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Effects of Experienced Disgust on Habituation During Repeated Exposure to Threat-Relevant Stimuli in Blood-Injection-Injury Phobia

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Despite growing evidence implicating disgust in the etiology of blood-injection-injury (BII) phobia, the relevance of disgust for exposure-based treatment of BII phobia remains largely unknown. Individuals with BII phobia were randomly assigned to a disgust (view vomit videos) or neutral activation (view waterfall videos) condition. They were then exposed to 14 videotaped blood draws, during which fear and disgust levels were repeatedly assessed. Participants then engaged in a behavioral avoidance test (BAT) consisting of exposure to threat-relevant stimuli. Examination of outcome comparing the identical first and last blood-draw clips revealed that fear and disgust toward blood draws was significantly reduced in both groups. Disgust levels were also found to be more intense for the video stimuli relative to fear levels whereas the opposite was true for BAT stimuli. Contrary to predictions, the disgust induction did not enhance reductions in negative responses to the target video or reduce behavioral avoidance. Growth curve analyses did show that individuals with BII phobia exposed to the disgust induction showed greater initial fear levels during repeated exposure than those in the neutral condition. However, this effect was not consistently observed across different analytic approaches. Changes in fear during exposure were also found to be independent of changes in disgust but not vice versa, and greater initial fear levels during repeated exposure to threat was associated with fear and disgust levels during the BAT. The implications of these findings for conceptualizing the role of disgust in etiology and treatment of BII phobia are discussed.

Keywords: disgust; blood; phobia; exposure; habituation

BLOOD-INJECTION-INJURY (BII) phobia is characterized by an excessive and irrational fear and avoidance of specific situations (e.g., hospitals), stimuli (needles), and procedures (surgery; Marks, 1988), impacting approximately 4% of the general population (Agras, Sylvester, & Oliveau, 1969; Costello, 1982). Serious health consequences may ensue from this phobia (Hamilton, 1995) as individuals may delay or avoid various medical procedures, such as routine preventive checkups, diabetic insulin injections (Mollema, Snoek, Ader, Heine, & van der Ploeg, 2001), or intravenous chemotherapy (Harris, Jones, & Carey,

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2009). Similar to other phobias, BII phobia is thought to develop through multiple pathways including direct conditioning, observational learning, or receiving fear-relevant information (Kleinknecht, 1994). Unlike most other phobias, however, the experience of disgust appears to be a core feature of BII phobia (Olatunji, Cisler, McKay, & Phillips, 2010).

Several lines of evidence support disgust as an important emotion in the phobic experience for BII-related concerns. For example, exposure to BII stimuli is often accompanied by the experience of nausea and production of a disgust facial expression (Lumley & Melamed, 1992). Studies have also shown that phobic individuals respond to images of BII-relevant stimuli with fear and disgust, with disgust being the dominant emotional response when compared directly to fear (Sawchuk, Lohr, Westendorf, Meunier, & Tolin, 2002; Tolin, Lohr, Sawchuk, & Lee, 1997). Individuals with BII phobia have also been characterized by a heightened "disgust sensitivity," with responses to both phobia-relevant and general disgust elicitors with greater disgust than controls (de Jong & Merckelbach, 1998). Elevated disgust reactions among individuals with BII phobia has also been observed on measures of behavior (Olatunji, Connolly, & David, 2008) and information processing (Sawchuk, Lohr, Lee, & Tolin, 1999). Neuroimaging research has also shown that those with BII phobia show stronger occipital activation within the right cuneus and lingual gyrus than controls during initial viewing of disgust images (Schienle et al., 2003). This finding suggests that specific areas of the brain appear to be more sensitive to disgust content among individuals with BII phobia.

A review of the literature suggests that disgust is a core feature of BII phobia and elevated disgust sensitivity may be considered as a relevant risk factor for BII phobia (see Cisler, Olatunji, & Lohr, 2009, for review). Phobic behavior toward BII stimuli may be maintained by a combination of overestimation of perceived harm during contact with and avoidance of the disgust-evoking features of the phobic object itself. Although not without debate (see Gerlach et al., 2006; Olatunji, Williams, Sawchuk, & Lohr, 2006), some have even argued that the fainting response observed in nearly 75% of patients with BII phobia may be partially accounted for by heightened disgust levels (Page, 1994, 2003); a possible index of excessive parasympathetic activation (Stark, Walter, Schienle, & Vaitl, 2005). Although it remains unclear if the fainting response in BII phobia can be directly accounted for by disgust, it is possible that responses to threat in BII phobia is characterized by a "disgust structure" akin to the "fear structure" posited by emotional processing theory (EPT; Foa & Kozak, 1986). That is, the "phobic structure" in BII phobia may consist of appraisals of threat-relevant stimuli as uncontrollable, unpredictable, dangerous, *and* disgusting.

According to EPT, the degree to which exposure reduces voidance is proportional to the amount of information presented during exposure that is incompatible with the "fear structure," once that fear structure becomes activated. The fear structure consists of stimulus propositions, response propositions, meaning propositions, and interrelations between these propositional networks. Thus, fear reduction is facilitated through the weakening of the associations between the propositional networks. Although exposure-based treatments are efficacious for the treatment of BII phobia (Ayala, Meuret, & Ritz, 2009), it has been shown that 20 to 60% of individuals with BII phobia do not achieve clinically significant improvement at posttreatment (e.g., Öst, Fellenius, & Sterner, 1991; Öst, Hellstrom, & Kaver, 1992). Research has shown that the propositional networks that motivate avoidance in BII phobia also consist of disgust-related information (Cisler et al., 2009; Olatunji et al., 2010). Recent research comparing the decline in fear and disgust during repeated exposure to threat-relevant stimuli in BII phobia found that while exposure led to significant declines in both fear and disgust across trials, the decay slope observed for fear was significantly greater than that for disgust (Olatunji, Smits, Connolly, Willems, & Lohr, 2007). These patterns of findings suggest that disgust in BII phobia may be more resistant to extinction than fear and perhaps targeting disgust in the context of exposure-based treatment for BII phobia could potentially result in better outcomes.

One hypothesis is that exposure-based interventions may be enhanced by inclusion of trials designed to desensitize other negative emotional states, like disgust, that co-occur with fear (Woody & Teachman, 2000). Consistent with the basic tenant of EPT, direct activation of the phobic structure appears necessary for habituation to occur (Foa & Kozak, 1986). Furthermore, activation can be enhanced through maximizing the concordance between the threat-relevant exposure stimuli and the BII phobia structure. Accordingly, evoking the experience of disgust in BII phobia may facilitate access to the phobic structure, resulting in greater activation, and hence, potentially greater habituation during repeated exposure.

The present study builds on research on the affective correlates of BII phobia in examining the impact of disgust activation on reducing fear and disgust during repeated video exposure to threat-relevant stimuli among individuals with BII phobia. Those with BII phobia randomly assigned to a disgust activation