Atten Percept Psychophys (2014) 76:1871–1872
DOI 10.3758/s13414-014-0784-2

News from the field

Published online: 15 October 2014

VISUAL WORKING MEMORY

Musicians' Memories

Weiss AH, Biron T, Lieder I, Granot RY, Ahissar M (2014). Spatial vision is superior in musicians when memory plays a role. *Journal of Vision, 14*(9):18, 1–12 doi: 10.1167/14.9.18

Trained musicians tend to be better than other participants at a range of cognitive tasks, many of which don't seem to have much to do with music. What is it that makes them better? To address this question Weiss et al. (2014) tested musicians and nonmusicians (roughly matched for performance on the Wechsler Adult Intelligence Scale) in (1) syllable span, (2) auditory frequency discrimination, (3) simultaneous spatial frequency discrimination (the *Sim* task), and (4) sequential spatial frequency discrimination (the *Seq* task). In each of the spatial frequency discrimination tasks, a standard grating (0.2 cycles per degree) was presented on every trial (always first in the sequential task; always on the top half of the screen in the simultaneous task), and the task was to judge whether the other grating was higher or lower in spatial frequency than this standard.

Results: Not surprisingly, the musicians had lower auditory frequency discrimination thresholds. Also not surprisingly (given previous findings), the musicians had significantly longer syllable spans. The most interesting results came from the two spatial frequency discrimination tasks. The musicians were significantly better than the nonmusicians at *Seq* but not the *Sim* task. This finding in itself suggests that musicians may have better working memories than nonmusicians.

Several ancillary results also suggest this. (1) Both the *Seq* and syllable span tasks require memory. If memory were the factor limiting performance in both of these tasks, then we would expect performance in these two tasks to be correlated. This is precisely what was found for the nonmusicians, but *not* for the musicians. (2) Both the *Seq* and *Sim* tasks require comparison of different spatial frequencies. If the noise in the process used to make this comparison is the factor limiting performance in both of these tasks, then we would expect performance in these two tasks to be correlated. This is precisely what was found for the musicians, but *not* for the nonmusicians.

Conclusion: Musicians have better working memories than nonmusicians.—C.C.

VISUAL SEARCH

The role of object categories

Cunningham, C. A., & Wolfe, J. M. (2014). The Role of Object Categories in Hybrid Visual and Memory Search. *Journal of Experimental Psychology: General*, *143(4),* 1585–1599.

Everyone constantly looks for things throughout their daily lives. This visual search task has been extensively studied by vision scientists in the last several decades. In these studies, the observers usually search for only one target, or occasionally several, possible targets. Wolfe (2012) asked the observers to search for up to 100 possible targets and found that the response times increased linearly with the *log* of the number of possible targets (i.e., memory set). This finding is different from the classic finding that the response times increases linearly with the number of items in the visual display (i.e., display set).

Given the finding of Wolfe (2012), one naturally wonders whether this logarithmic search through large memory sets is the mechanism that allows us to look for targets that are defined by a conceptual category in which the members may be visually dissimilar from each other. For example, we are good at finding an animal in the environment, even though different animals could look very different from each other and cannot be defined by any single visual feature such as a color, a shape, or a type of texture.

Cunningham and Wolfe (2014) addressed this important question in a recent paper. Experiment 1 showed that the logarithmic rule did not apply to a well-trained category, but did apply to a target set that is temporarily learned as an arbitrary combination of members. Specifically, categorical search for a digit among letters was not like searching for targets from a 10-

item memory set. However, though searching for any of N arbitrary alphanumeric characters was like searching for targets from an N-item memory set of arbitrary objects. Thus, it does not appear that search for members of a known category is logarithmic like search through arbitrary objects.

Experiment 2 and 3 showed that visual search for multiple categories followed both of the rules describing search for multiple objects. Namely, the effect of display set size was linear, whereas the effect of memory set size was logarithmic. However, each category behaved like one item in the memory set, not like a set of memorized objects. A conceptual model was then developed to define the core components in categorical searches.

Cunningham and Wolfe (2014) marked an important breakthrough because it has opened the new area of visual search for categories, which better reflects the real-world visual search activities than search for precisely defined objects does. Hopefully, future studies will refine the conceptual model proposed by Cunningham and Wolfe (2014), and perhaps will also lead to other alternative models. Additionally, Cunningham and Wolfe (2014) have also pointed to other interesting questions that need to be addressed in the future. For example, what is the nature of the "memory" system that can store so many target templates? It clearly differs from the typical visual working memory because of its gigantic capacity. From Cunningham and Wolfe, we know searching through this memory system is a logarithmic function of set size. Future studies will be needed to explore this potentially important new mechanism.–L.Q.H.

Additional References

Wolfe, J.M. (2012). Saved by a log: How do humans perform hybrid visual and memory search? P*sychological Science, 23*(7), 698–703. doi: 10.1177/0956797612443968

CUEING

Dividing attention, easy; remembering how, hard

Close, A., Sapir, A., Burnett, K., & d'Avossa, G. (2014) Attention to multiple locations is limited by spatial working memory capacity. *Journal of Vision, 14*(9):17. doi: 10.1167/14.9.17

If you're trying to find a target in one of four positions, would you rather have a totally valid precue in two of those positions, or a half-valid precue in one? The totally valid cues are a better bet. Information theory says that a single precue has more information only when its validity surpasses 81 %.

Close et al compared the efficacy of two precues, indicating a target in one of two positions with 100 % validity, with that of one 81 %-valid precue. Both enhanced performance by a similar amount, compared to (non-informative) pre-cueing of all four positions.

Those enhancements imply that observers were able to differentially weigh stimulus information presented in the four positions. If they were able to successfully ignore two positions when precues indicated the alternatives, then their performance with a single, 81 %-valid cue suggests similarly ideal weighting in that condition too.

Validly pre-cueing three of six positions is just as informative of precueing two of four, but those cues had to remain visible throughout each trial for observers to fully exploit them. These results underscore the problem with inferring attentional limitations from cueing experiments. Short-term memory limitations may masquerade as inefficient allocations of attention.—J.A.S.