Multimodal benefit for low-level visual working memory

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Working memory can store information in multiple brain regions including primary sensory, parietal, and frontal cortices. Such an architecture could lead to a behavioural benefit when storing items from different sensory modalities (multimodal memory) over storing items from the same modality (unimodal memory). Here, we investigated whether such a multimodal benefit exists for low-level auditory and visual features. We used a delayed estimation task with two samples per trial and a retro cue after the delay. Crucially, this means participants had to keep two features in mind during the whole delay period. Sample stimuli consisted of either the orientation of a Gabor patch or the frequency of a pure tone and could be paired with stimuli either from the same or the other modality. In 40 healthy adults, we observed that memorizing a tone and an orientation led to a decrease in orientation error compared to keeping two orientations in mind. Further analysis indicates that this multimodal benefit might be due to decreased precision of the orientation recall in the unimodal condition. We did not find a difference in error when recalling pitch stimuli between the unimodal and bimodal condition. The decrease in precision in the visual unimodal task could be the result of a change in the allocation of neuronal resources for working memory storage. To avoid interference between multiple stimuli in sensory areas, individual items could be allocated to anterior brain regions representing these items in a less precise and more abstract format. In our task, memorizing two items from different modalities would then rely more on the respective sensory cortices resulting in increased precision.