Testing the Effect of the Youth Mindful Awareness Program on Negative Affect
NCT04718129
January 23, 2025

Data Analysis Plan

Average momentary negative affect (mNA). We created scalar invariant latent average mNA variables using the 7 EMA NA items (sad, tired, irritable, nervous, angry, afraid, and lonely) at pre- and post-intervention. Each item at each of the two time points represented the participant's average score on that item across all the EMA prompts at that time point. Unstandardized loadings were constrained to equal one for each item to create a latent, unweighted average variable and were so constrained across time; each item's intercept was constrained to be equal over time. Together, these constraints on the loadings and intercepts result in the latent average mNA variable being scalar invariant over time; that is, the latent variable has the same scale over time such that changes from pre to post can be interpreted quantitatively.

We included a priori correlated residuals for each item with itself from pre- to post-intervention. Standardized loadings were salient (≥ .30) for each of the 7 items at both pre (average loading = .53; range = .34 to .81) and post (average loading = .50; range = .30 to .79). Thus, the latent average mNA variable was well defined at both T1 and T2. We then saved factor score estimates for each participant for their latent average mNA at pre and post for the analyses of whether the intervention impacted average mNA. The factor score determinacy coefficients equaled .89 at both pre and post.[1] Testing for group differences on the average mNA factor score estimates at pre showed that the intervention and control condition did not differ significantly at T1 (t = .67, df = 108; 2-tailed p = .50; Cohen's d = .20).

Stressor-independent negative affect. The measure of stressor-independent mNA (mNA-SI) was derived from a similar scalar invariant latent variable model as for latent average mNA

[1] All factor score determinacy coefficients reported are for participants with complete data on the measure's indicators.

above with one exception. In the mNA-SI model, each item at each of the two time points represented the participant's average score on that item at that time point for only those prompts for which they reported that they had *not* experienced a stressor since the previous EMA prompt. Standardized loadings were salient (≥ .30) for six of the seven items at both pre (average loading = .38; range = .22 to .58) and post (average loading = .45; range = .26 to .77). Thus, the latent mNA-SI variable was well defined at both T1 and T2. We then saved factor score estimates for each participant for their latent mNA-SI at pre and at post for the analyses of whether the intervention impacted average mNA-SI. The factor score determinacy coefficients equaled .82 at pre and .86 at post. Testing for group differences on the latent mNA-SI factor score estimates at pre-intervention revealed that the intervention and control conditions did not differ significantly at T1 (t = -.06, df = 100; 2-tailed p = .96; Cohen's d = -.01).

Stressor-reactive negative affect. We used a two-step process to derive a measure of stressor-reactive negative affect (mNA-SR). The first step was to specify a similar scalar invariant latent variable model as for latent average mNA above with one exception. In this model, each item at each of the two time points represented the participant's average score on that item at that time point only for those prompts for which they reported that they *had* experienced a stressor since the last EMA prompt. Standardized loadings were salient (≥ .30) for all seven items at both pre (average loading = .51; range = .34 to .73) and post (average loading = .49; range = .32 to .71). Thus, the latent mNA in the presence of a stressor variable was well defined at both time points. We saved factor score estimates for each participant for their latent mNA in the presence of a stressor at pre and at post. The factor score determinacy coefficients equaled .87 at pre and .86 at post.

Momentary negative affect (mNA) in the presence of stressor(s) has been taken to reflect the individual's baseline levels of mNA, mNA-SI, and their change in mNA in reaction to stressors, mNA-SR (e.g., Bolger & Schilling, 1991; Shackman et al., 2016). Thus, the second step in deriving a mNA-SR measure at T1 and T2 was to partial the mNA-SI score from the latent mNA in the presence of a stressor at that time point. The residuals of these regressions represent the increase in NA in reaction to a stressor; we saved these scores to use as the mNA-SR measure. Testing for group differences in mNA-SR at pre showed that the intervention and control condition did not differ significantly at T1 ($t = -.11$, $df = 98$; 2-tailed $p = .91$; Cohen's $d = -.02$). Importantly, mNA-SR was less temporally stable from pre to post ($r = .73$) than the almost perfectly stable mNA-SI ($r = .96$), thus, indicating that there was more change in mNA-SR than mNA-SI over the course of the study. Indeed, mNA-SR was a little less temporally stable from pre to post than the estimate of the latent average mNA ($r=.78$) indicating somewhat more change in mNA-SR than mNA over the course of the study.

Effects of the mindfulness intervention on mNA, mNA-SI and mNA-SR. Although still debated, there are some contexts in which difference scores are preferable to analyses of regressed change to estimate change over two time points (e.g., Maxwell & Delaney, 2004; Rogosa, 1995; Willet, 1988; Zinbarg et al., 2010). There is consensus, however, that regressed change is preferable to difference scores in the context of a randomized design (e.g., Maxwell & Delaney, 2004; Zinbarg et al., 2010). Thus, in the current randomized design, we used regressed change to test the effect of the mindfulness intervention on mNA-SI, mNA-SR, and mNA. That is, for each of these variables, we performed a regression in which the individual's post score was the dependent variable, the individual's pre score was a covariate, and intervention condition was the main predictor of interest.

Principal Components Analyses of Changes in Symptom Measures. To minimize inflation of type I error rate that would have resulted from correlating the change in mNA-SR with the changes in each individual symptom scale and sub-scales, we performed principal components analyses (PCAs) of the change scores for all eight child symptom scales and sub-scales. Our PCAs used the scree test to determine the number of components to extract and an oblique (oblimin) rotation. The scree test on the eigenvalues suggested extracting two components (the eight eigenvalues equaled 4.16, 1.38, .65, .57, .43, .29, .29, and .24). After Oblimin rotation, the factor pattern matrix (see Supplement Table 1) clearly indicated that PC1 was loaded on by the five SCARED subscales, whereas PC2 was loaded on by the remaining measures (GAD7, PHQ, and NA15). The two components were moderately correlated (r=.45). This moderate correlation is consistent with a second-order PC that we called Internalizing Change. Using the common identifying constraint of equal first-order factor loadings, each of the two first-order PCs loaded on this second-order factor .67. Given that the first-order PCs likely reflected method variance and the second-order PC was strong, our analyses of associations of symptom change with change in mNA-SR utilized factor score estimates reflecting the second-order PC (Internalizing Change). The factor score determinacy coefficient for the second-order PC factor score estimates equaled .88.