The Scarier the Better: Maximizing Exposure Therapy Outcomes for Spider Fear

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**Abstract**

Background: While exposure therapy effectively reduces anxiety associated with specific phobias, not all individuals respond to treatment and some will experience a return of fear after treatment ceases. Aims: This study aimed to test the potential benefit of increasing the intensity of exposure therapy by adding an extra step that challenged uncontrollability (Step 15; allowing the spider to walk freely over one’s body) to the standard fear hierarchy. Method: Fifty-one participants who had a severe fear of spiders completed 2 x 60-minute exposure sessions 1 week apart in a context that was either the same or different to the baseline and follow-up assessment context. Participants were categorized into groups based on the last hierarchy step they completed during treatment (Step 14 or fewer or Step 15). Results: Those who completed Step 15 had greater reductions in fear and beliefs about the probability of harm from baseline to post-treatment than those who completed fewer steps. Although completing Step 15 did not prevent fear from returning after a context change, it allowed people to maintain their ability to tolerate their fear, which earlier steps did not. Despite some fear returning after a context change, individuals who completed Step 15 tended to evidence greater reductions in fear from baseline to the follow-up assessment than did participants who completed 14 or fewer steps. Conclusions: Overall, these results suggest that more intensive exposure that directly challenge harm beliefs may lead to better outcomes than less intensive exposure.

**Keywords:** exposure therapy, spider phobia, return of fear, renewal, prediction errors, inhibitory learning, anxiety

**Introduction**

Spiders are among the most feared animals (Bennett‐Levy & Marteau, 1984; Davey, 1994; Merckelbach, van der Molen, & van den Hout, 1987). Individuals who fear spiders believe that spiders aim at them (96%) and that contact will cause them to panic (91%), which will lead them to go crazy (91%) or die (64%). Only 20% believe that spiders will bite them (Arntz, Lavy, Van den Berg, & Van Rijsoort, 1993). Thus, irrational beliefs about uncontrollable contact and inability to tolerate anxiety seem to underlie most people’s fear of spiders. Although exposure therapy is the most effective treatment for reducing spider fear (Wolitzky-Taylor, Horowitz, Powers, & Telch, 2008), some individuals do not respond to it and others experience a return of fear after treatment ceases (Andersson et al., 2009; Bandarian-Balooch, Neumann, & Boschen, 2015; Mineka, Mystkowski, Hladek, & Rodriguez, 1999; Mystkowski, Craske, & Echiverri, 2002; Rodriguez, Craske, Mineka, & Hladek, 1999; Shiban, Pauli, & Mühlberger, 2013).

Exposure therapy repeatedly and gradually exposes individuals to a spider in the absence of harm. Individuals only proceed to more difficult exposures once their anxiety has abated (Bandarian-Balooch et al., 2015; Mineka et al., 1999; Mystkowski et al., 2002; Öst, 1989; Öst, Ferebee, & Furmark, 1997; Rodriguez et al., 1999). The final step of the fear hierarchy often involves letting a spider walk on one’s hand (Mineka et al., 1999; Mystkowski et al., 2002; Öst, 1989; Rodriguez et al., 1999). After a few hours of gradual exposure, most individuals can touch a spider with minimal fear (Mineka et al., 1999; Mystkowski et al., 2002; Rodriguez et al., 1999). Despite this impressive outcome, individuals often experience a return of fear after a change in context, such as when confronting a spider in a different physical environment or after the passage of time (Andersson et al., 2009; Bandarian-Balooch et al., 2015; Mineka et al., 1999; Mystkowski et al., 2002; Rodriguez et al., 1999; Shiban et al., 2013).

The return of fear phenomenon has led learning theorists to believe that extinction (the mechanism underlying exposure therapy) does not involve unlearning but rather the learning of a new inhibitory memory (Bouton, 1993) or that it does involve unlearning but that the conditions of extinction training often fail to completely erase the original fear memory (Delamater & Westbrook, 2014). According to Rescorla and Wagner (1972), learning during extinction is regulated by the discrepancy between the predicted outcome and the actual outcome. Greater prediction errors should result in stronger extinction, in that a fear stimulus will not lose its ability to evoke a conditioned fear response until fear expectancies are maximally violated. Thus, spiders will elicit a fear response until exposure therapy maximally violates a client’s expectations (e.g., demonstrates that the person can tolerate their anxiety during uncontrollable contact).

High intensity exposures may produce greater prediction errors than low intensity exposures, as high intensity exposures involve exposing an individual to a feared stimulus or situation that highly predicts the occurrence of a biologically significant event. High intensity exposure (e.g., multiple 60-second hyperventilation trials with 15-second rest periods in between) has been found to be more effective than low intensity exposure (e.g., 60-second hyperventilation trials with long rest periods and diaphragmatic breathing in between trials) for reducing anxiety sensitivity and other panic-related symptoms immediately post-treatment (Broman-Fulks, Berman, Rabian, & Webster, 2004; Deacon, Farrell, et al., 2013), but research has not examined whether high intensity exposure eliminates the return of fear after treatment. From a theoretical standpoint, greater prediction errors should result in stronger extinction learning and thus should be associated with less return of fear after treatment than procedures that produce weaker prediction errors.

According to Craske and colleagues’ (2008) theory on optimizing inhibitory learning, exposure therapy should target distress intolerance when individuals’ fear predictions include not being able to tolerate the anxiety associated with a feared stimulus. Fear toleration is a key aspect of adaptive emotion regulation (Gross & Thompson, 2007), whereas avoidance of anxiety is associated with the onset and maintenance of anxiety disorders (Craske & Barlow, 2014; Hayes, Orsillo, & Roemer, 2010; Hofmann, 2007; Mineka & Zinbarg, 2006; Newman & Llera, 2011). As changes to a person’s physical environment (e.g., moving from the therapist’s office to one’s home) can cause fear to return, ensuring clients can tolerate anxiety should lead to less avoidance, and thus, less chance of relapse. Thus, focusing on clients’ ability to tolerate anxiety rather than reductions in anxiety during exposure therapy may lead to better long-term outcomes.

**The present study**

This study was a preliminary test of the benefit of adding an extra, more challenging step to the standard fear hierarchy (Step 15). The extra step involved letting the spider walk freely on one's body, an exposure that transferred control from the person to the spider by allowing the spider to engage in involuntary contact. As *more* exposure may improve therapy outcomes (i.e., extended extinction; McCallum, Kim, & Richardson, 2010), we standardised the duration of therapy and assigned participants to a hierarchy group based upon the last step of the hierarchy they had completed by the end of treatment. In order to enhance the ecological validity of our assessment of return of fear, all participants completed the behavioural approach task (BAT) within a living room. We randomized half the participants to complete the exposure hierarchy in the living room (Same-Context group) and the other half to complete it in a therapist's office (Different-Context group) so that we could test for return of fear after a context change (renewal). We tested for renewal after only a 25-minute delay from treatment so as not to confound renewal with a test for spontaneous recovery (i.e., the return of fear due to the passage of time).

We hypothesized that at post-treatment, participants who completed step 15 would report 1) greater reductions in the probability of harm, 2) more fear reduction, and 3) greater ability to tolerate their reactions to the spider than those who did not make it to Step 15. After a context change, we expected that participants who completed Step 15 would be less likely to experience a return of fear than those who had completed fewer steps. We expected that this would translate into Step 15 participants having the greatest improvements in the number of steps completed and in the level of fear experienced during the follow-up BAT.

**Method**

**Design**

This experiment utilized a 2 (treatment context) × 2 (step completion) × 3 (time) design. Participants fearful of spiders were randomly assigned to one of two experimental treatment context groups (Same-Context or Different-Context). Those in the Same-Context group completed assessments and treatment in a living room. Those assigned to the Different-Context group completed assessments in a living room, but treatment in a therapist's office. The two rooms differed in size, layout, furniture, temperature, and odour.

Participants were categorised into one of two step completion groups (Step 14 or lower; Step 15) based upon which step of the fear hierarchy they completed by the end of treatment. These groups were then compared across three time points: immediately prior to Session 1 (baseline; Time 1); immediately after Session 2 (post-treatment; Time 2); and 25 minutes after the end of Session 2 (follow-up; Time 3). As we had no apriori information regarding how many participants would complete Step 15 within the two sessions, we stopped recruitment after achieving a similar sample size to previous studies examining renewal of spider fear (Mineka et al., 1999; Mystkowski et al., 2002; Rodriguez et al., 1999).

**Participants**

Fifty-five first year psychology students were recruited from 365 students who reported a severe fear of spiders on the Fear of Spiders Questionnaire (score range 54-108; Szymanski & O'Donohue, 1995) and who also denied any heart, respiratory, or neurological problems. Of the 55 participants enrolled into the study, four attended the Time 1 appointment only. The final sample consisted of 46 women and five men, ranging in age from 17 to 47 (*Med* 18, *IQR* = 3). Most participants (75%) were Australian born.

**Materials**

**Physiological activity.** Electrodermal activity (EDA; skin conductance), an objective assessment of spider fear, was measured using a Biopac MP150 system during the Time 1 and 3 BAT. Two pre-gelled, general purpose, high conductivity, Ag/AgCl biopotential electrodes with a circular contact were placed on the palm of one hand after cleaning it with an alcohol swab. The Biopac MP150 system constantly delivered 0.5 volts and the sampling rate for EDA was set at 250Hz. Data were stored using Acq*Knowledge* 4 software (Biopac Systems Inc., Goleta, CA).

**Fear of Spiders Questionnaire (FSQ).** The FSQ consists of 18 statements tapping cognitive, behavioural, and physiological domains of spider fear (Szymanski & O'Donohue, 1995). Each item is rated on a seven-point Likert-type scale from 0 (*strongly disagree*) to 6 (*strongly agree*) with higher scores indicating greater fear of spiders. When using an 8-point scale, Huijding and de Jong (2006) categorized high fear as scores above 55 (47 on a 7-pt scale). The FSQ has demonstrated excellent psychometric properties (Muris & Merckelbach, 1996) and good internal consistency was found in current study (*α* = .85).

**Fear expectancies.**Participants described their worst-case spider scenario (e.g., if a spider crawls freely on me, then it will go inside my body and I will get hurt) and then rated the probability of the expected outcome occurring (0 = *Not at all*, 25 = *Mildly likely*, 50 = *Moderately likely*, 75 = *Very likely*, and 100 = *Extremely likely)*, how much fear they would experience during this situation (0 = *No fear*, 25 = *Mild fear*, 50 = *Moderate fear*, 75 = *Severe fear*, and 100 = *Extreme fear*), andhow much they believed they could tolerate it (0 = *Not at all*, 25 = *Mildly*, 50 = *Moderately*, 75 = *Very much*, and 100 = *Completely*). These ratings were assessed at baseline, post-treatment, and follow-up.

**Fear ratings.**The 0 – 100-point scale identified above also was used to measure fear levels during the BAT.

**Procedure**

The experiment consisted of two lab visits scheduled one week apart. During Visit 1, the experimenter obtained informed consent, connected participants to the psychophysiological equipment in the living room and established a 5-minute resting period. Participants then provided baseline fear ratings and completed the BAT (Time 1), followed by a brief break. Next, participants spent one-hour engaging in the fear hierarchy in their randomly assigned room (Same-Context or Different-Context). During Visit 2 (one week later), participants completed their second, one-hour session of exposure to the spider in their assigned room (Time 2). Afterwards, participants were escorted to the waiting room where they watched one episode of *The Big Bang Theory.* After this 25-minute break, all participants returned to the living room to complete the BAT (Time 3).

Experimenters and therapists were highly trained Psychology Honours students and Master of Clinical Psychology students. In addition to eight hours of training on the study, all experimenters ran at least four practice participants before running participants in this study. For any given participant, the assessor and therapist were two different people and the assessor was blind to the number of steps the participant had completed during treatment. All study procedures received ethics approval from Macquarie University Human Research Ethics Committee (HREC# 5201500955). All authors have abided by the Ethical Principles of Psychologists and Code of Conduct as set out by the APA.

**Behavioural Approach Task (BAT).** The BAT assessed self-reported affect and degree of avoidance toward a live female Australian golden orb weaver spider (*Nephila clavipes)* that was 4.5 cm long with legs outstretched. The spider was housed in a 30cm x 30cm x 30cm clear glass container with a sliding lid that contained air holes. The container sat on top of a round coffee table in a living room. The BAT used in this study was modified from the standard 14-step procedure (Mineka et al., 1999; Mystkowski et al., 2002), such that an additional step was added to the end of the procedure: “*Step 15 - Let the spider walk freely over the body*” (See Table 1).

Participants stood at the door of the experimental room (a living room), approximately 2.5m from the spider before they started the BAT, and were told: “*Now we are going to conduct the approach test. Your job is to get as close to the spider as you can tolerate. If you can let the spider crawl all over you, do that; if not, get as close to that point as you can. You have 2 minutes to approach the spider. Please let me know when you think you cannot go any further*.” The experimenter then uncovered the container with the spider and indicated that the participant could start the BAT. At Time 1, when participants stopped the BAT, they paused for 10 seconds and then reported on their fear rating (Time 1 BAT). During the Time 3 BAT, participants stopped at the Time 1 BAT final distance to report on their fear (Time 3 BAT Fear) before moving onto their final approach distance. EDA activity was monitored continuously.

**In vivo exposure.** Before beginning the exposure hierarchy tasks, the therapist instructed participants that the goal of exposure was to confront a spider for a prolonged period so that they could test their “worst-case scenario” beliefs. Exposure sessions followed the BAT step sequence (see Table 1), and treatment began with the final step reached during the Time 1 BAT. The experimenter modelled each step first and then encouraged participants to do the step. During each step, the experimenter guided participants to focus on their reactions toward the spider and discussed the likelihood that their worst-case scenario would happen and how much they could tolerate their reactions to it. As an example, “You said that if you gave up control and let the spider walk freely on you, that the spider would crawl inside you and that you would get hurt. Right now, how likely do you think that will happen? How well could you tolerate getting hurt?” Participants remained on a step until they indicated that they were unable to learn anything more about their worst-case scenario beliefs. If participants declined to move to the next step, they repeated the current step until they completed 60 minutes of exposure. At the end of both exposure sessions, participants reported on their fear and fear expectancies.

**Scoring and Statistical Analysis**

While EDA was recorded continuously throughout the baselines and the BATs, only the peak (maximum) reading from the last 10 seconds of each baseline (the five minute period preceding each BAT), and from the Time 1 BAT, Time 3 BAT-Initial Step. In order to reduce variance resulting in large individual differences, we then log-corrected EDA. The level of maximum EDA (BATmax) experienced during BAT Time 1 and Time 3 was calculated as the difference between the maximum log EDA during the baseline and the maximum log EDA during its corresponding BAT [e.g., log10(max Time 1 BAT EDA +1) - log10 (max baseline Time 1 +1).

To select covariates, we assessed for potential differences in age and FSQ score between the hierarchy step groups and the context groups at Time 1 using independent samples *t*-tests and, if assumptions were violated, Mann-Whitney U tests. We conducted a Fischer’s exact test to examine differences in gender proportions between groups. We also examined if BAT steps at Time 1 differed between the hierarchy step groups using Mann-Whitney U tests in order to discover if participants’ starting point determined their hierarchy step group status. Differences between groups on other variables at Time 1 were tested as part of the generalized linear mixed models examining treatment efficacy.

As participants’ ratings for fear variables were not normally distributed, we tested generalized linear mixed models using SAS Version 9.4 to examine changes in participants’ fear expectancies from Time 1 to Time 2 (changes across treatment) and from Time 2 to Time 3 (return of fear). Generalized linear mixed models also examined changes from Time 1 to Time 3 in terms of participants’ fear ratings and EDAmax readings at the initial BAT stopping step. Gamma distributions were specified for all worst case scenario fear expectancy ratings, BAT fear ratings, and EDAmax recordings. Fear ratings were transformed by adding one and EDAmax was transformed by adding .05 (minimum value was -.04) because gamma distributions cannot include negative values or values of zero. The main effects of time, hierarchy step, and context were examined, as were all interactions among those variables. Given the unreliability of *p*-values (Cumming, 2013), and the lack of power to identify statistically significant three-way interactions between time, hierarchy step, and context (Dawson & Richter, 2006), both *p*-values and effects sizes were considered when interpreting findings. Cohen’s (1992) recommendations for small (*d* > .20), medium (*d* > .50), and large (*d* > .80) were used to understand the magnitude of these effect sizes. Taylor’s (2015) recommendations were used to compute Cohen’s *d* effect sizes. When computing *d*s examining between group differences in context, mean differences were computed by subtracting Same-Context scores from Different-Context scores; when examining group differences in hierarchy step, mean differences were computed by subtracting the Step 15 group mean from the Step 14 or lower group mean; when examining group differences in time, scores from the earlier time were subtracted from scores at the later time.

**Results**

**Preliminary Analyses**

Of the 51 participants who completed the second session of exposure to the fear hierarchy, 17 stopped at Step 14 or lower and 34 stopped at Step 15. These two step completion groups did not differ in regards to FSQ scores, *t*(49) = 1.00, *p* = .32, or gender proportions, Fisher’s exact test: *p* = 1.00, but the Step 14 or lower group was older, *z* = -2.51, *p* = 0.01, at Time 1 and completed fewer BAT steps at Time 1 (*z* = 3.73, *p* < .001). None of these variables statistically varied across the two treatment context conditions, (FSQ scores: *t*(49) = 1.06, *p* = .29; gender: Fisher’s exact test *p* = 0.18; age: *z* = 1.00, *p* = 0.32; BAT steps at Time 1: *z* = -0.27, *p* = 0.79) at Time 1. Based on these findings, only age was included as a covariate in the remaining analyses. BAT steps at Time 1 was not used as a covariate because BAT steps at Time 2 was our grouping variable, and thus, inclusion of this instrumental variable could increase the bias of an estimated treatment effect (Sauer, Brookhart, Roy, & VanderWeele, 2013). Descriptive statistics are presented in Table 2.

**Worst case scenario ratings: Change from Time 1 to Time 2**

The tests of fixed effects on worst-case scenario ratings are presented in Table 3. For probability ratings, only the effect of time was statistically significant. The effect of time was large for both groups, and the effect size for the Step 15 group was twice as large as the effect size for the Step 14 or lower group (*d* = -.96 vs *d* = -2.08). In examining the effects of treatment on fear ratings, the interaction between time and step completion was statistically significant. At Time 1, differences between the Step 14 or lower group and the Step 15 group indicated a minimal difference (*d* = -.03), but at Time 2, there was a large effect size difference between the Step 14 or lower group and the Step 15 group (*d* = 1.89). When examining the interaction, the Step 14 or lower group evidenced a medium effect size difference between Time 1 and Time 2 (*d* = -.57), while the Step 15 group evidenced a large effect size difference between these time points (*d* = -2.50). In regards to tolerance ratings, the fixed effect for time was statistically significant. At Time 1, there was a large effect size difference between the Step 14 or lower group and the Step 15 group (*d* = -.93), which was maintained at Time 2 (*d* = -.91). Both groups evidenced a large effect size increase in tolerance ratings between Time 1 and Time 2 (Step 14 or lower group: *d* = 1.88; Step 15 group: *d* = 1.88). These findings partially support the hypothesis that the Step 15 group would evidence better outcomes immediately post-treatment. The Step 15 group evidenced larger reductions in their harm beliefs and self-reported fear, but they did not evidence greater improvements in their ability to tolerate their worst-case scenarios.   
**Worst case scenario ratings: Change from Time 2 to Time 3**

When looking for evidence of renewal, none of the coefficients were statistically significant in predicting probability ratings (see Table 4) and none of the groups (i.e., Step 14 or lower/Same Context, Step 14 or lower/Different Context, Step 15/Same Context, Step 15/Different Context) evidenced even a small effect size change over time (*d*s = -.04 to .16), which indicates that harm beliefs did not return after a context change. However, evidence of renewal was found when examining fear and tolerance ratings (see Table 4). Across time, a large, statistically significant effect size difference (*d* = 1.43) for fear ratings occurred between the two Step groups. Regardless of Context, the Step 14 or lower group evidenced minimal change between Time 2 and Time 3 (*d*s = .02 to .09). Yet, individuals who completed Step 15 in the Same-Context (*d* = **-**.29) evidenced a small decrease in fear and those in the Different-Context (*d* = .25) evidenced a small increase in fear from Time 2 to Time 3. When examining tolerance ratings, statistically significant effects occurred for step completion, context, and the interaction between step completion and context (see Table 4). Although the three-way interaction was not statistically significant, examination of effect sizes revealed that the Same Context and Different Context groups who completed Step 15 evidenced minimal change in their tolerance ratings between Time 2 and Time 3 (*d*s = -.02 and -.19, respectively). This was also true for those that completed Step 14 or lower in the Same Context (*d* = -.12); however, those that completed Step 14 or lower in the Different Context evidenced a small effect size reduction in tolerance ratings over time (*d* = -.40). Overall, these results provide partial support for our hypothesis that Step 15 would predict individuals from renewal. Specifically, Step 15 seems may only protect individuals from losing their ability to tolerate their worst-case scenarios after a change in context.

**BAT: Change from Time 1 to Time 3**

Table 3 displays the fixed effects tests examining self-reported and objectively-measured fear at the Time 1 BAT and Time 3 BAT-Initial Step. For self-reported fear, the effect of time was statistically significant. Both groups largely improved over time with the effect size being somewhat larger (but not statistically significantly different) for the Step 15 group (*d* = -1.37 vs *d* = -2.38). In regards to EDAmax, none of the coefficients were statistically significant. The change over time for the Step 14 or lower group was below the cut-off for a small effect (*d* = -.15), but almost moderate in size for the Step 15 group (*d* = -.49). These effect sizes provide some support for the Step 15 group improving to a greater degree than the Step 14 group, but given the lack of statistical significance, conclusions are tentative.

**Discussion**

We found partial support for our hypothesis that high intensity exposure would more effectively treat spider fear than less intensive exposure. Although both groups evidenced extremely large reductions in their self-reported fear from Time 1 to Time 3 (*d*s = -1.37 to -2.38), those who completed the more intensive exposure step (Step 15) fared better in some respects. Consistent with our predictions, at the end of treatment, individuals who completed Step 15 reported that their worst-case scenarios were less likely to occur, and after a context change, they did not lose their ability to tolerate their worst case scenarios as did individuals who completed Step 14 or lower. Yet contradictory to our predictions, Step 15 participants experienced a return of fear after treatment, and thus, lost some of the benefit they received during treatment in regards to greater fear reductions. Thus, the main benefit from completing more difficult exposures may be in reducing harm beliefs and in improving one’s ability to tolerate aversive experiences.

The current study adds to the accumulating research that reducing harm probability estimates and improving one’s ability to tolerate aversive experiences is associated with better exposure therapy outcomes. As spider fear is often based on extreme beliefs about the probability of unexpected and uncontrollable contact with a spider (e.g., it will settle on a part of my body I cannot reach; de Jong & Muris, 2002) and about beliefs of dying or going crazy from panic induced by this contact (Arntz et al., 1993), a fear hierarchy that does not violate these expectancies may not maximally assist individuals in reducing their fear of spiders. Adding exposure steps, such as Step 15 in this study, may allow for greater extinction learning through the generation of larger prediction errors (i.e., targets expectancies to a greater degree) and through increased attention. Step 15 likely involves a more salient conditioned stimulus (CS) than earlier steps and as such, it may encourage individuals to pay greater attention to the CS’s inability to predict the expected unconditioned stimulus (US). According to Pearce and Hall (1980), attention to a CS declines during extinction trials as the CS begins to predict the absence of a US rather than its occurrence.

Öst, Salkovskis, and Hellstrom (1991) recommended almost 30 years ago that individuals engage in behavioural experiments that require them to give up control (e.g., having the spider walk on the back of the head). Later, Öst referred to this practice as overlearning and claimed that it may not be required for good outcomes (Öst, 2012). Relapse has not been reported in studies that have followed Öst’s overlearning recommendations (Öst, 1996; Öst et al., 1997; Öst et al., 1991), but studies that have used other end-points for exposure therapy have shown fear to return after treatment (Andersson et al., 2009; Bandarian-Balooch et al., 2015; Mineka et al., 1999; Mystkowski et al., 2002; Rodriguez et al., 1999; Shiban et al., 2013). The current study, along with a treatment study for panic disorder (Deacon, Kemp, et al., 2013), demonstrates that exposure exercises that allow for more direct tests of harm expectancies may engender better therapeutic outcomes than do routine exposure assignments. Unfortunately, many therapists never use exposure techniques with their clients, and when they do, they often rely on imaginal exposure (Hipol & Deacon, 2012). Negative beliefs about exposure therapy are associated with having less training, using easier exposure activities, and being less likely to encourage continued and increasing contact with a feared stimulus (Deacon, Farrell, et al., 2013). Given that exposure to feared stimuli is an empirically supported principle of change for anxiety, it is fortunate that engaging in a one-day didactic workshop on exposure therapy reduces negative beliefs about exposure therapy (Deacon, Farrell, et al., 2013). However, if remains unknown if therapists who hold negative beliefs about exposure therapy will engage in difficult exposures after such a short training.

Although our study is limited by not assessing for the presence of specific phobia, for its small sample size, and for not randomizing groups to a specific hierarchy step and including a yoked-group to control for duration of treatment, its findings provide preliminary evidence that clients who engage in difficult, high intensity exposures that test their specific fear predictions may have better treatment outcomes than those who only engage in exposures that less optimally violate their fear predictions. Our study also highlights the importance of assessing more than just fear. Although the Step 15 group evidenced a slight return of fear after treatment, they maintained their ability to tolerate fear while the Step 14 and lower group lost some of their ability to tolerate fear. As techniques aimed at preventing renewal are not always effective (Dibbets, Moor, & Voncken, 2013; King, Graham, & Richardson, 2018), it is imperative that therapists focus on increasing their clients’ ability to tolerate aversive experiences. This study showed that Step 15 participants increased their ability to tolerate their worst-case scenarios 4.4 - 4.6 fold, while Step 14 and lower participants increased their ability 3.3 – 3.9 fold. Thus, exposure is a viable method for improving distress tolerance and more intensive exposures may be better at it.

**Required Information**

**Acknowledgements**

This study used the Simulation Hub at Macquarie University to test for return of fear. The Simulation Hub contained a “real” living room and therapist’s office.

**Ethical statements**

All authors have abided by the Ethical Principles of Psychologists and Code of Conduct as set out by the APA http://www.apa.org/ethics/code/. Macquarie University’s Human Research Ethics Committee approved this study (5201500091).

**Conflict of Interest**

Melissa M. Norberg, Amie Newins, Yan Jiang, Jianqiu Xu, Eduard Forcadell, Cristina Alberich, and Brett Deacon have no conflict of interest with respect to this publication.

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| --- |
| Table 1. Behavioural Approach Test (BAT) Steps |
| Step 1 Stand 5 feet from the cage of the spider.  Step 2 Stand 1 foot from the cage and look down at the spider.  Step 3 Place the palm of hand against the closed container near the spider.  Step 4 Stand at a close distance to the spider’s cage and place the palm of hand on either side of the container with face 1 foot away from the container.  Step 5 Open the top cover and look down at the spider, focus on the spider.  Step 6 Watch the spider as it crawls around its cage.  Step 7 Direct the spider’s movement with a small paintbrush 5 times.  Step 8 Touch the spider with a heavily gloved hand 5 times.  Step 9 Put a heavily-gloved hand on the bottom of the cage and let the spider walk over it.  Step 10 Touch the spider with a latex-gloved hand 5 times.  Step 11 Put a latex-gloved hand on the bottom of the cage and let the spider walk over it.  Step 12 Touch the spider with bare fingers 5 times.  Step 13 Let the spider walk on bare hand with arm covered.  Step 14 Let the spider walk on bare hand with arm uncovered.  Step 15 Let the spider walk freely over the body. |

Table 2. Descriptive Statistics by Group

|  |  |  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
|  | **Step 14 or Lower – Same Context**  ***n* = 9** | | | **Step 14 or Lower– Different Context**  ***n* = 8** | | | **Step 15 – Same Context**  ***n* = 18** | | | **Step 15 – Different Context**  ***n* = 16** | |
| **Variable** | ***M*** | ***SD*** | | ***M*** | ***SD*** | | ***M*** | ***SD*** | | ***M*** | ***SD*** |
| Age | 20.00 | 2.87 | 24.00 | | 9.77 | 18.78 | | 2.34 | 20.31 | | 4.33 |
| Baseline FSQ Score | 84.00 | 12.83 | 78.75 | | 18.50 | 79.06 | | 14.66 | 75.25 | | 13.13 |
| Time 1 – WCS – Prob. | 90.00 | 10.90 | 80.63 | | 17.82 | 84.61 | | 17.60 | 87.88 | | 13.26 |
| Time 2 – WCS – Prob. | 28.33 | 29.79 | 46.50 | | 37.90 | 11.72 | | 19.35 | 14.50 | | 19.56 |
| Time 3 – WCS – Prob. | 32.22 | 28.84 | 48.75 | | 37.11 | 12.83 | | 19.49 | 14.38 | | 19.99 |
| Time 1 – WCS – Feara | 92.11 | 11.68 | 96.25 | | 6.94 | 90.00 | | 9.84 | 96.56 | | 5.07 |
| Time 2 – WCS – Fear | 61.11 | 23.29 | 71.25 | | 26.02 | 22.61 | | 22.20 | 17.00 | | 19.49 |
| Time 3 – WCS – Fear | 60.56 | 18.28 | 76.25 | | 18.66 | 17.28 | | 21.48 | 24.25 | | 23.88 |
| Time 1 – WCS – Tol.a | 12.78 | 17.87 | 8.25 | | 17.24 | 20.00 | | 18.37 | 18.63 | | 18.13 |
| Time 2 – WCS – Tol. | 57.78 | 28.84 | 31.88 | | 22.51 | 93.28 | | 9.35 | 88.63 | | 13.12 |
| Time 3 – WCS – Tol. | 50.56 | 23.11 | 26.88 | | 21.03 | 92.28 | | 8.77 | 82.69 | | 18.94 |
| Time 1 – BAT Fear | 81.67 | 17.32 | 86.25 | | 10.26 | 83.06 | | 11.28 | 87.50 | | 12.91 |
| Time 3 – BAT Fear | 19.11 | 16.98 | 40.00 | | 22.20 | 11.39 | | 12.55 | 13.44 | | 20.47 |
| Time 1 – BAT EDAmaxb | 0.13 | 0.09 | 0.24 | | 0.15 | 0.12 | | 0.11 | 0.22 | | 0.15 |
| Time 3 – BAT EDAmaxb | 0.16 | 0.16 | 0.15 | | 0.20 | 0.10 | | 0.08 | 0.12 | | 0.10 |

*Notes*. FSQ = Fear of Spiders Questionnaire; WCS = Worst Case Scenario; Prob. = Probability; Tol. = Tolerance; BAT = Behavioral Approach Test; Step = Final step from the Time 1 BAT; Fear = Fear rating at participant’s final step from the Time 1 BAT; EDAmax = Peak electrodermal activity taken from the last 10 seconds of the BAT minus the peak electrodermal activity taken from the last 10 seconds of baseline.

a One participant was missing fear and tolerance ratings at Time 1.

b One participant was missing EDA data at Time 1, two participants were missing EDA data at Time 3, and one participant was missing EDA data at both Time 1 and Time 3.

Table 3. Tests of Fixed Effects from Time 1 to Time 2 and from Time 1 to Time 3

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Dependent Variable** | **Predictor** | **Estimate** | ***t*** | ***p*** |
| WCS – Prob | Age | -.01 | -.34 | .737 |
|  | **Time** | **-1.17** | **-2.81** | **.007** |
|  | Hierarchy Step | -.07 | -.19 | .852 |
|  | Context | -.08 | -.19 | .852 |
|  | Time\*Hierarchy Step | -.82 | -1.61 | .114 |
|  | Time\*Context | .59 | .96 | .340 |
|  | Hierarchy Step\*Context | .13 | .23 | .817 |
|  | Time\*Hierarchy Step\*Context | -.39 | -.52 | .605 |
| WCS – Feara | Age | .01 | .79 | .432 |
|  | Time | -.41 | -1.41 | .164 |
|  | Hierarchy Step | -.01 | -.03 | .976 |
|  | Context | .01 | .02 | .985 |
|  | **Time\*Hierarchy Step** | **-.96** | **-2.73** | **.009** |
|  | Time\*Context | .10 | .23 | .818 |
|  | Hierarchy Step\*Context | .05 | .13 | .894 |
|  | Time\*Hierarchy Step\*Context | -.45 | -.89 | .381 |
| WCS – Tola | Age | -.01 | -.31 | .759 |
|  | **Time** | **1.64** | **4.48** | **<.001** |
|  | Hierarchy Step | .51 | 1.45 | .154 |
|  | Context | -.62 | -1.48 | .146 |
|  | Time\*Hierarchy Step | -.03 | -.07 | .943 |
|  | Time\*Context | -.03 | -.06 | .952 |
|  | Hierarchy Step\*Context | .58 | 1.13 | .263 |
|  | Time\*Hierarchy Step\*Context | .04 | .05 | .958 |
| BAT Fear at Initial Step | Age | .00 | .02 | .984 |
|  | **Time** | **-1.21** | **-5.45** | **<.001** |
|  | Hierarchy Step | .02 | .10 | .918 |
|  | Context | .06 | .25 | .804 |
|  | Time\*Hierarchy Step | -.38 | -1.38 | .177 |
|  | Time\*Context | .44 | 1.39 | .174 |
|  | Hierarchy Step\*Context | -.00 | -.02 | .988 |
|  | Time\*Hierarchy Step\*Context | -.04 | -.10 | .924 |
| BAT EDAmax at Initial Stepb | Age | -.02 | -1.59 | .118 |
|  | Time | -.16 | .55 | .586 |
|  | Hierarchy Step | -.07 | -.27 | .786 |
|  | Context | .54 | 1.78 | .081 |
|  | Time\*Hierarchy Step | -.31 | -.88 | .384 |
|  | Time\*Context | -.50 | -1.20 | .237 |
|  | Hierarchy Step\*Context | -.06 | -.16 | .877 |
|  | Time\*Hierarchy Step\*Context | .23 | .45 | .655 |
| *Notes*. WCS = Worst Case Scenario; Prob. = Probability; Tol. = Tolerance; BAT = Behavioral Approach Test; Step = Final step from the Time 1 BAT; Fear = Fear rating at participant’s final step from the Time 1 BAT; EDAmax = Peak electrodermal activity taken from the last 10 seconds of the BAT minus the peak electrodermal activity taken from the last 10 seconds of baseline. a One participant was missing fear and tolerance ratings at Time 1. b One participant was missing EDA data at Time 1, two participants were missing EDA data at Time 3, and one participant was missing EDA data at both Time 1 and Time 3. | | | |  |

Table 4. Tests of fixed effects from Time 2 to Time 3.

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
| **Dependent Variable** | **Predictor** | **Estimate** | ***t*** | ***p*** |
| WCS – Prob | Age | .01 | .20 | .844 |
|  | Time | .18 | .74 | .463 |
|  | Hierarchy Step | -.91 | -1.53 | .132 |
|  | Context | .78 | 1.07 | .291 |
|  | Time\*Hierarchy Step | .05 | .18 | .859 |
|  | Time\*Context | -.24 | -.68 | .500 |
|  | Hierarchy Step\*Context | -.53 | -.61 | .545 |
|  | Time\*Hierarchy Step\*Context | .10 | .22 | .827 |
| WCS – Fear | Age | .03 | .81 | .421 |
|  | Time | .03 | .11 | .912 |
|  | **Hierarchy Step** | **-1.50** | **-2.90** | **.006** |
|  | Context | .02 | .04 | .972 |
|  | Time\*Hierarchy Step | -.40 | -1.42 | .162 |
|  | Time\*Context | .09 | .28 | .781 |
|  | Hierarchy Step\*Context | -.42 | -.56 | .579 |
|  | Time\*Hierarchy Step\*Context | .60 | 1.47 | .147 |
| WCS – Tol | Age | .00 | .31 | .757 |
|  | Time | -.05 | -.68 | .498 |
|  | **Hierarchy Step** | **.64** | **3.54** | **.001** |
|  | **Context** | **-.68** | **-3.08** | **.004** |
|  | Time\*Hierarchy Step | .04 | .45 | .654 |
|  | Time\*Context | -.13 | -1.20 | .236 |
|  | **Hierarchy Step\*Context** | **.62** | **2.34** | **.024** |
|  | Time\*Hierarchy Step\*Context | .06 | .43 | .666 |

*Notes*. WCS = Worst Case Scenario; Prob. = Probability; Tol. = Tolerance; BAT = Behavioral Approach Test; Step = Final step from the Time 1 BAT; Fear = Fear rating at participant’s final step from the Time 1 BAT; EDAmax = Peak electrodermal activity taken from the last 10 seconds of the BAT minus the peak electrodermal activity taken from the last 10 seconds of baseline. a One participant was missing fear and tolerance ratings at Time 1. b One participant was missing EDA data at Time 1, two participants were missing EDA data at Time 3, and one participant was missing EDA data at both Time 1 and Time 3.