Effects of Confronting the Feared Outcome during Exposure Therapy on the Return of Fear: An Analogue Study

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Thesis

Submitted to the Faculty of the

Graduate School of Vanderbilt University

in partial fulfillment of the requirements

for the degree of

MASTER OF ARTS

in

Psychology

May 31, 2021

Nashville, Tennessee

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ACKNOWLEDGEMENTS

I would like to thank my advisor, Dr. Bunmi Olatunji for his patience and mentorship over the last four years, as it has been instrumental in my learning and growth. I would also like to thank Dr. Antonia Kaczkurkin and Dr. Steve Hollon, for their valuable input and support as members of my committee, and my husband and my parents, for their endless love and encouragement. I am so appreciative of you all.

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CHAPTER 1

Introduction

Anxiety disorders affect as many as half of individuals at some point in their lifetime (Moffitt et al., 2010) and are characterized by excessive fear or avoidance of certain stimuli or situations (American Psychiatric Association, 2013). Anxiety disorders have debilitating effects on individuals' functioning and quality of life, and represent a significant economic burden (e.g., DuPont et al., 1996; Greenberg et al., 1999). Accordingly, there has been increased emphasis on identifying mechanisms that contribute to the development and maintenance of these disorders in order to develop more efficacious treatments. Fear conditioning has been an especially useful framework for better understanding how anxiety disorders are developed and maintained (Grillon, 2008). Through conditioning, individuals learn to associate a neutral stimulus with an aversive response and over time, the neutral stimulus begins to elicit an anticipatory fear reaction (Craske et al., 2014). To disrupt the maintenance of conditioned fear responses, fear conditioning is eliminated through extinction, during which the feared stimulus is repeatedly presented in the absence of the aversive response. Exposure therapy is considered the most efficacious treatment for anxiety disorders (e.g., Olatunji, Cisler, & Deacon, 2010; Wolitzky-Taylor, Horowitz, Powers, & Telch, 2008; Norton & Price, 2007) because it targets learned fear partially through the process of extinction.

Exposure therapy requires anxious individuals to systematically confront the feared stimulus to test their expectancies (i.e., their feared beliefs). New learning is thought to occur as an individual identifies the mismatch between their expectancy (e.g., "if I encounter a snake, it

will bite me) and the exposure outcome (e.g., "I held a snake and nothing catastrophic happened"; Rescorla & Wagner, 1972). It has been proposed that the greater the discrepancy between expectancy and outcome, the greater the inhibitory learning (Craske et al., 2014). Importantly, individuals are not unlearning the original fear association during exposure therapy, but rather building new, safety learning (i.e., inhibitory learning) that competes with the old learning (e.g., Bouton, 1993). The old fear learning remains intact and retrievable following exposure, which can be problematic for maintaining treatment gains (Bouton, 1993). For example, the phenomenon known as the "return of fear" (Rachman, 1979) refers to the resurgence of fear from post-exposure to follow-up and is thought to occur when the original fear association is uncovered and/or reinforced (for a review, see Stewart & Craske, 2020). Return of fear is estimated to occur for a significant portion of individuals (19-62%) and thus, represents a significant obstacle in maintaining long-lasting benefits of exposure (Craske & Mystkowski, 2006; Vervliet, Craske, & Hermans, 2013). This has initiated efforts to identify strategies for maximizing inhibitory learning during exposure therapy in order to attenuate fear renewal.

One strategy for maximizing inhibitory learning in order to attenuate fear renewal is to leverage methods that enhance and deepen extinction learning. For example, exposure in multiple contexts has been shown to successfully offset context renewal, or the return of fear when the phobic stimulus is presented in a different environment from that of extinction (e.g., Mineka, Mystkowski, Hladek, & Rodriguez, 1999; Mystkowski, Craske, & Echiverri, 2002). Multiple context exposure is believed to expand the environments in which fear is extinguished and thus, enhance the retrievability of inhibitory learning. Indeed, the benefits of multiple contexts have been shown in human laboratory settings (Bandarian-Balooch, & Neumann, 2011) and clinical analogue samples alike (Vansteenwegen et al., 2007). Although there is clear and

consistent evidence that renewal of fear is attenuated when conducting exposure in multiple extinction contexts compared to a single context, the renewal of fear is not completely abolished with exposure in multiple contexts. Accordingly, it has been observed that using multiple extinction contexts in combination with other methods of attenuating renewal may facilitate elimination of fear renewal (Bandarian-Balooch, Neumann, & Boschen, 2015).

Research has shown that the introduction of an aversive stimulus (e.g., shock) during extinction increases momentary physiological arousal but importantly, also enhances the learning experience and serves as protection against fear renewal later on (e.g., Culver et al., 2018). Similarly, occasional reinforcement (i.e., intermittently presenting the original fear association during extinction) has been shown to consistently slow the rate of fear renewal compared to non-reinforced extinction during conditioning paradigms (e.g., Thompson, McEvoy, & Lipp, 2018; Bouton, Woods, & Pineno, 2004). Researchers have posited that when the aversive stimulus is reinforced, the old fear association is particularly salient, maximizing the learning that occurs when the stimulus is subsequently presented *without* the aversive response (Culver et al., 2018). Although this enhanced learning experience may attenuate fear renewal in the lab, very little research has attempted to translate these experimental findings to a clinical context. One study did examine the effects of excitatory stimuli and sustained arousal during exposure therapy for fear of public speaking, but the excitatory stimuli failed to increase arousal as intended. However, results did reveal that greater variability in fear levels during treatment predicted better outcomes for public speaking anxiety (Culver, Stoyanova, & Craske, 2012), suggesting that emotion variability may also play a role in the relationship between occasional reinforcement and attenuated fear renewal.

Variability in exposure therapy may be operationalized in a number of ways including variability in how hierarchy items are presented (Jacoby et al., 2019), variability in the presentation of threat-relevant stimulus cues (e.g., Lang & Craske, 2000), and variability in the timing of the exposure (Tsao & Craske, 2000). These methods likely result in variability in emotional state during exposure therapy (e.g., Kircanski et al., 2012) which may be an effective strategy for enhancing inhibitory learning. Although the exact mechanism by which variability in exposure therapy is linked to superior treatment outcomes is unclear, prior research suggests that emotion variability increases retention of learned information by optimizing the retrieval cues relevant to such information (e.g., Bjork & Bjork, 1992; 2006). When experiencing fluctuations in fear during exposure (i.e., greater emotion variability), individuals learn to associate a larger range of emotional responses with extinction (Bouton, 2000; Kircanski et al., 2012). This broader association in turn, offsets context renewal (Craske et al., 2014) and may strengthen inhibitory learning and reduce the risk of fear renewal. Given research showing that variability in fear responding facilitates longer term reductions in subjective and physiological fear for individuals experiencing anxiety-related symptoms (Culver et al., 2012; Kircanski et al., 2012), occasional reinforcement during exposure in multiple contexts may reduce return of fear by maximizing emotion variability.

Although experimental research suggests that occasional reinforcement may maximize inhibitory learning during exposure and subsequently reduce return of fear, the clinical utility of this approach remains unclear. Accordingly, the present study addresses this gap in the literature by examining the extent to which occasional reinforcement, operationalized as the inclusion of an aversive event during exposure in multiple contexts attenuates the return of fear in an anxious sample. It was hypothesized that compared to snake fearful participants randomized to a standard

repeated exposure in multiple context condition, those assigned to repeated exposure in multiple context that also includes presentation of an aversive stimulus (e.g., snake bite) would experience attenuated return of fear at a one-week follow-up, as measured by changes in behavioral approach and subjective expectancy ratings. Consistent with the extant literature (e.g., Culver et al., 2012), it was also hypothesized that the fear outcome group would experience increased subjective distress variability during exposure. Lastly, exploratory analyses were conducted to examine the extent to which distress variability during exposure mediates the relationship between exposure intervention condition and subjective and behavioral return of fear indices.

CHAPTER II

Method

2.1 Design

Participants were randomly assigned to one of two experimental groups: a multiple-context exposure group [MCE], $n = 37$; or a multiple-context + fear-outcome exposure group [MCE + FO], $n = 37$. The two exposure groups were compared across three time points: baseline (immediately prior to exposure), post-exposure (immediately following exposure), and follow-up (one week following exposure).

2.2 Participants

The final sample consisted of 74 participants who endorsed high levels of snake fear on the Fear of Snakes Questionnaire (FSQ; Olatunji et al., 2017; Milosevic & Radomsky, 2008). Individuals were recruited through a university-sponsored mass distribution email listserv and ResearchMatch, a national health volunteer registry created by several academic institutions and supported by the U.S. National Institutes of Health as part of the Clinical Translational Science Award (CTSA) program. Participants were considered eligible based on the criteria of scoring ≥ 55 on the Fear of Snakes Questionnaire (FSQ), consistent with high levels of fear (e.g., Huijding & de Jong, 2006). The mean FSQ score for eligible participants was 108.38 (SD = 11.94) and the minimum FSQ score was 84. In order to assess for a clinical diagnosis of snake phobia, the Anxiety Disorders Interview Schedule (ADIS-IV; Brown, DiNardo, & Barlow, 1994) was also administered. Based on the ADIS, 87.8% of participants ($n = 65$) met criteria for snake phobia. As part of the ADIS participants were also asked what they were most concerned would happen

during an encounter with a snake (i.e., their expectancy), and 100% of participants reported "the snake will bite me" as a feared outcome.

Participants had a mean age of 39.93 (SD = 12.00) and 87.8% of the sample was female (N = 68). The race/ethnicity composition was as follows: White (n = 63; 85.1%), African American/Black (n = 4; 5.4%), Asian/Pacific Islander (n = 5; 6.8%), Hispanic/Latino (n = 1; 1.4%), Other (n = 1; 1.4%).

2.3 Measures and Materials

Self-Report Questionnaires

Fear of Snakes Questionnaire (FSQ; Olatunji et al., 2017; Milosevic & Radomsky, 2008). The Fear of Snakes Questionnaire is an 18-item self-report measure assessing snake phobia. The FSQ was adapted from the Fear of Spiders Questionnaire, which has been regarded as more time-specific and sensitive to differences in phobic and non-phobic responding following treatment compared to similar measures such as the SPQ (Syzmanski & O'Donohue, 1995). Items on the FSQ are rated on a Likert scale from 0 (*totally disagree*) to 7 (*totally agree*), with scores ranging from 0 to 126. The FSQ demonstrated excellent internal consistency in the present study (α = .90).

Beck Anxiety Inventory (BAI; Beck & Steer, 1990; Beck, Epstein, Brown, & Steer, 1988). The BAI is a 21-item self-report measure that assesses common symptoms of anxiety. Individuals are asked to what extent various symptoms of anxiety have bothered them over the past month. Items are rated on a Likert scale from 0 (*not at all*) to 3 (*severely- it bothered me a lot*). The BAI demonstrated excellent internal consistency in the present sample (α = .93).

Psychoeducation

Prior to the assigned exposure intervention, participants were given a brief form of psychoeducation as follows: *"while it's often scary to confront the things that scare us, research suggests that repeated exposure is an effective strategy in reducing fear because we have the opportunity to learn that our feared outcomes aren't as likely or as severe as we think they might be."*

Exposure Intervention

The video exposure intervention was created using E-Prime 3.0 software and consisted of four 5-minute videos of snakes with 1-minute inter-trial intervals. Four video run orders were determined by a random number generator and utilized to counterbalance the presentation of videos within each condition. During the exposure intervention, all participants viewed the same four novel snake videos. For the multiple context exposure [MCE] group, each 5-minute snake video ran without interruption. For the multiple context + fear-outcome exposure [MCE + FO] group, the aforementioned video played for 2 minutes and 30 seconds, automatically switched to a 10-second video of a snake biting someone, and then automatically returned for the remaining 2 minutes and 20 seconds. Thus, both exposure groups received the same length of video exposure in multiple contexts (4 trials, 5 minutes each for a total of 20 minutes).

Exposure Process

Consistent with Culver and colleagues (2012), Subjective Units of Distress Scale (SUDS) ratings were collected at 0, 1, 2, 3, 4, and 5 minutes of each of the four exposure videos, yielding 24 distress ratings in total. At each time point, the experimenter asked for verbal reports of SUDS on a scale of 0 (*no distress*) to 100 (*the most distressed I've ever felt*).

Emotional Intensity

A one-item self-report measure of Emotional Intensity was administered immediately after the exposure intervention to determine whether any group differences in outcomes could be attributed to the intensity of the exposure task itself, rather than the inclusion of an aversive stimulus. Both groups were shown still images of the four exposure videos and asked, "How emotionally intense did you find this video?". Participants rated their perceived emotional intensity on a visual analogue scale ranging from 0 (*not intense at all*) to 100 (*the most intensity I've ever experienced*). The multiple context + fear-outcome exposure group was also asked to rate the emotional intensity of the bite video. The emotional intensity responses were then averaged to create one overall emotional intensity rating for each participant.

Primary Outcomes

Behavioral Approach Task (BAT). A computer-delivered BAT modeled after behavioral approach tasks used in previous research (e.g., Meng, Kirkby, Martin, Gilroy, & Daniels, 2004) served as the behavioral outcome. The BAT consisted of 25 rank-ordered images and videos that were assembled and presented in a manner that was progressively more threatening (see Figure 1 for examples). In order to successfully complete a step, the participant was asked to view the image or video for 10 consecutive seconds. The experimenter recorded BAT scores as the highest image/video viewed, which ranged from 0 to 25. Higher scores indicated greater behavioral approach. For each completed step, participants were also asked to rate how anxious that image/video made them feel on a scale of 0 (*not anxious at all*) to 100 (*the most anxious I've ever felt*).

Negative Expectancy. Immediately prior to each exposure video, participants were presented with a still image of the video and asked, "to what extent do you expect this snake to bite someone?" Participants rated their expectancy using a visual analogue scale that ranged

from 0 (*definitely not going to happen*) to 100 (*definitely going to happen*). The same expectancy question was asked immediately after exposure and at the one-week follow-up to measure changes in expectancy over time. At each stage (i.e., pre-exposure, post-exposure, follow-up), the expectancy ratings for the four exposure videos were averaged to yield a single expectancy score.

2.4 Procedure

Review and approval for this study was obtained from Vanderbilt University's Institutional Review Board. The study consisted of two sessions held over Zoom with a trained graduate-level researcher. At the start of session 1, participants provided informed consent and the researcher administered the Anxiety Disorders Interview Schedule for DSM-IV (ADIS-IV; Brown, DiNardo, & Barlow, 1994) to assess for clinical diagnosis and completed the BAI using RedCap (Research Electronic Data Capture), a secure, web-based application designed to assist in data collection for research studies (Harris et al., 2009). RedCap is hosted by Vanderbilt University and supported by UL1 TR000445 from NCATS/NIH. Participants were then guided through the BAT to assess baseline avoidance of snakes. After declining a step or completing the BAT, participants were given a brief form of psychoeducation and an overview of the exposure intervention, including familiarization with the 0-100 SUD and negative expectancy scales.

Participants were then randomized to view the multiple-context exposure [MCE] videos or the multiple context + fear-outcome exposure [MCE + FO] videos. Before and after each five-minute exposure video of the intervention, negative expectancy ratings were collected. All participants provided SUDS ratings at the beginning of each exposure video and at 1-minute intervals for the duration of the exposure. Similar to Culver and colleagues (2012), participants were instructed in advance to quickly and verbally report their distress each time the

experimenter asked "SUDS?" After completing the exposure task, participants rated the emotional intensity of each exposure video and then completed the same BAT to measure post-exposure avoidance of snakes. Exactly 7 days after session 1, participants returned to complete the same negative expectancy questions asked pre- and post-exposure (i.e., for each video, "to what extent do you expect this snake to bite someone?"). Participants then completed the BAT again before being debriefed and compensated $30 for their time.

2.5 Data Analytic Overview

Exposure Outcomes. A series of 2 (Group: MCE, MCE + FO) x 3 (Time: Pre, Post, Follow-Up) Repeated Measures Analyses of Variance (ANOVA) were conducted to examine changes in expectancy, behavioral approach, and subjective distress.

Exposure Process Variables. Consistent with previous research (e.g., Culver et al., 2012; Jacoby et al., 2019), the following three variables were computed to summarize indices of fear: (1) emotion variability: the standard deviation of SUDS ratings across all four exposure videos, (2) mean subjective distress: the average SUDS ratings across all four exposure videos, and (3) within-session habituation (WSH): peak fear level (i.e., highest SUDS level) minus final fear level (i.e., final SUDS rating during exposure). An independent samples t-test was conducted to compare intervention group differences in emotion variability, mean distress, and within-session habituation. Pearson's correlations were also conducted to examine the relationship between process and dependent measures.

Mediation Analyses. Mediation models were tested to examine the extent to which emotion variability mediates the association between exposure group and post-exposure outcomes. Mediation analyses were conducted in SPSS 27 using the PROCESS macro (Hayes, 2013), and 95% bootstrap confidence intervals were used to examine the significance of the

indirect effects. Bootstrapping procedures generate an estimate of the indirect effect, as well as a 95% confidence interval. If zero is not included in the confidence interval, one can conclude the indirect effect significantly differs from zero and thus, the mediating variable (emotion variability) significantly mediates the relationship between the independent and dependent variables.

CHAPTER III

Results

3.1 Descriptive Statistics

As shown in Table 1, there were no significant differences between age, gender, race, and baseline BAI anxiety among the exposure conditions (all *p*s > .10). Further, there were no significant differences between the two exposure groups on baseline levels of snake fear or the proportion of individuals who met ADIS-IV clinical criteria for snake phobia (*p*s > .10).

3.2 Differences in Emotional Intensity

An independent-samples t-test revealed that the multiple-context (M = 50.49, SD = 3.95) and multiple context + fear-outcome exposure groups (M = 54.45, SD = 2.69) did not significantly differ in emotional intensity ratings for the exposure intervention, $t(65.26) = -.83$, $p > .10$.

3.3 Exposure Outcomes

3.3.1 Changes in Expectancy. A 2 (Group: MCE, MCE + FO) x 3 (Time: pre-exposure, post-exposure, follow-up) repeated measures ANOVA was conducted to examine changes in expectancy ratings. There was a significant main effect of time, $F = 112.38$, $p < .001$, $\eta p^2 = .61$ and a significant time by condition interaction, $F = 4.54$, $p = .013$, $\eta p^2 = .06$ (see Figure 2). Independent samples t-tests showed that the two conditions did not significantly differ in expectancy ratings at pre-exposure or post-exposure (both *p*s > .10). However, an independent samples t-test at follow-up showed that compared to the multiple-context alone exposure group,

the multiple-context + fear-outcome group reported significantly lower levels of expectancy at a 1-week follow-up, $t(62.57) = 2.38$, $p = .02$, $d = .55$.

3.3.2 Changes in Behavioral Approach. A 2 (Group: MCE, MCE + FO) x 3 (Time: pre-exposure, post-exposure, follow-up) repeated measures ANOVA was conducted to examine changes in maximum number of BAT steps completed. Results revealed a significant time by condition interaction, $F = 4.67$, $p = .015$, $\eta p^2 = .06$ (see Figure 3). Main effect of time was examined separately for the MCE alone and MCE + FO conditions. Although there was not a significant main effect of time for the MCE alone condition ($p > .10$), there was a significant main effect of time for the MCE + FO condition, $F = 4.96$, $p = .02$, $\eta p^2 = .03$. Pairwise comparisons showed individuals in the MCE + FO condition completed significantly more BAT steps at follow-up than at pre-exposure ($p = .02$) and post-exposure ($p = .04$). There were no significant differences in the number of BAT steps completed at pre-exposure and post-exposure for the MCE + FO condition ($p = .11$).

3.3.3 Changes in Subjective Anxiety. A 2 (Group: MCE, MCE + FO) x 3 (Time: pre-exposure, post-exposure, follow-up) repeated measures ANOVA was conducted to examine changes in average BAT anxiety ratings. There was a significant main effect of time, $F = 50.51$, $p < .001$, $\eta p^2 = .42$, and a marginally significant time by condition interaction, $F = 2.47$, $p = .09$ (see Figure 4). A series of independent samples t-tests showed no significant group differences in average BAT anxiety ratings at pre-exposure, post-exposure, or a 1-week follow-up (all *p*s > .10).

3.4 Group Differences in Exposure Process Measures

Figure 5 depicts the subjective units of distress for the multiple context exposure and multiple context + fear-outcome exposure groups. A series of independent-samples t-tests were

conducted to compare group differences in emotion variability, mean subjective distress, and habituation during exposure. There was a significant difference in self-reported emotion variability (i.e., SD of SUDS) during exposure, such that the multiple context + fear-outcome exposure group (M = 14.82, SD = 5.07) reported significantly more variability in distress compared to the multiple context alone exposure group (M = 11.32, SD = 6.15), $t(74) = -2.71$, $p < .01$, $d = .62$. In contrast, there was not a significant difference in self-reported mean distress during exposure for the multiple context alone exposure group (M = 50.76, SD = 26.69) and the multiple context + fear-outcome exposure group (M = 55.41, SD = 17.38), $t(74) = -.900$, $p > .10$. Similarly, there was not a significant difference in within-session habituation for the multiple context exposure group (M = 28.03, SD = 21.67) and the multiple context + fear-outcome exposure group (M = 34.18, SD = 20.73), $t(74) = -1.27$, $p > .10$.

3.5 Association Between Exposure Process and Outcomes

Emotion variability during exposure was significantly, positively correlated with changes in expectancy ($r = .27$, $p = .019$) and the number of BAT steps completed at follow up ($r = .31$, $p = .007$), but not with mean BAT anxiety at follow-up ($r = .08$, $p > .10$). Within-session habituation was also significantly, positively correlated with changes in expectancy ($r = .29$, $p = .014$). However, within-session habituation was only marginally significantly correlated with the number of BAT steps completed ($r = .23$, $p = .05$), and not significantly correlated with mean BAT anxiety ($r = -.15$, $p > .10$). Mean subjective distress was only marginally correlated with the number of BAT steps completed at follow up ($r = -.23$, $p = .05$) and not significantly correlated with changes in expectancy ($r = -.04$, $p > .10$). However, mean subjective distress was significantly, positively correlated with mean BAT anxiety at follow up ($r = .55$, $p < .001$).

3.6 The Mediating Role of Emotion Variability

A mediational model was conducted to determine the extent to which emotion variability mediates the relationship between exposure intervention condition and number of BAT steps completed at follow-up. A 95% bootstrap confidence interval revealed that the true indirect effect for emotion variability was estimated to lie between .02 and 2.5 (Effect = .99, SE = .67). This 95% confidence interval does not contain zero, and as depicted in Figure 6 it can be concluded that emotion variability significantly mediates the relationship between exposure intervention condition and number of BAT steps completed at follow-up. Effect size calculations estimating the ratio of the indirect effect to the total effect (Alwin & Hauser, 1975) indicate that the indirect effect of emotion variability accounts for 32.97% of the total effect exposure intervention condition has on the number of BAT steps completed at follow-up.

A second mediational model was conducted to determine the extent to which emotion variability mediates the relationship between exposure condition and subjective return of fear (i.e., changes in expectancy from post-exposure to follow-up). A 95% bootstrap confidence interval revealed that the true indirect effect for emotion variability was estimated to lie between -2.6 and 1.75 (Effect = -.43, SE = 1.05). This 95% confidence interval does contain zero and thus it cannot be concluded that the indirect effect of emotion variability significantly differs from zero suggesting that emotion variability did not significantly mediate the relationship between exposure condition and changes in expectancy.

CHAPTER IV

Discussion

The present study examined the extent to which incorporating reminders of the feared outcome during exposure therapy leads to attenuated return of fear. The findings showed that compared to the multiple context alone group, the multiple context + fear-outcome exposure group showed significantly lower return of fear at a one-week follow-up, as measured by subjective expectancy ratings and number of BAT steps completed at follow-up. Appetitive conditioning research with rats has shown that reacquisition to a conditional stimulus (CS) that had been conditioned and extinguished was more rapid than acquisition in a group that had received no prior conditioning (Bouton et al., 2004). However, the addition of occasional reinforced trials to extinction slowed this rapid reacquisition effect. An initial effort to translate such findings to humans examined the effect of occasional reinforced extinction trials using a fear conditioning and extinction paradigm (Culver et al., 2018). The findings showed that although US-expectancy ratings did not provide evidence of protection against rapid reacquisition in the partially reinforced extinction group, there was evidence of protection from spontaneous recovery effects. Consistent with these basic research findings, the present study shows that a sparse partial reinforcement procedure (in which the perceived catastrophic outcome is occasionally presented) may help undermine the return of fear among snake fearful participants.

The observed effect of occasional reinforcement on the return of fear is somewhat counter intuitive. Indeed, this approach would be contrary to the misguided fears of some

clinicians that aversive events during exposure therapy could cause harm to patients (for a review see Olatunji, Deacon & Abramowitz, 2009; Lokers, 2020). Although clinical research on this issue remains limited, the available basic research does suggest that occasional reminders of the feared outcome during exposure may enhance corrective learning because 1) the original fear association resurfaces when the feared outcome (e.g., bite) is introduced and 2) the subsequent presentation of the feared stimulus *without* the feared outcome provides a violation of expectancy (Culver et al., 2018). Consistent with this view, it has been noted that the greater the discrepancy between the expected and observed outcome during exposure therapy, the greater the inhibitory learning (Craske et al., 2014). Introducing occasional reminders of the feared outcome is also consistent with long standing recommendations to incorporate "desirable difficulties" (Bjork, 1994) into exposure in order to strengthen learning and facilitate long term change (e.g., Craske et al., 2008; Abramowitz, Deacon, & Whiteside, 2019). Although "difficulties" are added challenges during exposure that slow the decline of fear, these challenges are "desirable" in that they provide additional learning opportunities representative of real-world encounters and expand retrieval cues for safety learning (Hermans, Craske, Mineka, & Lovibond, 2006).

Incorporating viewing of a snake bite into exposure may be conceptualized as a desirable difficulty that teaches participants that even if their feared outcome *does* occur, they are able to tolerate the associated distress. This corrective learning may better prepare participants with potential real-life encounters with the feared stimulus consequently preventing relapse. Incorporating such difficulties into exposure may also promote distress tolerance, a key facet of the inhibitory learning framework. According to the inhibitory learning model, fear is not necessarily reduced in exposure; rather, an increased tolerance of fear is learned (Knowles &

Olatunji, 2019). In fact, it has been posited that distress tolerance may be a better indicator of successful treatment than habituation to distress (Craske et al., 2008). Although successful therapy has been conceptualized based primarily on the occurrence of within-session habituation (Foa, Hubbert, & Cahill, 2006; Foa & Kozak, 1986), there is little evidence showing that habituation is a strong predictor of exposure outcomes (Baker, Mystkowski, et al., 2010; Meuret, Seidel, Rosenfield, Hofmann, & Rosenfield, 2012). Although habituation often occurs during treatment (e.g., Grayson, Foa, & Steketee, 1982), it appears to reflect within-session performance rather than long-term learning (Craske et al., 2008; Kircanski et al., 2012).

Although the exact mechanism by which occasional reinforcement during exposure therapy may prevent the return of fear is unclear, it is important to note that the multiple context + fear-outcome exposure group showed significantly greater distress variability than the multiple context alone exposure group. In contrast, the groups did not significantly differ in within-session habituation or mean levels of distress. Given that the intervention conditions did not significantly differ in habituation, this would be an unlikely mechanism for explaining the fact that the fear-outcome group showed significantly less subjective expectancy for a snake to bite and increased behavioral approach at the one-week follow-up. Greater distress variability was significantly related to both changes in expectancy and the number of BAT steps completed at follow-up in the present study. The present findings are also consistent with conceptual models which suggest that increasing variability is one potential modification to the delivery of exposure therapy that could maximize inhibitory learning (Craske et al., 2014; Knowles & Olatunji, 2019).

Exploratory analyses were also conducted to examine the extent to which distress variability during exposure mediates the relationship between the intervention conditions and the outcome variables at follow-up. Although a significant mediational effect was not observed for

the subjective expectancy for a snake to bite, distress variability during exposure did significantly mediate the relationship between the intervention conditions and increased behavioral approach of snake images at the one-week follow-up. In fact, distress variability accounted for nearly one-third of the total effect of exposure intervention condition on the number of BAT steps completed at follow-up. These findings are consistent with previous research showing that greater variability in subjective fear during exposure predicted lower subjective fear at follow-up (Kircanski et al., 2012). The present findings suggest that increased distress variability during exposure therapy may be one mechanism by which introducing occasional reminders of the feared outcome during exposure has its effect on decreasing the return of fear. It is important to note that introducing occasional reminders of the feared outcome may not necessarily change the intensity of the exposure intervention. Previous research suggests that patients may refuse exposure-based treatments due to beliefs about their difficulty (Abramowitz, 2006). Despite greater distress variability in the multiple context + fear-outcome exposure group, the present study found that the two exposure interventions did not significantly differ in perceived intensity. This suggests that introducing occasional reminders of the feared outcome in exposure-based treatments may not necessarily contribute to dropout.

It has been posited that exposure in multiple contexts in combination with other methods of attenuating renewal may provide a more effective approach to reduce the renewal of fear (Bandarian-Balooch, Neumann, & Boschen, 2015). The present study suggests that presenting occasional reminders of the feared outcome is one such method that can potentially yield better long-term outcomes by maximizing emotion variability during exposure therapy. This approach may broaden and strengthen retrieval cues, such that the newer, safety learning can be applied to a wider range of memories (Bjork & Bjork, 1992, 2006). Although these preliminary findings

have important clinical implications, they should be interpreted in the context of study limitations. One important limitation is the use of repeated exposure to videos in different contexts in a single 'session' as an analogue to exposure therapy. Emotional processing theory proposes that exposure therapy can alter the relationships between the fear stimulus and networks that consists of information about the feared stimulus, escape or avoidance responses to the feared stimulus, and the meaning of the fear (Foa & Kozak, 1986). However, this process requires that the network first be activated. The exclusive use of videos in a single session may not be an optimal approach to activating the fear network for the purposes of exposure therapy. A single session video-based intervention approach may also provide relatively weaker representations of the feared outcome, imprecise distinctions between contexts, and may also fail to capture between-session processes that may be therapeutic. Future research that employs a bone fide exposure therapy intervention that is delivered in multiple sessions will bolster more confidence in the present findings. The present study is also limited by reliance on self-report measures and a computer-delivered visual BAT. Future research should include an *in-vivo* BAT as well as physiological measures related to fear and anxiety (e.g., skin conductance data, heart rate variability). A research approach that employs multiple levels of analysis may offer more precision in better understanding when and how incorporating reminders of the feared outcome into exposure interventions reduces fear renewal.

Funding Source

This study received financial support from Vanderbilt University's Institute for Clinical and Translational Research (VICTR #VR54373). The funding source had no role in the collection, analysis, or interpretation of data, or writing of the manuscript.

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Table 1. *Descriptive characteristics of participants within the multiple context exposure and multiple context + fear-outcome exposure conditions*.

Intervention Condition	Multiple-context alone exposure group (n = 37)	Multiple-context + fear-outcome exposure group (n = 37)	t / χ^2
Age	41.54 (12.45)	38.32 (11.47)	0.91
% Female	94.59	81.08	3.29
% White	81.08	89.19	5.02
% Phobia Dx on ADIS	89.19	86.49	0.13
FSQ	107.00 (13.16)	109.68 (10.67)	-0.95
BAI	18.92 (12.25)	14.35 (12.43)	1.59

Note. ADIS = Anxiety Disorders Interview Schedule. Dx = Diagnosis. FSQ = Fear of Snakes Questionnaire. BAI = Beck Anxiety Inventory. There were no significant group differences in descriptive characteristics.

Step 1

Step 7

Step 19

Step 25

Fig. 1. Examples of snake stimuli used in increasingly difficult steps for the behavioral approach task.

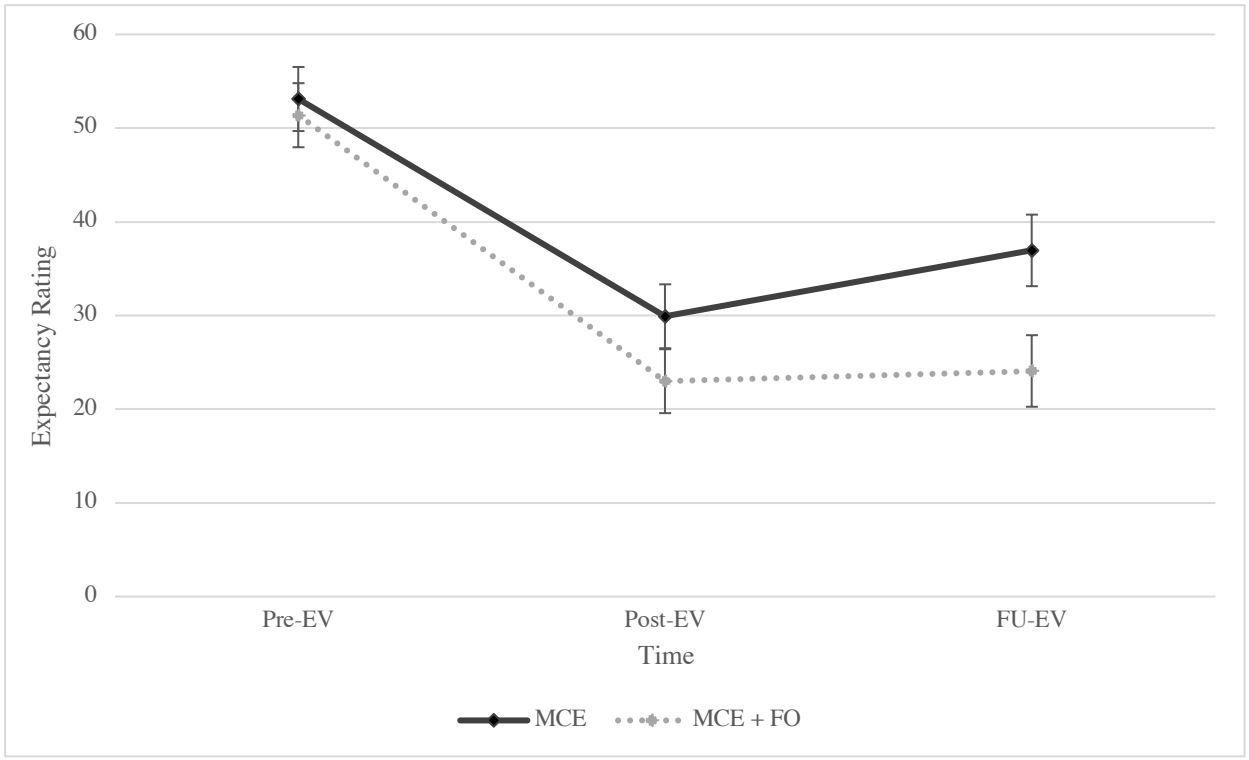

Fig. 2. Changes in expectancy ratings for the two exposure conditions from pre-exposure, post-exposure, and the one-week follow-up. Error bars: +/- 1 standard error.

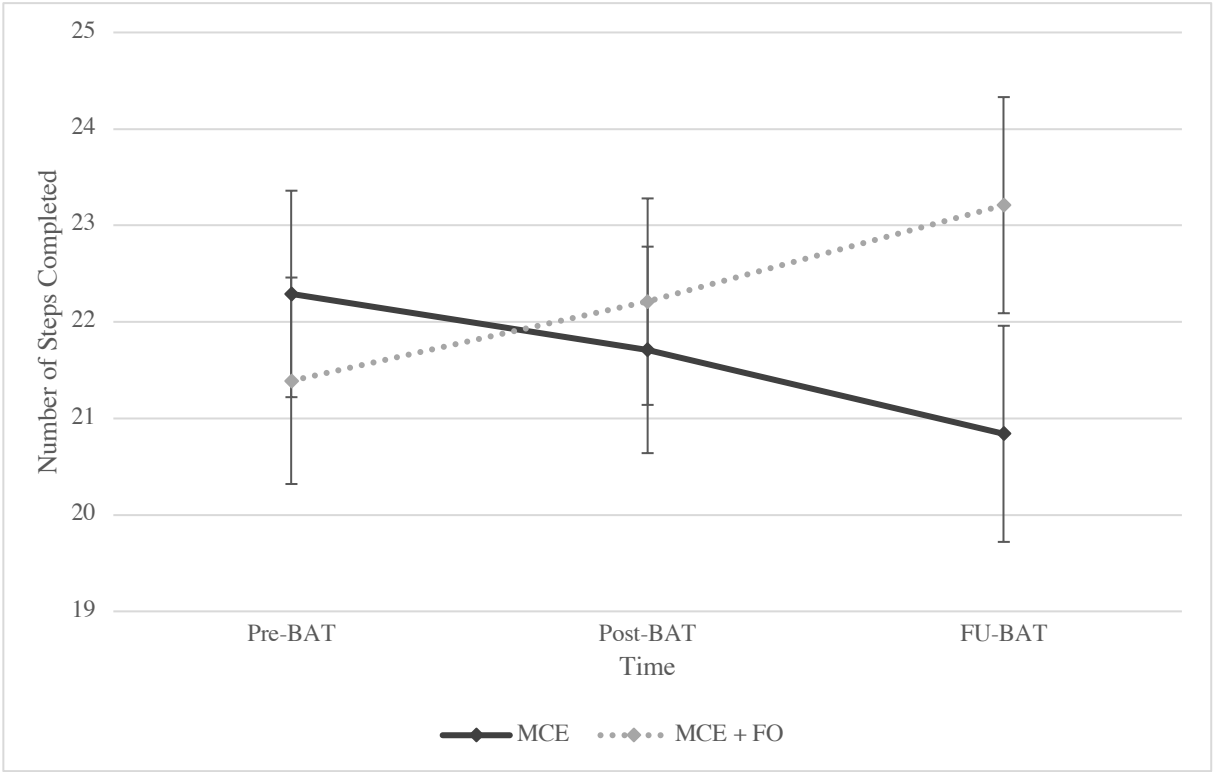

Fig. 3. Changes in behavioral approach for the two exposure conditions from pre-exposure, post-exposure, and the one-week follow-up. Error bars: +/- 1 standard error.

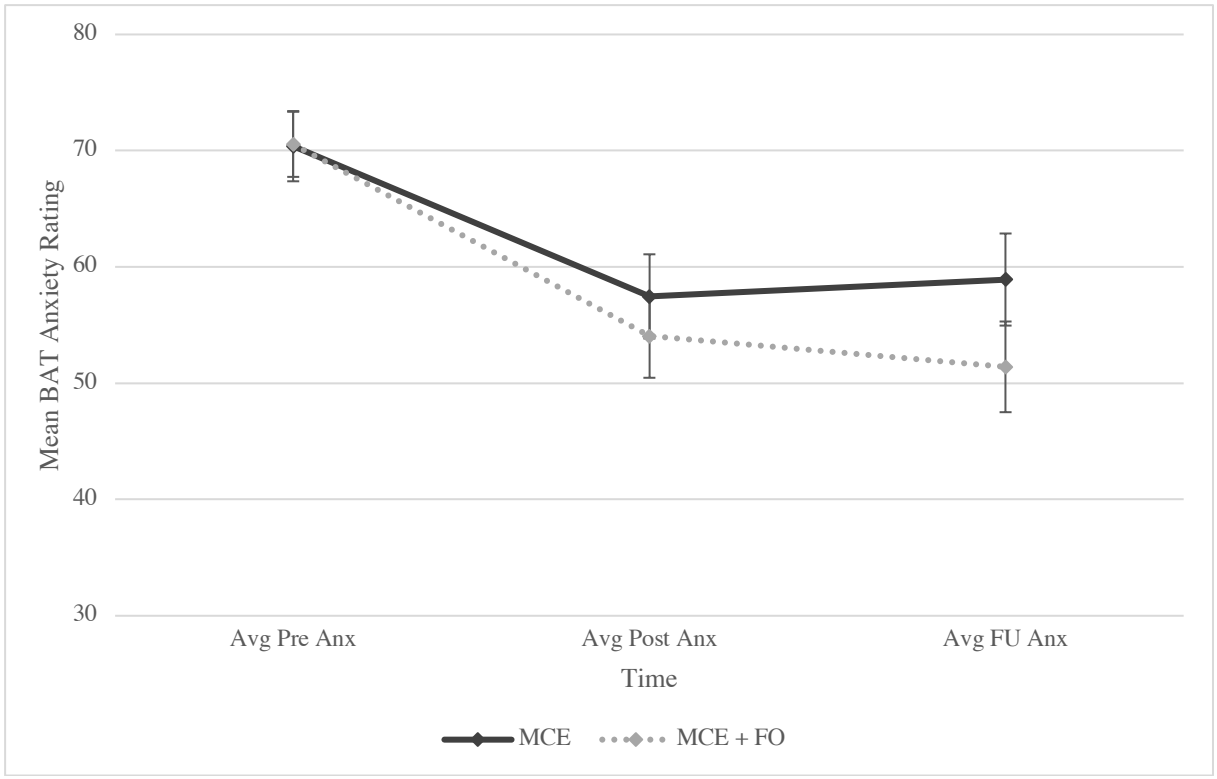

Fig. 4. Changes in mean anxiety during the behavioral approach task for the two exposure conditions from pre-exposure, post-exposure, and the one-week follow-up. Error bars: +/- 1 standard error.

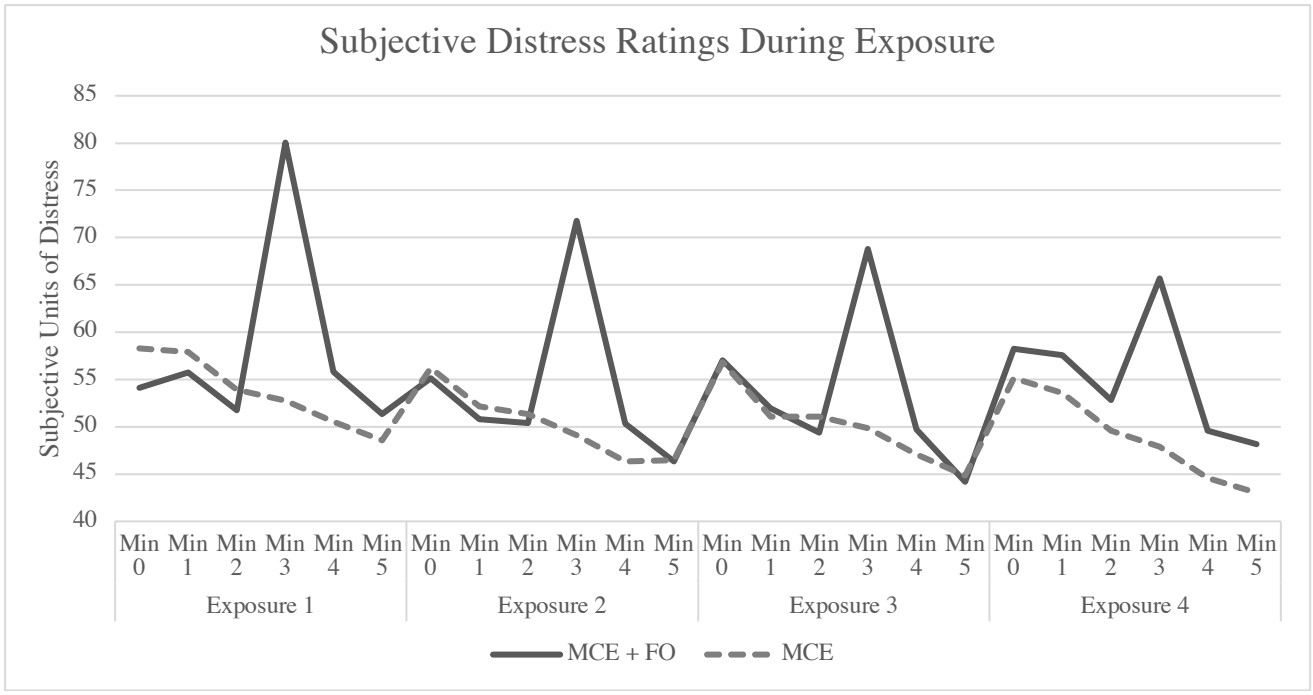

Fig. 5. Subjective units of distress rating during exposure for the multiple context + fear-outcome exposure group and the multiple context alone exposure group.

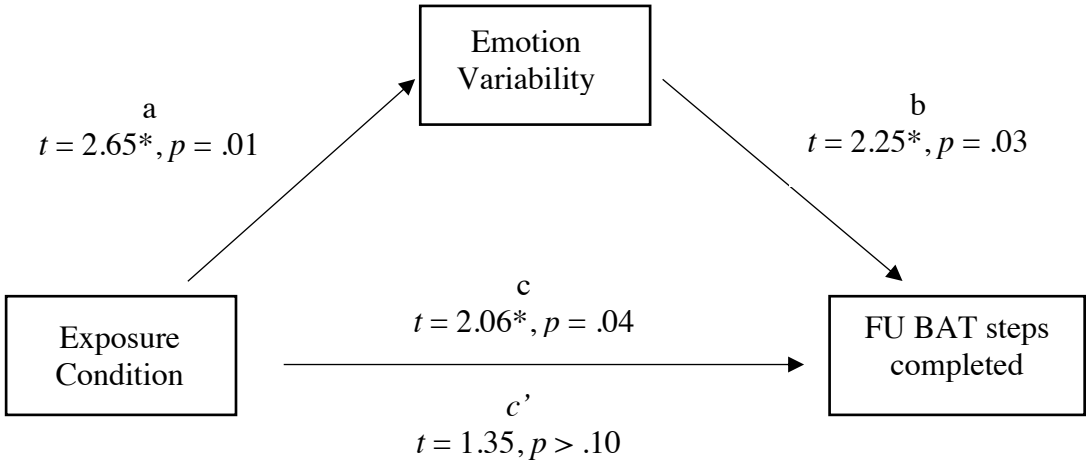

Fig. 6. Mediational model of the association between exposure condition, emotion variability (i.e., standard deviation of subjective units of distress), and number of behavioral approach task steps completed at the one-week follow-up. Path c in the model represents the total effect and path c' represents the direct effect. * = $p < .05$.