



## Evaluative conditioning of fear and disgust in blood-injection-injury phobia: Specificity and impact of individual differences in disgust sensitivity

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### ABSTRACT

The present study examines whether the repeated pairing of neutral facial expressions with phobic-relevant stimuli differentially influences evaluative ratings of fear and disgust between analogue blood-injection-injury (BII) phobic ( $n = 40$ ) and non-phobic ( $n = 40$ ) participants. Consistent with prior research, BII phobics reported greater disgust sensitivity than non-phobic participants even after controlling for between group differences in anxiety symptoms. Results from the evaluative conditioning experiment indicated that pre- to posttest increases in fear ratings were only marginally greater for phobic compared to non-phobic participants. However, increases in disgust from pre- to posttest were greater for phobic compared to non-phobic participants and greater for neutral expressions that were paired with threat-relevant stimuli compared to stimuli not paired with threat-relevant stimuli. Subsequent analysis also indicated that pre- to posttest increases in disgust ratings of neutral expressions that were paired with threat-relevant stimuli was moderated by disgust sensitivity levels among phobic and non-phobic participants. Heightened fear and disgust ratings were subsequently reduced by an extinction procedure. Implications of present findings in understanding the role of fear and disgust in BII phobia are discussed.

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Examination of comorbid fear and disgust in blood-injection-injury (BII) phobia has gained increased attention in the research literature (Koch, O'Neil, Sawchuk, & Connolly, 2002; Olatunji, Lohr, Sawchuk, & Westendorf, 2005). Although fear and disgust consist of readily distinguishable physiological, behavioral, and subjective dimensions (Olatunji & Sawchuk, 2005; Woody & Teachman, 2000), their co-occurrence in BII phobia has been a rather consistent finding (Olatunji et al., 2005; Sawchuk, Lohr, Tolin, Lee, & Kleinknecht, 2000). Indeed, studies generally show that BII phobics report higher levels of disgust than fear upon exposure to phobic-relevant stimuli (e.g., Sawchuk, Lohr, Westendorf, Meunier, & Tolin, 2002; Tolin, Lohr, Sawchuk, & Lee, 1997). As a result, it has been argued that disgust may play a more pivotal role than fear in BII phobia (Page, 1994; Rachman, 1990). In support of this notion, facial expressions of blood phobics upon exposure to surgical films have been found to be more associated with disgust rather than

fear (Lumley & Melamed, 1992). Furthermore, there is some evidence suggesting that disgust may explain fainting symptoms commonly observed among individuals with BII phobia (Page, 2003).

Elevated disgust responding in BII phobia has been observed in various contexts. For example, Sawchuk, Lohr, Lee, and Tolin (1999) found that BII phobic participants were more likely to complete general disgust-related word stems than non-phobic participants, suggesting an implicit memory bias towards disgust. Diminished medial prefrontal cortex activity among BII phobics, compared to controls, has also been observed for threat-relevant and disgust inducing images suggesting reduced cognitive control of disgust among BII phobics (Hermann et al., 2007). It has been suggested that propensity towards experiencing stronger feelings of disgust towards threat-relevant stimuli in BII may be due to heightened 'disgust sensitivity.' Disgust sensitivity has been described as a genetically based personality trait that should be viewed as a specific vulnerability factor for certain anxiety disorders and is marked by the propensity towards experiencing disgust (Muris, 2006). Indeed, questionnaires assessing disgust

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sensitivity (e.g., Disgust Scale; Haidt, McCauley, & Rozin, 1994) have been found to be positively correlated with measures of BII phobia (Sawchuk et al., 2000; Tolin et al., 1997).

While existing literature has been largely invested in examining affective responses to phobic-relevant objects, much less is known about mechanisms of learning that may contribute to the acquisition of disgust-related associations in BII phobia. In addition to reliable differences in physiological, behavioral, and subjective dimensions (Woody & Teachman, 2000), fear and disgust may also be distinguished by differences in learning mechanisms. Learned pathways to fear acquisition include classical conditioning, observational learning, and negative information transfer (Rachman, 1977). Although disgust may also become associated with stimuli through similar learning mechanisms (Olatunji & Sawchuk, 2005), evaluative conditioning (EC) has been proposed to play a more prominent role in the acquisition of disgust (Schienle, Stark, & Vaitl, 2001). EC is based upon an unmediated and non-cognitive appraisal of stimuli along dimensions of like/dislike, good/bad, or pleasant/unpleasant (Martin & Levey, 1987). The assignment of either a positive or negative valence to a previously neutral stimulus may serve an adaptive function (McKay & Tsao, 2005). Such evaluative appraisals may serve an adaptive function through rapid information processing and facilitating danger-related avoidance. EC may be particularly functional in BII phobics as a mechanism of avoiding specified objects or situations in which fainting may occur. Experimentally, EC theory proposes that contingent presentations of a subjectively neutral stimulus (conditioned stimuli; CS) with a positive or negative stimulus (unconditioned stimuli; UCS) will result in an affective change of the neutral stimulus in the direction of the UCS (De Houwer, Thomas, & Baeyens, 2001).

The EC paradigm may be a useful methodology for examining disgust-based learning and acquisition (McKay & Tsao, 2005). For instance, Rozin, Millman, and Nemeroff (1986) found that participants expressed a reduced preference for a glass of juice after seeing a dead, sterile cockroach dropped into a different glass of the same kind of juice. Consistent with EC, the negative valence of the cockroach (UCS) was presented in close association with the juice (CS) leading it to also gain a negative appraisal. Rozin (1986) also found that an object or food being paired with a disgust-eliciting stimulus was the main reason given for an affective change from like to dislike. In a more recent study, Olatunji, Forsyth, and Cherian (2007) found that electrodermal and evaluative responses were of larger magnitude to a word (CS+) that was reliably paired with the UCS (pictorial stimuli depicting bodily mutilation) compared to a word (CS-) that was reliably followed by neutral pictures (inanimate common objects). Of note is that during extinction, participants continued to evaluate the CS+ as more disgusting relative to the CS-, whereas distress and fear-related emotional ratings attenuated across extinction trials.

Consistent with conditioning theories of phobic acquisition (i.e., Davey, 1997), avoidance of BII stimuli capable of eliciting disgust may be influenced by earlier, unpleasant evaluative experiences that are moderated by disgust sensitivity. Etiology of BII fears appears consistent with EC as stimuli such as blood and bodily mutilation may also be avoided for their evaluative properties. Thus, the negative evaluative response may represent a central aspect of behavioral avoidance in BII phobia (e.g., Eifert, Craill, Carey, & O'Connor, 1988). An EC perspective of BII phobia may also have implications for treatment. It has been argued that extinction-based procedures are often ineffective in altering conditioned disgust evaluations because EC conditioning experiences are more durable (Baeyens, Crombez, van den Bergh, & Eelen, 1988; Baeyens, Eelen, Crombez, & Van den Bergh, 1992). After exposure treatment, avoidance behavior may be markedly

reduced. However, disgust evaluations of the phobic stimuli may persist (de Jong, Vorage, & van den Hout, 2000). If conditioned aversions are resistant to extinction, this may partially explain why 10–15% of clients do not benefit from exposure treatment (Barlow, Hayes, & Nelson, 1984) and why relapse occurs for some (e.g., Woody & Teachman, 2000).

Two studies to date have evaluated the learning of disgust in BII-related fears. Schienle et al. (2001) presented participants with neutral pictures paired with disgusting, pleasant, and neutral pictures. Assessment of facial muscle tension at the *m. levator labii* region of the face revealed a stronger increase in muscle tension toward the neutral pictures of the neutral-disgusting pairs in participants high in blood fear in comparison to those low in blood fear. Muscle tension at this particular site has been shown to increase during disgust reactivity (Yartz & Hawk, 2002), thereby implicating the influence of EC processes. However, these findings are complicated by the observation that the same muscle is contracted during smiling (Schienle et al., 2001). Schienle, Schäfer, Walter, Stark, and Vaitl (2005) also examined facilitated disgust learning in BII phobia. BII phobics and non-phobics underwent an EC experiment in which they were presented with picture pairs consisting of neutral pictures followed by disgust-inducing, fear-inducing, pleasant, or neutral scenes. Results indicated that EC occurred equally in both groups.

In the present study, we further investigated if fear and disgust EC can occur easier with analogue BII phobic participants relative to non-phobic controls. The present study expands upon prior research with use of neutral facial expressions as CS. Specifically, it was predicted that the repeated pairing of neutral facial expressions with BII-relevant pictorial stimuli (blood, injections, and injury) would lead phobic participants to evaluate the neutral expressions as more fearful and disgusting than non-phobics. The present study also examines the extent to which changes in evaluative learning of disgust are moderated by disgust sensitivity. It was predicted that participants high in disgust sensitivity would be more susceptible to disgust conditioning. Lastly, we examine if an extinction procedure would yield significant reductions in fear and disgust aversions among BII phobic and non-phobic participants.

## 1. Method

### 1.1. Participants

Participants were selected from undergraduate psychology classes based on their scores on the Injection Phobia Scale-Anxiety (IPS-Anx; Öst, Hellstrom, & Kaver, 1992) and participated in exchange for research credit. Based on their questionnaire score, participants were classified into two mutually exclusive groups.

The BII phobia group<sup>1</sup> ( $n = 40$ ; 73% female) consisted of participants meeting the following criteria: scoring equal to or higher than the injection phobia patient mean on the IPS-Anx; endorsement of dizziness in the presence of blood-injection stimuli and/or avoidance of medical procedures. The non-phobic group ( $n = 40$ ; 73% female) consisted of participants meeting the following criteria: scoring equal to or less than 2 S.D. below the injection phobia patient mean on the IPS-Anx; reporting neither dizziness in presence of blood-injection stimuli nor avoidance of medical procedures.

<sup>1</sup> The use of the term “phobic” is admittedly problematic, as formal diagnostic interviews were not conducted. However, given our hypotheses, referring to these participants as “fearful” presumes that they experience fear rather than disgust. Thus, the more conventional label of “phobic” was used for the sake of clarity.

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