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The effects of safety-seeking behavior and guided threat reappraisal on fear reduction during exposure: an experimental investigation

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Abstract

We examined the effects of safety-seeking behavior and guided threat focus and reappraisal on fear reduction during exposure. Participants (N=46) displaying marked claustrophobic fear were randomized to one of three 30-min exposure conditions: (a) guided threat focus and reappraisal; (b) safety-behavior utilization; or (c) exposure only control. Tripartite outcome assessments during a behavioral approach test, along with measures of suffocation and restriction fears were obtained at pre- and post-treatment, and at a 2-week follow-up. Treatment process measures were collected throughout treatment and consisted of indices of fear activation; within and between-trial fear habituation; and suffocation and entrapment expectancies. Measures of safety behavior utilization and attentional focus were also collected to assess the integrity of the experimental manipulations. Consistent with prediction, those encouraged to utilize safety-behaviors during exposure showed significantly more fear at post-treatment and follow-up relative to those encouraged to focus and reevaluate their core threat(s) during exposure. Moreover, growth curve analyses of treatment process data analyses revealed that safety-behavior utilization exerted a detrimental effect on between-trial habituation; whereas guided threat reappraisal enhanced between-trial habituation.

Keywords: Fear reduction; Exposure; Safety behaviors; Claustrophobia; Cognitive processes; Clinical trial

1. Introduction

The concept of safety has played an increasingly important role in our understanding of pathological fear and its modification. The ubiquitous nature of safety-seeking behavior in anxiety

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disorders has been well documented, although specific patterns may vary. People with social phobia, for example, will mentally rehearse sentences to counter a fear of talking funny; eat small amounts of food to counter a fear of vomiting; or avoid holding an object to counter a fear of shaking uncontrollably (Wells et al., 1995). Similarly, patients with panic disorder and agoraphobia will engage in a variety of safety behaviors such as check for the presence of hospitals, bathrooms, and exits; carry safety aids such as water, medications, or cellular phones; and avoid activities that elicit strong physical sensations, for example, caffeine, exercise, or alcohol (Kamphuis & Telch, 2000; Rachman, 1983, 1984). Those with generalized anxiety disorder will repeatedly seek reassurance from others, insist on regular and frequent contact with family, avoid risks, and engage in checking and overprotective behavior (Woody & Rachman, 1994).

Recognition of the linkage between safety behaviors and anxiety disorders has led to theorizing on the role of safety behaviors in the maintenance and modification of pathological fear. As early as 1974, Bandura, Jeffery and Wright emphasized the importance of fading patients' response aids during exposure to enhance their one's sense of personal mastery. Rachman (1984) proposed a safety signal theory based on Gray's (1971) elaboration of Mower's (1960) two-stage theory. Rachman proposed that the pairing of safety cues with feared stimuli could be used therapeutically to enhance motivation for regular exposure practice thus facilitating long-term reductions in fear and avoidance. Included in the theory are specific factors that enhance or reduce a sense of safety.

Rachman's safety signal perspective has been outlined in the analysis and treatment of both agoraphobia (Rachman, 1983) and generalized anxiety disorder (Woody & Rachman, 1994). In treating agoraphobia, patients would be encouraged to travel towards rather than away from their safety signals (e.g., home). Although acknowledging that this may initially strengthen the reliance on the safety signal, Rachman (1983) believes argued that the opportunity to establish new safety signals might outweighs any adverse effects of increased reliance on the original safety signal.

In support of the immediate fear reducing effects of safety cues, it has been found that they can aid in the reduction of initial anxiety while the safety cues are available. For instance, during CO2 provocation, the presence of a safe person decreases panic patients' subjective anxiety, whereas the absence of a safe person increases anxiety (Carter, Hollon, Carson, & Shelton, 1995). Moreover, those who are provided safety information or safety cues are less likely to experience heightened fear in response to biological challenges (Rapee, Telfer, & Barlow, 1991; Telch, Silverman, & Schmidt, 1996; Schmidt & Telch, 1994).

Although the provision of safety cues may reduce the immediate experience of fear, the use of safety-seeking behaviors in response to phobic situations that pose no real threat might ultimately contribute to fear maintenance (Salkovskis, 1991). How might the utilization of safety-seeking behaviors contribute to the maintenance of pathological fear? One possibility is that safety-seeking behaviors prevent or weaken threat disconfirmation through a misattribution of safety (Salkovskis, 1991). Anxious patients erroneously attribute their failure to be harmed (safety) to their judicious use of one or more safety-seeking behaviors, thus leaving the original faulty threat perception unscathed (Salkovskis, 1991; Telch, 1991).

In order for safety-seeking behavior to affect threat perception, one would expect a linkage between safety-seeking behaviors and threat-relevant cognitions. Such was found to be the case in a recent study showing that the safety-seeking behaviors of 147 panic disorder patients were meaningfully related to their perceived threats (Salkovskis, Clark, & Gelder, 1996). These findings are consistent with the hypothesis that safety behaviors function to help patients avert a perceived threat.

Preliminary support for the deleterious effects of safety-behavior utilization (SBU) on fear reduction during exposure comes from two studies (Wells et al., 1995; Salkovskis, Clark, Hackman, Wells, & Gelder, 1999). In the first study (Wells et al., 1995), significantly greater anxiety reduction and cognitive change were observed among eight social phobics instructed to *refrain* from using safety behaviors during exposure.

Salkovskis et al. (1999) randomly assigned 18 patients with panic disorder with agoraphobia to either 15 min of situational exposure with safety-behavior fading plus a disconfirmation rationale (experimental condition), or situational exposure without safety-behavior fading (exposure control). Compared to patients receiving 15 min of exposure, patients who were instructed to withdraw their safety-behaviors during exposure reported significantly greater reduction in subjective fear. These data support the hypothesis that exposure can be more effective when in-situation safety-seeking behaviors are identified and eliminated.

Several limitations deserve mention. First, neither study included manipulation checks to determine patients' actual use of safety behaviors during treatment. Second, therapeutic rationale was confounded with safety behavior fading, namely, a disconfirmation rationale was provided to patients in the safety-behavior fading conditions, whereas an extinction rationale was provided to patients in the exposure control conditions. Third, since patients in the safety-behavior fading condition were instructed to focus on their perceived threat in addition to refraining from using safety behaviors, it is unclear whether focusing on fears or fading of safety behaviors accounted for the greater fear reduction observed in the safety-behavior fading condition.

The present study sought to clarify the effects of safety-seeking behavior on fear reduction during exposure. Students displaying marked claustrophobia were randomly assigned to one of three exposure conditions: (a) exposure with guided threat focus and reappraisal (GTR); (b) exposure with SBU; and (c) exposure only control (CRL). All three groups received 30 min of self-guided exposure. Participants in the GTR condition were instructed to focus on their fear-relevant threats during each treatment trial and to test the validity of their threat perceptions. This treatment element has been previously shown to enhance fear reduction relative to an CRL condition (Kamphuis & Telch, 2001). Those in the SBU condition were provided several specific safety strategies for managing their fear during exposure (i.e., checking the door latch to insure it was unlocked, opening an air portal to let fresh air into the chamber, speaking to the experimenter through an intercom). Those in the CRL condition received the same amount of self-guided exposure but without access to safety strategies and without specific instructions to focus and reappraise their perceived threat. To assess the integrity of the experimental manipulations, data were collected on the pattern and frequency of SBU as well as attentional focus during exposure. We hypothesized that relative to those who had no access to these safety strategies, participants in the safety-behavior condition would display less fear reduction pre- to post-treatment and greater return of fear at follow-up. Moreover, we hypothesized that compared to exposure *without* threat focusing and reappraisal; exposure *with* threat focusing and reappraisal would result in greater fear reduction and less return of fear.

2. Method

2.1. Participants

Severely claustrophobic college students from a large southwestern university (N=46) took part in the experiment. Participants were selected from a large subject pool (n=5010) of introductory psychology students through a two stage screening procedure. The final sample was predominantly female (93%) and Caucasian (76%). Five percent were Asian, 7% African American, and 12% Hispanic. Participants ranged in age from 18 to 51 (Mean age=19.66; SD=5.11). Students received course credit for participation in the experiment.

2.2. Design

Participants were randomly assigned to one of three 30-min exposure conditions: (a) GTR; (b) SBU; and (c) CRL. Outcome assessments consisted of self-report questionnaires and subjective, behavioral, and psychophysiological responses during two consecutive behavioral approach tests. These measures were collected at: pre-treatment; post-treatment; and 2-week follow-up. Treatment process indices were collected at 5-min intervals and consisted of subjective ratings of peak fear, suffocation and entrapment concerns (see below).

2.3. Procedure

2.3.1. Screening

During the first stage of screening potential participants rated their overall fear of enclosed spaces on a five-point Likert scale (0=no fear, 1=mild fear, 2=moderate fear, 3=severe fear, 4=extreme fear). Students were invited for further screening if they reported moderate or greater fear of enclosed spaces. Of the 5010 screened, 350 met this criterion, and of these, 116 agreed to take part in the second stage of screening (see below).

Students' responses to two consecutive behavioral approach tests (see below) comprised the second stage of screening. Those (N=58) who were unable to remain in the chamber for 2-min or who reported a SUDS level of 50 or greater were invited to participate. Of these, 12 students declined to participate, leaving a final sample of 46 randomized participants.

2.3.2. Behavioral approach tests (BATs)

2.3.2.1. BAT-1 Upon completing informed consent procedures, and several self-report questionnaires (see below), participants were fitted with an ambulatory heart rate monitor, after which they completed several paper-and-pencil questionnaires (see below). Next, participants were escorted to the first claustrophobia chamber (BAT-1) and asked to look inside the BAT-1 chamber for 5 s. The chamber consisted of a long, dark, narrow observation corridor measuring 11.40 m×57 m×2.29 m. At the entrance of the corridor was a single unlocked door with a 5 cm×7.5 cm rectangle painted with glow in the dark paint. At the other end was a small dimly lit night-light. After viewing the inside of the chamber for 5 s, participants completed the Claustrophobic Concerns Questionnaire

(CCQ; Valentiner, Telch, Petruzzi, & Bolte, 1996). They were then provided the instructions outlining specific requirements for entering and exiting the chamber.

Heart rate and length of time in the chamber were monitored. Maximum time spent in the chamber was limited to 2 min, though the participant was not made aware of the 2-min limit. After 2-min, the experimenter opened the door and instructed the participant to exit. Upon exiting, the participant completed ratings of peak fear.

2.3.2.2. BAT-2 BAT-2 was a tall filing cabinet measuring 0.91 m×0.43 m×1.98 m. The procedure for BAT-2 was similar to that for BAT-1. Participants were first instructed to look inside the cabinet for 5 s, after which they completed a prediction questionnaire similar to that used for BAT-1. Next, participants were again accompanied to the cabinet and asked to enter (see BAT-1). Heart rate and length of time in the cabinet were again monitored. The maximum time spent in the cabinet was limited to 2 min If the participant remained in the cabinet for the full 2-min, the experimenter opened the door and instructed the participant to exit. Upon exiting, the participant completed a post-exposure questionnaire similar to that for BAT-1. Upon completion of the BATs, the participants' resting heart rate was recorded for 5 min while they sat in an adjacent room facing a public hallway with the door open.

2.4. Treatment conditions

2.4.1. Procedures common to all treatment conditions

Eligible participants returned 2 weeks later to begin treatment. Participants in each of the three conditions received a total of 30 min of self-guided in vivo exposure to the claustrophobic chamber used for BAT-1. The exposure consisted of six, 5-min exposure trials with approximately 10 min between each trial to allow participants to complete treatment process measures.[1] Participants were provided instructions similar to those given during the baseline assessment with additional instructions specific to their treatment condition. All participants were accompanied to the chamber and instructed to look inside for 5 s. After viewing the chamber, they completed the CCQ. Next, the participants were again accompanied to the chamber, and given instructions commensurate with their treatment condition.

Heart rate and length of time in the corridor were monitored. Upon exiting the chamber, participants were escorted to a nearby room where they completed post-exposure rating scales of: (a) peak fear; (b) threat expectancies as measured by the CCQ; (c) attentional focus; and(d) safety behaviors (see below). These measures were administered on an Apple Macintosh computer. The inter-trial interval, degree of booster instructions, and therapist contact were equivalent between groups.

2.5. Exposure with SBU

Participants assigned to the SBU condition received a treatment rationale emphasizing that claustrophobic fear is fuelled by concerns about lack of fresh air or of being trapped. Participants

[1] One subject could not remain in the chamber for five-min during treatment trial one and therefore her total exposure was divided into seven trials.

were told that in order to assist them in overcoming their fear, several safety strategies would be made available to them. These included: (a)opening a small window in the chamber to allow access to fresh air; (b) standing near the exit door of the chamber in order to allow quick escape; (c) checking the latch of the exit door to insure that the door was unlocked; and (d) talking with the experimenter through an intercom. Instructions made explicit that these safety strategies were optional but could be used if the participant felt the need. Immediately prior to the next trial, participants were reminded of the specific safety behaviors available to assist them in overcoming their fear.

2.6. Exposure with GTR

Participants in the GTR condition received a treatment rationale identical to that given to the two other experimental groups. Participants were also informed of the efficacy of eliminating unrealistic fears by focusing on their specific perceived threat(s) and providing evidence contrary to the threat. Participants were not provided access to the safety strategies available to the participants in the SBU group. Upon exiting, the experimenter queried the participant as to the extent that they were able to focus on the threat and the relevant information to test the validity of the threat. Immediately prior to the next treatment trial, participants were reminded to continue to focus on their perceived threat during the trial and to look for evidence that would weaken their belief in the threat.[2]

2.7. Exposure control (CRL)

Participants in the CRL received a treatment rationale identical to that given to the two other experimental groups. Moreover, the rationale emphasized that repeated exposure to the phobic situation would help them overcome their fear. They received the identical duration of self-guided in vivo exposure as the other two conditions. However, controls were not provided access to the safety strategies made available to those in the SBU group, nor were they provided instructions to focus and reappraise their perceived threat as those in the GTR group.

2.8. Assessments

2.8.1. Outcome measures

2.8.1.1. Suffocation scale (SS) The SS is a 15-item self-report scale for assessing fear of suffocation. Items (e.g. “Working under a car for 15 min”) are rated on a 0 (not at all anxious) to 4 (extremely anxious) Likert scale. The scale has shown good psychometric properties (Rachman & Taylor, 1993).

2.8.1.2. Restriction scale (RS) The RS is a 15-item self-report scale for assessing entrapment fears. Items (e.g., standing for 15 min in a straight jacket) are rated on 0 (not at all anxious) to

[2] A more detailed description of the GTR treatment can be found in Kamphuis and Telch (2001).

4 (extremely anxious) Likert scale. The scale has shown good psychometric properties (Rachman & Taylor, 1993).

2.8.1.3. Peak fear Immediately following each BAT, participants were required to rate their maximum level of fear. Fear level was measured on a Likert scale ranging from 0 (No fear) to 100 (Very Severe).

2.8.1.4. Clinical status Based on the recommendations by Jacobson and Truax (1991), participants were classified as showing clinically significant change if: (a) the participant's level of pre- to post-treatment change was statistically reliable; and (b) if a "treatment responder" if their level of functioning at post-treatment fell outside the range of the claustrophobic population, as defined by two standard deviations from the mean of that population.

2.8.1.5. Heart rate Subjects' heart rate was monitored continuously using an ambulatory heart rate monitor (UNIQ Heartwatch Model 8799, Computer Instruments Corp.). The unit consists of an electrode belt worn around the chest, which transmits heart rate signals to a wrist receiver that depicts and stores heart rate data. The unit also has a built-in event marker that was used to indicate when the subject entered and exited the experimental chamber. Heart rate readings were sampled every 15 s during the course of the experiment. A baseline heart rate index was calculated by averaging the subjects' heart rate over a 5-min rest period following the second pretreatment BAT.[3] Similarly, performance heart rate for each exposure trial was indexed by averaging subjects' heart rate over the full duration of the exposure trial. Finally, HR reactivity index was calculated as the difference between subjects' baseline and performance heart rate.

2.8.2. Process measures

2.8.2.1. CCQ The CCQ (Valentiner et al., 1996) is an empirically derived two-factor scale assessing danger expectancies associated with claustrophobia. Items (e.g., I might be trapped, I might run out of air) are rated on a Likert scale ranging from 0 (no concern) to 100 (extreme concern). Each of the two sub-scales (entrapment and suffocation) has shown high internal consistency and test–retest reliability (Valentiner et al., 1996). The CCQ was administered at the end of each treatment trial in order to assess changes in threat expectancies over the course of treatment.

2.8.2.2. Subjective fear indices Immediately following each treatment trial, participants rated their peak fear, beginning fear, and ending fear on Likert scales ranging from 0 (no fear) to 100 (extreme fear).

2.8.2.3. Attentional focus check Immediately following each treatment trial, participants were administered a three-item scale assessing the extent to which their thoughts were focused on:

1. distracting themselves;

[3] Baseline heart rate was collected after the behavioral testing as opposed to before based on our experience showing that heart rate collected prior to exposure was often elevated due to participants' anticipatory anxiety about entering the chamber.

2. potential dangers; and
3. whether the dangers were actually occurring while in the chamber.

Participants rated their degree of focus on a Likert scale ranging from 0 (not at all) to 100 (completely). The SBU group was asked additional questions about their use of coping strategies and the degree to which they were helpful. The GTR group was asked additional questions concerning their ability to focus on the threats, and their belief that the identified threats would not occur.

2.9. Statistical analyses

To confirm that the randomization procedure resulted in comparable groups, baseline differences were examined using one-way ANOVAs. These analyses revealed that the groups did not differ on any of the measures at pre-treatment.

2.9.1. Manipulation checks

Subjects' adherence to experimental instructions was moderate to high. The degree of focus (0–100) on the threat was computed as the average percent of focus across the six treatment trials. Ratings of threat focus were 84% for the GTR, 34% for SBU and 28% for CRL.

Most participants in the SBU condition (82.3%) utilized at least one safety behavior during treatment. Of those, 58.82% utilized one, 23.53% utilized two, and 0% utilized three options during at least one of the treatment trials. For those using safety behaviors 77% found the safety behaviors to be at least moderately helpful. Interestingly, of those who did not rate safety behaviors as helpful, the majority continued to use them anyway.

Fig. 3 illustrates the degree of threat focus and the number of safety behaviors used for each condition during each trial. Participants' primary focus of attention was categorized as either being focused toward the threats (threat focus) or away from the threats (distraction).

2.9.2. Outcome analyses

Changes from pre- to post-treatment on the primary outcome measures (peak fear while performing the BAT, restriction fears, suffocation fears, and heart rate) were examined using paired *t*-tests. Return of fear was examined in a similar fashion comparing the outcome indices at post-treatment and follow-up.

Between-group differences at post-treatment and follow-up were examined separately using MANCOVAs. Significant effects were followed by multiple comparison tests. For all analyses, pre-treatment levels of the outcome indices were entered as covariates. Chi-square analyses were performed to test for between-group differences in the proportion of participants achieving clinically significant change.

2.9.3. Treatment process

Individual growth curve modeling (Francis, Fletcher, Stuebing, Davidson, & Thompson, 1991; Wilett, Ayoub, & Robinson, 1991) was used to examine between-group differences in fear activation, within-trial habituation, and between-trial habituation during treatment. First, a simple linear regression was calculated for each participant using the score for each process measure

(i.e., peak fear, CCQ-restriction, and CCQ-suffocation) as the dependent variable and the treatment trial as the independent variable. These analyses yielded two parameters for each participant: (a) initial score level, which corresponds to the intercept in the within-subject regression model; and (b) score change, which corresponds to the slope in the within-subject regression model and is an estimate of the amount of change in the measure associated with each treatment trial. Next, ANOVAs were performed using the initial score level (intercept) as the dependent variable, treatment condition as the grouping factor, and the corresponding pre-treatment measure as a covariate.

To examine within-trial habituation, the percent change in subjective fear during each treatment trial was calculated. This change was defined as the difference between maximum subjective fear and ending subjective fear, divided by maximum subjective fear. When maximum subjective fear was zero, the percent change in subjective fear was coded as zero. Next, a repeated measures ANOVA was performed using fear change as the dependent variable, treatment trial as the within-subjects factor, and treatment condition as the between-subjects factor.

3. Results

3.1. Treatment outcome

Means and standard deviations for the primary outcome measures at pre-treatment, post-treatment, and follow-up are presented in Table 1.

3.1.1. Within-group effects

Each of the three treatment conditions showed significant pre- to post-treatment reductions in peak fear and heart rate reactivity for both BAT1 and BAT 2 (all $ps<0.05$). Moreover, significant reductions in restriction and suffocation fears were observed among all three conditions (all $ps<0.01$), with the exception that participants in the SBU group showed *no* significant reduction in suffocation fear.

3.1.2. Between group effects

3.1.2.1. Post-treatment A significant main effect of treatment condition was observed at post-treatment across the six treatment outcome measures [Roy's Largest Root $F(6, 26)=6.86$, $p<0.001$]. Follow-up univariate tests revealed a significant main effect of treatment condition on peak fear for BAT 1 [$F(2, 30)=8.31$, $p<0.001$]; peak fear for BAT 2 [$F(2, 30)=14.61$, $p<0.001$]; restriction subscale of the Claustrophobia scale [$F(2, 30)=11.54$, $p<0.001$]; and the suffocation subscale of the Claustrophobia scale [$F(2, 30)=3.36$, $p<0.05$]. The pattern of between-group differences at post-treatment varied as a function of the specific outcome measure. On measures of peak fear during both BAT 1 (training chamber) and BAT 2 (generalization chamber), the GTR and CRL groups displayed significantly greater improvement at post-treatment than the SBU group.

A somewhat different pattern of results emerged on measures of restriction and suffocation fear. Compared to SBU, GTR led to significantly more improvement on both the restriction and suffocation subscales. Moreover, GTR outperformed CRL on the restriction subscale. There were

Table 1
Means, standard deviations and intergroup comparisons for post-treatment and follow-up fear indices[a]

Measures	GTR			SBU			CRL		
	Pre	Post	FU	Pre	Post	FU	Pre	Post	FU
	N=13	*N*=13	*N*=13	*N*=17	*N*=16	*N*=16	*N*=12	*N*=12	*N*=12
BAT 1 chamber peak fear (0–100)									
M	66.92	5.86[a]	10.38[a]	55.29	34.69[b]	36.88[b]	61.55	11.15[a]	22.92[ab]
SD	15.48	10.83	14.50	7.17	27.17	26.82	13.73	14.74	29.58
HR(BPM)									
M	92.8	88.74	96.4	96.7	83.49	96.34	96.7	88.45	95.16
SD	12.82	12.35	10.78	12.80	9.33	14.99	15.48	13.62	14.33
BAT 2 Cabinet peak fear (0–100)									
M	59.63	13.00[a]	11.77[a]	58.23	49.68[b]	43.7	45.83	18.4	23.75[ab]
SD	28.76	14.78	16.22	16.29	27.35	29.64	32.04	23.75	33.11
HR (BPM)									
M	90.65	87.28	100.98	91.10	81.85	97.27	91.92	82.30	93.56
SD	13.59	14.97	13.00	12.44	8.16	15.26	12.43	9.82	12.88
SS									
M	29.69	13.36[a]	13.31	26.53	21.44[b]	19.12	32.25	17.08[ab]	16.33
SD	12.12	12.70	10.86	6.80	10.48	7.00	9.63	11.66	10.52
RS									
M	40.77	15.71[a]	16.62[a]	39.29	29.50[b]	28.38[b]	39.33	27.31[b]	23.50[ab]
SD	7.80	13.67	14.43	6.97	11.89	10.35	10.31	14.61	14.18

[a] Note. Means with different italic letters are significantly different at the 0.05 level.

no significant between-group differences at post-treatment on heart rate reactivity during the BATs (see Table 1).

3.1.2.2. Follow-up A marginally significant multivariate main effect of treatment condition was observed at follow-up across the six treatment outcome measures [Roy's largest root $F(6, 24)=2.07$, $p=0.095$]. Follow-up univariate tests revealed a significant main effect of treatment condition on peak fear for BAT 2 [$F(2, 28)=5.71$, $p<0.01$] and the restriction subscale of the Claustrophobia scale [$F(2, 28)=4.47$, $p<0.05$]. The main effect of treatment condition on peak fear during BAT 1 approached significance [$F(2, 28)=3.14$, $p=0.059$]. In general, the pattern of between-group differences resembled those seen at post-treatment. Compared to the GTR group, the SBU group displayed significantly greater peak fear during BAT 1 and BAT 2 and higher scores on the restriction subscale of the Claustrophobia scale. None of the other pair-wise comparisons at follow-up were significant.

3.1.3. Clinical significance

Figs. 1 and 2 present data on the percentage of participants in each of the three conditions who achieved clinically significant improvement at post-treatment and follow-up. At post-treatment, the percentages of participants who met criteria for "clinically significant improvement" in their

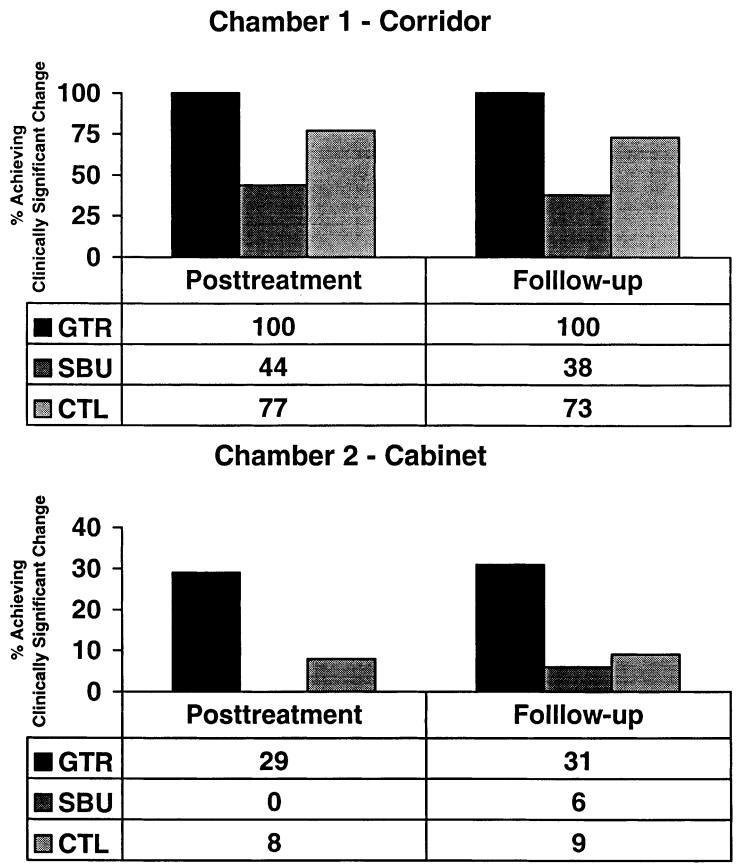

Fig. 1. Percent of participants achieving clinically significant change at post-treatment and follow-up.

reactions to the treatment chamber were 100% in the GTR condition, 44% in the SBU condition, and 77% in the CRL condition [$\chi^2(2)=16.94$, $p<0.0005$]. At follow-up, these percentages were 100% in the GTR condition, 38% in the SBU condition, and 73% in the CRL condition [$\chi^2(2)=9.975$, $p<0.007$].

Although the *pattern* of between-group differences in participants' response to the generalization test chamber (BAT 2) was similar to that of BAT 1, the magnitude of fear change was far lower, that is, 29, 0 and 8% met the stringent criterion of clinically significant change in the GTR, SBU and CRL groups respectively [$\chi^2(2)=7.52$, $p<0.03$]. At follow-up, these percentages were 31, 6, and 9% in the GTR, SBU and CRL groups, respectively [$\chi^2(2)=3.59$, NS].

3.2. Treatment process analyses

3.2.1. Fear activation

Contrary to expectation, there were no between-group differences in fear activation as measured by peak fear ratings or HR reactivity during the first 5-min of treatment. These findings indicate

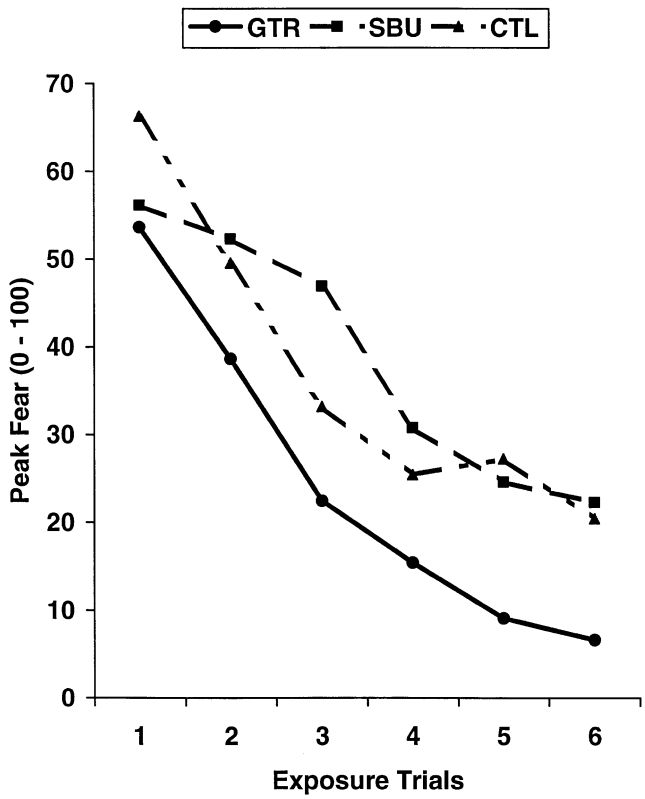

Fig. 2. Changes in peak fear across treatment trials for each of the three exposure conditions.

that making safety behaviors available during exposure did not reduce initial fear levels significantly.

3.2.2. Within-trial habituation

Growth curve analyses examining the level of fear decline *within* treatment trials revealed that participants from each of the three treatment groups displayed marked but comparable reductions in subjective fear within each of the six treatment trials. These findings suggest that the observed differences in treatment outcome cannot be accounted for by differential changes in within-trial habituation.

3.3. Between-trial habituation

Significant reductions in peak fear, CCQ-suffocation, CCQ-restriction, and heart rate reactivity were observed across the six treatment trials (all $ps<0.0001$). Therefore, all three exposure conditions were effective in reducing both fear and threat expectancies. Group differences in the pattern of between-trial habituation was examined using individual growth curve modeling. Fig. 2 presents data on participants' subjective peak fear during each 5-min treatment trial. These data show a clear divergence between groups during treatment ($F=6.20$, $p<0.01$). Post-hoc compari-

sons using Turkey's Studentized Range Test showed that compared to those in the GTR or CRL groups, participants in the SBU condition showed significantly *less* between-trial habituation during the first 15-min of treatment ($p<0.05$). Moreover, participants in the GTR group showed significantly greater fear decline over the six treatment trials than participants in either of the other two groups ($ps<0.05$)

Fig. 3 presents data on participants' suffocation and entrapment concerns for each of the six 5-min treatment trials. Compared to participants in the CRL and SBU groups, those in the GTR group displayed significantly greater reductions in both suffocation and restriction concerns ($ps<0.05$). None of the other between-group differences were significant.

3.3.1. Return of fear

None of the three groups displayed a significant increase from post-treatment to follow-up as measured by Claustrophobia scale ratings or subjective fear during the BATs. Participants in the SBU group displayed a significant post-treatment to follow-up increase in performance heart rate during BAT 1 ($t=-3.66$, $p<0.005$); and all three groups displayed a significant increase in per-

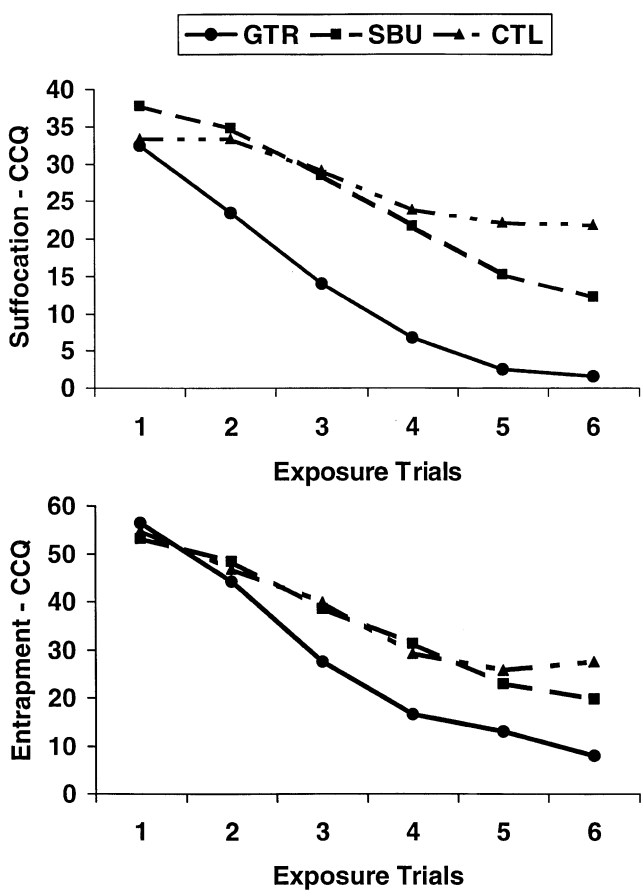

Fig. 3. Changes in suffocation and entrapment concerns across treatment trials for each of the three exposure conditions.

formance heart rate during BAT 2 (all $ps<0.05$). However, there were no significant between-group differences in the change in HR from post-treatment to follow-up.

4. Discussion

Our approach was to manipulate several parameters of exposure in order to examine the effects on fear reduction while controlling for the total duration of exposure. Our findings call into question the commonly used approach of encouraging phobic patients to utilize safety-seeking behaviors while confronting phobic threats. Although this approach is often touted as enhancing patients' sense of personal control, our data suggest that making safety behaviors more available during treatment interferes with fear reduction, while our GTR procedure enhanced treatment responsivity. Not only were differences between the conditions significant at post-treatment, but many of the differences were maintained at a brief follow-up. In addition, all conditions showed a transfer of treatment gains to the untreated generalization test chamber, i.e., BAT 2), and between group differences remained significant even though the generalization and treatment BATs were quite different physically.

Our findings are consistent with recent studies showing that patients' use of safety-seeking behaviors during exposure exert a negative effect on treatment outcome with both PDA patients (Salkovskis et al., 1999) and social phobics (Wells et al., 1995). In contrast, a facilitative effect on fear reduction was observed when claustrophobics were encouraged to focus on their perceived threats *and* gather disconfirming evidence related to these threats. This latter finding replicates the results of a recently completed study in our laboratory (Kamphuis & Telch, 2001).

Several interesting findings emerged from the treatment process analyses. As seen in Figs. 2 and 3, those receiving exposure with threat focus and guided reappraisal showed significantly greater changes over the course of the six treatment trials relative to those in the other two conditions. The greater fear reduction observed during treatment for the GTR group cannot be accounted for by greater fear activation since the GTR, CRL and SBU groups did not differ significantly in level of fear activation at the start of treatment. Nor, did the three groups differ with respect to within-trial fear change. Rather, our growth curve analyses suggest that the GTR component boosted the level of between-trial fear reduction. How might the GTR component lead to greater between-trial reductions in fear? Inspection of the changes in threat perception over the course of treatment provides some possible clues. As seen in Fig. 3, those in the GTR condition displayed significantly greater changes in threat perception (particularly suffocation concerns) over the course of treatment. These process data provide some support for the hypothesis that GTR was successful in facilitating the disconfirmation of participants' faulty threat perceptions. However, we cannot rule out the possibility that these cognitive changes were a *consequence* of enhanced fear reduction as opposed to playing a causal role.

Our process analyses also provide some clues as to how SBU might interfere with fear reduction. Contrary to expectation, phobics who were allowed to use safety strategies during exposure showed equivalent levels of fear activation and equivalent levels of within-trial habituation when compared to phobics who were not allowed access to these safety strategies. In contrast, safety strategies exerted a striking detrimental effect on *between-trial* habituation as indexed by subjective ratings of peak fear, particularly during the first half of the treatment.

What mechanism(s) might account for the apparent disruptive effect of safety-seeking behaviors during exposure? One possibility is that SBU exerts a negative effect on fear reduction by interfering with the process of threat disconfirmation (Salkovskis, 1991; Telch, 1991). Consistent with this view is our finding that participants who focused on their threat showed significantly greater fear reduction. Several pathways may be involved in explaining how SBU interferes with threat disconfirmation. First, as suggested by Salkovskis (1991), the utilization of safety-behaviors may lead to a misattribution of safety to the safety-seeking behavior itself, thus leaving the central core threat relatively unaffected. For example, the phobic airplane traveler who constantly checks the weather prior to departure might misattribute his safe flight to his diligent weather scanning rather than the inherent safety in air travel. It is also possible that the use of safety-seeking behaviors undermine one's sense of mastery to cope with perceived threats when the safety aids are no longer available. For example, panic patients who rely on carrying medication to cope with their fear of having a panic attack might misattribute their safety to the medication and thus feel less able to manage a panic attack on their own.

Second, SBU may interfere with threat disconfirmation by reducing one's available cognitive resources to process disconfirming information. Since the utilization of safety-behaviors requires the phobic to allocate attention to the availability and execution of safety strategies, less attentional resources are available for processing threat-relevant information. Evidence in support of this explanation comes from a recently completed study from our laboratory (Kamphuis & Telch, 2001) showing that claustrophobics who were given a demanding cognitive load distraction task during exposure showed significantly less fear reduction than a similar group who were instructed to focus on their perceived threats during exposure. These findings are consistent with several studies demonstrating detrimental effects of distraction on fear reduction [see Rodriguez & Craske (1993) for an excellent review].

A third possibility is that safety-seeking behaviors activate alarm mechanisms in the absence of cognitive appraisal. Through evolution, certain actions (e.g., checking for escape routes) may have acquired the capacity to transmit implicit signals of threat thus keeping alarm processes active. This process may be akin to the work suggesting that having people engage in certain actions (i.e., smile) activate the corresponding emotional experience, that is, feeling happy (Dimberg, 1988). At a neurophysiological level, it has been shown that direct neural pathways exist for sensorimotor information to go directly to the limbic system (Ledoux, 1998). Although speculative, safety behaviors may inadvertently transmit threat information (i.e., sensory and proprioceptive stimuli) subcortically to the amygdala thus interfering with habituation.

Several limitations of the study deserve comment. First, although we employed a stringent two-stage screening procedure to ensure that our research participants display marked phobicity (our sample represented the top 1% on indices of claustrophobic fear and avoidance), most did not meet DSM-IV criteria for specific phobia. Upon closer examination, our research participants meet all DSM-IV criteria with the exception of Criterion E (i.e., the person must experiences significant interference in social, academic or work functioning *or* experiences marked distress about having the phobia). Although we have no reason to believe that this clinical status variable limits the generalizability of our findings, the issue remains an empirical one and awaits replication with a treatment-seeking clinical sample.

Second, we did not obtain data on participants' causal attributions concerning safety behavior use. Our failure to do so precludes testing whether attributional factors were mediating the negative effects of safety behavior on fear reduction.

Lastly, our study design does not permit the effects of safety behavior *utilization* to be disentangled from the effects of safety behavior *availability*. We designed our safety behavior condition to make safety aids available without requiring their use. The rational for this decision was to more closely approximate how phobic people use safety aids in their natural environment (e.g., carrying rescue meditation in one's purse without actually ingesting it). Future studies need to clarify whether the negative effect of safety behavior utilization on fear reduction is primarily governed by the actual use of the aid of the perception that it is available if needed.

Two major implications of our findings for clinical practice deserve note. First, contrary to common clinical practice, our findings are in accord with those from the Oxford group (Salkovskis et al., 1999; Wells et al., 1995) suggesting that making safety aids available to patients may actually undermine the efficacy of exposure-based treatments. Consequently, clinicians should pay particular attention to the types of safety strategies used by the patient during exposure to feared activities, and to encourage and assist the patient in discarding these safety behaviors.

Our findings are at odds with the view that cognitive strategies do not add to the effectiveness of exposure-based treatments (Beidel & Turner, 1986). Rather, our treatment outcome and treatment process analyses suggest that greater fear reduction may occur when patients are encouraged to focus on their perceived threats during exposure and assisted in reevaluating the significance of the threat after each exposure trial.

Controlled laboratory-based research is sometimes criticized for its lack of clinical relevance. Defenders of laboratory-based clinical research have provided numerous arguments supporting its utility (Bandura, 1978; Borkovec, 1997). However, at a time when greater emphasis is being placed on health service research and treatment effectiveness studies (Seligman, 1995), those of us engaged in laboratory-based clinical research need to pay greater attention to the question, "Do our research findings offer clinicians anything useful that may assist them in working with patents in the real world?" The investigation of theory-driven change mechanisms and their mapping to procedural variations in treatment practice offer a potentially important direction for clinical research.

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