

# Disgust and Fear Responding in Contamination-Based Obsessive-Compulsive Disorder During Pictorial Exposure

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The emotion of disgust has been implicated in the development and maintenance of contamination-based obsessive-compulsive disorder (OCD). In the present study nonclinical participants with high ( $n=26$ ) and low ( $n=28$ ) levels of OCD contamination symptoms were exposed to 2 categories of disgust stimuli (blood injury and body waste) across 4 blocks using standardized disgust images. Self-report disgust and fear were recorded, as well as cardiovascular heart rate. In both groups, an initial primary disgust reaction was observed. Self-report disgust and fear, but not heart rate deceleration, was greater in the high symptom group. The high symptom group showed reductions in heart rate deceleration, whereas the low symptom group did not. Significant differences in self-report changes across time were observed between the groups, with fear increasing to a greater extent for high contamination fearful individuals when viewing body waste images. The implications of these findings for theoretical models and clinical treatment of OCD with prominent contamination symptoms are discussed.

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*Keywords:* contamination; disgust; heart rate; exposure; obsessive-compulsive disorder

OBSESSIVE-COMPULSIVE DISORDER (OCD) is a condition characterized by distressing intrusive thoughts

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(obsessions) that are alleviated by similarly repetitive, often ritualistic behaviors (compulsions) that the sufferer feels compelled to carry out. Epidemiological research supports the view that there may exist specific separable symptom presentations of OCD (OCCWG, 2003), leading some researchers to posit a multidimensional model of OCD (Mataix-Cols, do Rosario-Campos, & Leckman, 2005).

One of the most common and debilitating presentations of OCD is characterized primarily by contamination fears (Rachman, 2004; Rasmussen & Eisen, 1992). Contamination fears, defined as intense, intrusive feelings of being infected, polluted, or harmed, are precipitated by near or proximal contact with objects perceived to be soiled, dirty, or impure (Rachman). Consistent with a multidimensional view of OCD, recent research has indicated that OCD with contamination fears may be distinguishable from other presentations of OCD on neuropsychological (Hashimoto et al., 2011), neurobiological (Mataix-Cols et al., 2004; Phillips et al., 1998), behavioral (Zor, Fineberg, Eilam, & Hermesh, 2011), and cognitive (OCCWG, 2003; Tolin, Hannan & Brady, 2008) grounds. Furthermore, and of particular interest to the present study, researchers have suggested that OCD with contamination fears is characterized by abnormalities related to the emotion of disgust (Woody & Teachman, 2000).

OCD is currently classified as a disorder of anxiety, principally driven by abnormal fear experience (Barlow, 2000). The shift towards emphasizing the prominent role of disgust for OCD contamination

symptoms is therefore significant and may have far-reaching implications, not only in terms of its pathogenetic explication but also with respect to potential new clinical treatment strategies. A focus on elevated normative disgust experience in OCD with contamination fears is amenable to the newly proposed Research Domain Criteria (RDC) for the study of psychopathology (Sanislow et al., 2010). The RDC aims to link basic biological and behavioral components of normative and pathological functioning with the goal of creating valid and reliable phenotypes for various mental disorders. Thus, OCD with contamination fears might be viewed as an OCD symptom dimension that is characterized by elevated behavioral and biological markers of disgust that can be differentiated from normative markers in healthy populations.

There are several streams of research that suggest a principal role for disgust in OCD with contamination fears. First, convergent evidence from brain imaging and animal research studies indicate that disgust plays a prominent role in OCD with contamination fears. There is growing consensus that the insula cortex, and in particular the anterior insula, is responsible for the processing of disgust stimuli. Several studies employing functional magnetic resonance imaging (fMRI) in normal populations have observed increased anterior insula activation during exposure to both disgust stimuli (Calder et al., 2007; Heining et al., 2003; Jabbi, Bastiaansen, & Keysers, 2008; Jabbi, Swart, & Keysers, 2007; Murphy, Nimmo-Smith, & Lawrence, 2003; Wicker et al., 2003) and facial expressions of disgust (Phillips et al., 1998; Phillips et al., 1997; von dem Hagen et al., 2009). Experimental animal research has also consistently implicated the insula cortex as being critical for the processing of distaste and the acquisition of conditioned taste aversion (Dunn & Everitt, 1988; Kiefer & Orr, 1992; Smith & Berridge, 2005), phenomena commonly associated with disgust (Rozin & Fallon, 1987). Critically, increased activation of the insula brain region during disgust provocation is observed in OCD patients relative to controls (Shapira et al., 2003; Stein, Arya, Pietrini, Rapoport, & Swedo, 2006).

Furthermore, it appears that increased activation of the insula cortex in OCD is specifically related to the OCD with contamination fears subtype. Indeed, several studies report that OCD patients with contamination fears and washing compulsions show increased activation of this region relative to those with doubts and related checking symptoms during disgust provocation (Mataix-Cols et al., 2004; Phillips, et al., 1998). Taken together, neurobiological research strongly implicates a role for disgust in OCD with contamination fears,

characterized specifically by a hyperactive response during disgust provocation in the anterior insula region. The implication of this research is that individuals with contamination fears may be more reactive to disgust-related stimuli than individuals without OCD contamination fears. Studies investigating the relationship between OCD with contamination fears and self-report and behavioral indicators of disgust lend support to this notion.

A number of self-report and behavioral measures indicate elevated disgust experience in OCD with contamination fears. First, elevated levels of disgust experience (disgust propensity) are associated with an increased severity of OCD with contamination fears symptomatology (Cisler, Olatunji, Sawchuk, & Lohr, 2008; Mancini, Gagnani, & D'Olimpio, 2001; Olatunji, 2010; Olatunji, Cisler, Deacon, Connolly, & Lohr, 2007; Olatunji, Sawchuk, Lohr, & de Jong, 2004; Tolin, Woods, & Abramowitz, 2006). Furthermore, OCD patients typically report that feelings of contamination elicited by various objects are more often accompanied by feelings of disgust than fear (Tallis, 1996). Finally, OCD patients with contamination fears tend to report intense disgust feelings during exposure to obsession-related stimuli (Phillips et al., 2000). These data are again inconsistent with an account of OCD with contamination fears that focuses solely upon the role of fear in the disorder. However, such claims are limited by the reliance solely upon self-report indicators of disgust. There is a dearth of research that focuses on the physiological responses of individuals with contamination fears OCD during exposure to disgust stimuli (Cisler, Olatunji, & Lohr, 2009). The use of physiological indicators would benefit this area of research given that both fear and disgust may be differentiated on these grounds alone.

Both the fear and disgust emotional systems can be thought of as independent motivational systems that are responsive to distinct threats in the environment. Research continues to identify how disgust and fear are dissociable in terms of their behavioral, neurobiological, and physiological afferents (Calder, Lawrence, & Young, 2001). Fear is said to be a response to immediate visible danger, motivating protective fight or flight behaviors (Davis, Walker, Miles, & Grillon, 2010). Sympathetic nervous system activation following recognition of threat is purported to facilitate these behaviors (Davis et al., 2010). Supporting this claim, two physiological reactions (increased heart rate and skin conductance) that are indicative of increased sympathetic system activation have consistently been implicated during fear provocation (Bradley, Codispoti, Cuthbert, & Lang, 2001; Kreibig, 2010). Neurobiologically, a

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