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Strategic working memory performance may confound the interpretation of cumulative task statistics

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The mechanisms underlying the storage limitations of visual working memory are controversial. Some models assume that a discrete number of items can be stored (Zhang and Luck, 2008), while others posit that many representations with variable mnemonic precision can be retained (van den Berg et al, 2012). Typically, these models are fit to performance data from tasks that rely on summary statistics, such as the estimation of capacity on change-detection tasks or the estimation of precision from continuous report task error distributions. This approach ignores the influence of context-dependent strategies for task performance. Here, we investigate whether such strategies can improve task performance and confound the interpretation of performance statistics. On a whole report task, participants were presented with stimulus arrays containing up to 8 stimuli and reported the colour of all test items from a discrete array of equidistant colours. This approach allowed us to determine the accuracy of each selection on a trial-by-trial basis and to retain a measure of precision in colour space. Early results are mostly consistent with a recent continuous-response, whole-report study (Adam, Vogel, and Awh, 2017). We observed that response error distributions become increasingly diffuse with increased memory load, and found a downward trend in precision throughout successive responses. When a task manipulation was introduced at response onset to investigate output interference, some participants were unaffected, while others showed significant performance deficits. The possibility that different cognitive strategies were responsible for these differences prompted the use of generative modeling techniques to capture this behaviour. For example, late-trial responses (e.g. responses 5-8) were made with accuracy exceeding chance, and a model including strategic guessing produces very similar error distributions. This approach has the potential to reveal cognitive strategies employed during visual working memory tasks and to provide a novel description of high-load storage limitations.