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The effect of a retrieval cue on the return of spider fear

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ABSTRACT

Background and objectives: Exposure therapy is often used as treatment for anxiety disorders. However, a change in context after exposure can result in fear renewal. This renewal can be attenuated by using retrieval cues stemming from the exposure context. The present study investigated the effect of such a cue in spider-fearful persons.
Methods: Thirty-three participants underwent an *in vivo* exposure session while wearing a bracelet (retrieval cue). After exposure, half of the participants continued to wear the bracelet at home until follow-up (cue groups); the other half handed over the bracelet after exposure (no cue groups). Half of the participants in each group received the follow-up in the exposure context (AAcue and AAnocue); for the other half follow-up was conducted in a novel environment (ABcue and ABnocue).
Results: A switch in context at follow-up resulted in more self-reported anxiety and arousal compared to no switch. However, the retrieval cue did not attenuate this renewed responding.
Limitations: The number of participant per condition was limited, which might have obscured possible retrieval cue effects due to a lack of power. Additionally, information about the retrieval cue was provided after exposure, which might have weakened the association between the cue and exposure therapy. Furthermore, no autonomic measures were incorporated, restricting the effect to self-report measures. For future studies we would recommend to explicitly link the retrieval cue before onset of the exposure session and to incorporate autonomic measures.
Conclusions: Our findings indicate that a switch in context resulted in more self-reported anxiety and arousal, but that a cue stemming from the exposure context did not attenuate this renewal.

1. Introduction

Exposure therapy is a common treatment of many anxiety disorders such as specific phobias (Öst, 1997), obsessive-compulsive disorder (Abramowitz, 1996; Marks, Hodgson, & Rachman, 1975), post-traumatic stress disorder (Foa, Rothbaum, & Furr, 2003), or panic disorder (Barlow, Allen, & Basden, 2007) and involves repeated and systematic exposure to the feared object or situation. Such *in vivo* exposure therapy is usually conducted in a graduated fashion, starting from the least anxiety-provoking aspect to the most anxiety-provoking aspect of the feared stimulus or situation (Öst, 1997). In addition, the therapist often models each step, provides information, and shows how to interact with the phobic stimulus situation.

Although most of the above-mentioned anxiety problems respond robustly to this type of treatment, return of fear is frequently observed (e.g., Choy, Fyer, & Lipsitz, 2007; Mystkowski, Craske, & Echiverri, 2002; Rodriguez, Craske, Mineka, & Hladek, 1999). According to Bouton (2002, 2004) this return of fear is evidence that exposure (or extinction) does not destroy the original learning, but instead new learning takes place. This new learning is more or less confined to the environment or timeframe in which the exposure or extinction session took place (e.g., Bouton, 2002, 2004). Just the mere passage of time or encountering the feared object outside the 'safe' exposure context can trigger the old fear memory and elicit a renewed fear response.

These contextual renewal effects are not restricted to experimental settings with induced fear responses (e.g., Neumann & Kitlertsirivatana, 2010; Neumann & Longbottom, 2008), but can also be observed in (sub)clinical settings such as the return of spider fear (Mineka, Mystkowski, Hladek, & Rodriguez, 1999; Mystkowski et al., 2002; Mystkowski, Mineka, Vernon, & Zinbarg, 2003; Rodriguez et al., 1999). For example, a spider-fearful person is repeatedly exposed to a spider in a therapeutic setting. As a result new learning occurs and the fear response extinguishes. However, encountering a spider outside this context, for example at home, can trigger the old fear memory and lead to a renewed fear response.

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Several ways have been put forward to reduce a renewal effect after an extinction procedure or exposure therapy (see for reviews Bouton, 2002; Havermans & Jansen, 2003). A feasible and promising option that stems from animal studies is the incorporation of extinction retrieval cues (Brooks & Bouton, 1993, 1994). Retrieval cues are distinctive stimuli that are present during the extinction or exposure phase. Outside the extinction context these cues can function as a reminder of the extinction phase and facilitate retrieval of the, often less accessible, extinction memory.

The last decade, the use of retrieval cues in humans has gained attention. Several fear conditioning experiments have been conducted that tested the influence of a retrieval cue using computerized tasks (e.g., Dibbets, Havermans, & Arntz, 2008; Dibbets & Maes, 2011; Vansteenwegen et al., 2006). In these studies a change in context after extinction resulted in renewed responding. In the studies of Dibbets et al. (2008) and Dibbets & Maes (2011), the amount of renewal was attenuated when a retrieval cue stemming from the extinction context was co-present indicating that, at least partially, the extinction memory was retrieved.

Abovementioned studies indicate that a retrieval cue can attenuate fear renewal in a healthy population. However, to our knowledge only one study has tested the clinical relevance of retrieval cues using *in vivo* fear exposure (Culver, Stoyanova, & Craske, 2011). In this study students that were highly fearful of public speaking received an exposure session. The retrieval cues comprised of a white lab coat, a pen, and clipboard; the contexts used were two different rooms. The results indicated that a change in context after exposure resulted in fear renewal (Study 1). However, the authors were unable to find strong effects of the cues in retrieving extinction learning outside the exposure context. Only weak attenuation of renewal was observed; this effect was restricted to a dichotomous analysis of self-report data (Study 2). A replication with larger contextual differences did not reveal any effect of retrieval cues on renewal (Study 3). A possible explanation of the absence of a strong retrieval cue effect is that the cues were not explicitly encoded as part of the exposure context. As a result, the cues could not facilitate the retrieval of the extinction/exposure memory (Culver et al., 2011). Second, the cue was not presented between the exposure and the renewal test (one week later). Presenting the cue between exposure and follow-up has two advantages. First, it might prevent renewal between the exposure and follow-up session in case the feared stimulus or situation is encountered. Second, the retrieval cue can lead to the mental rehearsal of the exposure session. This latter is important as mental reinstatement of the exposure session and context might reduce the return of fear (e.g., Mystkowski, Craske, Echiverri, & Labus, 2006).

In sum, a change in context after extinction or exposure can elicit renewed responding in healthy as well as fearful participants. Evidence is available that a retrieval cue is an effective way to attenuate this renewal in healthy persons. Some, although weak, evidence exists that such a cue might be effective in fearful participants (Culver et al., 2011). The present study aims at extending previous results by testing the efficacy of a retrieval cue in spider-fearful persons. In order to establish a stronger link between the retrieval cue and exposure memory, the retrieval cues were explicitly linked to the exposure session and available between the exposure session and follow-up test.

Based on previous findings, we expected that a change in context after extinction would result in renewed responding and that this renewal would be attenuated by the presence of a retrieval cue.

The present study is highly important as it not only extends the sparse literature on the clinical relevance of retrieval cues, but is also a next step to assess the possibility to implement such cue in clinical exposure sessions.

2. Method

2.1. Participants

Thirty-three spider-fearful participants (1 male, 32 females) with scores between 16 and 27 on the Spider Phobia Questionnaire (SPQ, Klorman, Weerts, Hastings, Melamed, & Lang, 1974) were included. All participants reported a "marked and persistent fear that is excessive or unreasonable, cued by the presence or anticipation of a spider" for at least 6 months during a structured clinical diagnostic interview (SCID-I, Van Groenestijn, Akkerhuis, Kupka, Schneider, & Nolen, 1997).

2.2. Experimental conditions

A 2×2 factorial design was used with context (same versus switch) and retrieval cue (present versus absent) as between-subject factors resulting in four conditions (see Table 1). Participants were pseudo-randomly assigned to one of the four conditions, with the restriction that the persons that reported the highest and lowest amount of spider fear (SPQ scores and SCID-I interview) were equally distributed. Contextual cues were counterbalanced. Half of the participants received the exposure session and follow-up in the same context ($n = 16$, AA), half of the participants received the treatment and follow-up in different contexts ($n = 17$, AB). Half of the participants received a retrieval cue between the two sessions and at test ($n = 17$, cue), whereas no cue was provided for the other half ($n = 16$, no cue).

2.3. Stimuli

Two trained female university employees were used as therapists. The therapists differed regarding age (26 versus 39 years), clothing, posture (voluptuous versus lean), hair color and style (short and blond versus brown and long), and eyes (blue versus brown). Two different rooms on different floors served as contextual stimuli: a lab decorated as a bar (normally part of studies on alcohol cue reactivity) and a standard office room. The labs differed regarding decoration, floor covering, illumination color (yellow versus white light), furniture, and shape. Also the exposure material, except for the spiders, differed (e.g., color and form of the washing basins, brushes, table, etc.).

The retrieval cue was a colored rubber bracelet with a metal fastener. The participant was free to select the preferred color in order to enhance compliance. The bracelets had a distinct citronella odor (see also www.mosquitno.nl) and originally served as mosquito repellents. This citronella odor was easily noticeable and did not decline during the testing period. Using a compound retrieval cue has two advantages. First, two different modalities are activated, increasing the saliency of the retrieval cue and second, in case a part of the compound is unavailable (e.g., clothes covering the bracelet or having a cold) the remainder of the compound can help to retrieve the exposure memory.

Three different spiders served as phobic stimuli: a small giant house spider (*Tegenaria gigantea* 1 cm), a vibrating spider

Table 1
Overview of the experimental design.

	AAcue	AAnocue	ABcue	ABnocue
Session 1 Exposure	A cue	A cue	A cue	A cue
Week between Session 1 and Session 2	Cue	No cue	Cue	No cue
Session 2 Follow-up	A cue	A no cue	B cue	B no cue

Note: A and B represent different contexts, cue and no cue indicate whether the cue was present or absent, respectively. Contexts were fully counterbalanced.