Attention bias modification for reducing speech anxiety

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ABSTRACT

The mechanisms mediating the anxiolytic effects of attention bias modification (ABM) remain unclear. Accordingly, we randomly assigned speech-anxious subjects to receive four sessions of one of three training conditions: ABM, inverse ABM, and control. In the ABM condition, subjects viewed pairs of photographs of models displaying facial expressions of disgust and joy on a computer screen. Probes always replaced the positive face, and subjects pushed a button to indicate the identity of the probe (E or F) as rapidly as possible. In the inverse condition, the probes always replaced the negative face, and in the control condition, the probes replaced each face type equally often. After four training sessions, all groups exhibited statistically indistinguishable, but significant, reductions on self-report, behavioral, and physiological measures of speech anxiety. Self-report and behavioral measures of attentional control improved likewise. Contrary to early studies, ABM was not superior to control procedures in producing reductions on measures of social anxiety.

Socially anxious people often selectively attend to potentially threatening interpersonal cues (Rapee & Heimberg, 1997). Consider a socially anxious man who drums up the courage to attend a party. Hypervigilant for signs of rejection, he notices guests whose demeanor towards him seemingly signifies contemptuous derision, boredom, or both. Having difficulty disengaging attention from these cues, he ruminates about impending social rejection, and his worsening anxiety culminates in his flight from the party.

Such an attentional bias for threat may incite a negative, self-referential, downward spiral that worsens a person's anxiety proneness. Accordingly, it may figure in the maintenance and perhaps the etiology of anxiety disorders, as emotional Stroop and dot-probe paradigms illustrate (Bar-Heim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007). In one version of the original dot-probe paradigm (MacLeod, Mathews, & Tata, 1986), subjects view pairs of photographs of a person displaying a neutral and a threatening facial expression on a computer screen. One picture appears above center screen, whereas the other appears below it. The stimulus pair remains on the screen for 500 ms, and immediately thereafter, a probe appears where one of the faces had been. In this probe discrimination version, the subject presses a button to indicate the identity of the probe (e.g., E or F). An attentional bias for threat occurs when subjects are faster to

identify probes that replace the threatening face than probes that replace the nonthreatening face.

If an attentional bias for threat is a causal risk factor for anxiety proneness, then modifying the dot-probe paradigm so that probes consistently follow nonthreatening stimuli should attenuate this bias and reduce anxiety proneness (MacLeod, 1995). Consistent with this hypothesis, a study on undergraduate students showed that training subjects to attend to threatening stimuli increased anxiety proneness, whereas training them to attend to nonthreatening stimuli reduced it (MacLeod, Rutherford, Campbell, Ebsworthy, & Holker, 2002).

Extending this work further, clinical researchers have found that such attention bias modification (ABM) programs reduced anxiety symptoms in subjects with social anxiety disorder (Amir et al., 2009; Heeren, Reese, McNally, & Philippot, 2012; Schmidt, Richey, Buckner, & Timpano, 2009). Indeed, Amir et al. (2009) found that 50% of subjects lost the diagnosis after eight sessions of ABM spread over four weeks of training.

Promising results notwithstanding, questions remain about the mechanisms mediating the effects of these programs. For example, repeated exposure to threatening, but nondangerous, stimuli is the core of established behavioral treatments for anxiety disorders, whereas avoidance of these stimuli should impede anxiety reduction (Foa & Kozak, 1986). Accordingly, ABM programs seemingly violate the time-honored exposure principle embodied in our best behavioral therapies. In fact, one study revealed that training subjects to attend to faces expressing disgust was just as effective as training them to attend to emotionally neutral faces (i.e., standard

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ABM); both methods reduced public speaking anxiety (Klumpp & Amir, 2010). These puzzling results raise further questions about the mechanism mediating ABM. Does any kind of training requiring contingency learning bolster executive control over attention, thereby enabling subjects to improve control over their anxiety?

In the experiment reported here, we randomly assigned subjects with public speaking anxiety to one of three groups. All groups viewed pairs of faces, one positive and one negative. The positive face displayed joy, whereas the negative face displayed disgust. In the *ABM* group, probes (E or F) always appeared in the location vacated by the positive face. In the *inverse ABM* group, probes always appeared in the location vacated by the negative face. In the *control* group, probes followed positive and negative faces equally often.

We administered four training sessions sandwiched between pretraining and posttraining assessment sessions that included a speech task yielding self-report, behavioral, and physiological measures of anxiety. At both assessments, subjects completed self-report measures of anxiety, depression, and stress, plus self-report and behavioral measures of attentional control.

Greater reduction on measures of anxiety in the ABM group versus the other groups would be consistent with the hypothesis motivating the development of ABM, namely, that it reduces anxiety proneness via reducing an attentional bias for threat. If the inverse group exhibits greater improvement than the other groups, then this would suggest that training subjects to attend to threat, rather than avoid it, is most beneficial. If both the ABM and inverse groups exhibit more improvement than the control group does, this would suggest that any contingency learning fosters executive control over attention, producing adventitious benefits on anxiety reduction. If all three groups exhibit indistinguishable improvement in anxiety symptoms, then this would suggest an anxiolytic feature common to all three training regimes. Perhaps any attentional task, even one without a contingency between cue type and target, may bolster subjects' ability to control their attention in contexts likely to provoke anxiety. Alternatively, some kind of placebo or positive expectancy effect might be at work.

Method

Design

We used a 3 (Group; ABM, inverse, control) × 2 (Assessment; pretraining, posttraining) mixed design. Using an algorithm designed by the second author, we randomly assigned subjects to the ABM, inverse, and control groups. Research assistants (RAs) testing subjects knew what protocol to run (A, B, or C), but only the second author was aware of what protocol corresponded to ABM, inverse, and control training procedures. Hence, the experiment was double blind. Harvard University's Committee on the Use of Human Subjects approved the consent form and the study protocol.

Subjects visited our laboratory six times within four weeks, schedules permitting. The first and sixth visits were for the pretraining and posttraining assessments, respectively. The second, third, fourth, and fifth visits were for training. The assessment visits lasted approximately 60 min, whereas the training visits lasted no longer than 30 min with training per se usually taking between 13 and 15 min. Subjects received $20 per assessment visit and $10 per training visit as honoraria for participating in the study.

Subjects

We recruited speech-anxious subjects through the Harvard University Study Pool, via notices posted in public places in the Boston area, through online postings in the Jobs and Volunteers

sections of Craigslist.com, and through online postings in the Quickie Jobs section of Boston University's Student Employment Office website. An RA telephoned potential subjects who had expressed an interest in the study, and conducted a phone screen involving the brief version of Paul's (1966) Personal Report of Confidence as a Speaker (PRCS), validated by Hook, Smith, and Valentiner (2008). This version of the PRCS comprises 12 true/false questions concerning fear of public speaking. The RA invited individuals who scored at least an eight to enroll in the study.

The ABM group consisted of 20 subjects (14 male) whose mean age was 38.2 years (SD = 14.3). Their ethnicities were Caucasian ($n = 12$), African-American/Black ($n = 4$), and other ($n = 4$). The pretraining scores on the self-report version of the Liebowitz Social Anxiety Scale (LSAS; Liebowitz, 1987) indicated that 19 subjects (95%) met or surpassed the optimal cutoff score (30) for identifying patients with social anxiety disorder, whereas the pretraining LSAS scores of 13 subjects (65%) met or surpassed the optimal cutoff score (60) for identifying patients with the generalized subtype of social anxiety disorder (Rytwinski et al., 2009).

The inverse group consisted of 19 subjects (10 male) whose mean age was 34.7 years (SD = 12.8). Their ethnicities were Caucasian ($n = 10$), African-American/Black ($n = 7$), and other ($n = 2$). The pretraining LSAS self-report scores of 19 subjects (100%) met or surpassed the optimal cutoff score for identifying patients with social anxiety disorder, whereas the pretraining LSAS scores of 12 subjects (63%) met or surpassed the optimal cutoff score for identifying patients with the generalized subtype of social anxiety disorder.

The control group consisted of 18 subjects (10 male) whose mean age was 40.0 years (SD = 12.6). Their ethnicities were Caucasian ($n = 11$), African-American/Black ($n = 4$), and other ($n = 3$). The pretraining LSAS self-report scores of 18 subjects (100%) met or surpassed the optimal cutoff score for identifying patients with social anxiety disorder, whereas the pretraining LSAS scores of 13 subjects (72%) met or surpassed the optimal cutoff score for identifying patients with the generalized subtype of social anxiety disorder.

Procedure

Pre and posttraining assessment sessions

The first and sixth visits to the laboratory constituted pretraining and posttraining assessment sessions, respectively. The protocol for both sessions was as follows.

Questionnaires

Upon arrival for the pretraining assessment session, subjects read and signed the consent form. They then completed questionnaires on a desktop computer. Subjects completed the short form of the PRCS again; all scored at least eight, confirming their level of speech anxiety as assessed during the phone screen. Subjects completed the LSAS, the 21-item version (Henry & Crawford, 2005) of the Depression Anxiety Stress Scale (DASS; Lovibond & Lovibond, 1995), and the Attention Control Scale (ACS; Derryberry & Reed, 2002).

Attention network task

Sitting 65 cm from the screen of a desktop computer, subjects next completed the Attention Network Task (ANT; Fan, McCandliss, Sommer, Raz, & Posner, 2002). The ANT yields three reaction time-based measures, each tapping a different aspect of attention: *alerting, orienting,* and *executive control.* The first denotes achieving and sustaining a state of alert readiness. The second denotes the selection of information from sensory input. The third denotes overriding attentional conflict, and is the one most relevant to our study.