Stress regulation via self-administered mindfulness and biofeedback interventions in adults: A pre-registered meta-analysis

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BACKGROUND

Excessive stress can compromise people's everyday functioning and can be an important driver in developing depression and/or anxiety disorders. Thus, knowing how to regulate stress effectively is vital. However, research on stress regulation, like most research topics in psychology, is very likely affected by publication bias and issues of reproducibility. For that reason, we conducted a (pre-registered) meta-analysis to provide our best estimate of the effect size of two stress regulation strategies: Self-administered mindfulness meditation and Heart-Rate Variability biofeedback.

PRECISION IN ESTIMATING THE EFFICACY OF STRESS REGULATION

Past meta-analyses on self-administered mindfulness interventions and biofeedback have tried to estimate the level of publication bias in the literature. These meta-analyses have found that the given regulation strategies are moderately effective in reducing stress, depression, and anxiety. However, neither meta-analysis has dealt with publication bias adequately. For example, some meta-analyses on the topic used the trim-and-fill technique, which is known to have an excessive false-positive rate under most realistic conditions. To deal with publication bias we employed a combination of state-of-the-art publication bias correction methods, assuming a more realistic data-generating process behind the published effects of stress-regulation strategies. The combination of these techniques gave a precise estimate of the effect that could be expected in close replications of the studies included in this meta-analysis.

Total articles found: 1056

Included articles after duplicated removed: 592

Full text articles included: 24
Total effects included: 72

Total articles found: 262

Included articles after duplicated removed: 157

Full text articles included: 19
Total effects included: 42

Conversion of effect sizes, calculation of variances and p-values

Assessment of evidential value → *p*-curve analysis

Estimation of a naive meta-analysis effect and effect heterogeneity

Correction of publication bias with 4PSM and PET-PEESE

Inferential criteria: effect is present if **all** of the meta-analytic techniques detected one
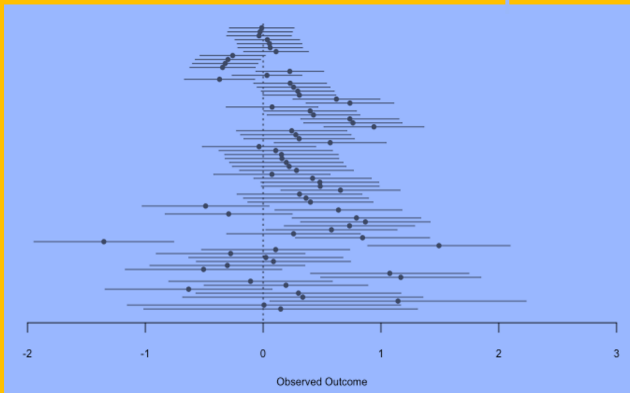
The naive meta-analytic estimated a significant effect for self-administered mindfulness (ES = 0.254, *p* < .001) and the *p-curve* as well suggested the presence of evidential value. However after applying publication bias correction techniques we could not infer the presence of evidential value with either the 4PSM (ES = 0.111, *p*=.756) and PET (ES= 0.124, *p*=.605)
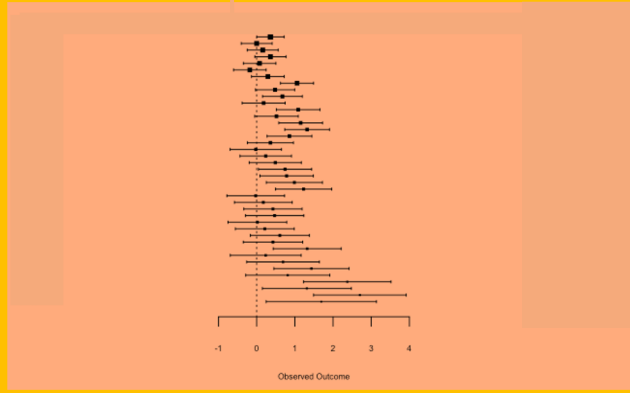
The naive meta-analytic estimated a significant effect for biofeedback (ES = 0.626, *p* < .001) and the *p-curve* as well suggested the presence of evidential value. After applying publication bias correction techniques we could still infer the presence of evidential value with the 4PSM (ES = 0.531, *p*=.003) but we had no evidential value with the PET (ES= 0.182, *p*=.338)

RESULTS

- According to our inferential criteria we did not find evidential value for both strategies.
- We found considerable publication bias in both literatures.
- We found substantial heterogeneity for both strategies.
- The majority of the studies on self-administered mindfulness and biofeedback were largely underpowered.

CONCLUSIONS

- We found no evidence for both self-administered mindfulness and biofeedback in terms of stress reduction.
- We found the majority of the studies to be underpowered to detect a small effect size.
- The literature on stress regulation suffers from publication bias and substantial heterogeneity in the effect sizes.
- Further studies in the form of registered reports are needed to clearly define whether these strategies have a proven efficacy in reducing stress levels or not.

PRE-REGISTRATION

Scan the QR code to have access to the complete pre-registration of the meta-analysis

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