The Attention Bias Modification Approach to Anxiety: Origins, Limitations, and Opportunities

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A central tenet shared by many cognitive models of psychopathology is that biases in basic information processing mechanisms causally contribute to clinical symptomatology. The nature of the proposed information processing biases varies across models and clinical conditions, and may involve selective patterns of memory, interpretation, expectancy, or attention. Consistent with influential cognitive accounts of anxiety dysfunction, there is now compelling evidence that anxiety disorders are characterized by an attentional bias that operates to selectively favor the processing of threatening information (1). In the most common assessment task used to demonstrate this anxiety-linked attentional bias, participants are required to identify small probe stimuli that appear on-screen while they are presented with emotional threatening and benign information in various screen locations. People with anxiety disorders typically demonstrate relative speeding to identify probes presented in the locus of the threatening information, indicating that they selectively attend toward this information. This anxiety-linked attentional bias is most evident for threatening information that matches the hallmark concern of the anxiety disorder, being observed for trauma-related threat information in posttraumatic stress disorder, for feared stimuli in specific phobias, and for a broader range of threat information in generalized anxiety disorder. In social anxiety disorder, such assessment tasks have repeatedly demonstrated an attentional bias that operates to favor the processing of socially threatening information, such as photographic images of angry faces (2).

While such findings are consistent with the hypothesis that attentional bias to threat causally contributes to dysfunctional anxiety, no such causal inference can be drawn from the observation that anxiety disorders are characterized by attentional bias to threat. Attentional bias modification (ABM) procedures were initially developed with the aim of testing this causal hypothesis, by experimentally inducing differential attentional bias and testing whether this manipulation affected anxiety symptomatology. For this purpose, a training contingency was introduced into the probe-based assessment task, such that probes predominantly appeared in the locus of the information that it was hoped participants would consequently come to attend toward. Early work confirmed that attentional bias could be modified in this way, and also verified the causal hypothesis by demonstrating that such attentional bias modification had an impact on the severity of anxiety symptoms (3). This led to the development of candidate anxiety interventions that therapeutically harnessed this early ABM approach. Supportive early findings consolidated the field (4, 5), but were followed by considerable inconsistency, as studies varied in the degree to which procedures intended to modify attentional bias successfully did so and, perhaps in consequence, also varied in the degree to which dysfunctional anxiety was attenuated (6, 7).

Many ABM studies to date have been compromised by limitations that are overcome by the illuminating study reported by Arad et al. in this issue of the *Journal* (8). For one thing, the great majority of prior studies have delivered variants of the above-described probe-based ABM approach. In recent years, the psychometric adequacy of this approach has come into question (9), suggesting the possibility that variability in findings could, in part, reflect poor psychometric reliability of the tasks employed. A second limitation is that the methods used to train change in attentional bias have been relatively unsophisticated, based on the hope that simply introducing a contingency such as positioning probes distally from threat information would suffice to attenuate attentional bias to threat. Third, prior studies seeking to determine whether ABM can deliver therapeutic benefits to people with social anxiety disorder have seldom employed designs that permit comparison with established treatments. Fourth, such studies have seldom included formal evaluation of clinical acceptability. The work of Arad et al. reported here is to be commended for overcoming each of these prior limitations.

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In their nicely designed, preregistered ABM study, Arad et al. employ a training variant of a new attentional bias assessment approach, which their previous research has convincingly shown to have far higher internal reliability than is the case for the probe approach (10). In this previous work, the researchers monitored eye gaze as participants freely viewed 60 different matrices, each comprising eight neutral faces and eight threatening faces displaying negative emotion. Relative to healthy control subjects, participants with a clinical diagnosis of social anxiety disorder were found to demonstrate

significantly longer gaze dwell times on the threatening faces, confirming operation of an attentional bias favoring threat. Importantly, the internal reliability of this new eye gaze assessment measure of attentional bias was found to be high, consistently exceeding 0.8. The psychometric reliability of this approach was confirmed by the present study, in which Cronbach's alpha was again reassuringly high (ranging from 0.81 to 0.93). A second major strength is that the training approach used by Arad et al. to modify attentional bias in their ABM study draws constructively on the established principles of operant conditioning (11). Specifically, whenever participants attended to the angry faces, this elicited the aversive consequence of disrupting the music they had chosen to listen to, whereas attending away from these threat stimuli and toward the benign faces elicited the rewarding consequence of music continuity. The resulting change in attention, as revealed by eye gaze dwell time, is very striking indeed. Incorporation of operant conditioning into the ABM approach across future studies seems likely to enhance the capacity to drive attentional bias change, potentially eliminating prior inconsistency in the degree to which intended ABM procedures successfully elicit the intended change in attention. A third major strength of Arad and colleagues' study is that the therapeutic impact of ABM was directly compared to that of treatment with a selective serotonin reuptake inhibitor (SSRI), in addition to a waiting list control condition. This design feature greatly increases clinical value, by enabling the authors to go beyond the claim that the ABM procedure had therapeutic impact, to also conclude that its clinical value was comparable to that of a well-established first-line treatment for social anxiety disorder. This is an extremely important finding, warranting the inference that ABM has completed its transition from an experimental procedure to an established treatment for social anxiety. The fourth strength of the study is that it carefully evaluated clinical acceptability of the ABM approach and, again, the findings provide reassurance in this regard. Not only did recipients give equivalent ratings for the credibility of both treatments, and express equivalent satisfaction with each, but attrition rates were substantially lower among those who received ABM than for those who received the SSRI intervention, further supporting acceptability of the ABM treatment.

Of course, the study is not without its limitations, and one hopes that future research will address some of the remaining issues that could usefully be considered. One limitation is that Arad and colleagues' report provides outcome data only at midtreatment and immediate posttreatment assessment points, so the maintenance of the reported treatment gains cannot yet be determined. I anticipate that this will be reported in a future publication, and follow-up data will show whether a single 12-week ABM intervention is sufficient to yield enduring clinical gains, or whether there may be value in delivering top-up ABM sessions to sustain these gains. Given rapid advances in eye movement assessment technology, which is increasingly being integrated into regular laptop computers, it may soon be possible for such top-up sessions to be completed at home, if it is determined that they could be beneficial. A second limitation of the study is that while the sample size permits appropriate power to assess and contrast the efficacy of the treatment conditions, it is not large enough to adequately test the hypothesis that the attentional change produced by the ABM procedure mediated symptom improvement (12). Larger samples in future replications and extensions could enable this. A third question of potential clinical importance that remains unanswered by the present study is whether or not the two treatments may potentially have additive therapeutic value. As the authors convincingly argue, it can reasonably be assumed that the mechanisms through which SSRIs and ABM deliver their therapeutic benefits are independent. Consequently, it is plausible that the combination of the SSRI and ABM interventions may potentially yield better clinical outcomes than either intervention alone. Empirically evaluating this possibility, with the aim of maximizing treatment efficacy, now becomes a worthwhile objective.

As the above comments indicate, the timely and valuable study reported here by Arad et al. represents a very significant step forward. The authors cleverly remediate some of the main limitations associated with prior ABM research, clearly validate a powerful new method of manipulating attentional bias, and convincingly demonstrate the clinical utility of this ABM approach in the treatment of social anxiety disorder. In addition to providing firm justification for the future clinical use of this ABM intervention in the treatment of social anxiety disorder, I anticipate that Arad and colleagues' work will stimulate interest in adapting this new ABM procedure to target the types of information implicated in the types of attentional biases that characterize different clinical conditions, including not only other anxiety disorders but also depression (13), eating disorders (14), and addictions (15). Thus, the commendable contributions of Arad and colleagues have brought the ABM field to an important juncture, and I very much look forward to looking back on this juncture from the perspective of the future advances enabled by their work, which I am quite certain will follow in its wake.

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REFERENCES

1. Cisler JM, Koster EHW: Mechanisms of attentional biases towards threat in anxiety disorders: an integrative review. Clin Psychol Rev 2010; 30:203–216
2. Pergamin-Hight L, Reut N, Bakermans-Kranenburg MJ, et al: Content specificity of attentional bias to threat in anxiety disorders: a meta-analysis. Clin Psychol Rev 2015; 35:10–18
3. MacLeod C, Rutherford E, Campbell L, et al: Selective attention and emotional vulnerability: assessing the causal basis of their

association through the experimental manipulation of attentional bias. J Abnormal Psychol 2002; 111:107–123
4. Bar-Haim Y: Research review: attention bias modification (ABM): a novel treatment for anxiety disorders. J Child Psychol Psychiatry 2010; 51:859–870
5. MacLeod C, Mathews A: Cognitive bias modification approaches to anxiety. Annu Rev Clin Psychol 2012; 8:189–217
6. Mogoaşe C, David D, Koster EHW: Clinical efficacy of attentional bias modification procedures: an updated meta-analysis. J Clin Psychol 2014; 70:1133–1157
7. Grafton B, MacLeod C, Rudaizky D, et al: Confusing procedures with process when appraising the impact of cognitive bias modification on emotional vulnerability. Br J Psychiatry 2017; 211:266–271
8. Arad G, Azriel O, Pine DS, et al: Attention bias modification treatment versus a selective serotonin reuptake inhibitor or waiting list control for social anxiety disorder: a randomized clinical trial. Am J Psychiatry 2023; 180:357–366
9. McNally RJ: Attentional bias for threat: crisis or opportunity? Clin Psychol Rev 2019; 69:4–13
10. Lazarov A, Basel D, Dolan S, et al: Increased attention allocation to socially threatening faces in social anxiety disorder: a replication study. J Affect Disord 2021; 290:169–177
11. Staddon JER, Cerutti DT: Operant conditioning. Annu Rev Psychol 2003; 54:115–144
12. Fritz MS, MacKinnon DP: Required sample size to detect the mediated effect. Psychol Sci 2007; 18:233–239
13. Suslow T, Hußlack A, Kersting A, et al: Attentional biases to emotional information in clinical depression: a systematic and meta-analytic review of eye tracking findings. J Affect Disord 2020; 274:632–642
14. Stott N, Fox JRE, Williams MO: Attentional bias in eating disorders: a meta-review. Int J Eat Disord 2021; 54:1377–1399
15. Cox WM, Fadardi JS, Intriligator JM, et al: Attentional bias modification for addictive behaviors: clinical implications. CNS Spectr 2014; 19:215–224