



# Reinstatement of conditioned responses in human differential fear conditioning

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Received 1 December 2004; received in revised form 14 August 2005; accepted 5 January 2006

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## Abstract

The present study aimed at investigating reinstatement of conditioned responding in human classical conditioning using a differential fear conditioning paradigm. Reinstatement is defined as the return of extinguished conditioned responses due to the experience of one or more unexpected USs. As expected the reinstatement group showed reinstatement of US-expectancy while a similar return of conditioned responses was not present in the control group. In the fear ratings a similar pattern was observed. In addition, and in line with previous findings, we found that the more negative the CS+ remained after extinction, the more return of conditioned responding was observed. Clinical implications and suggestions for further research are discussed.

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*Keywords:* Extinction; Reinstatement; Fear conditioning; Evaluative conditioning

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## 1. Introduction

During the last few decades exposure-based therapy has been demonstrated to be an effective treatment for anxiety disorders (e.g., Barlow, 1988; Rachman, 1990). Based on extinction theories, the general principle in this kind of therapy is to repeatedly expose

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patients to the object of their fear. However, despite the effectiveness of this treatment, clinical practice has demonstrated that not all patients remain symptom free at follow-up. A number of successfully treated patients show a return of anxiety symptoms after time has elapsed. For some, this is the basis for a complete restoration of the fear or phobia (i.e. relapse).

Recent conceptualizations of extinction contribute to a better understanding of this return of symptoms. While for a long time extinction was considered to be a process of ‘unlearning’ of a previously learned association (see Donegan, Gluck, & Thompson, 1989), there is now ample evidence to contradict this point of view. Specifically, four phenomena illustrate that extinction is better conceived of as a performance phenomenon that leaves the previously learned associations intact. These phenomena, named ‘spontaneous recovery’, ‘renewal’, ‘rapid reacquisition’ and ‘reinstatement’ (e.g., Bouton & Swartzentruber, 1991; Brooks, Hale, Nelson, & Bouton, 1995) demonstrate that conditioned responses can reappear after extinction, thus indicating that the previously learned association was not unlearned during extinction. Further understanding of these mechanisms and the conditions under which they appear in humans can provide us with important information on how to improve therapy in order to minimize the chances of relapse. In this respect there have been some interesting clinical studies on renewal (Mineka, Mystkowski, Hladek, & Rodriguez, 1999; Mystkowski, Craske, & Echeverri, 2002; Rodriguez, Craske, Mineka, & Hladek, 1999). Renewal is defined as the return of conditioned responses due to a context change after extinction. In these studies some evidence was found for return of fear (ROF) in spider phobics that were tested in a different context than they were treated in. In order to fill in the gap between animal laboratory research and clinical studies, Vansteenwegen et al. (2005) and Vansteenwegen et al. (2006) have been conducting human laboratory research on renewal. They found (ABA) renewal by using a differential fear conditioning paradigm in a student population with the darkness/illumination of the experimenter room as context manipulation (Vansteenwegen et al., 2005). In a next study (Vansteenwegen et al., 2006) they showed how providing extinction-cues during testing in the acquisition context, could attenuate these recovery effects.

The focus of this paper will be on reinstatement. Reinstatement is described as the return of conditioned responses due to the experience of one or more unexpected USs after extinction. Translated to a clinical situation this would mean the following: Imagine a student who develops elevator phobia after experiencing a panic attack in the elevator of the faculty building. After successful exposure treatment this student is again able to take the elevator without expecting a panic attack or being fearful. A few months after treatment, however, the student experiences a panic attack while waiting for an exam in the faculty building. This panic attack (analogous to the reinstating ‘US’ in an experiment) could lead to a re-emergence of the expectancy of a panic attack in the elevator.

Most of the research on reinstatement as a posttreatment source of fear return has been conducted in the animal laboratory (e.g., Bouton & Bolles, 1979; Bouton & Peck, 1989; Brooks et al., 1995; Rescorla & Heth, 1975). An experiment typically includes a number of subsequent phases. During acquisition, the animal learns the contingency between the CS and US, and conditioned responding is established. Next, an extinction phase follows in which the CS is presented alone, without the US. After conditioned responding is extinguished, one or more USs are administered without the CS being present. Following these USs the CS is tested under extinction and a return of conditioned responding is

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