Supplemental Material

Method

Estimating Precision and Capacity in the Color Wheel Task

We fit the data from the color wheel task to a mixture model, whereby we modeled degree error in responses using a mixture of von Mises (for circular stimulus space) and uniform distributions. The von Mises distribution captures items in working memory and the precision of those representations, whereas the uniform distribution captures items not in working memory and thus were random guesses. The standard deviation of the von Mises distribution is therefore inversely proportional to the precision of items within working memory, whereas the probability that an item was remembered (i.e., not in the uniform distribution) represents working memory capacity (there are a limited number of slots in working memory, so capacity can be quantified as the chance that an item was not remembered) (Zhang & Luck, 2008). This mixture model was fit by Bayesian parameter estimation with two free parameters: (1) SD, which is the width of the von Mises distribution (i.e., imprecision of items in working memory), and (2), probability of failure, which is the height of the uniform distribution (1 – probability of failure is probability of memory, which indicates capacity). These parameters were estimated using 5,000 trials after 500 burn-in trials; priors used for these parameters in estimation were group-level parameter values from a similar set size in a prior study (Zhang & Luck, 2008).

Readers familiar with tasks such as the OSPAN may notice that the color wheel used in this study has a set size of four—which is below most people's capacity on the OSPAN and other verbal working memory tasks—and may therefore wonder how the color wheel indexes working memory capacity. Visual working memory capacity is lower than verbal working memory capacity due to a variety of factors, such as word knowledge and rehearsal enhancing item encoding and maintenance, respectively, in verbal working memory. However, capacity estimates from visual working memory tasks are highly correlated with capacity estimates from verbal working memory tasks (Chow & Conway, 2015). In addition, numerous studies have found that capacity as assessed by the color wheel task (probability of memory (P_{mem}) × set size) is around 2.5 on average, with almost no participant showing a capacity greater than 4 (e.g., Chow & Conway, 2015; Luck & Vogel, 2013; Zhang & Luck, 2008; Zhang & Luck, 2011; though note that Chow & Conway multiplied P_{mem} by 100 in their manuscript). Although P_{mem} declines with set size, P_{mem} × set size provides a stable estimate of capacity for all set sizes of 3 and above (e.g., Chow & Conway, 2015; Zhang & Luck, 2008). Therefore, our set size of 4 items permits an accurate and stable estimation of visual working memory capacity, represented by $P_{mem} \times 4$. Because we only used one set size, we did not further multiply P_{mem} by set size and simply presented P_{mem} as our measure of capacity, as is typical.

Results

Covarying Social Desirability and Neuroticism

Although not in the *a priori* analytic strategy for this manuscript, social desirability and neuroticism data were collected as part of a larger study. We thus examined whether controlling for these variables altered associations between recent life stress, precision, and capacity. In these analyses, with or without controlling for the other covariates, recent life stress remained significantly associated with lower working memory capacity, both with and without excluding outliers ($-.24 < \beta s < -.19$, ps $< .004$). Similarly, recent life stress remained unassociated with working memory precision with or without excluding outliers ($-.12 < \beta s < -.00$, ps $> .053$).

Cumulative Lifetime Stress Exposure and Working Memory

It is possible that the association between recent life stress and working memory capacity was driven by worse working memory capacity contributing to the occurrence of more stressors. Although we cannot rule this possibility out, working memory capacity was unrelated to cumulative lifetime stress exposure, both before excluding outliers, $r(258) = -.05$, $p = .439$, and after excluding outliers, $r(255) = -.04$, $p = .510$, suggesting against this alternative explanation. In addition, in our prior study (Shields et al., 2017), we found that working memory capacity was unrelated to subsequent recent life stress exposure (i.e., over the following two weeks), further suggesting against this alternative explanation.

Supplemental Material References

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