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Overt verbalization of strategies to attend to and retain learning about the threat conditioned stimulus reduces US expectancy generalization during extinction



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ABSTRACT

Exposure-based treatments, such as cognitive behavioural therapy (CBT), are leading psychological treatments for anxiety disorders. However, non-response and relapse are common. Extinction principles underlie exposure-based treatments and emphasise that anxiety declines with repeated exposure to the threat conditional stimulus (CS+) in the absence of the aversive unconditional stimulus (US). Attention allocation towards threat stimuli enhances extinction learning and CBT outcomes. Overt verbalization promotes self-regulated learning by enhancing attention to important stimulus features, encoding and retention. This study examined whether overt verbalization of strategies to attend to and retain learning about the threat conditioned stimulus during extinction enhanced fear reduction and retention. A discriminative Pavlovian conditioning and extinction procedure was used. During acquisition, one geometric shape (CS+) was paired with an unpleasant tone (US), and another (CS-) was always presented alone. During extinction, both CSs were presented alone. Prior to extinction, the Verbalization group was instructed to verbalize strategies to enhance attention to (i.e., “look and learn”) and the retention of learning about (i.e., “lock it in”) the threat conditioned stimulus. The Control group completed ‘extinction-as-usual’ without verbalization strategies. Compared with the control group, overt verbalization (a) prevented generalization of US expectancies to the CS- during initial extinction trials, (b) produced more stable extinction of US expectancies during later extinction trials, and (c) yielded significant declines in self-reported anxiety from immediate to delayed post-extinction assessments. There were no verbalization effects on CS evaluations. Verbalization of attention-learning strategies produced less US expectancy generalization when stimulus relationships were initially uncertain, more stable extinction effects when sustained attention was required and greater anxiety reductions. Verbalization may be a simple, cost-effective way to enhance learning during exposure-based interventions and warrants further research with clinical samples.

1. Introduction

Anxiety disorders are among the most common forms of psychopathology across the lifespan. High prevalence rates (Kessler, Chiu, Delmer, & Walters, 2005) and debilitating outcomes emphasise the need for improved treatments. Exposure-based therapies, such as cognitive-behavioural therapy (CBT), are leading psychological treatments for anxiety disorders, with the vast majority of treatment outcome studies and meta-analyses demonstrating efficacy relative to control or waitlist conditions (Duits et al., 2015;

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Lissek et al., 2005; Olatunji, Cisler, & Deacon, 2010). However, Loerinc et al. (2015) concluded that the average response rate of adults in remission post-CBT was 49.5% and 53.6% at follow-up (1 month to 84 months), highlighting that almost half of individuals receiving CBT either do not experience an initial positive response or will relapse after successful treatment.

Learning models emphasise the role of aversive conditioning in the acquisition of anxiety disorders and extinction processes in treating these disorders (Lissek, 2012; Vervliet et al., 2013). The first phase of aversive conditioning involves a conditional stimulus (CS+) (e.g., dog) being repeatedly paired with an aversive unconditional stimulus (US) (e.g., growl) while another conditional stimulus (CS-) is never paired with the US to permit the examination of differential aversive conditioning. Although the CS+ does not initially induce an emotional response, it eventually becomes a signal for the aversive US which creates a conditioned response (CR), even in the absence of the US. Meanwhile, the CS- becomes a conditioned cue of safety (i.e., US absence). Extinction involves repeated exposure to the CS+ and CS- in the absence of the US, which eventually leads to a decrease in the CR; i.e. responses such as skin conductance magnitudes and subjective evaluations of US expectancy and negative CS evaluations typically decline reflecting a gradual decrease in fear. However, extinction does not erase the original CS+/US association but is thought to create a new CS+/no US safety association such that the CS has two meanings, one that is associated with the US and one that is not (Bouton, 1993). Thus, extinction depends on active inhibitory learning (Craske et al., 2014). A consequence of this dual meaning is that fear can return in response to various mechanisms, including the simple passage of time (i.e., spontaneous recovery) (see Boschen, Neumann, & Waters, 2009, for a review). Therefore, the extent to which fear returns provide the basis on which to infer that extinction depends on active inhibitory learning (Craske et al., 2014).

Utilising self-regulatory strategies during extinction trials that enhance the acquisition of the CS+/no US expectancy and improve fear reduction and retention could provide new directions for intervention research aimed at enhancing exposure therapy outcomes. According to cognitive theories, anxiety impairs attention control by interfering with the balance between top-down and bottom-up attention systems, leading to biases in the allocation of attention to threat stimuli and impairing goal-directed attentional systems (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & Van Ijzendoorn, 2007; Eysenck, Derakshan, Santos, & Calvo, 2007; Mogg & Bradley, 2016; Waters & Craske, 2016). Notably, attention allocation towards threat stimuli predicts enhanced fear reduction following extinction trials (Barry, Griffith, Vervliet, & Hermans, 2015; Waters & Kershaw, 2015) and stronger treatment outcomes following exposure-based CBT (Niles et al., 2013; Waters, Mogg, & Bradley, 2012; Waters, Potter, Jameson, Bradley, & Mogg, 2015). These studies have typically used tasks that assessed preferential attention allocation to threat compared to neutral stimuli and were administered before fear extinction experiments or exposure-based CBT. Nevertheless, on the basis that these studies highlight that attention towards threat stimuli enhances fear reduction following extinction-based procedures, incorporating self-regulatory strategies that enhance attention towards threat conditioned stimuli during extinction may enhance fear reduction and retention.

Distinct from verbalization for the purpose of social communication, verbalization as a self-regulatory strategy facilitates learning by enhancing (a) attention to important features of events and disregarding irrelevant ones, (b) encoding and retention of information via rehearsal processes, and (c) cognitive activity which in turn enhances the retention and retrieval of information (Schunk, 1986). Moreover, *overt* verbalization i.e., vocalizing words *out loud*, has been shown to have the strongest effect on explicit memory compared with other verbal modalities such as mouthing, whispering, silent reading and writing (see Forrin, MacLeod, & Ozubko, 2012). Relative to other modalities, saying words out loud involves encoding the additional dimension of speech which makes the event even more salient and memorable (Conway & Gathercole, 1987; Gathercole & Conway, 1988; Hopkins & Edwards, 1972; Hourihan & MacLeod, 2008). Recent studies have found that the use of overt verbalization strategies to enhance the consolidation of positive search strategies during positively-oriented, attention control training for anxious children was significantly associated with greater improvement in global functioning at post-treatment (Waters, Potter, Jameson, Bradley, & Mogg, 2015; Waters, Zimmer-Gembeck, Craske, Pine, Bradley, & Mogg, 2015; Waters et al., 2016). Moreover, verbalization strategies have been suggested as supplementary strategies during exposure treatment in order to improve long-term extinction effects (Craske et al., 2014). Thus, overt verbalization may be a promising self-regulatory strategy for enhancing attention deployment and learning during extinction trials, and by extension, exposure therapy, in order to enhance fear reduction.

The aim of the current study was to examine whether overt verbalization of strategies to attend to and retain learning about threat conditioned stimuli during extinction enhances fear reduction and retention. The findings will provide experimental evidence to inform intervention research on the use of overt verbalization strategies during exposure-based treatments to enhance outcomes and prevent relapse. It was hypothesised that overt verbalization of distinctive strategies designed to encourage attention to stimuli *during* each extinction trial and to retain that new learning *after* each extinction trial would lead to greater fear reduction and retention post-extinction, compared to an extinction-as-usual control condition (i.e., without the use of verbalization strategies). Specifically, it was predicted that in the context of participants acquiring differential conditioning to the CS+ relative to the CS- during acquisition, participants assigned to the verbalization condition would show (a) more rapid reduction in US expectancies and improvement in valence evaluations of the CS+ such that there would be no significant differentiation between the CS+ and CS- on either measure earlier during extinction trials compared to the control condition, and (b) lower self-reported anxiety ratings at immediate and delayed post-extinction assessments.

2. Method

2.1. Participants

Participants were 63 first year undergraduate students (14 male; 49 female) (mean age = 22.30; SD = 6.30) studying psychology at the Mt Gravatt Campus of Griffith University. Participation lasted 1 h and participants received 1% course credit. Participants were

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