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There is No Meta-Analytic Evidence of Blueberries Improving Cognitive Performance or Mood

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Travica et al. (2019) recently published a systematic review suggesting that blueberry consumption could be beneficial to cognitive performance and mood. From a meta-analytic perspective, the results of the research included in the review do not contain evidence in favor of these benefits.

To investigate this, we conducted a *p*-curve analysis (Simonsohn, Nelson, & Simmons, 2014) on the results reported by Travica et al. (2019) using the *p*-checker Shiny app (Schönbrodt, 2018). A *p*-curve analysis examines the frequency distribution of statistically significant ($p \leq .05$) *p* values. A strong positive skew (i.e., a far larger proportion of *p* values $< .025$ than $> .025$) on the *p*-curve suggests that there is evidential value in the included results. Conversely, for a uniform distribution (i.e., flatter than expected if the studies were powered at 33%) indicates that the results have no evidential value. Lastly, if the distribution is negatively skewed (i.e., a larger proportion of *p* values $> .025$ than $< .025$), this is indicative of no evidential value and intense *p*-hacking (where analyses are conducted repeatedly until a statistically significant result is observed; Simonsohn et al., 2014). *P*-curve uses *Z*-tests to test for each of these.

The *p*-curve analysis reported that the included studies do not contain evidential value ($Z = 0.782, p = .783$), and that the distribution of *p* values was flatter than would be expected if studies were powered at 33%, indicating no evidential value ($Z = -3.052, p = .001$). There was no evidence of negative skewness, suggesting no evidence of *p*-hacking ($Z = -0.782, p = .217$). To reproduce and observe a visual representation of these results, see <https://osf.io/b4z98/>.

Although these results reveal no evidential value in published research examining associations between blueberry consumption and cognitive performance and mood, it is important to note that the research does not suggest that there is no association (nor does it imply anything regarding the quality of the systematic review). However, if a true effect exists, the

magnitude of this effect is unclear (see also Brydges & Gaeta, 2019, for similar *p*-curve results on a different review examining associations between blueberry consumption and cognitive abilities). As Travica et al. (2019) concluded, “the use of standardized blueberry interventions, consideration of control formulations, and consistently reported cognitive performance tools, are recommended for future studies” (p. 10). It is also recommended that study pre-registration and sufficient statistical power (Munafò et al., 2017) be added to this list to ensure that high-quality, reproducible science is conducted. Based on the current research, however, researchers should avoid drawing any definitive conclusions regarding the effects of blueberries on cognitive performance or mood.

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