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Targeting the probability versus cost of feared outcomes in public speaking anxiety

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ABSTRACT

Cognitive–behavioral theory suggests that social phobia is maintained, in part, by overestimates of the probability and cost of negative social events. Indeed, empirically supported cognitive–behavioral treatments directly target these cognitive biases through the use of in vivo exposure or behavioral experiments. While cognitive–behavioral theories and treatment protocols emphasize the importance of targeting probability and cost biases in the reduction of social anxiety, few studies have examined specific techniques for reducing probability and cost bias, and thus the relative efficacy of exposure to the probability versus cost of negative social events is unknown. In the present study, 37 undergraduates with high public speaking anxiety were randomly assigned to a single-session intervention designed to reduce either the perceived probability or the perceived cost of negative outcomes associated with public speaking. Compared to participants in the probability treatment condition, those in the cost treatment condition demonstrated significantly greater improvement on measures of public speaking anxiety and cost estimates for negative social events. The superior efficacy of the cost treatment condition was mediated by greater treatment-related changes in social cost estimates. The clinical implications of these findings are discussed.

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Exposure to the probability versus cost of feared outcomes in public speaking anxiety

Theoretical models of anxiety (e.g., Beck, Emery, & Greenberg, 1985) emphasize the importance of biased cognitive processing in the development and maintenance of anxiety disorders. In particular, pathological anxiety appears driven by exaggerated appraisals of the probability (likelihood) and cost (severity) of feared outcomes. While probability and cost overestimates are present in all anxiety disorders, these biases may be differentially important in distinct anxiety disorders (Foa & Kozak, 1986). Most anxiety disorders are characterized by overestimates of the probability of objectively catastrophic outcomes (e.g., heart attack in panic disorder, death of a loved one in generalized anxiety disorder). In contrast, individuals with social phobia often overestimate both the probability and cost of outcomes that may be less severe (e.g., appearing foolish, being criticized). Social fears may be unique in that feared outcomes are not objectively disastrous; as such, fears regarding the consequences or cost of outcomes may be a more suitable target of treatment in social phobia than in other anxiety disorders.

Considerable research has documented the existence of probability and cost biases in social phobia. With regard to probability bias, Foa, Franklin, Perry, and Herbert (1996) found that individuals with social phobia rated negative social events as more likely to occur than did non-anxious controls. Other investigations (e.g., Andrews, Freed, & Tesson, 1994; Lucock & Salkovskis, 1988; Poulton & Andrews, 1996; Uren, Szabó, & Lovibond, 2004) have produced similar findings. Comparable conclusions have been established for cost bias. For example, Voncken, Bögels, and de Vries (2003) demonstrated that individuals with social phobia overestimate the consequences of social events, regardless of whether the events are positive, ambiguous, mildly negative, or profoundly negative. Compared to non-anxious controls, individuals with social phobia have also been found to evaluate negative social events as more threatening (e.g., Poulton & Andrews, 1996; Uren et al., 2004; Voncken, Bögels, & Peeters, 2007; Voncken et al., 2003) and to rate the outcomes of negative social events as more costly (e.g., Foa et al., 1996; Gilboa-Schechtman, Franklin, & Foa, 2000; McManus, Clark, & Hackmann, 2000; Smarí, Bjarnadóttir, & Bragadóttir, 1998; Wilson & Rapee, 2005).

Treatment studies also support the importance of probability and cost overestimates in social phobia. A number of investigations have demonstrated significant reductions in probability and cost biases following successful cognitive–behavioral therapy (e.g., Franklin, Huppert, Langner, Leiberg, & Foa, 2005; Lucock & Salkovskis, 1988; Poulton & Andrews, 1996; Voncken & Bögels, 2006). Reductions in

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cost bias are significantly correlated with reductions in social anxiety (Foa et al., 1996) and have been shown to mediate improvement in social phobic symptoms following treatment (Hofmann, 2004; Wilson & Rapee, 2005). Other research (e.g., McManus et al., 2000; Smits, Rosenfield, McDonald, & Telch, 2006a) has found that changes in probability bias better predict reductions in social anxiety than changes in cost bias.

The discrepant findings regarding the relative importance of probability and cost bias in social phobia may be related to differences in the assessment measures employed. Whereas the measures of Foa et al. (1996) required participants to rate the probability and cost of mildly negative social events, McManus et al. (2000) used a measure that included both mildly negative and profoundly negative social situations. Assessing only mildly negative social events may have increased the variability of cost estimates, as it may be that only individuals with social phobia would rate such events as especially costly.

Although both probability and cost bias are important in the treatment of social phobia, cognitive–behavioral therapy (CBT) protocols often focus primarily on probability bias and address cost bias only when necessary. For example, Smits et al. (2006a) instructed fearful participants to deliver speeches to an audience in a competent manner, and provided videotape feedback to some individuals with the goal of correcting faulty appraisals of their performance and the reaction of the audience (Smits, Powers, Buxkamper, & Telch, 2006b). Similarly, behavioral experiments included in cognitive therapy protocols typically focus on testing predictions about the probability of feared outcomes, rather than how costly those outcomes would be if they were to occur (e.g., McManus, Sacadura, & Clark, 2008; McManus et al., 2009). Though effective in reducing probability overestimates and social anxiety, such probability-focused exposures and behavioral experiments would seem to be of limited value in reducing the perceived cost of negative social events, and thus represent a suboptimal method for assessing the relative contributions of reductions in probability and cost estimates to improvement in social anxiety during CBT.

Clinicians have long recognized the power of targeting cost biases in the treatment of individuals with social phobia. Albert Ellis, one of the founders of CBT, is well-known for his use of "shame-attacking" exercises as a means of helping individuals recognize that the actual occurrence of feared social outcomes is tolerable (Ellis & Dryden, 1987). Patients who engage in social mishaps, violate social norms, or behave in other foolish or embarrassing ways are able to learn firsthand that the feared consequences of such behavior are less severe than expected. Indeed, authors of contemporary treatment manuals for social phobia (e.g., Antony & Swinson, 2000; Heimberg & Becker, 2002) have noted that treatment exercises focusing on cost bias may be most powerful in reducing social phobia. For example, Hofmann and Otto (2008) referred to cost exposures as "the single most effective strategy to target probability and cost estimates" (p. 110).

Despite the prominence of probability and cost biases in contemporary cognitive–behavioral models and treatment protocols for social phobia, treatment techniques focused on reducing these biases have rarely been examined in isolation. That is, exposures and behavioral experiments targeting probability and cost biases are often included with numerous other treatment components in social phobia treatment protocols, and dismantling studies have not been conducted to assess their unique contribution to overall outcomes. At present, enthusiasm for the effectiveness of cost-focused techniques in the treatment of social phobia is largely anecdotal and derived from clinical experience. As such, little is known about the comparative benefits of techniques with an explicit focus on reducing overestimates of the probability versus cost of negative social outcomes.

The present study was conducted to examine the relative efficacy of behavioral experiments targeting predictions concerning the probability versus cost of negative social outcomes for individuals with high public speaking anxiety. Undergraduate participants were randomly assigned to receive a single-session intervention designed to target either probability or cost overestimates. Assessments of social anxiety and cognitive biases were conducted at pretreatment, posttreatment, and one-week follow-up. We hypothesized that participants in the cost treatment condition would demonstrate significant reductions in cost bias and public speaking anxiety following treatment, and that participants in the probability treatment condition would demonstrate significant reductions in probability bias and public speaking anxiety. We further hypothesized that participants in the cost treatment condition would demonstrate significantly greater reductions in cost bias and public speaking anxiety, and that greater reductions in cost bias would account for the relative superiority of the cost treatment condition.

Method

Participants

The sample was selected from undergraduate students enrolled in psychology and criminal justice classes at the University of Wyoming. At the beginning of the semester, students completed a mass testing questionnaire for course credit that included the Speech Anxiety Thoughts Inventory (SATI; Cho, Smits, & Telch, 2004). Individuals who scored at least one standard deviation above the published mean ($\geq$73; Cho et al.) on this measure were recruited for the study via telephone and e-mail contacts. A total of 926 individuals were screened for the study, 154 of whom met the eligibility requirement and were invited to participate. Of those invited to participate, 37 individuals completed the study. Thus, the final sample consisted of 37 participants, including 28 women (75.7%). The mean age was 19.22 years ($SD = 2.66$). Most participants (81.1%) self-identified as Caucasian; fewer participants were Hispanic (10.8%), African American (2.7%), or Asian American (2.7%).

Experimental design

Participants were randomly assigned to the probability or the cost treatment condition. Following a probability or a cost-focused cognitive–behavioral treatment rationale and instructions, participants delivered a series of three brief speeches to an audience of two undergraduate confederates. Assessments of public speaking anxiety were conducted at pretreatment, immediately following each speech trial, at posttreatment, and at one-week follow-up. This research was reviewed and approved by the University of Wyoming institutional review board.

Measures

Speech Anxiety Thoughts Inventory (SATI; Cho et al., 2004)

The SATI is a 23-item measure that assesses cognitions related to public speaking fears. Participants rate the extent to which they believe statements concerning their public speaking ability (e.g., "I'll get tongue-tied") on a 5-point likert-type scale. The SATI has good test–retest reliability and internal consistency, and has good convergent and discriminant validity (Balon, 2007; Cho et al., 2004). The SATI demonstrated good internal consistency in the present study (Cronbach's $\alpha = .92$).

Probability Questionnaire and Cost Questionnaire (PQ and CQ; Foa et al., 1996)

This is a 40-item self-report inventory that describes social and nonsocial hypothetical events. As research has demonstrated that individuals with social phobia do not show probability and cost

biases in regard to nonsocial events (Lucock & Salkovskis, 1988; Stopa & Clark, 2000), for the purposes of the present study only the 20 social items were included. Participants separately rate the probability and cost of scale items (sample items: "You will feel shy around other people," "You will sound dumb while talking to others"). On the PQ, participants are asked to rate the probability that a particular hypothetical event (e.g., doing something foolish, being rejected) will happen to them. Ratings are on a 9-point likert-type scale, with scores ranging from 0 (not at all likely) to 9 (extremely likely). Scores on the CQ derive from participants rating the cost of these same hypothetical events on a 9-point likert-type scale, with scores ranging from 0 (not at all bad) to 9 (extremely bad). The PQ and CQ have demonstrated high internal consistency and good test–retest reliability (Foa et al., 1996) and demonstrated good internal consistency in this sample (both α's = .93).

Anxiety Sensitivity Index-3 (ASI-3; Taylor et al., 2007)

The ASI-3 is an 18-item self-report measure assessing fears of anxiety-related sensations. This measure consists of three six-item subscales which measure social, physical and cognitive aspects of anxiety sensitivity. The social concerns subscale was used in the present study to assess the fear of publicly observable anxiety reactions (sample items: "When I tremble in the presence of others, I fear what people might think of me," "When I begin to sweat in a social situation, I fear people will think negatively of me," "I think it would be horrible for me to faint in public".). Items are scored on a 5-point likert-type scale, with total scores ranging from 0 to 24. The ASI-3 social concerns subscale has good psychometric characteristics and discriminates individuals with social phobia from those with other anxiety disorders (Taylor et al., 2007). This subscale demonstrated adequate internal consistency in the present sample (α = .87). The ASI-3 social concerns subscale is essentially a measure of the perceived cost of appearing anxious to others, and was used in this study as an additional measure of cost bias that was expected to correspond closely to concerns associated with the potential consequences of public speaking. This scale complements the CQ, which assesses the perceived cost associated with negative social events in general.

Credibility and Expectancy Questionnaire (CEQ; Devilly & Borkovec, 2000)

The CEQ is a well-established measure of treatment expectancy and acceptance of treatment rationale. Following explanation of the treatment rationale, participants were asked to rate how logical the treatment was, their expectations regarding the success of the treatment, and their confidence in recommending the treatment on a 9-point likert-type scale. The CEQ consists of two parts, asking participants to report how much improvement they *think* will occur as well as how much improvement they *feel* will occur. This measure has been shown to possess good test–retest reliability and internal consistency (Devilly & Borkovec, 2000).

Acceptability and Aversiveness Questionnaire (AAQ)

The AAQ was constructed to assess participants' perceptions of the two treatment modalities. Following the intervention, participants were asked to rate the aversiveness of the treatment, the acceptability of the treatment, and the extent to which they personally liked the treatment on a 5-point likert-type scale ranging from 0 (not at all) to 4 (extremely).

Anxiety expectancy and peak anxiety

As described below, the treatment involved delivering a series of brief speeches to an audience. Immediately prior to each speech trial, participants rated the degree of anxiety they expected to experience on a 0 (no anxiety) to 100 (extreme anxiety) scale. Immediately following each speech, participants rated their peak anxiety during the trial on an identical 100-point scale.

Procedure

Procedures common to both conditions

Following informed consent, participants completed a demographic questionnaire and the assessment measures (SATI, PQ, CQ, ASI-3 social concerns subscale). Participants then received either a probability or cost-focused treatment rationale and completed the CEQ. In preparation for the public speaking intervention, participants were given 3 min to select a speech topic and to prepare for the speech. Participants then rated their expected anxiety for the upcoming trial. They were instructed to make eye contact with audience members and observe their nonverbal behavior to accurately gauge their reactions during the speech trials. Next, participants accompanied the experimenter into a larger adjoining room and delivered a 3-min speech on a topic of their choice to an audience of two individuals (undergraduate research assistants). Audience members were instructed to react genuinely to the speeches and were blind to the study hypotheses and experimental condition of the participant. Participants then returned to the adjoining room and provided ratings of peak anxiety during the speech and expected anxiety for the forthcoming trial. Participants were also asked to consider what they had learned during the previous trial regarding the accuracy of their predictions regarding either the probability or cost (depending on the participant's condition) of embarrassment and negative evaluation by the audience. The participant then accompanied the experimenter to the adjoining room and this process was repeated twice more. Following the third and final speech the participant again completed the study measures. Based on the results of Smits et al. (2006a) using a similar methodology, this single-session intervention was considered sufficient to produce statistically significant reductions in public speaking anxiety and probability and cost overestimates. Approximately one week later, participants returned to the laboratory and completed the study assessments once more. Trained graduate students and undergraduate research assistants served as the experimenters and all procedures were scripted to ensure standardization.

Probability treatment condition

Participants in the probability treatment condition were presented with a treatment rationale that emphasized the importance of overestimates of the probability of negative social outcomes in maintaining public speaking anxiety. They were informed that the best method of overcoming public speaking anxiety was to repeatedly practice public speaking to learn that the outcomes one fears are actually unlikely to happen. Participants were subsequently instructed to deliver their speeches as competently as possible.

Cost treatment condition

Participants in the cost treatment condition were informed that public speaking anxiety is maintained by overestimates of the cost of negative social events. They were instructed that the best method of overcoming public speaking anxiety was to repeatedly practice public speaking while purposely acting in a foolish manner. They were told that by doing so, they would learn that even if they were embarrassed or negatively evaluated during their speeches, it would not be as horrific or unbearable as may have been imagined.

Participants were instructed to engage in five types of potentially embarrassing behaviors throughout each speech trial: stuttering, shaking their hands, mumbling, pausing for at least 10 s, and making foolish statements (e.g., "I am really sweating right now"). These

behaviors were modeled by the experimenter and practiced by the participant prior to the intervention to ensure competence in their performance.

In designing the cost treatment condition, we considered that cost estimates could be tested by (a) having participants purposely act foolishly, and (b) having the audience react negatively to such behavior (e.g., by laughing at or ridiculing the participant). While treatment manuals for social phobia (e.g., Heimberg & Becker, 2002) advocate manipulating the behavior of others to approximate the client's feared outcome as closely as possible, we did not utilize this process for two reasons. First, specific feared outcomes would likely be idiosyncratic and difficult to reproduce in a standardized manner. For example, one person might fear being laughed at by the audience, whereas another individual might fear that audience members would appear bored. Second, it is likely that even when individuals with social anxiety act foolishly, others in their environment seldom respond with overt ridicule. That is, even though anxious persons may stutter noticeably during a speech, the audience is unlikely to mock them, point fingers, or walk out of the room. Hence, although our cost treatment condition may not have tested participants' "ultimate cost" per se, it provided a useful and possibly more externally valid means of testing cost predictions.

Results

Preliminary analyses

Baseline equivalence

To confirm that the randomization procedure resulted in comparable groups, we examined baseline differences using independent samples *t*-tests. Participants in the probability and cost treatment conditions did not differ significantly on demographic characteristics, including age, sex, or ethnicity (all p's $< .05$). There were no significant pretreatment differences between groups on the SATI, PQ, CQ, or ASI-3 social concerns subscale (all p's $> .05$), indicating that our randomization procedure resulted in comparable groups.

Manipulation check

Speeches delivered during the treatment trials were videotaped to ensure the integrity of the treatment conditions (i.e., to verify that participants behavior was different across conditions). Two research assistants, each blind to the hypotheses and methods of the study, were provided with the section of the treatment protocol describing instructions for the speech task in each condition. They then viewed the videotaped speeches of each participant and were asked to guess to which condition the participant belonged. Rater 1 correctly identified the treatment condition for 84.0% of participants; for Rater 2 the figure was also 84.0%. Interrater reliability was .79.

Treatment credibility and expectancy

Mean treatment credibility ratings for the probability condition ($M = 5.35$, $SD = 1.25$) and the cost condition ($M = 5.14$, $SD = 1.58$) did not significantly differ, $t\ (35) = .43$, $p = .67$. Likewise, mean ratings of treatment expectancy for the probability condition ($M = 33.06$, $SD = 15.82$) and the cost condition ($M = 39.87$, $SD = 17.33$) were not significantly different, $t\ (35) = 1.25$, $p = .22$.

Treatment effects

Descriptive statistics and the results of mixed ANOVAs for main outcome measures are presented in Table 1. A series of 2 (condition: probability versus cost) × 3 (time: pretreatment versus posttreatment versus follow-up) repeated measures analyses of variance (ANOVAs) were employed to analyze treatment effects. For the SATI, these analyses revealed a significant main effect of time ($p < .001$) and a significant time × condition interaction ($p = .05$). As predicted, a priori univariate contrasts demonstrated that participants in the cost condition evidenced greater reductions in public speaking anxiety from pretreatment to posttreatment than did those in the probability condition ($F\ [1, 35] = 4.98$, $p = .03$). Within-subject contrasts from posttreatment to follow-up were not significant ($p = .26$), indicating that participants in both conditions maintained the gains made during treatments.

Similar analyses were conducted for anxiety sensitivity related to social concerns. A 2 × 3 mixed ANOVA revealed a main effect of time ($p < .001$) and a significant time by condition interaction ($p = .04$). As hypothesized, a priori contrasts revealed significantly greater improvement on the ASI-3 social concerns subscale from pretreatment to posttreatment in the cost condition than the probability condition, $F\ (1, 35) = 4.54$, $p = .04$. Within-subject contrasts for change from posttreatment to follow-up were not significant ($p = .64$), indicating similar maintenance of treatment gains.

Scores on the PQ and CQ were also submitted to 2 × 3 repeated measures ANOVAs. A significant main effect of time was obtained for

Table 1
Descriptive statistics and between-group comparisons on outcome measures at pretreatment, posttreatment, and follow-up assessments.

Measure	Probability condition *M* (*SD*)	Cost condition *M* (*SD*)	Main effect of time *F* (2, 70)	Main effect of condition *F* (1, 35)	Time × condition interaction *F* (2, 70)
SATI			37.22***	.75	3.22*
Pretreatment	60.17 (16.22)	62.79 (9.14)			
Posttreatment	52.39 (14.25)	44.05 (14.79)			
Follow-up	45.44 (16.81)	40.42 (16.22)			
ASI-3 social concerns subscale		9.27***	.59	3.47*	
Pretreatment	12.67 (6.34)	13.42 (4.54)			
Posttreatment	12.94 (6.18)	10.53 (4.35)			
Follow-up	11.22 (5.98)	9.26 (4.04)			
PQ			7.92**	.25	.57
Pretreatment	73.28 (29.45)	72.21 (23.57)			
Posttreatment	71.17 (30.67)	65.05 (23.08)			
Follow-up	65.33 (30.04)	60.21 (21.84)			
CQ			8.45**	.56	3.15*
Pretreatment	85.00 (33.10)	86.16 (22.76)			
Posttreatment	84.89 (31.80)	73.37 (28.88)			
Follow-up	79.33 (35.60)	68.68 (27.04)			

Note. $^{*}p < .05$; $^{**}p < .01$; $^{***}p < .001$.

PQ scores ($p < .001$). The time × condition interaction was not significant ($p = .57$). Analysis of CQ scores revealed a main effect of time ($p < .001$), and a significant time × condition interaction ($p = .05$). Consistent with our hypothesis, univariate a priori contrasts indicated significantly greater improvement in the cost condition from pretreatment to posttreatment, $F\ (1,\ 35) = 5.05$, $p = .03$. The contrast analyzing changes from posttreatment to follow-up was not significant ($p = .85$), indicating equivalent maintenance of treatment gains across conditions.

To assess the magnitude of improvement within and between the treatment conditions, we used the procedures for calculating effect sizes recommended by Morris and DeShon (2002) for independent groups pretest–posttest designs. Uncontrolled within-group effect sizes, computed to characterize the magnitude of change within each treatment condition, were calculated as the difference between pre- and posttreatment means divided by the pretreatment standard deviation. Between-group effect sizes were determined by comparing standardized mean differences from pretreatment to posttreatment in each condition using the formula $[(M_{post,\ PE} - M_{pre,\ PE})/SD_{pre,\ PE}] - [(M_{post,\ CE} - M_{pre,\ CE})/SD_{pre,\ CE}]$, where PE = probability exposure and CE = cost exposure. These findings are presented in Table 2. Using Cohen's (1988) description of effects sizes of .2, .5, and .8 as depicting small, medium, and large effects, respectively, these results indicate a pattern of small-to-medium improvements in the probability condition and medium-to-large improvements in the cost condition. Between-group differences favored the cost condition on each variable and varied in size from small (PQ), medium (ASI-3 social concerns subscale, CQ), and large (SATI).

Treatment process

Anxiety expectancy and peak anxiety across speech trials

Figs. 1 and 2 depict changes in peak fear and anxiety expectancy during the speech trials for participants in the probability and cost conditions. A series of 2 (condition: probability versus cost) × 3 (time: trial 1 versus trial 2 versus trial 3) mixed ANOVAs were conducted to analyze improvement in these variables across the treatment trials. Analyses of peak anxiety revealed a significant main effect of time, $F\ (2,\ 70) = 14.86$, $p < .001$; the time by condition interaction was non-significant ($p = .40$). Analyses of fear expectancy revealed a significant main effect of time, $F\ (2,\ 70) = 7.27$, $p < .001$, and a significant time × condition interaction, $F\ (2,\ 70) = 4.62$, $p = .01$. Univariate contrasts revealed that individuals in the cost condition experienced greater reductions in fear expectancy from trial 1 to trial 2 [$F\ (1,\ 35) = 7.16$, $p = .01$] than did individuals in the probability condition, whereas improvement from trial 2 to trial 3 was equivalent between conditions ($p = .83$).

Table 2
Within-group and between-group effect size estimates (d) for treatment and maintenance phases.

Measure and phase	Probability condition	Cost condition	
	Within-group d*	Within-group d*	Between-group d±
SATI			
Treatment	.48	2.05	1.57
Maintenance	.49	.25	−.24
ASI-3 Social Concerns Subscale			
Treatment	−.04	.42	.46
Maintenance	.28	.29	.01
PQ			
Treatment	.07	.30	.23
Maintenance	.19	.21	.02
CQ			
Treatment	.00	.56	.56
Maintenance	.17	.17	.00

Note. *Positive values indicate change in the direction of improvement. ±Positive values indicate greater improvement in the cost condition; negative values indicate greater improvement in the probability condition. Treatment phase = improvement from pretreatment to posttreatment; maintenance phase = improvement from posttreatment follow-up.

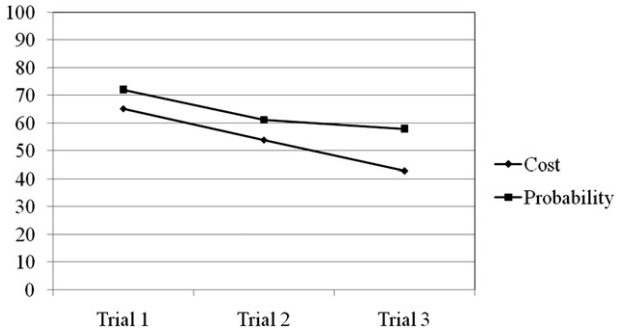

Fig. 1. Changes in peak fear during the speech trials by treatment condition.

Participants' perceptions of the treatments

Independent samples t-tests were computed to compare participants' perceptions of the probability and cost interventions. Mean aversiveness ratings for the probability condition ($M = 2.11$, $SD = .83$) and cost condition ($M = 1.84$, $SD = 1.07$) were in the moderate range and did not significantly differ, $t\ (35) = .85$, $p = .40$. Similarly, ratings of treatment acceptability were in the moderate range (probability condition $M = 2.00$, $SD = .84$; cost condition $M = 2.47$, $SD = .90$) and did not differ significantly by treatment condition, $t\ (35) = 1.65$, $p = .11$. Ratings of the personal likeability of the treatment (probability condition $M = 1.11$, $SD = 1.37$; cost condition $M = 1.53$, $SD = 1.47$) were generally low and did not significantly differ by treatment condition, $t\ (35) = .89$, $p = .38$.

Mediation of treatment effects

Given the significant condition × time interactions on the CQ and ASI-3 social concerns subscale, mediational analyses were conducted to determine whether changes in these variables accounted for the superiority of the cost condition over the probability condition on the SATI and fear expectancy during the speech trials. Using the SPSS macro and procedures for testing multiple mediators (Preacher & Hayes, 2004; Preacher, Rucker, & Hayes, 2007), we examined whether improvement on the CQ and ASI-3 social concerns subscale mediated the effect of treatment condition on the SATI and fear expectancy, respectively. Change scores from pretreatment to posttreatment were used to represent changes in the mediators and outcome variables; the unique effect of the cost treatment condition was represented by a dummy code.

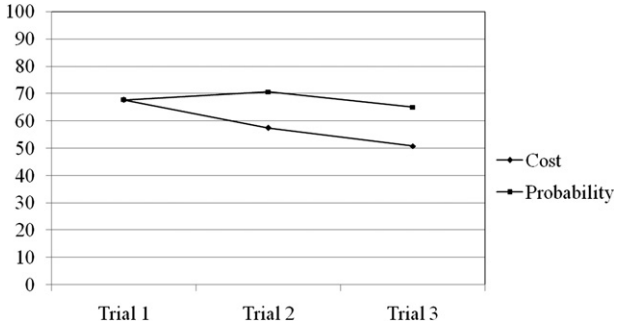

Fig. 2. Changes in fear expectancy during the speech trials by treatment condition.

The difference between treatments accounted for significant variance in the change in SATI scores, $B = 10.96$, $SE = 4.91$, $p = .03$; however, after the two measures of cost bias were included in the regression, this path was non-significant, $B = .88$, $SE = 3.34$, $p = .79$. The total indirect path from the difference between treatments to change in SATI via change in CQ and ASI-3 social concerns subscale scores was significant, $B = 10.08$, $SE = 4.08$, $p = .01$. Hence, significant, full mediation was demonstrated. The overall regression accounted for 68.1% of the variance in change in SATI scores, $F(3, 33) = 23.47$, $p < .001$.

An identical mediational analysis was conducted for fear expectancy during the speech trials. Treatment condition accounted for significant variance in the change in fear expectancy scores, $B = 14.12$, $SE = 5.88$, $p = .02$. After the two measures of cost bias were included in the regression, this path was non-significant, $B = 7.07$, $SE = 5.89$, $p = .24$. The total indirect path from treatment condition to change in fear expectancy via change in CQ and ASI-3 social concerns subscale scores was significant, $B = 7.05$, $SE = 3.52$, $p = .04$. Hence, significant, full mediation was demonstrated. The overall regression accounted for 32.3% of the variance in change in fear expectancy, $F(3, 33) = 2.25$, $p = .005$.

Discussion

The present study was conducted to examine the relative effectiveness of behavioral experiments focused on testing predictions concerning either the probability or cost of negative social outcomes in the treatment of individuals with high public speaking anxiety. Participants in the probability and cost conditions demonstrated a statistically significant and equivalent degree of improvement in probability overestimates and peak fear during the treatment trials. However, participants receiving a cost-based rationale and treatment experienced more improvement in overestimates of social cost, fear expectancy during the treatment trials, and public speaking anxiety than did participants receiving a probability-based intervention. Ratings of treatment aversiveness, acceptability, and likeability did not differ between the conditions. Overall, our findings highlight the potential benefits of using treatment exercises designed to reduce cost overestimates in the treatment of social anxiety.

It is noteworthy that reductions in probability estimates were significant and comparable across treatment conditions despite the absence of any discussion of probability estimates in the cost condition. One interpretation of this finding is that our probability-focused treatment was not sufficiently powerful in reducing probability estimates. Alternatively, as suggested by Hofmann and Otto (2008), cost-focused behavioral experiments may be especially effective in reducing both probability and cost biases. Participants in the present study's cost treatment condition likely observed that the expected negative reactions of the audience members seldom occurred despite having exhibited potentially embarrassing behaviors during the speech trials. Indeed, clinical experience suggests that behavioral experiments in which participants engage in social mishaps are often powerful precisely because of the corrective information about probability overestimates they convey (i.e., "I can't believe nobody laughed at me when I spilled my drink"). Thus, greater focus on cost-focused techniques in CBT may yield benefits with respect to both probability and cost estimates. We are not suggesting that practitioners discontinue probability-focused techniques in the treatment of social anxiety, or that targeting probability overestimates is not beneficial. Estimates of both probability and cost are necessary in creating a threat perception, and these estimates are likely present to different degrees for different feared outcomes. For fears of objectively non-catastrophic outcomes like appearing foolish or being negatively evaluated, targeting cost estimates may be especially helpful. Conversely, it may be of little therapeutic value to attempt to reduce estimates of the cost of feared outcomes commonly seen in other anxiety disorders such as contracting a serious illness, being sexually assaulted, or dying.

The superior efficacy of the cost condition on measures of public speaking anxiety and fear expectancy during speech trials was fully mediated by the greater reduction in cost estimates in this condition. Although consistent with our hypothesis, this finding cannot be used to infer a causal relationship because data from mediators and outcome variables were gathered at the same time. Using a three-session intervention similar to the probability condition in the present study, Smits et al. (2006b) demonstrated that changes in probability estimates, but not cost estimates, caused subsequent reductions in public speaking anxiety. Our discrepant findings highlight the potential importance of analyzing the mediating effects of cost bias in the context of an intervention specifically designed to reduce this bias.

Importantly, the conclusions that can be drawn about the therapeutic effectiveness of cost versus probability intervention techniques must be limited to the specific treatment exercises employed in this study. In the probability treatment condition, participants were asked to test their predictions about the likelihood of social embarrassment during repeated public speaking practices. This is an admittedly narrow intervention for reducing probability overestimates, as no other techniques were included to enhance the efficacy of the intervention such as video feedback on performance (e.g., Rapee, Gaston, & Abbott, 2009; Smits et al., 2006a) or instructions to eliminate safety behaviors (McManus et al., 2009). Although the inclusion of such techniques could have increased the potency of the probability treatment exercise, the probability and cost interventions were designed to be focused and structurally equivalent to maximize internal validity.

There are several possible reasons why the cost specific intervention may have been particularly effective at reducing overestimates of the severity of negative social outcomes. In the typical probability-focused treatment, the patient attempts to competently perform a social task and learns that feared outcomes are unlikely to occur. Assuming the treatment goes as planned, no direct information about the cost of feared outcomes is acquired. In contrast, treatments focusing on the cost of negative social events allow the patient to directly assess the severity of the actual occurrence of feared outcomes. Because patients are instructed to engage in social mishaps by the therapist, cost specific treatment exercises provide a unique opportunity for patients to observe the cost of feared outcomes without taking personal responsibility for having produced them. In this context, patients may attribute their behavior to the therapist rather than their own incompetence. Thus, patients are free to observe the social consequences of their actions without engaging in the heightened self-focused attention and self-criticism that usually accompany self-induced social failures and interfere with the process of threat disconfirmation. Cost specific behavioral experiments and exposures involve having patients act in direct opposition to the action tendencies normally associated with social anxiety. Countering avoidance by acting in an opposite manner may enhance fear reduction by increasing the availability of threat disconfirming information (Wolitzky & Telch, 2009). In the present study, participants in the cost treatment condition were instructed to engage in five actions (e.g., stuttering, shaking their hands) that were in direct opposition to the action tendencies associated with public speaking anxiety. The benefits of this approach were demonstrated by Wolitzky and Telch (2009), who found that "fear antagonistic actions" markedly improved the effectiveness of exposure therapy for acrophobia. According to these authors, fear antagonistic behaviors may enhance threat disconfirmation by eliminating the

use of safety behaviors, creating new nonthreatening associations with the phobic target, or by the direct transmission of safety information to the brain's alarm system. In addition, self-perception theory (Bem, 1967, 1972) posits that individuals may infer their beliefs and emotions from observing their own behavior and the circumstances in which it occurs. From this perspective, the act of avoiding a feared stimulus will lead the actor to experience anxiety and infer the presence of danger. Conversely, the act of approaching a feared stimulus via fear antagonistic actions should promote decreased anxiety and perceptions of danger. Although these ideas are speculative and presently unverified by empirical research, the present findings complement those of Wolitzky and Telch in demonstrating the therapeutic benefits of having fearful individuals engage in fear antagonistic actions during CBT.

The present results are preliminary and should be interpreted in the context study of the limitations of this study. The absence of a wait-list or alternative treatment condition leaves open the possibility that improvement was influenced by expectancies, test sensitization, and regression to the mean on the study measures. The one-session intervention was highly standardized and brief, and is not representative of the typical course of CBT provided to individuals with social phobia. The degree of improvement in this study was modest owing to the relatively small dose of treatment. The findings of Smits et al. (2006a) using a similar intervention to this study's probability treatment condition suggest that additional treatment sessions would have yielded a substantial and linear decrease in social anxiety symptoms and cognitions. The one-week follow-up period was designed to assess the short-term stability of treatment gains, and conclusions about the longer-term benefits of the present interventions are premature. Additional research using a clinical sample of individuals with social phobia, a more clinically representative dose of treatment, a longer follow-up period, and improved methods for assessing mediation (Kraemer, Wilson, Fairburn, & Agras, 2002) would help to establish the reliability of the present findings.

In summary, the present findings highlight the potential efficacy of treatment exercises focusing specifically on correcting predictions concerning social cost in the reduction of social anxiety and suggest that this procedure works via its effects on reducing cost bias. It is possible that CBT for social phobia may produce greater therapeutic benefit, at least with some patients, through greater emphasis on the cost of negative social events. At present, most CBT protocols prescribe conducting probability exposures during initial exposure sessions and reserve cost exposures either for later exposure sessions (e.g., Hofmann & Otto, 2008) or for a subset of patients who are deemed good candidates for them by virtue of a functional analysis (e.g., Heimberg & Becker, 2002). Unfortunately, research has not yet addressed (a) the relative contributions of probability and cost exposures to the efficacy of CBT for social phobia, (b) the possibility that CBT may be enhanced by increased emphasis on cost-focused exposures, and (c) whether there exist subtypes of socially phobic individuals who might preferentially respond to probability versus cost exposures. Future research in this area has the potential to lead to the development of CBT protocols that better target the dysfunctional cognitive and behavioral processes thought to maintain social phobia.

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