Novel Biobehavioral Methods for Assessing the Anxiety-Related Attention Bias

by

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Anxiety disorders will affect an estimated one in three Americans, significantly impacting emotional health and quality of life. High personal and economic costs make research on the etiology, maintenance, and treatment of anxiety a crucial public health goal. Selective and exaggerated attention towards threat, termed attention bias (AB), has been identified as a core behavioral and neurocognitive mechanism in anxiety. A novel treatment, attention bias modification training (ABMT), targets AB and aims to ameliorate anxiety. Rarely acknowledged, however, are the challenges in the conceptualization and measurement of AB. First, associations between anxiety and AB in anxious populations have been increasingly inconsistent. Second, traditional measurement relies on mean reaction times providing a static snapshot of attention. This ignores temporal variability in AB that may more accurately represent the dynamic nature of AB in anxiety and be a more informative measure of treatment-relevant individual differences. The goal of this study was to use innovative methods to identify pre-training individual differences that predict ABMT response. To do so, the current dissertation used temporally-sensitive behavioral (trial-level reaction times) and neurocognitive (event-related potentials; ERPs) metrics to measure AB in a clinically-anxious sample ($N = 93$) within the context of a larger ABMT randomized clinical trial (RCT). AB was assessed while EEG was simultaneously recorded in addition to anxiety and stress reactivity before and after one month of either ABMT or placebo training (PT). Furthermore, we measured training performance to track gains or losses during ABMT or PT. We hypothesized that ABMT would reduce AB and anxiety-related outcomes relative to PT and that pre-training individual differences in

temporally-sensitive metrics would predict ABMT outcomes above and beyond traditional AB. Overall, we found that contrary to predictions, ABMT and PT both led to improvements in training performance and stress reactivity. Consistent with predictions, individual differences in ERPs and TL-BS measured prior to training moderated the relationship between ABMT and clinical outcomes. Mean AB scores did not. Greater AB variability resulted in ABMT performance gains whereas an increase in AB resulted in higher anxiety following ABMT. In addition, larger pre-training P1 amplitudes (an ERP reflecting visual attention to threat) resulted in higher anxiety post-ABMT and an increase in N2 amplitudes (an ERP indexing cognitive control) was associated with lower post-ABMT anxiety but higher stress reactivity. Thus, results show that novel AB metrics revealed pre-training differences that were associated with better ABMT training performance and reduced anxiety. Current findings have the potential to advance the development of conceptually-sound behavioral and neurocognitive measures of AB. Such results can aid in the improvement of ABMT efficacy by identifying individual differences that predict for whom attention modification may be most beneficial. Implications for expanding measurement of AB and personalization of ABMT are discussed.

Keywords: Anxiety, AB, ABMT, ERPs, temporal dynamics, individual differences