



The effects of the non-contingent presentation of safety signals on the elimination of safety behaviors: An experimental comparison between individuals with low and high obsessive-compulsive profiles

Ioannis Angelakis*, Jennifer L. Austin

University of South Wales, School of Psychology, Pontypridd, Wales, UK

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ABSTRACT

Background and objectives: Safety behaviors, defined as engagement in avoidance within safe environments, are a key symptom of obsessive-compulsive and related disorders. They may interfere with daily functioning and as such their emission should be reduced. The purpose of the current study is to investigate the effects of the non-contingent presentation of safety signals (cues produced by safety behaviors) on reducing safety behaviors in participants self-reporting low and high OCD profiles.

Methods: In total, 32 participants were asked to play a game to gain points and avoid their loss. After having developed avoidance behavior, evidenced by maintaining all of their earned points, they were exposed to safe environments where no point loss was programmed. In Test 1, safety cues (blue bar) were produced contingent on performing safety behaviors. In Test 2, safety cues were presented continuously without any response requirement.

Results: Findings demonstrated that high OCD group displayed higher rates of safety behaviors than low OCD group. However, exposure to the non-contingent presentation of safety signals eliminated their emission in both groups.

Limitations: Future studies need to evaluate the effects of different non-contingent schedules on the suppression of safety behaviors.

Conclusions: These findings contribute to the literature by demonstrating that non-contingent introduction of safety signals eliminated safety behaviors completely, even in high OCD participants, who performed safety behavior at higher rates. Such a treatment protocol may ameliorate exposure therapy in which response prevention constitutes a key element and is generally associated with increased drop-out rates.

Avoidance is defined as behavior that prevents the onset of an aversive or unfavorable outcome, whereas escape removes the presence of a threatening stimulus or event (Dinsmoor, 1954, 1977). Avoidance and escape can be either overt (e.g., running away or removing a painful stimulus) or covert (e.g., creating pleasant mental pictures). By default, engagement in these behaviors reduces or eliminates the fear or distress that a person feels, thus strengthening response emission. When avoidance or escape occurs frequently in environments that are free from sources of aversive stimulation (i.e., “safe” environments), these responses are referred to as safety behaviors (e.g., Salkovskis, 1991, 1996). Safety behaviors initially elicit pleasant emotions, such as a sense of security; however, in the long-term, they may serve to prevent the individual from engaging in other productive activities. For example, the time expended repeatedly cleaning a surface or checking to ensure a door has been locked may prevent the person from engaging in

social or recreational activities. Safety behaviors constitute a key element of a number of psychological conditions, including obsessive-compulsive disorder (OCD; American Psychiatric Association [APA], 2013).

OCD is a serious mental health condition that is characterized by repetitive overt and covert behaviors that cause distress, apprehension, or interfere with a person's everyday functioning (APA, 2013; Veale & Roberts, 2014). These overt or covert acts can be obsessions (e.g., intrusive recurrent thoughts), compulsions (e.g., uncontrollable urge to behave in a certain way), or both. Obsessions usually serve to provide a source of aversive stimulation, especially in situations where danger does not explicitly exist. For example, obsessions might include excessive focus on moral or religious ideas or cleanliness. Compulsions, on the other hand, are behaviors that reduce the anxiety produced by obsessions, and might include ordering, counting, checking and

* Corresponding author. University of South Wales, School of Psychology, Pontypridd, Wales, CF37 1DL, UK.
E-mail address: ioannis.angelakis@southwales.ac.uk (I. Angelakis).

cleaning (APA, 2013; Stasik, Naragon-Gainey, Chmielewski, & Watson, 2012). Compulsions may function as avoidance behaviors that reduce threat or safety behaviors that elicit a sense of security (Rachman, Radomsky, & Shafran, 2008). However, the motivation for performing these behaviors may differ across situations and/or individuals. This differentiation is important, as performing compulsions to avoid a perceived unwanted outcome may render their emission more resilient than performing them to achieve a goal (e.g., Meulders, Van Daele, Volders, & Vlaeyen, 2016).

OCD affects a substantial proportion of the population and epidemiological studies suggest its lifetime prevalence to vary between 1.5% and 3.5% (Angst et al., 2004; Crino, Slade, & Andrews, 2005; Subramaniam, Soh, Vaingankar, Picco, & Chong, 2012). Further, as many as 28.2% of the general population have reported OCD symptoms at least once in their lifetimes (Ruscio, Stein, Chiu, & Kessler, 2010). One of the most well-researched treatments for OCD is exposure and response prevention (ERP), which has produced durable effects across a wide range of OCD symptoms (Olatunji, Davis, Powers, & Smits, 2013; Rosa-Alcázar, Sánchez-Meca, Gómez-Conesa, & Marín-Martínez, 2008; Öst, Havnen, Hansen, & Kvale, 2015). In ERP, the sufferer is exposed to situations that elicit anxiety and evoke obsessive thoughts, but is prevented from engaging in compulsions (e.g., Rachman et al., 1979). Repeated exposure to these situations reduces anxiety because the aversive event does not occur (i.e., extinction learning) or because new associations are developed by pairing the feared stimulus with a harmless one (Bouton, 1993; Craske, Treanor, Conway, Zbozinek, & Vervliet, 2014).

Although exposure treatments have been proven successful in treating anxiety and obsessive-compulsive disorders (e.g., Deacon & Abramowitz, 2004), these treatments are not without their limitations. For example, response prevention, which has been proposed as the key element in treating OCD-related conditions (Abramowitz, 1996), is generally associated with greater refusal (Kozak, 1999) and drop-out rates (Foa et al., 2005). A recent meta-analysis found that the dropout rate for ERP in OCD patients is lower (14.7%) than has been reported in previous studies (25%; Abramowitz, Taylor, & McKay, 2009). This rate is comparable to attrition estimates for other conditions, such as depression, and for other treatments, including cognitive therapy (Ong, Clyde, Bluett, Levin, & Twohig, 2016). Although these rates are lower than previously estimated, they still indicate that as many as one sixth of those who suffer from OCD and seek treatment will remain untreated.

To improve treatment acceptability and reduce drop-out rates, a growing body of research has examined the judicious use of safety behaviors, defined as their prudent use at early treatment stages (see Rachman et al., 2008). For example, Rachman, Shafran, Radomsky, and Zysk (2011) found that the combination of exposure to contaminants (rubbing the bottom of one's shoe) and the use of safety behaviors (the use of a wipe) significantly reduced fear of contamination in a student population reporting contamination fears. These results were slightly superior to the ones produced by those who were exposed to contaminants, but did not engaged in safety behaviors. However, those who engaged in safety behavior were more likely to report transient return of mild fear, suggesting that treatments that employ safety behaviors may need further refinement.

Milosevic and Radomsky (2013a) examined the efficacy of a cognitive rationale with the use of safety behaviors on reductions of fear of spiders. Participants were instructed to approach spiders with the primary aim of disconfirming their negative beliefs about them. Results showed that those who were offered safety items (e.g., gloves and jackets) approached the spider more closely than those who did not. However, participants from both groups demonstrated comparable declines in their negative beliefs regarding spiders. These results are consistent with findings suggesting that engagement in safety behaviors does not necessarily preclude extinction of the feared stimulus, evidenced by initial greater reductions in fear and greater proximity of the

feared stimulus (Hood, Antony, Koerner, & Monson, 2010; Milosevic & Radomsky, 2008; Sy, Dixon, Lickel, Nelson, & Deacon, 2011; van den Hout, Engelhard, Toffolo, & van Uijen, 2011). Thus, their use has been associated with enhanced treatment acceptability (Levy & Radomsky, 2014). However, the extensive use of safety behaviors may not be beneficial and fears may eventually return when the person stops performing them (Lovibond, Davis, & O'Flaherty, 2000; Powers, Smits, & Telch, 2004; Volders, Meulders, de Peuter, Vervliet, & Vlaeyen, 2012). Therefore, more research is needed to further understand the nature of safety behaviors and refine their use in exposure treatment protocols (e.g., Thwaites & Freeston, 2005).

It is well established that safety behaviors are maintained not only via the elimination of perceived threats, but also through the production of either external or internal cues which have been correlated with the absence of feared stimuli (Lohr, Olatunji, & Sawchuk, 2007). These cues are commonly referred to as safety signals (Angelakis & Austin, 2015a, 2015b; Engelhard, van Uijen, van Seters, & Velu, 2015; for a review on animal literature see; Dinsmoor, 2001). It has been proposed that safety signals function as inhibitory conditioned cues that prevent extinction of the feared stimulus, because they predict the absence of the primary aversive events and thus retain the emission of the behaviors that produce them (e.g., Soltysik, Wolfe, Nicholas, Wilson, & Garcia-Sanchez, 1983). The reinforcing effects of safety signals may explain why OCD patients have an elevated fear of contamination in the absence of physical contact with pollutants, or that they may not feel clean even after repeatedly washing (Rachman, 2004). In everyday life, a range of external stimuli may come to function as safety signals, including sounds, odors, material items (e.g., a cross or a "lucky" shirt), or even human figures (e.g., a trusted companion). Internal stimuli, such as autonomic responses, also may acquire capacity to function as safety signals. It is possible that the introduction of these signals independent of the emission of safety behavior (i.e., non-contingent presentation) may serve as a method of judicious use of safety behavior in exposure therapy.

Non-contingent or response independent presentation of events (Rescorla & Skucy, 1969) is a widely used method for treating aberrant behavior in individuals with (Hanley, Piazza, & Fisher, 1997) and without (e.g., Austin & Soeda, 2008) developmental disorders. In non-contingent preparations, highly preferred stimuli (e.g., attention) are delivered on fixed (Vollmer, Iwata, Zarcone, Smith, & Mazaleski, 1993), variable (Sprague, Holland, & Thomas, 1997), or continuous (Hanley et al., 1997) time schedules independent of the organism's behavior. Continuous or frequent presentations of these events serve to abolish the deprivation associated with them, such that the behaviors typically used to produce those events become less frequent or cease completely (Lalli, Casey, & Kates, 1997; Vollmer et al., 1993). Similar preparations and outcomes have been observed in psychopharmacology. For example, Markou, Arroyo, and Everitt (1999) demonstrated that the non-contingent cocaine administrations of a dose equal to or higher to the one administered in baseline sessions produced satiation effects in a rat-analogue example, evidenced by lack of engagement in cocaine-seeking behavior. Those animals who received cocaine contingent on emission of required responses, including those who received non-contingent doses lower to those administered in baseline, showed an increased cocaine-seeking behavior. These findings demonstrate the potential effects of the non-contingent presentations of reinforcing events on reducing the emissions of behaviors that produce them.

A similar treatment protocol designed to reduce or eliminate the engagement in safety behaviors in those with compulsive or related behaviors has yet to be examined. It is possible that a treatment based on the non-contingent presentation of stimuli associated with safety may facilitate the abandonment of safety behaviors, and further improve the acceptability of exposure treatments. The present study examined (1) the extent to which the production of external safety signals maintained engagement in safety behaviors in danger-free environments, and (2) whether non-contingent presentation of safety signals

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