



## Differential habituation of fear and disgust during repeated exposure to threat-relevant stimuli in contamination-based OCD: An analogue study

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### ABSTRACT

In the present study, participants ( $N = 20$ ) displaying marked contamination concerns were provided 30 min of repeated in vivo exposure to threat-relevant stimuli (cleaning a 'dirty' bed pan), during which time their fear and disgust levels were repeatedly assessed. Results indicated that repeated exposure led to a significant decline in fear but not disgust. The observed decline in fear remained significant after accounting for changes in disgust and vice versa. Although initial disgust was higher than initial fear ratings, differences between the two slopes were not statistically significant. Baseline trait anxiety and global disgust sensitivity levels prior to exposure did not moderate the level of fear or disgust activation during exposure. However, sensitivity specifically related to core and contamination disgust was marginally associated with fear and disgust parameters during outcome. There was also evidence that less fear decline during repeated exposure was associated with higher disgust ratings after the exposure was completed. Theoretical and clinical implications of the present findings for the treatment of contamination concerns in obsessive-compulsive disorder are discussed.

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Contamination fear is a commonly observed phenomenon in obsessive-compulsive disorder (OCD; Rachman & Hodgson, 1980; Rasmussen & Tsuang, 1986). Recurrent thoughts of contagion among patients with OCD lead to excessive washing and cleaning. Such neutralizing behaviors temporarily alleviate distress associated with contamination obsessions (Rachman, 1994), and as a result, negatively reinforce the avoidance of situations and stimuli that may cause disease and infection (Rachman & Shafran, 1998). Recently, there has been increased research and theoretical interest in identifying unique vulnerability factors for contamination fear (Rachman, 2004). There is some evidence that neutralizing behaviors may result from increased perception of vulnerability to disease via contact with germs/bacteria in the environment (Rachman, 1994). Such perceptions may reflect the tendency to overestimate the likelihood ("I will get sick if I don't wash my hands") and severity ("if I get sick I will die") of contamination (Deacon & Olatunji, 2007). Studies also suggest that contamination-based OCD may be maintained by reoccurring fears

of rapid, spreading infection following contact with perceived contaminants (Riskind, Abreu, Strauss, & Holt, 1997).

Current models of contamination fear suggest that obsessive thoughts regarding imminent contamination elicit excessive and irrational fear/anxiety. However, more recent research suggests that these obsessive thoughts may instead be largely associated with excessive and irrational feelings of disgust (Olatunji & McKay, 2007; Woody & Teachman, 2000). Disgust, as a basic emotion, elicits a reliable physiological response, facial expression, and withdrawal/avoidance pattern that functions to protect individuals from contact with contaminated stimuli (Olatunji & Sawchuk, 2005). Consequently, it has been suggested that the relation between disgust and contamination fear commonly observed in OCD may be conceptualized in the context of a 'disease avoidance model' (Matchett & Davey, 1991). This model suggests that disgust may motivate avoidance and neutralizing behaviors in contamination-based OCD, in order to promote sanitation by preventing contact with perceived contaminants (Olatunji, Sawchuk, Lohr, & de Jong, 2004).

Cognitive appraisals that derive from excessive disgust may cause individuals with OCD to overestimate the consequences of contact with contaminants (Deacon & Olatunji, 2007). Indeed, correlational studies have shown that measures of the general propensity to experience disgust are significantly correlated with measures of contamination fear (Olatunji, Williams, Lohr, &

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Sawchuk, 2005) even when controlling for symptoms of anxiety and depression (e.g., Mancini, Gragnani, & D'Olimpio, 2001; Olatunji, Sawchuk, Arrindell, & Lohr, 2005). One study examining disgust in patients with OCD found that OCD washers showed significantly higher disgust levels than non-anxious controls, and marginally higher disgust levels than a sample of non-washing OCD patients (Woody & Tolin, 2002).

Studies incorporating behavioral assessments have also reported important relations between disgust and contamination fear (Tsao & McKay, 2004). For example, Olatunji, Lohr, Sawchuk, and Tolin (2007) recently found that contamination fearful participants demonstrated less compliance and less approach behavior than low contamination fearful participants on a series of eight disgust-specific behavioral tasks. Furthermore, Deacon and Olatunji (2007) found that disgust sensitivity was significantly associated with anxious and avoidant responding to contamination-related behavioral tasks when controlling for anxiety and depression. Functional magnetic resonance imaging (fMRI) studies have also provided some support for the proposed relationship between disgust and contamination-based OCD with compulsive washers displaying activation of the insula, which is important for the perception of disgust, during presentation of disorder-relevant images (Husted, Shapira, & Goodman, 2006; Stein, Liu, Shapira, & Goodman, 2001).

Although multiple studies implicate disgust in contamination concerns observed in OCD, it remains unclear what role disgust plays in treatment outcome for contamination fear. Recent research suggests that relative to fear, disgust may be more resistant to extinction (Olatunji, Forsyth, & Cherian, 2007). This finding raises the question as to whether interventions that effectively reduce fear and anxiety in contamination-based OCD (i.e., repeated exposure) also reduce disgust. Studies that have begun to address this question in regards to spider phobia and blood–injection–injury phobia found that the decay slope for fear is significantly greater than that for disgust, suggesting that during exposure, extinction of disgust in these phobic conditions occurs at a slower rate than extinction of fear (Olatunji, Smits, Connolly, Willems, & Lohr, 2007; Smits, Telch, & Randall, 2002). In a preliminary examination of the treatment of disgust among contamination fearful participants with OCD, McKay (2006) found that compared to a group with primarily other symptoms of OCD, the contamination fearful group habituated more slowly and to a lesser degree during exposure treatment. Contrary to the findings of McKay (2006), however, Cogle, Wolitzky-Taylor, Lee, and Telch (2007) recently found no differences in the rate of decline between anxiety and disgust during exposure-based treatment for compulsive washers. Although these preliminary findings suggest that disgust reactions observed in contamination-based OCD are amenable to exposure-based interventions, the nature of the decline in disgust, relative to fear, remains unclear.

The present study examines the relationship between declines in fear and disgust during exposure to threat-relevant stimuli. In an analogue sample of participants reporting high levels of symptoms of contamination-based OCD, exposure process data were analyzed using individual growth curve analyses. This analogue sample was considered appropriate for use in this study, given that there is a growing body of literature suggesting that OCD symptoms occur on a continuum of severity and have their origin in largely normal human processes (Burns, Formea, Keortge, & Sternberger, 1995; see Gibbs, 1996 for a review). Thus, the results of psychopathology studies using analogue samples appear to be relevant to understanding the symptoms of patients with OCD. In the present study, we attempt to address five specific research questions. First, do fear and disgust significantly decline during repeated exposure? Second, does the decline in fear remain significant after controlling for changes in disgust and vice versa?

Third, is there a difference in the rate of decline in fear and disgust across exposure trials? Fourth, do baseline individual differences measures of disgust and anxiety predict fear and disgust parameters? Fifth, do fear and disgust parameters during exposure predict outcome?

## 1. Method

### 1.1. Participants

#### 1.1.1. Screening

Participants were selected from undergraduate psychology courses based on their score on the Padua Inventory (PI; Burns, Keortge, Formea, & Sternberger, 1996) contamination fear subscale. Burns et al. report mean scores of 13.87 for patients with OCD. In accordance with these norms and previous research (Deacon & Olatunji, 2007; Olatunji, Lohr, et al., 2007), the analogue contamination-based OCD participants ( $N = 20$ ) consisted of those with scores  $\geq 14$ .

### 1.2. Design

Participants received up to 30 min of self-guided exposure to contamination threat-relevant stimuli (cleaning a 'dirty' bed pan). Repeated assessments of subjective fear and disgust were obtained throughout exposure (every 15 s). These ratings were used in subsequent analyses to address the major study hypotheses.

### 1.3. Procedure

#### 1.3.1. Behavioral approach test (BAT)

The BAT consisted of a series of 10 tasks of increasing difficulty ranging from standing 15 feet from a display consisting of materials (bed pan filled with 'urine,' toilet brush, latex medical gloves, paper towels, and liquid cleaner) necessary for cleaning a dirty bed pan to touching the inside of the bed pan (see Table 1). The liquid inside the bed pan was apple juice (although participants were informed that it was urine). A maximum of 15 s were allowed to execute each of the BAT tasks and participants rated their peak fear and disgust on a 0–10 scale after each task.

#### 1.3.2. Exposure

Participants were first instructed about the BAT, at which point subjective fear (0–100) and disgust (0–100) levels were assessed before self-guided in vivo exposure to the BAT (pre-exposure). The self-guided exposure procedures for the present study were modeled after those employed by Smits et al. (2002). Specifically,

**Table 1**  
Description of the behavioral avoidance task

Task	Instructions
1	Stand 15 feet away from 'dirty' bed pan
2	Stand 7.5 feet away from 'dirty' bed pan
3	Stand next to the 'dirty' bed pan
4	Put on the latex gloves that was next to the 'dirty' bed pan
5	Empty the 'urine' for the 'dirty' bed pan in a Rubbermaid container
6	Pick up toilet scrub brush and hold it
7	Scrub the inside of the 'dirty' bed pan with the toilet scrub brush and disinfectant
8	Wipe the inside of the 'dirty' bed pan with a paper towel
9	Remove the latex gloves and place them in the garbage can
10	Touch the inside of the 'dirty' bed pan

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