



Information processing in contamination fear: A covariation bias examination of fear and disgust

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ABSTRACT

The current study represents the first examination of covariation biases in contamination fear. Using an undergraduate sample we examined covariation bias for specific emotion outcomes (fear specific and disgust specific) associated with contamination stimuli in high contamination fear (HCF; $n = 32$) and low contamination fear (LCF; $n = 30$) individuals. Following random stimulus-outcome presentation participants provided estimations on the proportion of each presented stimulus-expression pairing. Analyses revealed a specific bias for the over-estimation of fear *and* disgust contingencies among the HCF group, but not the LCF group. The current study also revealed a specific covariation bias among HCF, not LCF, participants to over-estimate the contingency between contamination stimuli and fear outcomes, not disgust outcomes. Further, results indicate that HCF individuals significantly under-estimate the covariation among contamination stimuli and safety outcomes compared to LCF participants. These findings are discussed in terms of theoretical implications for information processing biases in anxiety disorders.

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Anxiety disorders are among the most prevalent of psychological disorders (Ohayon, 2006). The American Psychiatric Association (2000) suggests that approximately 2.5% of the population will meet diagnostic criteria for obsessive compulsive disorder. Additionally, studies suggest that approximately half of individuals with OCD report contamination fears (Rasmussen & Eisen, 1992). Contamination fear is defined as the persistent fear of being tainted or impure through real or perceived contact with a contaminated object such as a dirty person or place

(Rachman, 2004). Indeed, persistent contamination fears mediate avoidance and escape behaviors (e.g., excessive washing). Studies have suggested further that disgust and fear are prominent emotions within several anxiety disorders including OCD-contamination fear (Deacon & Olatunji, 2007). Additionally, previous research also indicates that treatment of OCD individuals experiencing contamination fears is less effective compared to non-contamination fearful OCD patients (Cohelo & Whittal, 2001). Reduced treatment efficacy may be due to the interactive or additive effects of pathological levels of disgust in relation to fear.

There has been emerging research interest in the role of disgust in anxiety disorder etiology (Olatunji & Sawchuk, 2005). This recent interest follows from findings indicating that the primary function of disgust is to protect the self from various forms of contamination (Matchett & Davey,

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1991; Woody & Teachman, 2000). Consequently, disgust/contamination-relevant outcomes rather than fear/harm-relevant outcomes may be most pertinent to an understanding of the maintenance of contamination-relevant OCD and other psychological disorders that involve a significant disgust component.

Mowrer's two-factor conditioning model (1960) has been readily applied as a pathogenic explanation for numerous anxiety disorders over the years including obsessive-compulsive disorder (OCD; cf., Taylor, 2007). According to this model, pathological fears initially develop through a classical conditioning process where, for example, a contamination stimulus is paired with illness or some otherwise aversive experience. This contamination fear is then maintained through an operant conditioning process, specifically through the principles of negative reinforcement. Such a process may take the form of excessive washing in order to avoid illness or reduce adverse emotions such as fear or disgust.

Mowrer's two-factor model fits well with a behavioral theory of anxiety; however, its explanatory power has been questioned in the etiology of OCD-contamination fears. For example, Jones and Menzies (1998) found that OCD-washers and control participants do not report significant differences in terms of conditioning experiences. This finding calls into question the function of classical condition in the etiology of contamination fears. A number of explanations might account for this finding (for a review see Mineka & Öhman, 2002). Nevertheless, additional, non-associative theories (e.g., cognitive theory) have been proposed to account for the limitations of Mowrer's theory to provide a more comprehensive account of fear-based etiology. One possible etiological pathway to contamination fear is the perceived covariation between contamination stimuli and aversive outcomes. Accordingly, inaccurate contingency perception may contribute to the etiology and maintenance of OCD-contamination fears through reinforcing danger expectancies and strengthening associative learning contingencies (e.g., Mineka & Sutton, 1992).

Further complicating matters are the relatively recent findings that the emotion of disgust, in addition to fear, assumes a functional role in contamination fears (e.g., Olatunji, Lohr, Sawchuk, & Tolin, 2007; Olatunji, Smits, Connolly, Willems, & Lohr, 2007; Olatunji, Williams, et al., 2007). Unlike fear, the emotion of disgust has yet to be paired with an environmental UCS. For example, children at a young age display characteristic fear responses to environmental stimuli such as loud noises (cf. Merckelbach & de Jong, 1996), however they fail to react to typical core disgust elicitors such as excrement until a later age (cf. Rozin, Haidt, & McCauley, 1993) suggesting disgust stimuli do not contain innate properties and are therefore conditioned stimuli. Accordingly, conditioning experiences and individual biases (e.g., information processing biases) which may strengthen conditioning occurrences may be particularly functional in disgust-based disorders.

Information processing theory posits that anxious or fearful individuals exhibit a tendency toward biased interpretations of threat stimuli (e.g., McNally, 1996). Thus, information processing biases (i.e., attention, interpretation, & memory) are implicated as etiological factors

in anxiety disorders, acting both as cognitive diatheses and maintenance factors of pathological anxiety states (Beck & Clark, 1997). Currently, there is limited research examining information processing in contamination-relevant OCD. The literature has yet to examine the phenomenon of covariation bias within this population. Moreover, despite empirical findings indicating that both fear and disgust mediate aversions to several anxiety disorders (cf. Woody & Tolin, 2002); very little research exists examining the information processing of disgust in addition to the information processing of fear. Since contamination fearful individuals experience both fear and disgust in response to contamination stimuli (e.g., Olatunji, Sawchuk, Lohr, & de Jong, 2004), a thorough examination of information processing biases in a contamination fearful population necessitates inclusion of both fear and disgust relevant stimuli.

Covariation bias refers to the propensity to perceive an inaccurate relationship between two events (Chapman & Chapman, 1969). For example, spider phobic individuals might perceive an overestimated relation between the presentation of a spider and pain, compared to non-phobic individuals. Congruent with information processing theory, covariation biases are hypothesized to function as maintenance and pathogenic factors for anxiety disorders by reinforcing harm expectations and strengthening learning contingencies (e.g., Mineka & Sutton, 1992). A number of studies have tendered support for this prediction (e.g., de Jong, Merckelbach, & Arntz, 1995; de Jong, Van den Hout, & Merckelbach, 1995; Tomarken, Mineka, & Cook, 1989). The typical covariation methodology requires the presentation of several types of stimuli (e.g., snake, knife, landscape pictures) immediately followed by several types of paired outcomes (e.g., electric shock, tone, nothing) (e.g., Tomarken et al., 1989). Each picture/outcome pairing occurs in equal frequency. Following repeated stimulus/outcome presentations the participants are asked to estimate the overall percentage of trials in which each stimulus was presented with each outcome. Results characteristically yield an over-estimated covariation bias for fear-aversive stimulus-outcome pairings compared to fear-neutral pairings. Further, a number of studies indicate that that fearful individuals provide more biased covariation estimates compared to less fearful individuals (de Jong, Merckelbach, et al., 1995; de Jong, Van den Hout, et al., 1995; Kennedy, Rapee, & Mazurski, 1997).

Two studies to date have examined disgust-relevant outcomes in anxiety within a covariation paradigm. de Jong and Peters (2007a) examined covariation bias within a sample of blood-injection-injury (BII) fearful and non-fearful individuals. They found that neither high nor low BII fearful individuals preferentially reported covariation of BII stimuli with fear or disgust outcomes. In a series of related studies, Pury and Mineka (1997) also examined covariation estimates among high and low BII fear cohorts. They found that all participants, regardless of prior fear, displayed a bias to over associate BII stimuli with fear outcomes (i.e., shock). This finding suggests feared outcomes are associated with fearful and disgusting stimuli; however they did not include a disgust specific outcome. An additional and related study examined covariation of

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