



## Orienting and maintenance of gaze in contamination fear: Biases for disgust and fear cues<sup>☆</sup>

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### ABSTRACT

The present study examines the extent to which attentional biases in contamination fear commonly observed in obsessive–compulsive disorder (OCD) are specific to disgust or fear cues, as well as the components of attention involved. Eye tracking was used to provide greater sensitivity and specificity than afforded by traditional reaction time measures of attention. Participants high (HCF;  $n = 23$ ) and low (LCF;  $n = 25$ ) in contamination fear were presented with disgusted, fearful, or happy faces paired with neutral faces for 3 s trials. Evidence of both vigilance and maintenance-based biases for threat was found. The high group oriented attention to fearful faces but not disgusted faces compared to the low group. However, the high group maintained attention on both disgusted and fearful expressions compared to the low group, a pattern consistent across the 3 s trials. The implications of these findings for conceptualizing emotional factors that moderate attentional biases in contamination-based OCD are discussed.

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Over two decades worth of research suggests that anxiety disorders are characterized by attentional biases to threat (for review, see Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van Ijzendoorn, 2007). The modal finding in such research is increased allocation of attention to threatening stimuli, through biases in the orienting of attention (vigilance; Mogg & Bradley, 1998), or in the continued engagement of attention (maintenance; Weierich, Treat, & Hollingworth, 2008). Biases are typically found for disorder-specific threats, for example, social stimuli in social anxiety (faces; Garner, Mogg, & Bradley, 2006), or spider stimuli in spider phobia (Rinck & Becker, 2006). Recent research suggests that attentional biases to threat may play an important role in the maintenance or etiology of anxiety (Koster, Fox, & MacLeod, 2009). Accordingly, experimental treatments that target attentional biases have been found to reduce symptom severity, as reflected in self-report measures and clinician ratings (Schmidt, Richey, Buckner, & Timpano, 2009), as well as behavioral outcomes (Amir, Weber, Beard, Bomyea, & Taylor, 2008).

While attentional biases appear to be a cardinal feature of anxiety disorders, demonstrating such biases in obsessive–compulsive disorder (OCD) has been difficult (Summerfeldt & Endler, 1998). OCD is an anxiety disorder defined by persistent,

unwanted thoughts or impulses (obsessions) that motivate rigid, excessive behaviors (compulsions) aimed at undoing obsession-related harm (Abramowitz, Khandker, Nelson, Deacon, & Rygwall, 2006). Many have noted that OCD is an anomalous anxiety disorder, and some have even suggested that the diagnoses be reclassified (Enright & Beech, 1990). The failure to demonstrate attentional biases to threat in OCD, across multiple studies (e.g., McNally, Riemann, Louro, Lukach, & Kim, 1992; Moritz et al., 2004, 2008) may provide evidence for these positions. However, another possibility is that the heterogeneity of obsessive–compulsive (OC) concerns, as well as their idiosyncratic nature, has made the demonstration of attentional biases in OCD particularly difficult. Some null findings may be attributed to the use of the same or largely overlapping threat stimuli for patients with different types of OC symptoms (Kampman, Keijsers, Verbraak, Näring, & Hoogduin, 2002; Kyrios & Iob, 1998; Moritz et al., 2004). In contrast, most of the studies that have demonstrated attentional biases in OCD (Amir, Najmi, & Morrison, 2009; Foa, Ilai, McCarthy, Shoyer, & Murdock, 1993; Tata, Leibowitz, Prunty, Cameron, & Pickering, 1996) have matched threat stimuli with specific types of OC concerns.

Others have suggested that attentional biases in OCD occur only in the contamination-based subtype (Summerfeldt & Endler, 1998). Indeed, biases have been found most often in patient groups in which all (Foa et al., 1993; Tata et al., 1996) or a majority of individuals (Foa & McNally, 1986) have contamination concerns. Of the many OC symptom dimensions, contamination concerns are the most common (Rasmussen & Tsuang, 1986), reported by roughly 50% of patients (Rachman & Hodgson, 1980; Rasmussen & Eisen,

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1992). Recent investigations of this symptom dimension have focused on the role of disgust, which is thought to serve a disease-avoidance function by motivating withdrawal from contamination threats (Matchett & Davey, 1991; Oaten, Stevenson, & Case, 2009). Some have suggested that contamination-based OC symptoms can be understood as a fundamental dysregulation of disgust (Olatunji, Lohr, Sawchuk, & Tolin, 2007). Indeed, increased disgust sensitivity (Haidt, McCauley, & Rozin, 1994)—a construct encompassing how frequently one experiences disgust, and how distressing one finds the experience—is predictive of OC symptom severity (e.g., Muris et al., 2000) and behavioral avoidance (e.g., Tsao & McKay, 2004), a finding replicated in many studies, including those that controlled for trait anxiety and depression (Deacon & Olatunji, 2007; Olatunji, Lohr, et al., 2007; Olatunji, Williams, et al., 2007).

In light of these findings, the present study investigated the possibility of a disgust-specific attentional bias in individuals with elevated contamination fear. Given that threat should be more associated with disgust than fear in the context of this disorder, we hypothesized that increased allocation of attention would occur more for disgusted faces, compared to fearful or happy faces. Indeed, neural responses to disgusted expressions, but not fearful or happy expressions, were found to distinguish patients with contamination-based OCD from controls (Lawrence et al., 2007). Facial stimuli have been used in many studies on attentional biases in anxiety disorder (e.g., Mogg, Millar, & Bradley, 2000; Garner et al., 2006), in part because they allow experimenters to vary emotional content while holding other stimulus attributes constant. In addition, research on the neural substrates of fear and disgust recognition supports the notion that, through associative learning, facial expressions of emotion become capable of activating emotional appraisals and eliciting emotional responses (Phillips et al., 2004).

Although increased attention to disgust cues in individuals with elevated contamination fear was hypothesized, it was unclear how this bias would manifest given competing accounts of the attentional components implicated in threat-related biases (Weierich et al., 2008). Increased allocation of attention could derive from facilitated detection, reflected in biased orienting towards threat (Mogg & Bradley, 1998); alternatively, increased attention could begin *after* detection with difficulty disengaging attention (Fox, Russo, Bowles, & Dutton, 2001), reflected in increased dwell time on threat. Weierich et al. note that the former “vigilance” hypothesis and the latter “maintenance” hypothesis need not be mutually exclusive, and could both account for increased allocation of attention to threat. To adequately assess both hypotheses, eye tracking technology was utilized to provide the sensitivity and specificity needed to parse components of attention.

## Methods

### Participants

Three large undergraduate classes at a Southern University ( $n = 368$ ) were screened using the contamination and washing subscale of the Padua Inventory (PI; Burns, Keortge, Formea, & Sternberger, 1996), in order to identify students high and low in contamination concerns. Individuals one standard deviation or more above the sample mean were recruited for the high contamination fear (HCF) group ( $n = 23$ ; mean age = 18.95,  $SD = .90$ ; % female = 78.3), while individuals one standard deviation or more below the sample mean were recruited for the low contamination fear (LCF) group ( $n = 25$ ; mean age = 19.17,  $SD = 1.27$ ; % female = 60). Mean age and percent female did not significantly differ between groups. Means and standard deviations of PI scores for the HCF and LCF group are provided in Table 1.

**Table 1**

Means (SDs) of measures of self-reported symptoms, valence of facial stimuli, and behavioral avoidance by participant group.

Self-report measures		HCF	LCF	
Measure	M (SD)	M (SD)	M (SD)	<i>t</i>
PI	21.35 (4.76)	1.56 (1.26)	19.68***	
OCI-R washing	4.43 (2.23)	.48 (1.36)	7.49***	
DS-R	64.65 (12.62)	42.64 (13.87)	5.74***	
STAI-T	45.37 (6.67)	37.91 (7.19)	3.72**	
<i>Valence ratings of expressions</i>				
Emotion	M (SD)	M (SD)		<i>t</i>
Disgusted	1.00 (.89)	1.56 (1.09)	1.93‡	
Fearful	1.67 (1.15)	2.07 (.81)	1.35	
Happy	4.85 (.72)	4.34 (.88)	2.08*	
Neutral	2.63 (.60)	2.76 (.64)	.72	
<i>Behavioral avoidance in a public restroom</i>				
Outcome	M (SD)	M (SD)		<i>t</i>
% Completion	43% (23)	85% (20)	6.55***	
Reported distress	24.68 (7.19)	8.92 (7.43)	7.17***	

Note. HCF = High Contamination Fear, LCF = Low Contamination Fear, OCI-R = Obsessive–Compulsive Inventory—Revised, DS-R = Disgust Scale—Revised, STAI-T = State Trait Anxiety Inventory—Trait Version, Form Y, ‡ $p < .07$ , \* $p < .05$ , \*\* $p < .01$ , \*\*\* $p < .001$ .

Reported levels of contamination fear in our analogue group were comparable to levels reported by individuals meeting diagnostic criteria for OCD; Burns et al. (1996) found that patients diagnosed with OCD had a mean PI score of 13.87.

### Measures

The *Padua Inventory* (PI; Burns et al., 1996) contamination fear subscale is a 10-item measure of contamination obsessions and washing compulsions. The PI contamination fear subscale had an alpha coefficient of .96 in the present study.

The *Obsessive–Compulsive Inventory—Revised* (OCI-R; Foa et al., 2002) is an 18-item questionnaire assessing six types of OCD symptoms: Washing Concerns, Checking/Doubting, Obsessing, Mental Neutralizing, Ordering, and Hoarding. The OCI-R Washing concerns scale was used in the present study and had an alpha coefficient of .78.

The *State Trait Anxiety Inventory—Trait Version, Form Y* (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) is a 20-item scale that measures the enduring or chronic experience of anxiety. The alpha coefficient for the STAI-T was .91 in the present study.

The *Disgust Scale—Revised* (DS-R; Olatunji, Lohr, et al., 2007; Olatunji, Williams, et al., 2007) is a 25-item questionnaire assessing sensitivity to a range of disgust elicitors, including core, animal-reminder, and contamination disgust. The DS-R had an alpha coefficient of .89 in the present study.

### Public restroom behavioral avoidance task (BAT)

To further validate our analogue group with a more objective index, a behavioral measure of contamination fear was administered. Participants were led into a nearby public restroom, and were asked to touch surfaces that sampled a spectrum of perceived contamination risk. Participants were asked to touch inside of the sink, inside of the trashcan, on the seat of the toilet, and inside of the toilet (in that order). After each step, experienced distress was rated verbally on a 0 (no distress) to 10 (extreme distress) scale. If participants declined to complete a step, they were asked to imagine completing the step with their eyes closed, and then provide a rating.

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