intercepts and set size slopes (Oh & Kim, 2004; Woodman & Luck, 2004)

To investigate where these effects occur in terms of attentional deployment during search, we monitored eye-movements during search under various kinds of memory load.

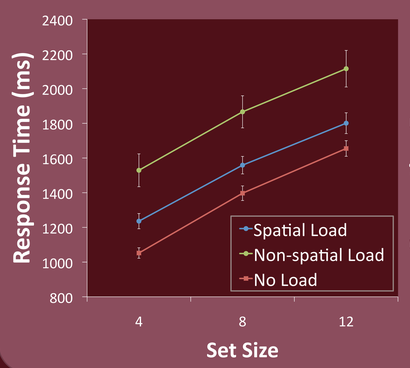
EXPERIMENTS

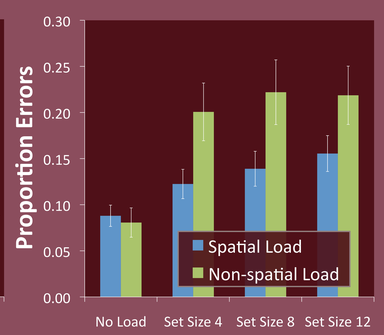
Visual search with memory load:

- Memory alone, search alone, and dual task (within)
- Non-spatial vs. Spatial memory load (between)



RESULTS

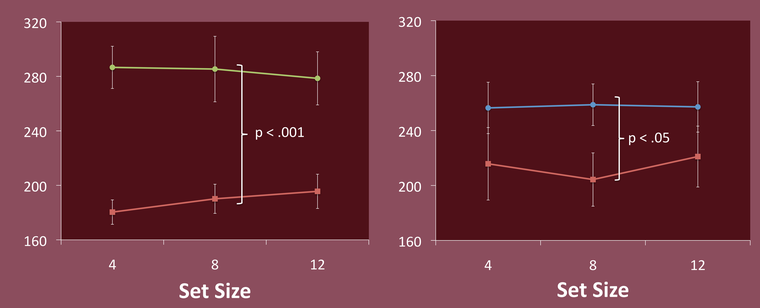




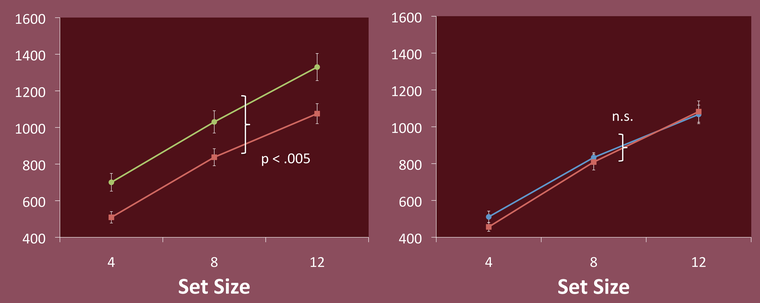
RESPONSE TIME DECOMPOSITION

Spatial Load | Non-spatial Load | No Load

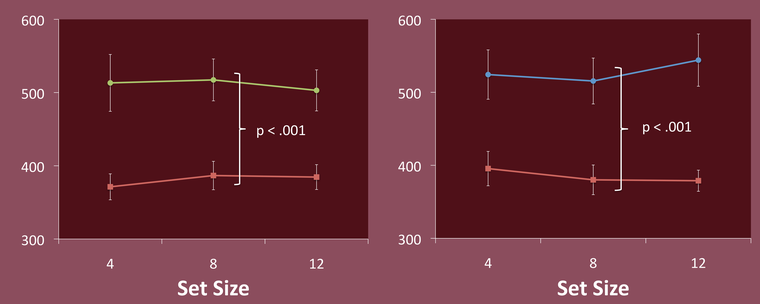
Latency to the first saccade (ms)



Search Time (ms): (Total RT) – (First saccade latency + Time after fixating target)



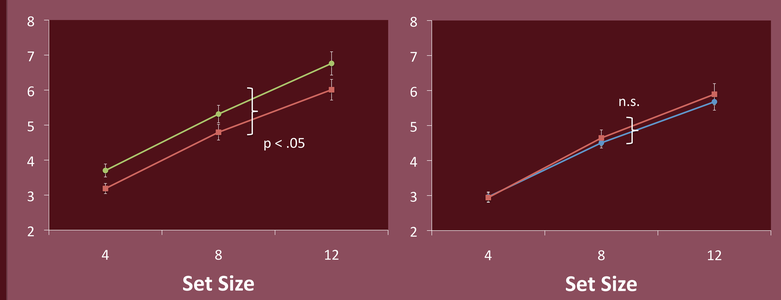
Time to generate response following target fixation (ms)



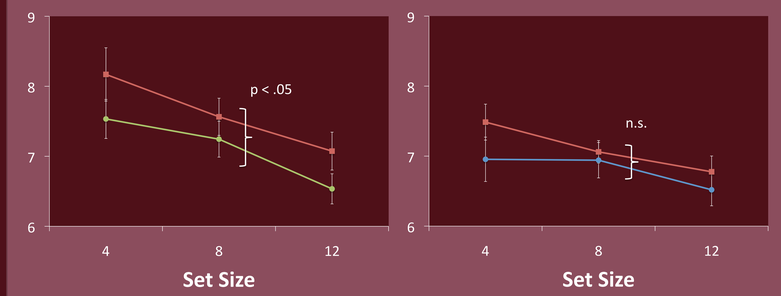
RESOLVING SEARCH TIME EFFECTS

Spatial Load | Non-spatial Load | No Load

Number of fixations to reach target



Average saccade amplitude (degrees of visual angle)



CONCLUSIONS

We demonstrate effects of memory load on three components of visual search response times:

- Latency to the first saccade – increased for both spatial and non-spatial memory loads
- Search time – increased selectively under non-spatial loads
- Time to respond following fixation of the target – increased for both load types

The increase in search time under non-spatial load appears to result from a constrained window of attention, as evidenced by smaller average saccade amplitudes and the consequent requirement of an additional fixation during search.

REFERENCES

Oh S-H, & Kim M-S. (2004). *Psychonomic Bulletin & Review, 11(2)*, 275-281.
Woodman GF, Vogel EK, & Luck SJ. (2001). *Psychological Science, 12(3)*, 219-224.
Woodman GF, & Luck SJ. (2004). *Psychonomic Bulletin & Review, 11(2)*, 269-274.