**Active working memory tasks interfere with inefficient search but NOT with efficient search, guided by bottom-up salience.**

Beatriz Gil-Gómez de Liaño\*, Trafton Drew\*\*, Daniel F. Rin\*, and Jeremy M. Wolfe\*\*\*

\*Universidad Autónoma de Madrid,

\*\*University of Utah,

\*\*\*Harvard Medical School-Brigham & Women’s Hospital

It is still unclear how working memory representations bias attentional selection in visual search and, specifically, how that bias affects top-down and/or bottom-up guidance in search. Researches on the influence of Working Memory (WM) load in visual search have found some discrepant data sometimes showing a WM modulation (e.g. Oh & Kim, 2004), but sometimes finding lack of effects of *passive* working memory loads on search (e.g. Woodman, Vogel & Luck, 2001). However, recent data have shown that *active* working memory tasks do modulate visual search performance (Gil-Gómez de Liaño, Drew, Quirós & Wolfe, 2014). Does the effect of active WM tasks occur both for efficient and inefficient searches? We compared WM effects on a relatively inefficient search for a specific object among heterogeneous distractor objects and efficient search for a salient object among homogeneous distractors. As in Gil-Gómez de Liaño et al. (2014), we used two active WM tasks: active-span tasks and updating n-back tasks. In the first active-span task, participants had to count how many times WM items were repeated through several visual search trials. In the second task, information in WM had to be updated during the search task. The results show that active WM tasks only interfered with inefficient search tasks, not with efficient search. Moreover, inefficient searches, but not efficient ones, were sensitive to the degree of WM load: high WM loads in the active-span and updating tasks, produced higher RT x set size slopes in search (control-no load: 21 msec/item, high load-active span: 36 msec/item, high load-updating: 34 msec/item). No load differences were found for slopes in efficient search (control-no load: 0.44 msec/item, high load-active span: 1.96 msec/item, high load-updating: 2.79 msec/item). The results suggest that active working memory loads specifically interfere with top-down guidance during visual search, but not under bottom-up guided search.

Main text: 300 words

References

Gil-Gómez de Liaño, B., Drew, T., Quirós, M. & Wolfe, J. M. (2014). Updating for free? Span and Updating tasks modulate Visual Search in a similar manner. *Journal of Vision, 14(10)*, 917.

Oh S-H, Kim M-S. (2004) The role of spatial working memory in visual search efficiency. *Psychonomic Bulletin Review 11(2)*, 275–281.

Woodman, G.F., Vogel, E.K., & Luck, S.J. (2001). Visual search remains efficient when visual working memory is full. *Psychological Science, 12*, 219-224.





