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Evaluating changes in judgmental biases as mechanisms of cognitive-behavioral therapy for social anxiety disorder

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ABSTRACT

Reductions in judgmental biases concerning the cost and probability of negative social events are presumed to be mechanisms of treatment for SAD. Methodological limitations of extant studies, however, leave open the possibility that, instead of causing symptom relief, reductions in judgmental biases are correlates or consequences of it. The present study evaluated changes in judgmental biases as mechanisms explaining the efficacy of CBT for SAD. Participants were 86 individuals who met DSM-IV-TR criteria for a primary diagnosis of SAD, participated in one of two treatment outcome studies of CBT for SAD, and completed measures of judgmental (i.e., cost and probability) biases and social anxiety at pre-, mid-, and posttreatment. Treated participants had significantly greater reductions in judgmental biases than not-treated participants; pre-to-post changes in cost and probability biases statistically mediated treatment outcome; and probability bias at midtreatment was a significant predictor of treatment outcome, even when modeled with a plausible rival mediator, working alliance. Contrary to hypotheses, cost bias at midtreatment was not a significant predictor of treatment outcome. Results suggest that reduction in probability bias is a mechanism by which CBT for SAD exerts its effects.

Theoretical models posit that social anxiety disorder (SAD) is maintained in part by judgmental biases concerning the probability and cost of negative social events (e.g., Clark & Wells, 1995; Rapee & Heimberg, 1997). Specifically, individuals with SAD tend to believe that negative social events are extremely likely to occur (i.e., probability bias), and that if such events were to happen, the consequences would be awful or unbearable (i.e., cost bias). Foa and Kozak (1986) argued that one mechanism of action of cognitive-behavioral therapy (CBT) for anxiety disorders is a reduction in the exaggerated perception of probabilities and costs associated with feared outcomes. This idea has been termed the threat reappraisal mediation hypothesis. From a CBT perspective, cost and probability biases are modified through challenges to distorted cognitions about the cost and probability of negative social events and through exposure, in which a person learns that feared outcomes are not as likely or as costly as anticipated. It is the shift of the distorted cognitions to more realistic appraisals and the new learning that results from exposure that leads to reduced anxiety.

Some researchers have questioned the causal role of cognitive change in clinical improvement with CBT (e.g., Longmore & Worrell, 2007), leading other scholars to call for tests of existing mediation models using more recently developed methodological guidelines (see Hofmann, 2008). In a recent review of the literature on the threat reappraisal mediation hypothesis in cognitive-behavioral treatment of anxiety disorders, Smits, Julian, Rosenfield, and Powers (2012) described the following criteria as critical to establishing that a variable is a mechanism of treatment: 1) demonstration of statistical mediation; 2) demonstration that CBT causes threat reappraisal; 3) demonstration that threat reappraisal causes anxiety reduction; and 4) demonstration of specificity of the threat reappraisal-anxiety reduction relation. Formal tests of statistical mediation are useful in demonstrating significance of the paths between treatment and the hypothesized mechanism (path a) and between the mechanism and the specified outcome of interest (path b), and of the indirect mediated $a \times b$ pathway (i.e, Criterion 1). Demonstration that CBT causes threat reappraisal (i.e., Criterion 2) is critical to establishing that threat

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reappraisal occurred as a result of treatment, versus some other variable or as a function of time. Studies comparing CBT to viable alternative treatments are ideally suited to draw conclusions that CBT—versus some non-specific therapeutic factor—caused threat reappraisal, although studies comparing CBT to a wait-list control can also permit researchers to make causal inferences. Demonstration that threat reappraisal temporally preceded anxiety reduction (i.e., Criterion 3) is essential for demonstrating that changes in the hypothesized mechanism caused changes in the outcome. Finally, demonstration of specificity by ruling out other plausible mechanisms (i.e., Criterion 4) strengthens evidence for the causal relation between the mediator and the outcome.

In their review, Smits et al. (2012) identified eight studies that examined the threat reappraisal hypothesis in relation to SAD. No single study both tested and established all four criteria. The majority (n = 5; 62.5%) demonstrated statistical mediation (Foa, Franklin, Perry, & Herbert, 1996; Hoffart, Borge, Sexton, & Clark, 2009; Hofmann, 2004; Rapee, Gaston, & Abbott, 2009; Smits, Rosenfield, McDonald, & Telch, 2006). Fewer than half (n = 3; 37.5%), however, established CBT as a cause of threat reappraisal (Hofmann, 2004; Rapee et al., 2009; Taylor & Alden, 2008) or demonstrated specificity of the threat reappraisal-anxiety reduction relation (Hoffart et al., 2009; Rapee et al., 2009; Smits et al., 2006). According to Smits et al., four studies attempted to establish causality of the mediator-to-outcome effects but did not model the data in ways that permitted strong causal inferences (Hoffart et al., 2009; Hofmann, 2004; Taylor & Alden, 2008; Wilson & Rapee, 2005). In these studies, threat reappraisal in earlier phases of treatment was correlated with symptom improvements later in treatment, but testing of causality by controlling for earlier levels of social anxiety symptoms was absent. Only Smits et al. (2006) demonstrated that threat reappraisal was associated with social anxiety reduction after controlling for earlier levels of social anxiety, providing stronger support for the hypothesis that threat reappraisal caused reduction in social anxiety. In this study, cost and probability biases independently accounted for variance in fear reduction within and between sessions, with change in probability bias accounting for a greater proportion of variance than change in cost bias. Within-session reductions in probability bias predicted within-session reductions in fear, which predicted further reductions in probability bias (i.e., a reciprocal relation), whereas within-session reduction in cost bias did not predict reduction in fear, but was a consequence of it. Although this study is the most methodologically rigorous examination of the threat reappraisal mediation hypothesis to date, it has a major limitation in that fear ratings, but not social anxiety symptoms, were measured during treatment. Furthermore, the cross-lagged panel analyses only examined within-session change in a three-session treatment protocol, so the conclusion regarding mediation is limited to within-session processes using an abbreviated treatment period. The authors encouraged research that applies their analytic strategy to a longer, more typical treatment protocol to provide information about change between treatment sessions – the aim of the present work.

The current project tests the threat reappraisal mediation hypothesis in the context of an eight-week course of CBT for SAD using the criteria outlined by Smits et al. (2012). Specifically this study examined whether or not 1) changes in judgmental biases statistically mediated treatment outcome; 2) CBT caused threat reappraisal, meaning individuals randomly assigned to receive CBT had lower threat appraisal following treatment than individuals assigned to a waitlist control; 3) threat reappraisal caused social anxiety symptom reduction, meaning earlier levels of judgmental bias predicted change in social anxiety; and 4) threat reappraisal remained a significant mediator of treatment outcome when modeled with a plausible rival mediator, working alliance. Working alliance was chosen as the rival mediator for the present study because of its reliable, albeit modest, effect on treatment outcome in psychotherapy in general (approximately 8% of the total variance in therapy outcomes; see Horvath, Del Re, Flückiger, & Symonds, 2011 for a review). Specifically, we hypothesize that changes in both cost and probability estimates will mediate treatment outcome and that judgmental biases will remain a significant predictor of treatment outcome when modeled simultaneously with the rival mediator, working alliance. These hypotheses address each criterion proposed by Smits and colleagues to test the threat reappraisal mediation hypothesis.

We also explore the extent to which improvement in SAD is better accounted for by changes in cost versus probability bias. Foa and Kozak (1985) originally theorized that inflated cost estimates are the primary variable mediating change in SAD because, whereas other anxiety disorders are characterized by overestimates of the probability of objectively catastrophic outcomes (e.g., heart attack, death of a loved one), the feared outcomes in SAD (e.g., appearing foolish, being embarrassed) are not objectively dangerous. Empirical research with clinical samples has, however, yielded mixed findings: two studies found cost bias to be more important (Foa et al., 1996; Rapee et al., 2009), two studies found probability bias to be more important (McManus, Clark, & Hackmann, 2000; Smits et al., 2006), and two studies found each to be significant predictors and did not make inferences about their relative importance (Hoffart et al., 2009; Taylor & Alden, 2008). Based on Foa and Kozak's original theory, we hypothesize that reductions in cost will be a stronger predictor of treatment outcome than reductions in probability when modeled simultaneously.

1. Method

The present study uses data from two treatment studies: a randomized controlled trial comparing Exposure Group Therapy (EGT; Hofmann, 2002) and Virtual Reality Exposure Therapy (VRE; Anderson, Zimand, Hodges, & Rothbaum, 2005) for SAD to wait-list controls (Anderson et al., 2013; Study 1) and an uncontrolled trial examining amygdala activity as a predictor of treatment response to VRE using functional magnetic resonance imaging (fMRI; Study 2). For the purposes of this study, procedures in these two trials were identical, with one exception: participants in Study 2 were not randomly assigned to treatment; they all received VRE.

1.1. Participants

Participants were 86 individuals who met DSM-IV-TR (APA, 2000) criteria for a primary diagnosis of generalized (n = 40) or non-generalized SAD (n = 46), completed eight weeks of the waitlist or treatment protocol, and identified public speaking as their most feared social situation. Participants were included only if they identified public speaking as their most feared social situation because both the VRE and EGT protocols exclusively utilized public speaking exposures. Eligible participants on psychoactive medication were required to be stabilized on their current medication(s) and dosage(s) for at least 3 months and to remain on the stabilized regimen throughout the course of the study. Exclusion criteria included (a) history of mania, schizophrenia, or other psychoses; (b) recent prominent suicidal ideation; (c) current alcohol or drug abuse or dependence; (d) inability to wear the virtual reality helmet; (e) history of seizures; and (f) inability to undergo an fMRI (e.g., claustrophobia, metallic implants) (Study 2 only). Additionally, participants were required to be literate in English.

Most participants (n = 68; 79.1%) received a diagnosis of SAD alone. The most common secondary diagnoses were specific phobia