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Exposure treatment in multiple contexts attenuates return of fear via renewal in high spider fearful individuals

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ABSTRACT

Background and objectives: Research has demonstrated that after exposure treatment, re-exposure to a previously feared stimulus outside of the treatment context can result in renewal of fear. The current study investigated whether conducting exposure treatment in multiple real-life contexts can attenuate renewal of fear.
Methods: Forty-six moderate to high spider fearful individuals were randomly allocated to groups that received exposure treatment in either one context or three contexts. Follow-up testing was conducted one week and four weeks after exposure in the treatment context or a novel context.
Results: Renewal of fear was found for the single extinction context group when exposed to the feared object in a novel context with self-report of fear, heart rate, and behavioural avoidance. However, renewal of fear was attenuated for the multiple extinction context group.
Limitations: The sample included moderate to high spider fearful participants rather than clients with spider phobia, potentially limiting the generalisability of the findings to clinical populations.
Conclusions: Using multiple extinction contexts in combination with other methods of attenuating renewal (e.g., context similarity) may provide a means to reduce the risk of renewal of fear.

Following succesful exposure based treatment of specific phobias, there is a high risk of relapse of anxiety symptoms (Choy, Fyer, & Lipsitz, 2007; Rachman, 1966; Rose & McGlynn, 1997; Wolpe, 1958). Conditioning research has provided strong evidence that the renewal effect is an underlying mechanism responsible for return of fear (Bouton, 2002). Over three decades of laboratory research with animals (e.g., Bouton, 1988; 1993) and humans (Neuman, Boschen, & Waters, 2008) and clinical-analogue research (e.g., Mineka, Mystkowski, Hladek, & Rodriquez, 1999; Mystkowski, Craske, Echiverri, & Labus, 2006)has concluded that a renewal of fear may occur when a feared stimulus is encountered outside of the treatment context. Therefore, it is required to establish methods that can enhance the generalisability of exposure treatment across contexts and thereby attenuate renewal of fear.

Potentially due to methodological differences (Bandarian-Balooch; Neumann, & Boschen, 2012a), laboratory-based research with humans has shown that extinction treatment in multiple contexts does (e.g., Bandarian-Balooch, Neumann, & Boschen, 2012b; Neumann, 2006) and does not attenuate renewal (Neumann, Lipp, & Cory, 2007).[1] Conversely, clinical analogue studies (Rowe & Craske, 1998; Shiban, Pauli, & Mühlberger, 2013; Vansteenwegen et al. 2007) have consistently found that conducting exposure treatment in multiple contexts attenuates renewal of fear when follow up is conducted in novel contexts (synonymous to ABC renewal in laboratory research). Based on the notion that contextual changes include stimulus feature changes (Bouton & Swartzentruber, 1991), Rowe and Craske (1998) conducted exposure treatment with moderate to high spider fearful participants. Modest support was found for the notion that exposure treatment using multiple stimuli (different spiders) enhances the generalisability of exposure treatment.

Vansteenwegen et al. (2007) exposed a sample of spider anxious students to video footage of a spider in multiple filmed contexts (filmed rooms of a house) or one context. During follow up testing

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[1] There are also laboratory based studies with animals where extinction treatment in multiple contexts did (e.g., Chelonis et al., 1999) and did not attenuate renewal (Bouton, García-Gutiérrez, Zilski, & Moody, 2006; Thomas et al., 2009).

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in a novel context, they found a significant renewal of fear as indicated by self-report of fear and skin conductance for the group that was exposed to the video footage of the spider in one filmed context. Moreover, renewal of fear was attenuated for the group that was exposed to the video footage of the spider in multiple filmed contexts.

More recently, Shiban et al. (2013) attenuated renewal of fear in 40 spider phobic individuals using a virtual spider and multiple virtual contexts that differed by background colour (e.g., red vs yellow coloured walls, floor, and ceiling). Although no virtual context change control group was included, self-reported fear and skin-conductance responses revealed significant renewal of fear to a virtual spider was found for those that received exposure treatment in only one virtual context. For those that received exposure treatment in multiple virtual contexts, renewal was attenuated.

The present study aimed to extend the findings reported by Vansteenwegen et al. (2007) and Shiban et al. (2013). Neither study consistently used real-life contextual changes, possibly limiting the applicability of these studies to real-life clinical situations where contexts: a) may vary by multiple sensory cues (e.g., visual, olfactory, and tactile cues), b) may present unique challenges (e.g., handling a spider in the forest may require different skills to handling a spider in a bathroom), c) may vary on the informative value of the present cues (e.g., some spider hunt in dark places and must be approached more cautiously than in the light). Both experience with a task (e.g., Carr & Durand, 1985) and the informative value of contextual cues (e.g., Léon, Abad, & Rosas, 2010) have been found to moderate attention to contextual cues and consequently affect the context dependence of learning.

Shiban et al. (2013) did conduct a behavioural avoidance test (BAT) using a real-life contextual change and spider to examine the generalisability of their virtual reality treatment. However, during this test, group differences were limited to behavioural avoidance (participant-determined distance to the spider) and participants were not instructed to touch the spider, which potentially resulted in ceiling effects on fear renewal. Nevertheless, the single extinction context group was found to be more avoidant of the real-life spider than the multiple extinction context group, showing some evidence of generalisation to real-life contexts and spiders. Additionally, tests for renewal in both Shiban et al. (2013) and Vansteenwegen et al. (2007) were conducted immediately after treatment. Thus, the long-term effects of exposure treatment in multiple real-life contexts using a real-life spider on renewal of fear remain to be determined.

The current study examined whether conducting exposure treatment in multiple real-life contexts with a real-life spider enhances the generalisability of exposure treatment to novel contexts and attenuates renewal of fear. In contrast to previous studies (e.g., Mystkowski et al., 2006), the current study allowed participants to complete any step they were willing at each stage of testing, to enhance the likelihood of observing avoidance. As participants were required to move freely within and between each context, similar to, for instance, Mystkowski et al. (2006), heart rate was used to measure physiological fear.

Participants were randomly allocated to either a control group (BBB), which received treatment in one context (B) and each follow up in the same context (B), a single extinction context group (BEF), which received treatment in one context (B) and each follow up in a novel context (E and F respectively), or a multiple exposure context group (BCDEF), which received treatment in three different contexts (B, C, and D) and each follow up in a different context (E and F respectively). Follow up testing was conducted one week and again four weeks after treatment for all groups. Screening, pre-treatment, and post-treatment tests were conducted in the exposure treatment context for all groups. It was hypothesized that there would be a renewal of fear as indicated by increases in verbal self-report of fear, heart rate, and avoidance ratings for the BEF group. It was also hypothesised that renewal of fear would be attenuated for the BCDEF group.[2]

1. Method

1.1. Participants

Forty-Six[3] moderate to extremely fearful participants (36 females and 10 males; age: $M = 26.52$, range = 18–55, $SD = 10.15$) scoring between 17 and 26 ($M = 20.04$, $SD = .41$) on the Spider Phobia Questionnaire (SPQ; Klorman, Weerts, Hastings, Melamed, & Lang, 1974) participated for treatment benefits and/or in exchange for partial course credit. Of the sample, 47.83% were Australian/New Zealander, 10.86% European, 26.08% Asian, 6.52% North American, 4.34% African, and 4.34% South American. Recruitment was via website advertisement or mass testing sessions using the SPQ during university classes. Participants were not formally assessed for spider phobia but were screened at pre-treatment assessment using behavioural approach tests, the SPQ and a psychological and medical treatment history screening questionnaire. Participants were randomly assigned to the control group, BBB ($n = 15$), single extinction context group, BEF ($n = 16$), or multiple extinction context group, BCDEF ($n = 15$). Group membership was independent of gender, χ^2 (2) = .84, $p = .85$.

1.2. Therapist

The principal author served as experimenter under the supervision of the third author who has extensive experience with using exposure therapy to treat anxiety disorders. The principal author conducted this experiment as part of the research component of his clinical psychology training. To ensure consistency in treatment adherence and pace of treatment across participants, the same exposure hierarchy was used for all participants, a treatment manual was devised and used at each session, and the researchers frequently discussed adherence to the treatment manual.

1.3. Apparatus

The spider was one non-harmful *Nephila plumipes* (Brunet, 1998) (body length approximately 1.5 cm, legspan approximately 10 cm). The same spider (contained in a box or cage in all contexts) was used throughout the experiment. The five experimental contexts were authentic locations within the university campus. The contexts included a psychological treatment room, a bathroom, an office, a Faraday cage, and an outdoor patio. The contexts were counterbalanced across groups and phases of the experiment. The contexts naturally varied by size, lighting, colour, furniture, background noise, odour, and colour (green, pink, blue, yellow, white) of therapy tools (papers, pencils, and clipboards). The colour, material, and content of the tarantula cage varied in a relevant fashion to fit the contexts (e.g., white plastic bin containing shampoo bottles and

[2] No hypothesis was made for the BBB group as it acted as a control group for the BEF and BCDEF groups.

[3] Fifty-four people were initially screened and three were excluded due to insufficient pre-treatment avoidance/fear (e.g., touched the spider at pre-treatment and reported fear below 70 on a 100 points scale) and one person was removed due to psychological conditions (actively receiving psychological treatment for major depressive disorder) and four individuals were removed due to medical conditions (two persons with allergies, one with heart problems, and one with respiratory problems) as determined by responses on a psychological and medical treatment history screening questionnaire.