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Untangling attention bias modification from emotion: A double-blind randomized experiment with individuals with social anxiety disorder



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ABSTRACT

Background: Uncertainty abounds regarding the putative mechanisms of attention bias modification (ABM). Although early studies showed that ABM reduced anxiety proneness more than control procedures lacking a contingency between cues and probes, recent work suggests that the latter performed just as well as the former did. In this experiment, we investigated a non-emotional mechanism that may play a role in ABM.

Methods: We randomly assigned 62 individuals with a DSM-IV diagnosis of social anxiety disorder to a single-session of a non-emotional contingency training, non-emotional no-contingency training, or control condition controlling for potential practice effects. Working memory capacity and anxiety reactivity to a speech challenge were assessed before and after training.

Results: Consistent with the hypothesis of a practice effect, the three groups likewise reported indistinguishably significant improvement in self-report and behavioral measures of speech anxiety as well as in working memory. Repeating the speech task twice may have had anxiolytic benefits.

Limitations: The temporal separation between baseline and post-training assessment as well as the scope of the training sessions could be extended.

Conclusions: The current findings are at odds with the hypothesis that the presence of visuospatial contingency between non-emotional cues and probes produces anxiolytic benefits. They also show the importance of including a credible additional condition controlling for practice effects.

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1. Introduction

Recently, a growing body of research has accumulated on a new treatment for reducing social anxiety disorder (SAD), called attention bias modification (ABM). ABM builds upon cognitive theories of psychopathology that implicate attentional bias (AB) for social-threat cues, such as faces expressions anger or disgust, in the maintenance, and perhaps the etiology, of SAD (Morrison & Heimberg, 2013). The clinical purpose of ABM is to reduce excessive AB, thereby diminishing anxiety symptoms (MacLeod & Mathews, 2012).

The most common ABM procedure is a modification of the visual dot-probe task (MacLeod, Rutherford, Campbell, Ebsworthy, &

Holker, 2002) based on the classic work of MacLeod, Mathews, and Tata (1986). In the original version of the task (MacLeod et al., 1986), participants viewed two stimuli (e.g., a threatening word/photograph and a neutral word/photograph) presented in two distinct locations (left/right or up/down) on a computer screen for a brief duration (usually 500 ms). Immediately thereafter, a probe appeared in the location previously occupied by one of the two stimuli. In different versions, participants had to indicate the location of the probe (right/left or up/down) or to indicate the identity of the probe (e.g., “E” or “F”) as quickly as possible. An AB was demonstrated when participants responded faster to the probe when it replaced a threatening stimulus than when it replaced a nonthreatening stimulus, indicating that their attention was directed to the location occupied by the threatening stimulus.

In ABM, researchers typically modify the original task so that the probe nearly always (e.g., 95% of the trials) replaces the neutral or positive stimulus, thereby redirecting subjects' attention to non-threatening cues. In the control condition, there is no contingency between cues and probes. Relative to the control condition,

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ABM reduces symptoms in people with SAD, as several studies have shown (e.g., Amir et al., 2009; Heeren, Reese, McNally, & Philippot, 2012; Li, Tan, Qian, & Liu, 2008; Schmidt, Richey, Buckner, & Timpano, 2009). These findings have suggested that ABM could have important clinical potential for treating SAD, as it entails a very simple protocol, little effort and motivation from the patient, little contact with a mental health professional, and can be easily disseminated.

However, despite these promising initial results, recent evidence suggests that the picture may be more complicated than initially thought as several studies with inconsistent findings have been published. More specifically, some studies have shown that ABM and the no-contingency condition did not significantly differ at post-training, neither for AB nor for anxiety symptoms (e.g., Julian, Beard, Schmidt, Powers, & Smits, 2012; McNally, Enock, Tsai, & Tousian, 2013). On measures of anxiety, socially anxious participants in the control group exhibited statistically significant improvement indistinguishable from that of participants in the ABM group. Several explanations have been formulated.

According to Klumpp and Amir (2010), such a training procedure, regardless of the direction of the contingency between emotional probes and cues, may bolster top-down executive control in ways that strengthen one's ability to reduce anxiety proneness. In an experiment providing data congruent with this hypothesis, they randomly allocated moderately socially anxious individuals to one of three different conditions: (1) training to attend to non-threat (i.e., ABM), (2) attend to threat, or (3) a control condition in which there was no contingency between cues and probes. After a single-session, individuals who were trained to attend to threat as well as those receiving ABM reported less state anxiety in response to an impromptu speech compared to individuals in the no-contingency control condition.

An alternative account is that attention training is effective to bolster top-down control in ways that reduce anxiety regardless of the presence of a contingency. Accordingly, McNally et al. (2013) reported an experiment in which they randomly assigned speech-anxious individuals to one of the three training conditions mentioned above while also including self-report and behavioral measures of executive attention control before and after the training. After four sessions of training, participants, irrespective of group assignment, exhibited significant decreases in self-report, behavioral, and physiological measures of anxiety associated with a speaking task. More importantly, all three training conditions improved attentional control. Heeren, Mogoșe, McNally, Schmitz, and Philippot (2015) corroborated these findings.

Finally, several authors have suggested a third explanation (e.g., Cristea, Kok, & Cuijpers, 2015; Emmelkamp, 2012). Because ABM and the no-contingency condition performed indistinguishably well, one cannot rule out the possibility of mere practice/test-retest effects. Indeed, all three groups in the McNally et al. (2013) experiment improved on multiple measures of anxiety, and this finding is consistent with a practice effect or a placebo effect. Merely undergoing the speech task twice may have reduced anxiety in all three groups. Alternatively, positive expectancy or placebo effects may be engendered by any sort of computerized training that participants believe may help them. A positive expectancy fostered by such training may encourage socially anxious subjects to engage in previously-avoided social activities, emboldened by the belief that training has equipped them to enter social situations with ease and confidence. Consequently, repeated exposure to previously-avoided situations would likely diminish their distress and correct any problematic beliefs that can sustain social anxiety. Consistent with this possibility, Enock, Hofmann, and McNally (2014) found that highly socially anxious subjects who were randomized to either ABM or no-contingency conditions exhibited

indistinguishably larger reductions in self-reported anxiety symptoms than did individuals in a wait-list control group. Subjects who merely completed online questionnaires without any sort of training at all did not improve.

As a consequence, these puzzling findings raise questions about the mechanisms of ABM's effectiveness. Moreover, the understandable focus on AB for emotional stimuli has led to neglect of other non-emotional mechanisms that may drive ABM (Heeren, De Raedt, Koster, & Philippot, 2013). However, regardless of their emotional valence, repeated exposure to pairs of faces, such as those in most ABM studies for SAD, may act as a traditional exposure therapy as may the speech challenge tests that some investigators have used.

Hence, the main aim of the present study was to examine the impact of both contingency-based and no-contingency-based ABM paradigms that do not involve any emotional material, but rather involve geometric shapes devoid of emotional significance on top-down executive control of attention and on anxiety. In the present double-blind experiment, we randomly assigned 62 individuals with a DSM-IV diagnosis of SAD to one of three conditions: 1) a non-emotional attention training with a contingency between cues and probes (hereafter called the "Contingency Condition"), 2) a non-emotional attention training without such a contingency (No-contingency condition), and 3) a Control condition (a mere discrimination task to control for test-retest effects). Rather than using a wait-list control group, we used this third condition to maintain optimal blinding of both the assessors and the participants.

We had several predictions. First, if attention training is effective because of increased attentional control arising from any contingency-based procedure regardless of the direction of attention, then participants in the contingency condition should exhibit greater improvement than participants in the two other conditions on measures of top-down control as well as measures of anxiety. By contrast, if attention training is effective regardless of the presence of a contingency, the non-emotional training with a contingency and the non-emotional training without a contingency should exhibit greater improvement than should the control condition. Finally, if improvements in both top-down control and anxiety result from a practice/test-retest effect, all groups should exhibit improvement.

2. Method

2.1. Participants

We recruited 62 individuals with a primary DSM-IV diagnosis of Generalized SAD (American Psychiatric Association, 1994) from the Université Catholique de Louvain community. To guard against placebo (expectancy) effects, we did not inform participants of any potential anxiolytic benefits of the training procedures. A total of 603 volunteers responded to our invitation to participate in a study investigating the mechanisms underlying social interaction among shy people. As depicted in Fig. 1, 77 individuals met the initial eligibility criteria as assessed via a screening questionnaire. These criteria were (a) scoring above 56 on the self-report version of the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987), (b) having no current substance abuse or dependence, (b) having no current heart, respiratory, neurological problems, or use of psychotropic medications, (c) having no current psychological or psychiatric treatment, and (d) having normal or corrected-to-normal vision. Subsequently, these 77 individuals completed a structured interview to assess diagnostic eligibility. To confirm the diagnosis of Social Anxiety Disorder, we administered the social phobia section of the Mini International Neuropsychiatric Interview (MINI;

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