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Differential Examination of Disgust in Spider, Blood-Injection, and Contamination Fear: Self-Reported and Attention-Based Assessment of Differences

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DIFFERENTIAL EXAMINATION OF DISGUST IN SPIDER, BLOOD-INJECTION, AND
CONTAMINATION FEAR: SELF-REPORTED AND ATTENTION-BASED ASSESSMENT
OF DIFFERENCES

A Dissertation

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ABSTRACT

Biased attention toward threat has been demonstrated across anxiety disorders as well as among nonclinical samples. While such studies have produced findings of attentional bias for fear-related or threatening stimuli, other types of emotionally laden stimuli have been ignored. This study sought to examine the experience and impact of disgust on individuals experiencing various types of anxiety, which may play a more significant role than fear in some disorders such as obsessive-compulsive disorder (OCD) and some specific phobias. Specifically, this study examined self-reported disgust and attentional bias in relation to disgust and threatening stimuli. A modified dot-probe task with pictorial stimuli was administered to participants endorsing fears of spiders, blood and injections, or contamination as well as participants reporting no such fears. Results indicated that each anxiety group endorsed more disgust than those without anxiety. Further, no group differed from another in regards to vigilance-avoidance, orienting, or disengaging; however, gender differences emerged on the orienting and disengagement indices. Overall, a pattern of delayed disengagement was evidenced across all groups. The results of this study help inform etiological and maintenance factors of anxiety.

CHAPTER 1. INTRODUCTION

Anxiety disorders are the most frequently occurring class of psychiatric disorder, with a lifetime prevalence of approximately 28.8% (Kessler et al., 2005). While anxiety itself is a prominent problem, impairments and deficits associated with it can cause additional difficulties. One such potential impairment is the presence of attentional bias. For instance, it has been suggested that the cognitive vulnerability to anxiety results in part from an automatic tendency for anxious individuals to selectively encode emotionally threatening information (Beck & Clark, 1997; MacLeod, 1991). Individuals with anxiety are more likely than nonanxious individuals to direct their attentional resources toward threatening stimuli (Mathews & MacLeod, 2005; Williams, Watts, MacLeod, & Mathews, 1997). They are also more likely to direct these resources toward threatening stimuli as opposed to neutral stimuli (see Kindt & Van Den Hout, 2001; MacLeod, Mathews, & Tata, 1986 for reviews). Such conclusions have been reached for individuals with various types of anxiety and fears using several different methodologies (e.g. the emotional Stroop task, dot-probe task, visual search tasks) and provide evidence that these individuals are hypervigilant for threat and danger (e.g., Asmundson & Stein, 1994; Lavy, van Oppen, & van den Hout, 1994; Mogg & Bradley, 2004; Ohman, Flykt, & Esteves, 2005). Previous studies have found attentional bias for fear-related or threatening stimuli; however, other types of emotionally laden (e.g., disgust, anger, sad) stimuli have largely been ignored. For instance, very few studies have examined attentional bias towards disgust-evoking stimuli, which may in fact play a more significant role than fear in some disorders (e.g., obsessive-compulsive disorder; OCD). In this dissertation, the attentional impact of disgust and generally threatening stimuli, which has garnered more attention in the extant literature, are examined in a sample of young adults using a modified dot-probe task. In the subsequent sections, an introduction to

disgust, theories explaining relations among disgust and anxiety disorders, the role of disgust in spider phobia, blood-injection-injury (BII) phobia, and contamination-related OCD, and evidence for attentional bias to disgust-related stimuli are discussed.

1.1 Introduction to Disgust and Disgust Sensitivity

Disgust has been recognized as a basic human emotion that aids in our survival since the time of Darwin (1872/1965). It is thought to originate from the primitive sensation of distaste elicited by bad tasting, contaminated, or harmful foods (see Rozin & Fallon, 1987 for a review). This view of disgust suggests that the experience of disgust prevents the ingestion of harmful substances, therefore protecting against diseases (Izard, 1993; Matchett & Davey, 1991; Ware, Jain, Burgess, & Davey, 1994). Until recently, disgust has received little attention as a possible etiological or maintenance factor for anxiety disorders. As a result, current treatments often fail to address such emotional experiences, which may partly explain why treatments are ineffective for some patients and why others relapse.

The emotion of disgust has recently garnered empirical attention among psychopathology researchers, particularly in reference to specific phobias and OCD. A specific phobia is a persistent fear of a specific animal, object, or situation that causes anxiety upon exposure, resulting in avoidance of or marked distress when presented with the feared stimulus (American Psychiatric Association, 2000). Spider phobia and BII phobia are the phobias that have garnered the most empirical attention in relation to disgust. OCD, on the other hand, refers to the recurrent experience of obsessions (i.e., persistent thoughts, ideas, images, or impulses that are nonsensical in nature but intrusive and cause distress) and/or compulsions (i.e., repetitive behaviors an individual feels driven to perform in order to reduce anxiety) that are time-

consuming and either cause distress or significant impairment in daily functioning (American Psychiatric Association, 2000).

Empirically, research has largely focused on two aspects of disgust: 1) a person's propensity for experiencing disgust, and 2) a person's sensitivity to the emotional experience. Disgust propensity and sensitivity are related but distinct constructs; disgust propensity is the frequency at which a person experiences disgust emotional responses, while disgust sensitivity has been defined as the intensity at which the person experiences disgust emotions (van Overveld, de Jong, Peters, Cavanagh, & Davey, 2006). However, differing definitions of the term "disgust sensitivity" exist and many studies refer to it as a general proclivity toward experiencing disgust emotions (e.g. Olatunji, Cisler, Deacon, Connolly, & Lohr, 2007; Tolin, Woods, & Abramowitz, 2006). Therefore, this study highlights broad relations of disgust emotions to psychopathology and draws distinctions between propensity and sensitivity where possible (as defined by van Overveld et al., 2006).

1.2 Theories Relevant to the Relationship Between Disgust and Anxiety

Two theories have been proposed to explain the relationship between disgust and subjective anxiety or contamination fears – the disease-avoidance model (Davey, 1992) and the law of sympathetic magic (Frazer, 1959; Mauss, 1972; Rozin & Fallon, 1987). Both theories provide rationale for why stimuli that are commonly considered contagious become fear-relevant (Davey, 1994).

1.2.1 The Disease-Avoidance Model. Davey (1992) proposed that fearing animals that may harm humans through disease, dirt, or contamination might, in fact, be adaptive. Thus, certain animal fears might reflect a disease-avoidance process rather than a predator-defense process since some animal fears are thought to be disgust evoking rather than fear evoking. In

this respect, animals that might be feared or avoided due to disease-avoidance would fall into the following categories: 1) animals that are known to carry disease, 2) animals associated with disease-ridden or dirty places or putrefying food, and 3) animals that have physical characteristics that resemble natural disgust stimuli (e.g., animals that are slimy or resemble mucus). Researchers have also extended the disease-avoidance model to BII phobia and contamination-related OCD in order to explain the avoidance of disgust- and fear-relevant stimuli. Accordingly, Matchett and Davey (1991) have shown that disgust sensitivity is related to fear of animals that are not typically considered to attack or harm humans but are considered to evoke revulsion (e.g., maggots, slugs), as well as with fear of illness and death.

1.2.2 Laws of Sympathetic Magic. Sympathetic magic refers to an irrational understanding of how contagion is transmitted. Two principles apply to sympathetic magic – contagion and similarity. Contagion can be thought of as “once in contact, always in contact” (Rozin & Fallon, 1987). It is thought to occur by direct contact between an offensive or repulsive animal, person, or substance and a previously neutral object. The ability to contaminate previously neutral objects via contagion is a crucial feature of all disgust elicitors. Thus, only brief contact with a disgusting object is sufficient to transfer its repulsive characteristics to another object (Rozin & Fallon, 1987). Similarity, on the other hand, refers to a resemblance in some attributes between items indicates a fundamental similarity or identity. Thus, if two things are “similar,” then action taken against one item will influence the other (Mauss, 1902/1972).

Both contagion and similarity have been demonstrated in early laboratory and questionnaire studies. For instance, Rozin, Milliman, and Nemeroff (1986) demonstrated contagion by dropping a dead but sterilized cockroach into a glass of juice. Participants found the cockroach juice less desirable and were less apt to taste it than a different juice that was

contacted by an innocuous object. The same authors found that the prospect of wearing a laundered shirt of unknown origin was preferred to wearing a shirt previously worn by a disliked person via self-report. Rozin et al. (1986) demonstrated similarity by assessing participants' preference for consuming chocolate fudge in various shapes. They found that participants preferred chocolate fudge shaped like a muffin opposed to fudge shaped as dog feces. Participants also preferred holding a rubber drain mat rather than rubber vomit. In a questionnaire study, Rozin et al. (1986) found that participants rated soup presented in a new bedpan as less desirable than the same soup presented in a soup bowl.

1.3 Spider Phobia and Disgust

Animal phobias are among the most common type of specific phobias with prevalence estimates ranging from 3.3% to 4.3% (Becker, Rinck, Turke, Kause, Goodwin, Neumer, & Margrat, 2007; Depla, ten Have, van Balkom, & de Graaf, 2008). Most research on specific phobia centers on spider phobia. Fear of spiders has generally been thought of as a biologically prepared fear given several species of spiders have venom that is lethal to humans. However, it has also been suggested that a disease-avoidance model may better account for phobic avoidance of spiders (Matchett & Davey, 1991). A substantial body of literature has provided results consistent with this notion. Accordingly, various studies have found that individuals with spider phobia or elevated fear report greater disgust sensitivity than individuals without such fears (de Jong & Merckelbach, 1998; Mulkens, de Jong, & Merckelbach, 1996; Olatunji, 2006; Sawchuk, Lohr, Tolin, Lee, & Kleinknecht, 2000; Woody, McLean, & Klassen, 2005). Sawchuk et al. (2000) found that spider phobics reported elevated contamination fear relative to control participants; however, the spider phobics reported less fear of contamination than individuals with BII phobia. Some studies have also shown that spider phobic individuals report elevated

levels of revulsion to disgust stimuli (e.g., rotting food, feces) unrelated to their phobic concerns (Olatunji, 2006; Sawchuk et al., 2000). Several other lines of research, including studies of exposure/behavioral avoidance, facial expression, and cognitive biases provide further evidence for the relationship between spider phobia and disgust and are further discussed below.

1.3.1 Exposure to Disgust Evoking Stimuli in Spider Phobia. Behavioral avoidance tests (BAT), or behavioral procedures in which the clinician measures how long or how much contact a patient can tolerate in regards to an anxiety-inducing stimulus, are frequently implemented when studying the experience of disgust. Several studies have found adults and children with spider phobia or spider fear (i.e., not clinically diagnosed) endorse higher disgust ratings and demonstrate higher levels of disgust than control participants during a BAT (de Jong & Muris, 2002; Mulkens et al., 1996; Woody et al., 2005). For instance, Mulkens et al. (1996) conducted a series of unrelated behavioral experiments to assess relationships among fear of spiders and disgust sensitivity. Using a sample of women with or without spider phobia, the researchers examined the likelihood of 1) the women to drink a “contaminated” cup of tea (i.e., disgusting stimuli unrelated to spiders), and 2) eat a cookie that a spider touched. Participants also completed a BAT with a with a final step of coming into contact with a live spider. The researchers found that women with spider phobia were no different than controls in their general sensitivity to dirtiness (i.e., drink “contaminated” tea). They did, however, find that these women were significantly less likely to eat a cookie that had come into contact with a spider. The women with spider phobia also completed fewer steps of the BAT. Woody et al. (2005) found similar results as their sample of participants reporting high levels of spider fear were less likely to come into contact with a pen that a spider touched than controls; they also completed fewer steps of a spider BAT. The aforementioned studies found disgust to be a stronger

predictor of avoidance of spiders than anxiety (Woody et al., 2005) and fear of physical harm (de Jong & Muris, 2002). Such findings also parallel early work by Rozin and Fallon (1987) demonstrating the law of contagion.

Other studies have found that individuals with spider phobia and spider fear endorsed significantly more disgust and fear than control participants during a BAT (Deacon & Olatunji, 2008; Vernon & Berenbaum, 2002) and during exposure to pictures of spiders (Sawchuk et al., 2002; Thorpe & Salkovskis, 1998; Tolin et al., 1997). Deacon and Olatunji (2008) and Sawchuk et al. (2002) found that, though participants with spider fear reported more disgust and fear than controls, these participants exhibited greater self-reported fear relative to disgust. Conversely, Vernon and Berenbaum (2002) found a trend for greater self-reported disgust relative to fear during the BAT.

1.3.2 Disgust Facial Expressions in Spider Phobia. Some research suggests that individuals with spider fear display disgust facial expressions during exposure to spiders (de Jong, Peters, & Vanderhallen, 2002; Vernon & Berenbaum, 2002). For instance, using facial electromyogram (EMG), de Jong et al. (2002) compared the facial expressions of women with spider fear to women without such fear during exposure to a video of a spider. They found greater activation of the levator labii muscle, which has been found to be activated during exposure to disgust stimuli (Vrana, 1993), in women with spider fear compared to women without spider fear. Vernon and Berenbaum examined disgust and fear facial expression in participants with spider fear by coding their various facial expressions while being exposed to a spider. Results indicated that the participants with spider fear demonstrated increased frequency of disgusted and fearful facial expressions towards spiders than participants without spider fear. No differences were found between the frequency of disgusted and fearful facial expressions.

Physiological data has also shown that participants with spider fear responded with more disgust-related facial EMG activity when exposed to spiders than those without such fears (de Jong, Peters, & Vanderhallen, 2002). Given such findings, the propensity to respond with disgust has been implicated as a potential risk factor for developing spider phobia (de Jong & Merckelbach, 1998).

1.3.3 Cognitive Biases and Disgust in Spider Phobia. Cognitive biases are another factor thought to maintain anxiety and avoidant behavior in individuals with spider phobia and fear. Research has shown that participants with spider fear show Stroop interference (i.e., slower color-naming) for disgust-related words (e.g., “DIRT”) that are seemingly unrelated to their phobia (Barker & Robertson, 1997). These participants are also slower to respond to words pertaining to the physical attributes and movement of spiders; however, no differences were evidenced between word types (i.e., disgust-related words and words pertaining specifically to spiders).

Two studies used Implicit Association Tasks (IATs; a paradigm used to detect the strength of an individual’s automatic associations between mental representations of concepts or objects) to examine whether individuals with spider phobia associate spiders with disgust- or fear-related stimuli. Teachman, Gregg, and Woody (2001) conducted an IAT in which spiders were used as target stimuli and disgust (e.g., gross) and fear attributes (e.g., harm) were separate categories. Results indicated that participants with spider fear associated spiders with both fear and disgust to a greater degree than an anxious control group. Huijding and de Jong (2007) found analogous results with individuals diagnosed with spider phobia.

Other studies have utilized various other paradigms to further examine expectancy biases. Specifically, the following studies examined covariation bias, which is the propensity to perceive

an inaccurate relationship between two events or objects (Chapman & Chapman, 1969). For instance, van Overveld, de Jong, and Peters (2006) had participants with spider fear and no fears rate whether they expected pictures of spiders, maggots, dogs, and rabbits to be followed by a disgust outcome (e.g., drinking a distasteful liquid), a fear outcome (e.g., electric shock), or no outcome. Results indicated that the participants with spider fear were significantly more likely to expect both fear and disgust-related outcomes to follow spider pictures than the control participants. No differences were found between fear and disgust expectancies. In a similar study, de Jong and Peters (2007) found that participants with spider fear expected disgust-related outcomes to follow exposure to spider pictures, but not fear outcomes.

1.4 BII Phobia and Disgust

BII phobia is an atypical type of specific phobia. Like other specific phobias, BII phobia is characterized by an extreme fear and avoidance of specific stimuli (e.g., blood, injections, and bodily injury); however, those with BII phobia also exhibit a propensity toward fainting and/or dizziness when confronted with BII stimuli. Nearly four of five individuals with BII phobia faint when presented with BII-related stimuli (Öst, Sterner, & Lindahl, 1984; Thyer, Himle, & Curtis, 1985), while only 0.02% of those with other specific phobias report fainting in the presence of fear-relevant stimuli (Connolly, Hallam, & Marks, 1976). Prevalence estimates for BII phobia range from 1.8% to 3.2% (Becker et al., 2007; Depla et al., 2008; Fredrikson, Annas, Fischer, & Wik, 1996). Individuals with BII phobia often avoid or become distressed by stimuli and situations that are often thought of as disgust evoking, such as medical paraphernalia and mutilation.

Several studies have found that self-reported disgust positively correlated with symptoms of BII phobia (de Jong & Merckelbach, 1998; Olatunji, Sawchuk, de Jong, & Lohr, 2006;

Olatunji, Williams, Lohr, Connolly, Cisler, & Meunier, 2007). Using structural equation modeling, Olatunji et al. (2007) further found significant relations between disgust and BII fear independent of trait anxiety. Several investigations have also found that individuals with BII phobias and fears reported elevated levels of disgust toward a broad range of stimuli unrelated to their phobic concerns including rotting foods, bodily products, small animals, and foul odors (Sawchuk et al., 2000; Sawchuk et al., 2002; Tolin et al., 1997). In the subsequent sections, relationships among disgust and exposure to disgust evoking stimuli, facial expression, cognitive biases, and diphasic heart response are discussed.

1.4.1 Exposure to Disgust Evoking Stimuli in BII Phobia. Several studies have examined the response of individuals with BII phobia when exposed to disgust evoking stimuli. Two such studies have examined such responses through evaluative conditioning experiments (Schienle, Schäfer, Walter, Stark, & Vaitl, 2005; Schienle, Stark, & Vaitl, 2001). Evaluative conditioning refers to the observation that the contingent presentation of a subjectively neutral stimulus with a disliked stimulus will change the valence of the neutral stimulus in a negative direction (Braeyens, Eelen, Crombez, & van den Bergh, 1992). Schienle et al. (2001) repeatedly presented participants with and without blood fear with neutral pictures paired with disgust-inducing, pleasant, or neutral pictures while taking facial EMG recordings. Only the participants with fear of blood demonstrated disgust learning via increased EMG responses to neutral-disgust picture pairings. The participants with blood fear also rated the disgust-related pictures as more repulsive and reported greater disgust sensitivity in general. Schienle et al. (2005) replicated the aforementioned findings with a clinical sample of patients diagnosed with BII phobia. Other researchers have found that, when presented with pictorial stimuli depicting surgeries, participants with BII fears report more fear and disgust relative to control participants. Further,

the participants with BII fears reported significantly greater disgust than fear (Sawchuk et al., 2002; Tolin et al., 1997).

In another study, Olatunji, Ciesielski, Wolitzky-Taylor, Wentworth, and Viar (2012) assigned individuals with BII phobia to a disgust induction group that viewed vomit videos or a neutral induction group that viewed a video of a waterfall. Participants in both groups were exposed to a video of a blood draw repeatedly for 14 trials. Afterwards, the participants completed a BAT consisting of exposure to a hypodermic needle. Fear and disgust toward blood draws were significantly reduced in both groups as a function of repeated exposure (i.e., significantly different when comparing ratings from the first and last trials). The groups did not differ on disgust or fear ratings during the BAT. Contrary to expectation, disgust induction did not reduce behavior avoidance on the BAT.

One study incorporated disgust exposure into single sessions of treatment for individuals with both subclinical and clinical levels of symptoms severity (Hirai, Cochran, Meyer, Butcher, Vernon, & Meadows, 2008). Participants were divided into two treatment groups: one targeting fear alone and another targeting both fear and disgust. The treatments only differed in that the fear and disgust group received psychoeducation and in vivo exposure relevant to disgust evoking stimuli. The results indicated that both treatment groups significantly reduced self-reported anxiety and disgust as well as avoidance to BII-related stimuli. No differences emerged between groups (Hirai et al., 2008).

1.4.2 Disgust Facial Expressions in BII Phobia. One study, conducted by Lumley and Melamed (1992), examined facial expressions of participants with and without BII phobia while viewing a videotaped surgery. The authors defined a disgust facial expression as a furrowed eyebrow and/or raised upper lip, indicating levator labii muscle activation. They found that

individuals with BII phobia displayed significantly more disgust facial expressions than participants without BII phobia.

1.4.3 Cognitive Processes and Disgust in BII Phobia. Cognitive biases towards disgust have been evaluated in those with BII phobia or BII fear via a covariation paradigm, the modified Stroop task, and word-stem completion. de Jong and Peters (2007) examined covariation biases in BII fear. Specifically, they examined whether or not participants high and low in BII fear would over associate blood-related stimuli with disgust-related outcomes. Accordingly, participants were presented with neutral (e.g., rabbits) and disgust evoking stimuli (e.g., pictures of blood donations) and followed the presentation by one of three possible outcomes: a shock (i.e., harm-related outcome), drinking a disgusting fluid (i.e., disgust-related outcome), or nothing. Results indicated that both groups expected fear and disgust-related outcomes with equal probability, suggesting that disgust- or harm-related associative biases do not play a role in the maintenance of BII fears.

Woody and Tolin (2002) examined visual avoidance of injection photographs in a sample of participants reporting elevated symptoms of BII phobia. They found that the viewing time for injection photographs was predicted by self-reported scores on the Body Envelope Violations subscale of the Disgust Scale (Haidt, McCauley, & Rozin, 1994), in which higher subscale scores predicted decreased viewing time. No other subscale (i.e., Food, Hygiene, Animals, Sex, etc.) was significantly related to viewing time.

In an effort to examine information-processing biases in BII phobia, Sawchuk, Lohr, Lee, and Tolin (1999) employed a modified Stroop task and a word-stem completion task in a sample of participants with elevated BII fears. Even after a disgust mood induction, BII fearfuls did not show attentional bias to medical or disgust stimuli. Fearful participants did, however, complete

more medical and disgust word-stems than nonfearful participants. Taken together, this study found evidence for implicit memory bias, but not attentional bias, for both fear and disgust-related stimuli in those with BII fears.

1.4.4 Diphasic Heart Response, Vasovagal Syncope, and Disgust in BII Phobia. A promising, though controversial, piece of evidence for disgust in BII phobia is the unique heart rate response to BII-related stimuli, referred to as the diphasic response (Page, 1994; Sarlo, Palomba, Angrilli, & Stegagno, 2002; Thyer et al., 1985). The diphasic response entails a rapid acceleration of heart rate followed by a sharp decrease in heart rate that may result in syncope (i.e., fainting or a temporary loss in consciousness caused by a drop in blood pressure). The diphasic response is thought to occur exclusively when BII phobic individuals encounter disorder-relevant stimuli, rather than stressful situations that may provoke general anxiety (Öst et al., 1984; see Page, 1994 for a detailed description). The experience of disgust is characterized by parasympathetic activation (Levenson, 1992). Accordingly, Page (1994) suggests that the unique diphasic heart response found in BII phobia is mediated by parasympathetic activity. However, Sarlo et al. (2002) suggested that the initial heart rate increase is caused by sympathetic activation (suggesting fear) that weakens over time. This latter heart rate decrease was hypothesized to be mediated by parasympathetic activation (suggesting disgust). Taken together, it appears that the diphasic heart rate response found in BII phobia likely reflects both fear and disgust.

It is important to note that the diphasic heart rate has not been unequivocally demonstrated in BII phobia (e.g., Gerlach, Nat, Peeters, Griez, & Schruers, 2006; Ritz, Wilhelm, Gerlach, Kullowatz, & Roth, 2005). However, such studies differed from previous research in their definition of a diphasic response and the type of stimuli utilized (i.e., venipuncture film

instead of surgery film). Another research group suggested that the diphasic response might be specific to a subset of BII phobics (Vogele, Coles, Wardle, & Steptoe, 2003). Vogele et al. (2003) found that the individuals with BII phobia experienced a rapid increase in heart rate, followed by a decrease in heart rate also reported a history of fainting. Those without a history of fainting did not display the diphasic heart rate response. Thus, previous studies resulting in null findings may have used samples lacking a history of fainting or perhaps the diphasic heart rate is not intrinsic to BII phobia, but rather to the fainting response.

Other studies have found that exposure to BII stimuli evoked symptoms of fainting and subjective feelings of disgust in a sample of highly disgust sensitive individuals (Page, 2003) and injection-fearful blood donors (Viar, Etzel, Ciesielski, & Olatunji, 2010). Another study found that disgust evoking images increased symptoms of faintness to BII-related stimuli in a typical sample (Hepburn & Page, 1999). Taken together, it appears that individuals with BII phobia and fears experience elevated levels of physiological symptoms when exposed to BII stimuli. Despite the mixed findings of a diphasic heart response, it is evident that those with BII phobia experience physiological symptoms that differ from individuals with other types of specific phobias.

1.5 OCD and Disgust

Researchers have proposed increased disgust propensity or sensitivity as a central component of OCD (Cisler, Brady, Olatunji, & Lohr, 2010; Power & Dalgleish, 1997; Stein, Liu, Shapira, & Goodman, 2001), especially contamination-related OCD. In this context, contamination refers to a persistent fear of being tainted or impure through real or perceived contact with a contaminated object. OCD is a relatively uncommon psychiatric disorder with a 1-month prevalence of 1.1% (Torres et al., 2006) and lifetime prevalence of 2.3% (Ruscio, Stein,

Chiu, & Kessler, 2010). Notably, obsessions or compulsions surrounding contamination fears are possibly the most common OCD symptoms, with nearly half of patients with OCD reporting at least some contamination fears (Ball, Baer, & Otto, 1996; Olatunji, Sawchuck, Arrindell, & Lohr, 2005; Olatunji, Sawchuck, Lohr, & de Jong, 2004; Rasmussen & Eisen, 1992; Rasmussen & Tsuang, 1986). Self-report measures of disgust have been shown to significantly correlate positively with measures of contamination fear (Cisler, Olatunji, Sawchuk, & Lohr, 2008; Cisler, Reardon, Williams, & Lohr, 2007; Olatunji et al., 2005). Disgust has also been shown to predict contamination fears among non-clinical samples (Mancini, Gragnani, & D'Olimpio, 2001; Muris et al., 2000; Olatunji, Lohr, Sawchuk, & Tolin, 2007; Thorpe, Patel, & Simons, 2003; Tolin et al., 2006) as well among those diagnosed with OCD (Olatunji et al., 2004; Woody & Tolin, 2002). It is also important to note that some evidence suggests that disgust may be related to OCD with a religious focus (Olatunji, Tolin, Huppert, & Lohr, 2005; Zhong & Liljenquist, 2006). Given these associations, the relationship between disgust and contamination-related OCD seems robust and broad. The following sections summarize behavioral and cognitive bias studies examining the role of disgust in OCD (no studies involving the examination of facial expressions have been conducted to date).

1.5.1 Exposure to Disgust Evoking Stimuli in OCD. Avoidance behavior has received little clinical attention to date, perhaps because it is not regarded as part of the “core obsessive-compulsive experience” (de Silva, 2003). Thus, few studies have systematically examined the avoidance behavior of individuals with OCD through BATs and other comparable tasks. Several studies have observed, however, that behavioral avoidance is linked most often to contamination obsessions and washing/cleaning compulsions (de Silva, 2003; Jones & Krochmalik, 2003; Jones & Menzies, 1998; McKay & Robbins, 2008; Rachman & Shafran, 1998; Starcevic et al., 2011).

Subsequently, researchers have begun to design BATs that specifically address disgust-related issues.

Two studies have assessed individuals with elevated contamination fears with BATs and other comparable procedures. Olatunji et al. (2007) conducted a series of eight BATS covering the following domains: smells, rotting foods, small animals, death, body products, hygiene, body envelope violations (e.g., blood, internal organs, mutilation), and sympathetic magic. Participants were also exposed to a disgust inducing video and subsequently reported valence ratings. Results indicated that the high contamination group were less compliant and completed significantly fewer steps on all BATs, except the envelope violations task, than the low fear group. The high contamination group also report more disgust after viewing the video, though they were not different from the low fear group on negative affect ratings. Deacon and Olatunji (2007) found similar results across three BATs. They also found disgust sensitivity to mediate the relationship between contamination fears and avoidance behavior on BATs.

1.5.2 Cognitive Processes and Disgust in OCD. Tolin, Worhunsky, and Maltby (2004) investigated sympathetic magic appraisals in participants with contamination-related OCD, other anxiety disorders, and non-anxious controls by administering a “chain of contagion” task. The investigators asked each participant to identify the most contaminated object in the building (e.g., toilet or garbage can) and rate its degree of contamination. The experimenter then rubbed a clean pencil on the object and had the participant rate the pencil’s degree of contamination. The experimenter then rubbed the contaminated pencil on a new clean pencil. This process was repeated for a total of 12 pencils. Results indicated that the non-anxious and anxious groups evidenced nearly 100% decrease in appraisals of contamination across the 12 pencils; however, the OCD group showed only a 40% reduction. Thus, the non-OCD groups appeared to recognize

that the contagion decreased across the pencils whereas the OCD group tended to perceive a “chain of contagion,” in which the pencils continued to be contaminated.

One study has examined covariation bias with participants with elevated contamination fears and low-fear controls (Connolly, Lohr, Olatunji, Hahn, & Williams, 2009). Participants were presented with two pictures that pertain to contamination-specific fear (e.g., vomit or feces), general fear (e.g., a man with a knife), or neutral (e.g., chair or flowers) content. Following the presentation, participants were asked “what percent of (stimulus) pictures was followed by this outcome?” Participants responded by typing a number between 0 and 100. Results revealed that those with elevated contamination fear overestimated the pairings of contamination-related pictures with disgust and fearful facial expressions. Contamination stimuli were expected to be followed by disgust and fearful facial expressions at equivalent frequencies.

1.6 Evidence for Attentional Bias to Disgust-Evoking Stimuli

Few studies have examined attentional biases toward disgust evoking stimuli in anxiety disorders. However, attentional bias to fear-related stimuli is well-documented in spider phobia using various attentional paradigms such as the emotional Stroop task (Lavy & Van Den Hout, 1993; Thorpe & Salkovskis, 1997; Watts, McKenna, Sharrock, & Trezise, 1986), visual search and eye-tracking (Rinck, Reinecke, Ellwart, Heuer, & Becker, 2005), and the modified dot-probe task (Mogg & Bradley, 2006; Vrijssen, Fleurkens, Nieuwboer, & Rinck, 2009). Attentional bias to contamination-threat words has been demonstrated for patients with OCD using the emotional Stroop (Foa, Ilai, McCarthy, Shoyer, & Murdock, 1993; Lavy, van Oppen, & van den Hout, 1994), the modified dot-probe task (Tata, Leibowitz, Prunty, Cameron, & Pickering, 1996), and eye tracking (Armstrong, Sarawgi, & Olatunji, 2012).

On the contrary, little research has examined attentional bias toward fear-related stimuli in BII phobia. One study has implemented a dot-probe task in a sample of individuals with BII phobia and produced null findings (Wenzel & Holt, 1999). The lack of research and failure to replicate the attentional bias found with other specific phobias may be due to the physiological differences observed in BII phobia (i.e., the diphasic heart response, fainting). For instance, it has been suggested that the fainting response often observed in BII phobia may be mediated by disgust rather than fear (Page, 1994), or even a combination of disgust and fear (Sarlo et al., 2002). Additionally, researchers have found that individuals with BII phobia or fears tend to describe their response to blood, injury, and mutilation as that of disgust or aversion rather than fear (Rachman, 1990; Tolin et al., 1997).

A recent study implemented a modified dot-probe task to examine attentional biases to basic emotions (e.g., facial stimuli depicting anger, fear, disgust, happiness, and sadness) in a large nonclinical sample (Tran, Lamplmayr, Pintzinger, & Pfabigan, 2013). Findings indicated that highly anxious women, but not anxious men, exhibited attentional bias towards angry faces. The attentional bias found with highly anxious women was reflected by difficulty disengaging from the angry faces. These findings did not generalize to fearful or disgusted faces (Tran et al., 2013).

Two studies have found evidence of attentional bias to disgust-related (facial) stimuli in individuals with elevated contamination fears. Recently, Armstrong, Olatunji, Sarawgi, and Simmons (2010) examined attentional bias to fearful and disgusted faces in individuals reporting high and low levels of contamination fear. Participants were presented with disgusted, fearful, and happy faces paired with a neutral face as an eye-tracker recorded eye saccades and fixations. The authors found evidence for vigilance (i.e., initially orienting to stimulus) and maintenance

(i.e., time until disengagement or time fixated on stimulus) biases for the high contamination fear group. Specifically, this group oriented to fearful but not disgusted faces more than the low fear group; however, the high contamination fear group maintained their attention on disgusted and fearful faces longer than the low fear group. Cisler and Olatunji (2010) examined attentional biases in those reporting high levels of contamination fear using a spatial cueing task (i.e., reaction time task). The authors found that the contamination fear group showed delayed disengagement from both fear and disgust stimuli compared to controls. Taken together, it seems individuals with contamination fears spend more time fixating on disgust evoking stimuli compared to controls, suggesting disengagement may be more difficult for these individuals.

Sawchuk et al. (1999) examined implicit memory and attention bias toward disgust evoking words in participants with BII fears. Results from an emotional Stroop task (to assess attentional bias) failed to demonstrate attentional bias to either disgust-related or medical words; however, the participants with BII fears completed more medical and disgust word-stems (to assess implicit memory) than nonfearful participants. This suggests individuals with BII fears may exhibit implicit memory biases for disgust evoking stimuli.

Several brain-imaging studies and an electroencephalogram (EEG) study have been conducted to explore the role of disgust in phobias and OCD. Phillips et al. (2000) used functional Magnetic Resonance Imaging (fMRI) while patients with OCD (characterized by checking or washing obsessions and compulsions) and control participants viewed disgusting scenes. Those with OCD with washing symptoms reported elevated levels of disgust sensitivity and also showed increased activation of the occipito-temporal cortex and the insula, which is thought to reflect increased attention. Those with checking obsessions/compulsions and control participants did not show this brain-imaging pattern. Schienle, Schäfer, Stark, Walter, Kirsch,

and Vaitl (2003) similarly demonstrated that individuals with BII phobia show increased occipital activation using fMRI to disgust evoking pictures relative to controls. Conversely, Schienle, Schäfer, and Naumann (2008) failed to find event-related potential group differences for disgust in individuals with spider phobia and control participants using EEG. Taken together, brain-imaging research has found evidence of increased occipital activation in response to disgust eliciting stimuli for individuals with OCD (specifically washing) and BII phobia, though no support was found for those with spider phobia. Thus, individuals with spider phobia may process disgust evoking stimuli in a different manner than those with OCD and BII phobia.

1.7 Summary

Differences in disgust are evident between individuals with certain specific phobias or OCD and nonclinical control participants. Individuals with spider phobia, BII phobia, OCD, and related fears have been found to report more disgust on self-report questionnaires, while viewing disgust evoking pictures, and during BATs than control participants. They tend to complete fewer steps on BATs pertinent to their fears (e.g., spiders, needles, blood, contaminated foods, etc.) and report more disgust during the BAT than control participants. A substantial amount of evidence has indicated that individuals with disgust-related disorders and fears exhibit cognitive biases toward disgust-related stimuli. For instance, individuals with spider fear show Stroop interference for disgust-related words and those with spider fear, BII fear, and contamination fear show covariation biases for disgust-related outcomes. Additionally, those with spider and BII phobias and fears have been shown to evidence more disgust-related facial expressions than those without such fears.

An emerging field of research has begun to assess relationships between disgust and attentional bias. Though attentional bias towards fear-relevant stimuli has been well established

in the anxiety disorders, relatively few studies have examined if such biases exist toward disgust evoking stimuli, which likely constitutes a source of threat for some disorders (e.g., contamination-related OCD). Extant research has found that individuals with contamination fear exhibit attentional bias towards disgust evoking stimuli using eye tracking and a spatial cueing task. An implicit memory bias has been found for those with BII phobia using a word-stem completion task. Brain-imaging studies have found increased occipital activation (indicating increased attention) using EEG and fMRI for individuals with OCD (predominantly washing obsessions and compulsions) and BII phobia. However, no such activation was found for individuals with spider phobia using EEG. No study to date has found evidence of attentional bias towards disgust stimuli for individuals with spider phobia, thus those with spider phobia may not process such stimuli in the same manner as those with OCD and BII phobia.

1.8 Current Study

The aforementioned research consistently implicates the role of disgust in both specific phobias (spider and BII) and contamination-related OCD. The aims of the current study are two-fold. First, the current study examined differences in self-reported disgust (including disgust sensitivity and propensity) among individuals with elevated symptoms of spider fear, blood-injection (BI) fear, and contamination fear, as well as individuals reporting no such symptomatology. Disgust has been extensively examined with regard to each disorder separately; however, no study to date has compared the experience of disgust between specific phobias and OCD. Second, this study aimed to assess potential attentional biases toward disgust-evoking stimuli, using a modified dot-probe task, between participants with elevated spider, BI, or contamination fear and nonfearful controls.

This study is comprised of two primary parts – assessment via self-report of fear and disgust (Phase 1), and a modified dot-probe task (Phase 2; see Figure 1). The modified dot-probe task employed pictures determined to be disgust evoking, generally threatening or fear evoking, and neutral images (all pictures are disorder-irrelevant). This paradigm was used to examine attentional bias, including vigilance-avoidance, orientation, and disengagement in a sample of participants with disgust-related fears. Vigilance refers to the ability to maintain attention and alertness toward a stimulus over prolonged periods of time. Attentional avoidance refers to strategic efforts made in order to avoid allocating one’s attentional resources to a stimulus. Orienting (or facilitated attention) is the ease with which a threatening stimulus draw’s one’s attention and difficulty in disengagement refers to difficulty in removing attention from a threatening stimulus once attention has been allocated to it (see Cisler, Bacon, & Williams, 2009 for an extensive review of characteristics of attentional bias).

1.9 Hypotheses

Hypotheses for the current study are as follows:

Hypothesis 1: Participants in the symptomatic groups (i.e., spider, BI, and contamination fear) will report significantly more total disgust, disgust sensitivity, and disgust propensity than the control group.

Hypothesis 2: Given the pervasive nature of OCD (i.e., specific phobias are thought to only evoke intense anxiety when the individual is exposed to the feared stimulus), the contamination group is expected to report significantly more disgust propensity (i.e., frequency of experiencing disgust) than the BI and spider fear groups. Recent research has found those with contamination-related OCD to exhibit elevated disgust propensity (Olatunji et al., 2007) rather than sensitivity when compared to controls.

Hypothesis 3: Participants in the symptomatic groups compared to control participants will evidence attentional bias for disgust stimuli. This will be evidenced by significant differences on the vigilance-avoidance index.

Hypothesis 4: The anxiety groups (spider, BI, contamination fear) will show selective attention for the general threat compared to the control group (similar to that predicted for disgust stimuli).

Hypothesis 5: If attentional bias is evidenced, it is predicted that the bias will reflect a difficulty in disengaging from the disgust and threatening stimuli (i.e., opposed to orienting to it) reflected by longer latencies in responses.

CHAPTER 2. METHODOLOGY

2.1 Participants

Participants in Phase 1 were 999 adults recruited from undergraduate psychology classes. These participants completed self-report questionnaires online assessing various fears, including spider fear, BI fear, contamination fear, and also the lack of any significant fears. Individuals reporting high levels of these fears or no significant fears were invited to participate in Phase 2 of the study. They were invited with individualized emails. Individuals previously diagnosed with pervasive developmental delays, intellectual disability, schizophrenia, bipolar disorder, or learning disabilities were excluded from participating in Phase 2. Additionally, individuals with uncorrected vision problems were excluded.

As a result of this screening, 125 participants, ranging in age from 18 to 45 years (mean age = 20.30 years, $SD = 2.95$), completed Phase 2. Twenty-four males and 101 females participated and identified themselves ethnically as 75.2% Caucasian, 15.2% African American, 4% Asian, 2.4% Hispanic, and 3.2% as “other.” Participants were divided into four mutually exclusive groups: those with spider fear, those with BI fear, those with contamination fear, and a control group of participants denying significant fear of spiders, BI, and contamination. The spider fear group ($n = 36$) consisted of participants scoring equal to or higher than a score of 54 on the *Fear of Spiders Questionnaire* (Szymanski & O’Donohue, 1995) and endorsement of avoidance of spiders or intense distress when confronted with a spider (per Huijding & de Jong, 2006; Johnstone & Page, 2004 who implemented a cutoff score of 54). The BI group ($n = 13$) consists of participants scoring equal to or higher than the injection phobia patient mean of the Injection Phobia Scale – Anxiety ($M = 43.80$, $SD = 10.90$; Öst, Hellström, & Kåver, 1992) and endorsement of dizziness or fainting in the presence of blood or injection-related stimuli and/or

avoidance of medical procedures (e.g., shots or having blood drawn). The contamination fear group ($n = 34$) consisted of participants reporting scores equal to or higher than patients diagnosed with OCD on the contamination subscale of the Padua Inventory ($M = 13.87$, $SD = 7.96$; Burns, Keortge, Formea, & Sternberger, 1996). Finally, the control group ($n = 42$) included participants who meet the following criteria: 1) score equal to or less than the mean of the normative sample on the contamination subscale of the PI ($M = 6.54$, $SD = 5.53$; Burns et al., 1996); 2) score at or below the mean of the control group for the IPS-A ($M = 9.20$, $SD = 11.40$; Olatunji, Sawchuk, Moretz, David, Armstrong, & Ciesielski, 2010); 3) reported neither dizziness or fainting when in the presence of blood or avoid necessary medical procedures; and 4) score less than 11 on the FSQ (consistent with the low fear group of Huijding & de Jong, 2006) and denied avoidance of and intense distress from spiders. See Figure 1 for additional information about group assignment Table 1 for demographic statistics by group. All participants completed informed consent prior to participation in each Phase. The Louisiana State University Institutional Review Board approved this study. Participants received course credit upon completion of each Phase.

2.2 Measures and Apparatus

Demographic Questionnaire. The demographic questionnaire is a measure created to obtain background and history information about the participants. Items inquire about income level, race, age, gender, marital status, medical conditions, presence of psychiatric disorders, and family history of mental illness.

Depression Anxiety Stress Scales (DASS-21; Lovibond & Lovibond, 1995). The DASS-21 is a short form of the 42-item DASS (Lovibond & Lovibond, 1995). The DASS-21 yields three subscales measuring depression, anxiety, and stress symptoms over the previous

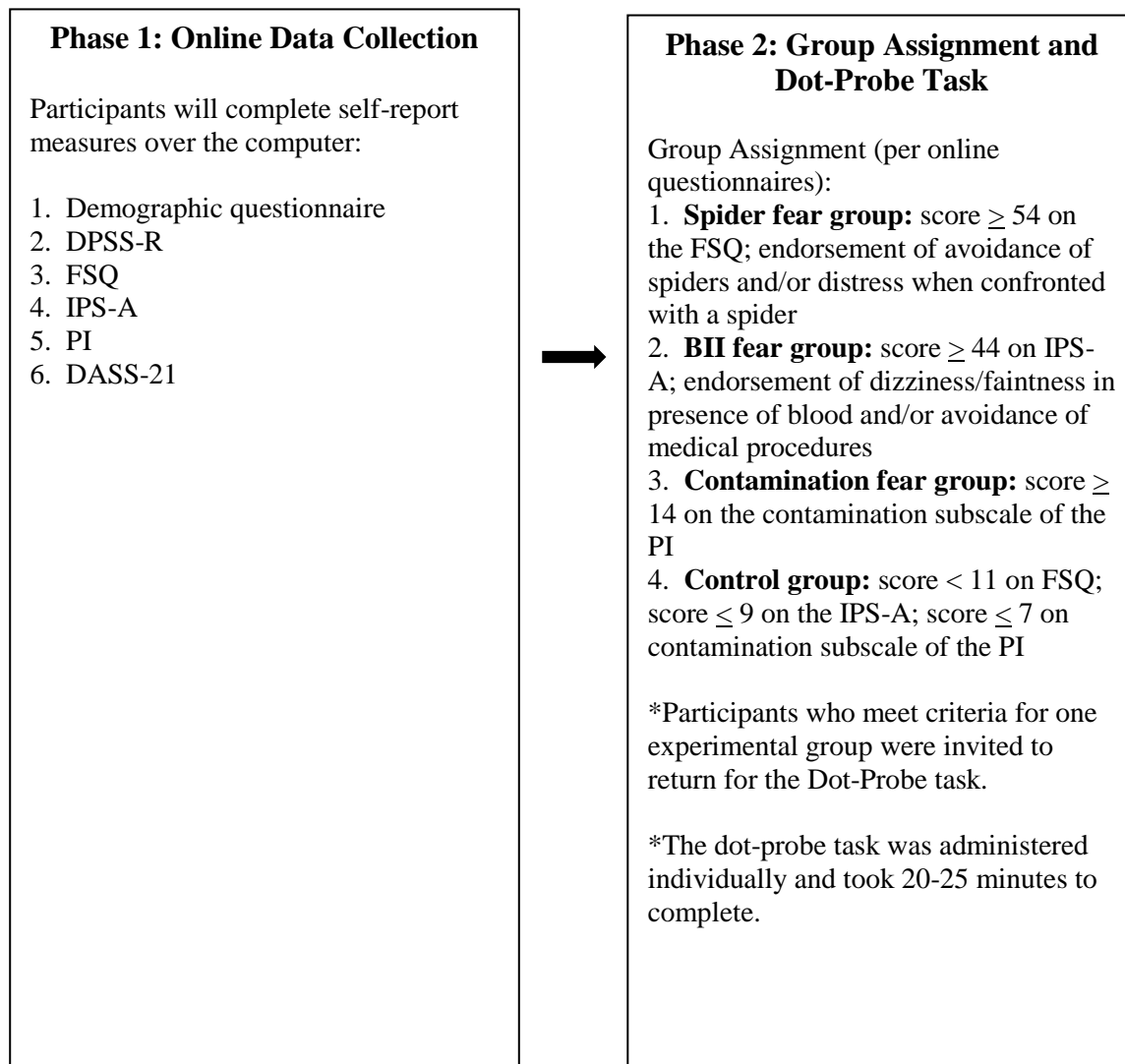


Figure 1
Study Procedures and Participant Grouping Assignments

week. Scores can range from 0 to 63, with the latter indicating more symptoms. The subscales demonstrate excellent internal consistency and good convergent validity in clinical and community samples (Antony, Beiling, Cox, Enns, & Swinson, 1998). For the current study, the DASS-21 total score demonstrated excellent internal consistency ($\alpha = 0.93$), taking into account those who participated in Phase 2. The Depression ($\alpha = 0.90$), Anxiety ($\alpha = 0.80$), and Stress ($\alpha = 0.83$) subscales, each of which consists of seven items, demonstrated good internal consistency.

Table 1
Demographic and Dependent Variables by Group

<u>Variable</u>	<u>Control</u>	<u>Spider</u>	<u>Blood-Injection</u>	<u>Contamination</u>	<u>Total</u>
Age	20.95 (4.38)	20.31 (1.77)	20.00 (1.47)	19.59 (1.93)	20.30 (2.95)
Gender (%)					
Males	14 (33.3)	2 (5.6)	2 (15.4)	6 (17.6)	24 (19.2)
Females	28 (66.7)	34 (94.4)	11 (84.6)	28 (82.4)	101 (80.8)
Ethnicity (%)					
Caucasian	32 (76.2)	26 (72.2)	11 (84.6)	25 (73.5)	94 (75.2)
African American	5 (11.9)	8 (22.2)	1 (7.7)	5 (14.7)	19 (15.2)
Hispanic	2 (4.8)	0 (0)	1 (7.7)	0 (0)	3 (2.4)
Asian	2 (4.8)	1 (2.8)	0 (0)	2 (5.9)	5 (4)
Other	1 (2.4)	1 (2.8)	0 (0)	2 (5.9)	4 (3.2)
DPSS-R Total	12.40 (6.66)	20.11 (7.72)	21.69 (7.40)	24.38 (8.97)	18.85 (9.05)
DPSS-R Propensity	6.98 (3.49)	9.86 (3.14)	9.23 (3.00)	11.29 (3.17)	9.22 (3.65)
DPSS-R Sensitivity	3.62 (2.83)	6.89 (3.28)	8.00 (3.70)	8.47 (4.53)	6.34 (4.07)
DASS-21 Depression	3.07 (3.54)	4.50 (4.30)	3.85 (3.58)	5.15 (4.55)	4.12 (4.10)
DASS-21 Anxiety	1.90 (2.58)	3.83 (3.38)	4.46 (4.37)	5.03 (3.39)	3.58 (3.46)
Vigilance-Avoidance Index					
– Neutral Pictures	11.09 (28.73)	10.66 (21.61)	3.41 (18.81)	11.73 (25.11)	10.34 (24.75)
– Disgust Pictures	13.86 (31.74)	25.05 (26.58)	2.92 (32.21)	11.05 (21.40)	15.18 (28.36)
– Threat Pictures	17.37 (27.69)	21.85 (24.20)	17.68 (40.37)	7.65 (22.29)	16.05 (27.18)
Orienting Index					
- Disgust Pictures	-25.49 (50.72)	-28.30 (38.37)	-44.39 (102.21)	-31.66 (33.93)	-29.94 (51.13)
- Threat Pictures	-12.36 (40.44)	-28.37 (32.16)	-41.03 (62.08)	-13.97 (35.06)	-20.39 (40.36)
Disengagement Index					
- Disgust Pictures	39.56 (62.86)	53.40 (48.70)	48.40 (83.92)	43.02 (38.32)	45.41 (55.50)
- Threat Pictures	29.96 (52.83)	50.07 (41.37)	58.62 (98.54)	21.55 (41.36)	36.44 (54.60)

Note: means and standard deviations are presented; standard deviations are in parentheses.

Disgust Propensity and Sensitivity Scale-Revised (DPSS-R; van Overveld de Jong, Peters, Cavanagh, & Davey, 2006). The DPSS-R is based on the 32-item *Disgust Propensity and Sensitivity Scale* (DPSS; Cavanagh & Davey, 2000) and consists of 16 items that measure the frequency (Disgust Propensity subscale; DP) and emotional impact (Disgust Sensitivity subscale; DS) of disgust experiences. Items are rated on a 5-point Likert scale ranging from 1 (never) to 5 (always); scores range from 16 to 80. The DPSS-R has demonstrated adequate reliability with the α coefficient of 0.78 for the Disgust Propensity subscale and 0.77 for the Disgust Sensitivity subscale (van Overveld et al., 2006). Olatunji, Cisler, Deacon, Connolly, and Lohr (2007) re-examined the factor structure and psychometric properties of the DPSS-R and found that four items did not adequately load on the factor structures. Accordingly, this study utilized only those items suggested by Olatunji and colleagues (2007). The DPSS-R also has demonstrated good reliability, a sound factor structure, and good convergent and discriminant validity (Olatunji et al., 2007). Cronbach's alpha for the DPSS-R total score, the Propensity subscale, and the Sensitivity subscale were 0.87, 0.70, and 0.75, respectively, for the current study (of those who participated in Phase 2) and demonstrated good reliability.

Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995). The FSQ is an 18-item measure that assesses an individual's fear of spiders and is rated on an 8-point Likert scale ranging from 0 (strongly disagree) to 7 (strongly agree). Items are totaled for a score ranging from 0 to 126. The measure assesses five domains: cognitive, behavioral, physiological, negative attitudes, and fear of harm. The FSQ has demonstrated good internal consistency ($\alpha = 0.96$) (Olatunji, et al., 2007). It has been shown to accurately distinguish spider phobics from non-phobics, as well as demonstrate score reduction of fear after treatment (Szymanski &

O'Donohue, 1995). Similarly, Cronbach's alpha for those who participated in Phase 2 of the current study indicated excellent internal consistency ($\alpha = 0.97$).

Injection Phobia Scale – Anxiety (IPS-A; Öst et al., 1992). The IPS-A is an 18-item measure, in which participants rate their degree of anxiety toward a variety of injection and/or venipuncture procedures. The measure is rated on a 5-point Likert scale, ranging from 0 (no anxiety) to 4 (maximum anxiety) with scores ranging from 0 to 72. The α coefficient for the IPS-A per Öst et al. (1992) was 0.93. Olatunji et al. (2010) recently re-examined the IPS-A due to the lack of psychometric assessment it had received. They found the IPS-A to demonstrate excellent test-retest reliability and internal consistency (α ranged from 0.93 to 0.96 in five studies). The IPS-A showed good convergent and divergent validity and successfully discriminated between patients with BII phobia and those without such anxiety (Olatunji et al., 2010). For the current study, Cronbach's alpha was 0.96 for the IPS-A.

Padua Inventory – Revised (PI; Burns et al., 1996). The PI is a 39-item self-report measure of obsessions and compulsions. Respondents rate the degree to which certain thoughts or behaviors distress them on a 5-point Likert scale, ranging from 0 (not at all) to 4 (very much). The PI contains five subscales: thoughts about harm to self/others, obsessional impulses to harm self/others, contamination obsessions and washing compulsions, checking compulsions, and dressing/grooming compulsions.

This study utilized the contamination obsessions and washing compulsions subscale of the PI in order to form the contamination fear group. The contamination subscale of the PI consists of 10 items that measure an individual's aversion toward contamination or the prospect of being contaminated (e.g., "I find it difficult to touch garbage or dirty things"). The total score of the contamination subscale is calculated by summing its items with scores ranging from 0 to

40. The contamination subscale has high internal consistency ($\alpha = 0.85$, Burns et al., 1996). It also correlates highly with other measures of contamination fear, such as the *Vancouver Obsessional Compulsive Inventory* (VOCI; Thordarson, Radomsky, Rachman, Shafran, Sawchuk, & Hakstian, 2004). Cronbach's alpha for participants completing Phase 2 was 0.87 for the 10 items of the contamination obsessions and washing compulsions subscale.

Picture Stimuli. The pictorial stimuli were selected from the International Affective Pictures System (IAPS; Lang, Bradley, & Cuthbert, 2008), which provides a normative set of emotional stimuli based on arousal (ranging from calm to excited), dominance (ranging from feeling controlled to in-control), and valence (ranging from pleasant to unpleasant) ratings. The pictures utilized for the dot-probe task were selected based on valence and arousal ratings. These pictures include three separate areas of content: neutral, disgust, and general threat (not specific to the feared stimulus or disgust; e.g., man holding a knife, gun). Both the disgust and general threat pictures were chosen based on low valence ratings (i.e., indicating unpleasant feelings towards the picture) and high arousal ratings (i.e., indicating the picture induced feelings of stimulation or frenzy). The photographs are in color and their contents span across a wide range of semantic categories. The photographs are 6.5 inches wide and 5 inches high. Permission to utilize the IAPS database was obtained prior to data collection as well as a formal agreement that outlined how the pictorial stimuli may be used. See Appendix A for a copy of the document that outlines use of the IAPS pictures. Additional pictures were supplemented from the Internet given the IAPS is limited in its quantity of threat- and disgust-related content.

Dot-Probe Task. The stimuli for the dot-probe task were created using MatLab and the Psychophysics Toolbox Version 3 (Brainard, 1997; Kleiner, Brainard, & Pelli, 2007; Pelli, 1997). As part of the Dot-Probe task, pictures were presented on a Dell desktop computer. Participants

were seated at eye level approximately 18 inches from a 14-inch computer screen. Responses were recorded on a keyboard. A black fixation cross, 1 cm x 1 cm, appeared in the center of the monitor for 500 ms. Pairs of pictures were then presented for 500 ms, one above the other, separated by approximately 3 cm. Immediately following the presentation of the pictures, a blank screen was presented for 50 ms (i.e., interstimulus interval), followed by a probe appearing in the former position of one of the pictures. Participants were instructed to make a decision about the location of the probe as quickly as possible. The probe remained on the computer screen until the participant made his or her selection by pressing the “X” key if the probe was located in the upper location and “M” if it was in the lower location. The next trial began 1500 ms after the participants made their selection. See Figure 2 for an example of the modified dot-probe task.

The dot-probe task was comprised of 245 trials, including 5 practice trials, 80 neutral – neutral pair trials, and 160 critical trials. Neutral pictures were included in order to serve as a baseline for responding and also to allow the calculation of orienting and disengaging indices. The practice trials included only neutral pictures. The critical trials included disgust-related or generally threatening pictures paired with neutral pictures that are similar in color. The probe was presented in the upper and lower locations equally.

2.3 Procedure

Participants were recruited from undergraduate psychology classes via an online experiment system. During initial recruitment, participants signed up for the study and were consented online prior to completion of a series of online self-report questionnaires.

Questionnaires included a demographic questionnaire, DASS-21, DPSS-R, FSQ, IPS-A, and the PI. Completion of the questionnaires took approximately 20 minutes.

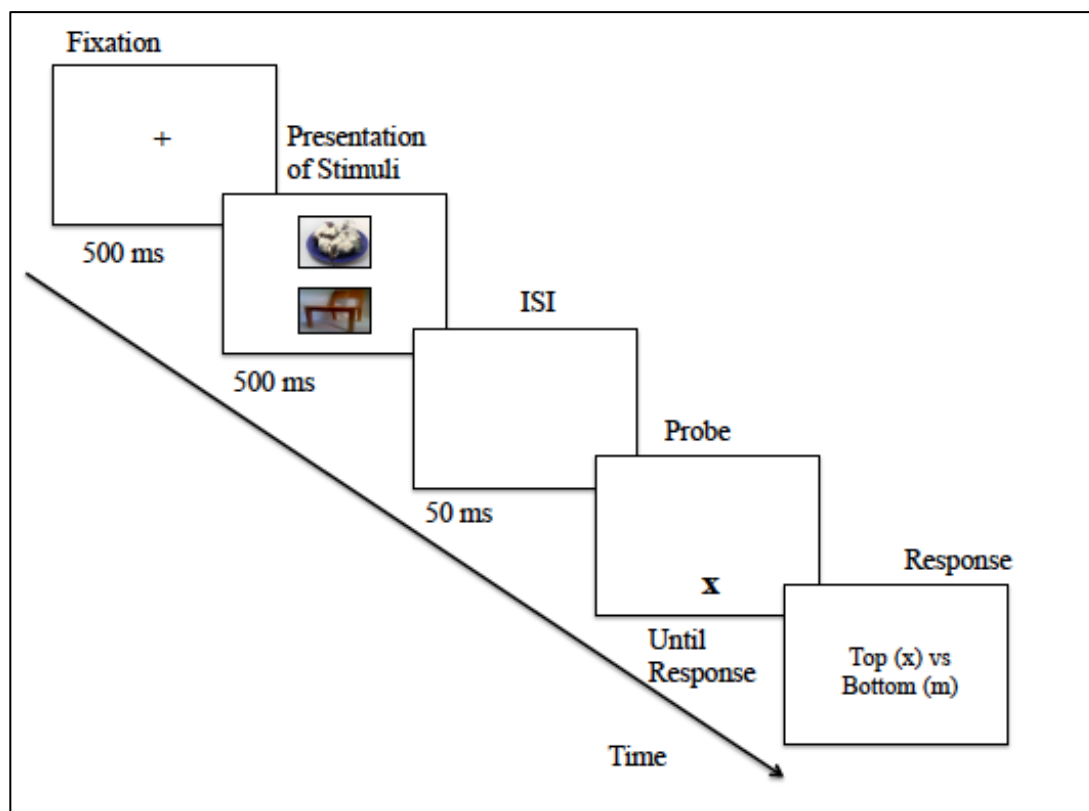


Figure 2
Example of the Dot-Probe Task

Based on responses to these questionnaires, a select group of participants (i.e., those endorsing elevated symptoms of spider, BI, contamination fears, or no fears) were invited to participate in the second phase of the study via individualized emails. Potential participants were given a password to sign up for Phase two and signed up online in the same manner as in Phase one. Participation was optional. For the second phase of the study, participants individually completed the modified dot-probe task. They were seated comfortably at a computer in a distraction-free room. Instructions for the task were read aloud by an experimenter and also displayed on the computer screen. Once the participant indicated that he/she understood the instructions, the practice trials began. Feedback about the accuracy of participants' responses was provided after each of the practice trials. Participants were instructed to respond as quickly

as possible on all trials. The experiment was comprised of four blocks; participants were offered a brief break after the completion of each block of trials. After completion of all trials, the experimenter debriefed the participants. The dot-probe task took approximately 20-25 minutes to complete. Course credit was provided as compensation for participation in each phase.

CHAPTER 3. RESULTS

3.1 Preliminary Analyses

To test for differences due to age, gender, and race among groups, several preliminary analyses were performed. A one-way analysis of variance (ANOVA) revealed no significant differences between the spider fear, BI fear, contamination fear, and control groups by age [$F(3, 124) = 1.40, p = .247$]. Chi Square analyses revealed no significant differences between the aforementioned groups due to ethnicity [$\chi^2(12) = 8.65, p = .733$]; there was a significant difference due to gender [$\chi^2(3) = 9.90, p < .05$] as gender was not equally distributed amongst groups. To examine the effects of gender and ethnicity on the dependent variables, ANOVAs were conducted for the total score of the DPSS-R for each of these demographic variables. Multivariate analysis of variances (MANOVAs) were also conducted to examine the impact of each demographic variable on the following dependent variables: the propensity and sensitivity subscales of the DPSS-R, each vigilance-avoidance index, each orienting index, and each disengagement index (each of these indices are further described below). Ethnicity and gender did not reveal any significant differences on the basis of the DPSS-R total score. The MANOVA for gender did not reveal a significant omnibus effect [Wilks' Lambda = 0.91; $F(9, 115) = 1.26, p = .27$] and was no further interpreted. Table 2 outlines descriptive statistics for dependent variables by gender. Ethnicity [Wilks' Lambda = 0.76; $F(40, 422.75) = .80, p = .809$] was not found to affect the dependent variables.

Overall, 15.2% ($n = 19$) of the total sample reported having a previously diagnosed psychiatric disorder (note that participants diagnosed with severe psychopathology were excluded from Phase 2 of the study). Of those diagnosed, approximately 48.4% of participants were diagnosed with anxiety disorders, 45.1% were diagnosed with depressive disorders, and

Table 2
Descriptive Statistics for Dependent Variables by Gender

<u>Variable</u>	<u>Males</u>	<u>Females</u>	<u>Sample Total</u>
DPSS-R Total	15.96 (7.21)	19.53 (9.34)	18.85 (9.05)
DPSS-R Propensity	8.38 (2.75)	9.42 (3.82)	9.21 (3.65)
DPSS-R Sensitivity	4.92 (3.50)	6.67 (4.14)	6.34 (4.07)
Vigilance-Avoidance Index			
- Neutral Pictures	7.33 (23.85)	11.06 (25.02)	10.34 (24.75)
- Disgust Pictures	17.62 (26.39)	14.60 (28.90)	15.18 (28.36)
- Threat Pictures	27.11 (28.62)	13.42 (26.30)	16.05 (27.18)
Orienting Index			
- Disgust Pictures	-25.24 (36.24)	-31.06 (54.15)	-29.94 (51.13)
- Threat Pictures	-26.24 (37.85)	-19.00 (40.99)	-20.39 (40.36)
Disengagement Index			
- Disgust Pictures	42.90 (52.94)	46.00 (56.34)	45.41 (55.50)
- Threat Pictures	53.42 (57.59)	32.41 (53.37)	36.44 (54.60)

Note: means and standard deviations are presented; standard deviations are in parentheses.

6.5% were diagnosed with eating disorders. Chi Square analyses revealed no significant differences among groups on the basis of previous diagnoses [$\chi^2(3) = 0.23, p = .97$]. One-way ANOVAs were conducted to examine differences between participants with fear of spiders, BI, and contamination as well as controls in self-reported anxiety and depression on the DASS-21. No differences were found between groups in regards to depression [$F(3, 124) = 1.78, p = .154$]. However, the groups did significantly differ on amount of anxiety experienced. Tukey post-hoc tests revealed that the control group exhibited less anxiety than spider fear [$p < .05$] and contamination fear groups [$p < .001$]. The anxiety groups did not significantly differ. See Table 1 for additional descriptive statistics by group including means and standard deviations for self-report measures.

3.2 Primary Analyses

3.2.1. Differences Between Groups on Self-Reported Disgust. To examine differences in self-reported disgust, an ANOVA was conducted between the anxiety (i.e., spider, BI, and contamination fear) and control groups on the DPSS-R total score and a MANOVA was used to examine potential differences on its subscales (DPSS-R Propensity and Sensitivity). Significant differences were found on the DPSS-R total score [$F(3, 124) = 16.47, p < .001, \text{partial } \eta^2 = .17$]. Tukey post-hoc analyses revealed that all anxiety groups significantly differed from the control group on the DPSS-R total score [$p < .001$ to $.01$ for each respectively]. No differences were found among the anxiety groups on the total score. In regards to the DPSS-R subscales, the omnibus effect of the MANOVA was significant [Wilks' Lambda = 0.71; $F(6, 240) = 7.62, p < .001, \text{partial } \eta^2 = .16$]. Differences were observed on Disgust Propensity [$F(3, 124) = 11.71, p < .001, \text{partial } \eta^2 = .23$], and Disgust Sensitivity [$F(3, 124) = 13.37, p < .001, \text{partial } \eta^2 = .25$]. In regards to Disgust Propensity, the control group exhibited less propensity than the spider and

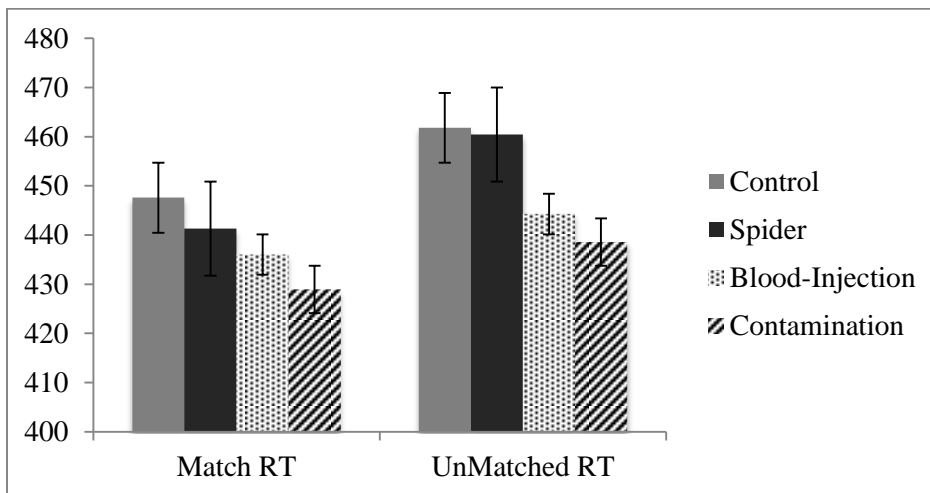


Figure 3

Total Reaction Time by Group. *Note:* data are presented in milliseconds according to probe placement (i.e., either occurring in the location of the critical picture or neutral picture).

and contamination fear groups [$p < .001$]; the control and blood fear groups did not significantly differ. The anxiety groups did not significantly differ on Disgust Propensity. In regards to Disgust Sensitivity, the control group exhibited less sensitivity compared to that of each anxiety group [$p < .01$ respectively]; the anxiety groups did not significantly differ. See Table 1 for descriptives for DPSS-R and its subscales by group.

3.2.2 Analyses to Assess Attentional Biases. Dot-probe trials with errors, response latencies over three standard deviations beyond the overall mean RT, and instances in which the participant responded before the probe appeared were removed prior to data analysis (< 2% of trials). There were no significant differences between groups on total number of errors [$F(3, 124) = 0.31, p = .82$]. A series of one-way ANOVAs were conducted to examine potential differences in RT for matched (i.e., probe appeared in the position of the critical picture) and unmatched (i.e., probe appeared in position opposite of critical picture) stimuli. These analyses revealed no

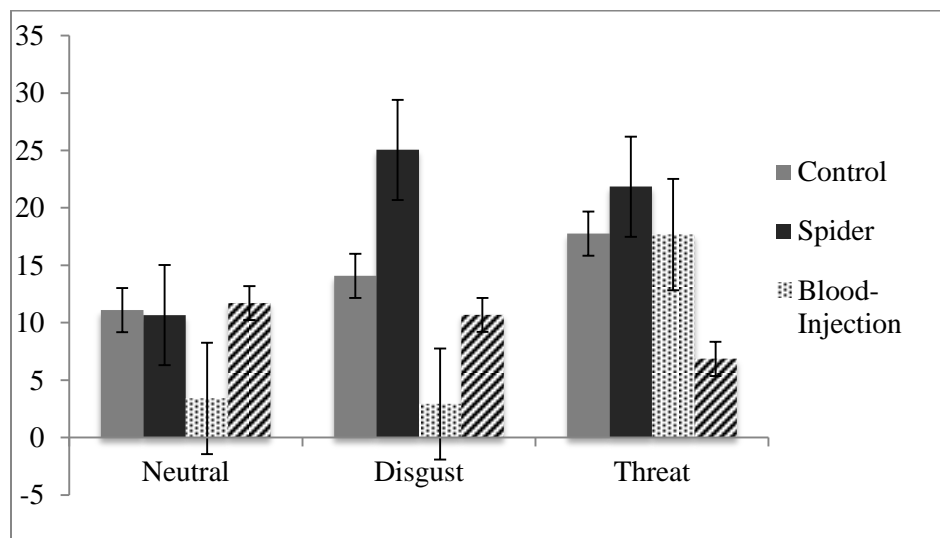


Figure 4
Vigilance-Avoidance Scores by Group for Picture Type. *Note:* the y-axis depicts index scores.

significant main effects or interactions for total RT on matched and unmatched trials. Figure 3 depicts total RT for matched and unmatched trials by group.

For each picture type (disgust, threat, or neutral), vigilance-avoidance scores were calculated for each group per MacLeod and Mathew's (1988) formula. The vigilance-avoidance score is calculated as $\frac{1}{2}((LC/UPr - UC/UPr) + (UC/LPr - LC/LPr))$, where C = critical picture (i.e., disgust) location, Pr = probe location (i.e., upper or lower position), U = upper, and L = lower. This equation calculates the mean speeding of detection latencies to probes in the same area as the target stimuli by subtracting them from equivalent probe detection times when the stimulus is in a different position. Positive values indicate vigilance (i.e., faster reaction time to probes following emotionally laden stimuli compared to probes following neutral stimuli), zero indicates no attentional bias, and negative values indicate avoidance (i.e., slower reaction times to probes following emotionally threatening stimuli compared to probes following neutral stimuli). A 4 (Group: spider, BII, contamination, control) x 3 (Picture type: disgust, threat, neutral) mixed factorial ANOVA, with picture type as the repeated measure, was conducted in order to compare groups on attentional bias scores for the three picture types. No significant main effect [$F(2, 120) = 1.96, p = .145, \text{partial } \eta^2 = .03$] or interaction [$F(6, 240) = 1.27, p = .272, \text{partial } \eta^2 = .03$] was found. Figure 4 shows vigilance-avoidance index scores by group for picture type.

Orienting and disengagement indices were also calculated for disgust and threat pictures in order to examine specific components of attention. These formulae were adapted from Salemink, van den Hout, and Kindt (2007). The orienting index was calculated by subtracting the mean reaction time for emotionally laden stimuli from the mean reaction time for neutral stimuli for each group. Positive scores indicate faster responses to probes appearing after disgust or

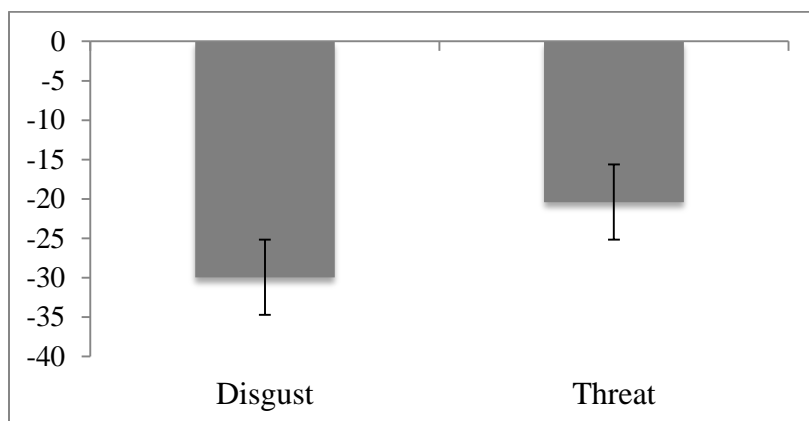


Figure 5

Orienting Index Scores by Picture Type. *Note:* the y-axis depicts index scores rather than RT in milliseconds.

threat compared to neutral stimuli. A 4 (Group) x 2 (Picture type: disgust, threat) mixed factorial ANOVA, with picture type as the repeated measure, was conducted with orienting index scores (refer to Table 1 for descriptive statistics by group). There was a significant main effect for Picture Type [$F(1, 121) = 5.09, p = .026, \text{partial } \eta^2 = .04$] (Pillai's Trace was used as Box's Test of Equality of Covariance Matrices was violated (Box's $M < .05$)) as participants, regardless of group, exhibited larger index scores for threat versus disgust pictures. Figure 5 depicts orienting index scores by picture type. Given orienting scores were negative across groups, no evidence of facilitated responding to probes appearing after emotionally laden stimuli was found. Scores for the orienting index are depicted by group in Figure 6.

The disengagement index (i.e., ease of removing attention from threat) was calculated by subtracting the mean reaction time for neutral stimuli in the presence of other neutral stimuli from the mean reaction time for neutral stimuli in the presence of threatening stimuli. Positive scores indicate slower responses to neutral pictures in the presence of threat compared to pairings with other neutral pictures. A 4 (Group) x 2 (Picture type: disgust, threat) mixed factorial

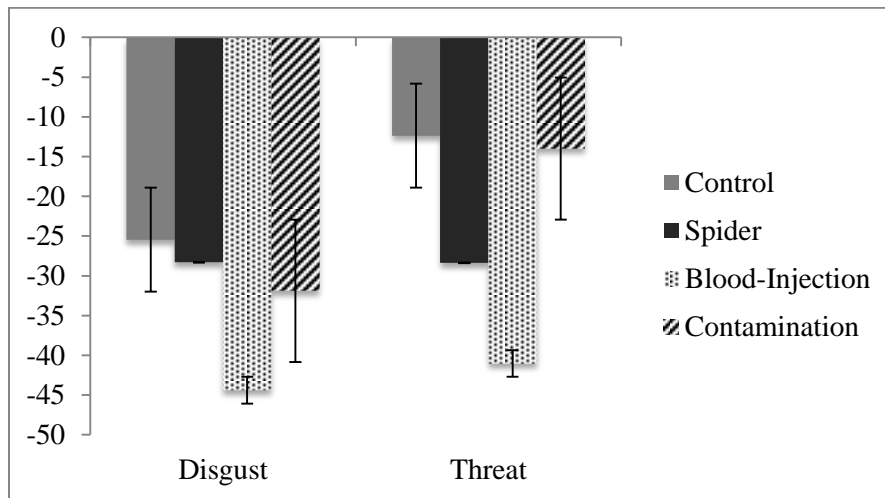


Figure 6
Orienting Index by Group. *Note:* the y-axis depicts index scores. Scores are not presented for neutral trials as those scores as used as a baseline measure in computing orienting and disengagement indices

ANOVA, with picture type as the repeated measure, was conducted with the disengagement index scores. Neither the main effect [$F(1, 121) = 1.35, p = .248, \text{partial } \eta^2 = .01$] nor the interaction [$F(3, 121) = 1.37, p = .257, \text{partial } \eta^2 = .03$] were significant. Given disengagement scores for all groups were positive, participants demonstrated a pattern of slowed responding to neutral pictures in the presence of emotionally laden pictures. Scores for the disengagement index are depicted by group in Figure 7.

3.2.3 Relationships Among Vigilance-Avoidance Indices and Disgust. Correlational analyses were conducted to examine the relationship between the vigilance-avoidance, orienting, and disengagement indices for each picture type and the DPSS-R total and its subscales. Significant correlations were found between the vigilance-avoidance index for threat pictures and the DPSS-R total ($r = -.181$), DPSS-R Propensity ($r = -.182$), and DPSS-R Sensitivity ($r = -.192$). No other significant correlations existed between the DPSS-R and its subscales and any other attentional index. See Table 3 for correlations among all dependent variables.

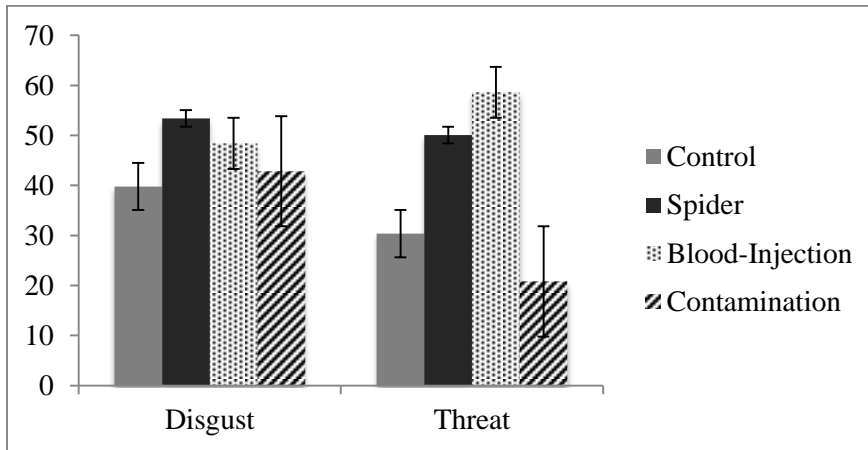


Figure 7
Disengagement Index by Group. *Note:* the y-axis depicts index scores

Table 3
Bivariate Correlations between Dependent Variables

	DPSS-R Total	DPSS-R Propensity	DPSS-R Sensitivity	V-A for Neutral	V-A for Disgust	V-A for Threat	Orienting for Disgust	Orienting for Threat	Disengage for Disgust
DPSS-R Propensity	.888**								
DPSS-R Sensitivity	.931**	.739**							
V-A for Neutral	-.121	-.067	-.138						
V-A for Disgust	-.054	-.083	-.032	.028					
V-A for Threat	-.181*	-.182*	-.192*	.084	.278**				
Orienting for Disgust	-.056	-.043	-.017	.163	.131	-.044			
Orienting for Threat	-.074	-.012	-.100	.182*	.027	-.285**	.673**		
Disengage for Disgust	.022	-.006	-.002	-.136	.385**	.187*	-.864**	-.612**	
Disengage for Threat	-.039	-.085	-.026	-.094	.117	.708**	-.518**	-.878**	.543**

Note: ** $p < .01$; * $p < .05$. DPSS-R = Disgust Propensity and Sensitivity Scale Revised; V-A = Vigilance-Avoidance Index

CHAPTER 4. DISCUSSION

The present study was designed to examine self-reported disgust and attentional processes among individuals reporting symptoms of various disorders that appear to be highly influenced by the emotion of disgust. This study differs from other examinations of attentional processes in that groups that are thought to be especially vulnerable to the experience of disgust were compared to each other and a group of control participants. Additionally, picture stimuli were implemented versus word or facial stimuli (e.g., Harkness et al., 2009). The present study examined participants' self-report of disgust as well as the utility of a vigilance-avoidance model of attentional bias among participants who reported elevated levels of spider fear, blood-injection fear, contamination fear, or no such fears.

Findings derived from self-report measures were generally consistent with a priori hypotheses as the anxiety groups reported more total disgust and disgust sensitivity (i.e., intensity) than the control group. Differences emerged on the basis of disgust propensity (i.e., frequency) in which spider and contamination fearful groups reported more disgust propensity than the control group (the BI group did not differ from the other anxiety groups or the control group). Contrary to expectation, the contamination group (i.e., thought to entail more pervasive fear/anxiety) did not report more propensity than the other anxiety groups who were expected to report less propensity on the basis of having a more specific and stimulus-driven fear.

The dot-probe task yielded findings that were not in support of the study hypotheses. No group differences emerged on the vigilance-avoidance index, orienting index, or the disengagement index. The groups also responded similarly on matched and unmatched trials as no differences were found. Of note, a main effect was found for picture type on the orienting index, in which participants across groups showed larger orienting scores for threat pictures than

disgust pictures. However, orienting scores did not provide evidence for enhanced (i.e., faster) responding to probes occurring after emotionally laden stimuli as these scores were negative for each group. Instead, participants, regardless of group, demonstrated positive disengagement scores indicating slowed responding to probes following emotionally laden stimuli. They also demonstrated a pattern of vigilance over avoidance as evidenced by positive vigilance-avoidance scores. Taken together, no groups differed in regards to selectively attending to disgust or generally threatening stimuli. All participants appeared to respond to threatening and disgust stimuli in a vigilant manner characterized by delayed disengagement.

These findings are consistent with Cisler and Olatunji (2010) in some respects as they found that attentional biases in contamination fearful participants did not differ as a function of fear versus disgust. They also found that their sample was characterized by a pattern of difficulty disengaging from sources of threat and did not demonstrate facilitated attention.

Although attentional biases are thought to be etiological and/or maintenance factors associated with anxiety, numerous studies have produced null findings in regards to threatening and disgust stimuli. In fact, attentional biases to disgust have only been demonstrated in regards to contamination fear (Armstrong et al., 2010; Cisler & Olatunji, 2010). No studies to date have found evidence for those with spider or BII phobia or elevated fears to show attentional bias for disgust stimuli using a dot-probe task or similar methodology (e.g., spatial cueing task, eye-tracking). Thus, the current study provides support that those with spider, BI, and contamination fears process threatening and disgust stimuli in a manner similar to those without these fears. Current findings are in opposition to the findings of Armstrong et al. (2010) and Cisler and Olatunji (2010) in this respect (i.e., these studies found group differences in attentional biases). This may be due, in part, to several methodological differences including type of stimuli (facial

pictures versus pictorial representations of threat and disgust) and paradigm implemented (eye-tracking and spatial cueing versus modified dot-probe task).

This is the first study to assess potential attentional biases towards pictorial stimuli depicting disgust scenarios in a dot-probe task. Other studies have commonly examined attentional biases towards threatening stimuli (i.e., words, pictures, facial pictures depicting negative emotional states); however, the current study set out to examine potential attentional biases towards disgust stimuli. Further, this study was the first, to the extent of our awareness, to compare multiple groups thought to be especially vulnerable to the experience of disgust (i.e., those with specific fears of spiders or blood and injections and those endorsing contamination-related symptoms of OCD).

Findings from this study demonstrated a propensity towards delayed disengagement rather than orienting towards threatening stimuli. This is consistent with prior research positing a delayed disengagement model of attentional bias regarding threat (e.g., Cisler & Olatunji, 2010; Fox, Russo, Bowles, & Dutton, 2001). According to the delayed disengagement model, all individuals will initially orient toward threat cues; however, some individuals take longer to disengage attention from threat-related stimuli. Therefore, it is not that attention is differentially drawn to threat-relevant stimuli, rather that some individuals have a difficult time disengaging their attention from threat cues subsequent to initial orienting of attention. Some evidence suggests delayed disengagement is particularly evident in trait anxious individuals (e.g., Fox, Russo, & Dutton, 2002). In this study, delayed disengagement was characteristic of participants regardless of their experience of anxiety.

Future research might benefit from taking gender into account when assessing attentional biases, which is rarely taken into account in attention-based research. Attentional variables could

potentially be implicated in the higher prevalence of women with anxiety disorders than men. McLean and Anderson (2009) offer an extensive review of gender differences in the prevalence and vulnerability of women to anxiety. Briefly, women score higher on self-reported measures of anxiety than men in nonclinical samples (Costa & McCrae, 2001; Feingold, 1994). Women are also more likely to endorse fear of repulsive animals (e.g., snakes and spiders) but not other common fears such as fear of enclosed spaces, bodily injury, or social fears when compared to males (Davey, McDonald, & Hirisave, 1998; Tucker & Bond, 1997). Such differences appear to be largely accounted for by women's higher endorsement of disgust sensitivity than men (Connolly, Olatunji, & Lohr, 2008; Davey, 1994b). This appears to be the same case for BII fears (Connolly et al., 2008), to the extent that the relationship between gender and BII fears is mediated by gender differences in disgust sensitivity (Olatunji, Arrindell, & Lohr, 2005). Thus, it is possible that women may attend differently to such stimuli than men.

Gender differences have recently been examined regards to attentional biases to basic emotions (e.g., anger, fear, disgust, happiness, and sadness; Tran et al., 2013). For instance, highly anxious women have been found to exhibit attentional bias towards angry faces; however, this type of selective attention was not found in highly anxious men. These findings did not generalize to fearful or disgusted faces (Tran et al., 2013) but do find differences in attentional bias. Other researchers utilizing ERP have found evidence that women high in anxious arousal demonstrate greater early visual processing (reflected by larger P100 amplitude) than men high in anxious arousal on the Stroop task with threatening words (Sass et al., 2010). Although these studies do not implicate attentional bias towards disgust stimuli specifically, evidence for a more general gender difference in the attention towards negatively valenced stimuli emerged.

4.1 Limitations

Several limitations are worth noting in the current study. First, despite recruiting a relatively large sample of participants for Phase 2, the groups were uneven. The BI group was considerably smaller ($n = 13$) than the other groups. This likely reflects a lower base rate of individuals reporting substantial fear of blood and injections given the large sample recruited in Phase 1. However, individuals with BI fears may represent a more impaired subset of the population and therefore be less likely to partake in research studies that entail the assessment of anxiety or fear. Secondly, gender was unevenly distributed in the current study which is likely due to a higher prevalence of women with anxiety disorders (e.g., anxiety disorders are approximately 1.5-2 times more common among women; McLean, Asnaani, Litz, & Hofmann, 2011). There were nearly four times as many female participants as male in the current study and the control group was most represented by the male participants. Additionally, this study employed a nonclinical undergraduate sample. As a result, the sample was grouped into anxious (i.e., reported significant fear) and nonfearful groups based on whether their self-report of symptoms was above or below a clinical cutoff on a single questionnaire, and it was not known whether they met criteria for an anxiety disorder at the time of the study. The study may have been stronger if participants were administered a clinical interview, such as the *Anxiety Disorders Interview Schedule* (ADIS; Brown, DiNardo, & Barlow, 1994) and grouped according to whether they met diagnostic criteria for an anxiety disorder (e.g., OCD, BII phobia, or spider phobia). As a result, the present findings are limited to those with elevated fears and generalization to clinical samples may not be appropriate.

Several limitations of the dot-probe paradigm are also worth noting. For instance, some researchers have questioned the utility of the dot-probe task as a measure of attention given the

probes are typically presented for 500ms after the stimulus is presented which limits information regarding the actual speed with which threatening stimuli are detected. Thus, the dot-probe task yields information regarding what the participant was attending to immediately before the probe presentation, but fails to specify which stimulus the participant first attended to (Byrne & Eysenck, 1995). Further, the dot probe stimuli were not evaluated by the participants for meaningfulness, and therefore may not have been relevant for all participants. Perhaps the disgust stimuli were not salient enough to evoke anxiety in the anxiety groups. In the planning of this study, it was thought that using pictorial stimuli over word stimuli would enhance ecological validity; however, this has yet to be empirically examined.

4.2 Conclusions and Implications of the Current Research

This study sought out to examine potential attentional biases among various types of anxiety in a nonclinical sample. Specifically, disgust-evoking stimuli were investigated as some types of anxiety may be especially vulnerable to the experience of disgust, perhaps, even more so than traditionally threatening stimuli. Despite reporting higher levels of disgust (i.e., disgust propensity, disgust sensitivity, and total disgust), anxious participants did not significantly differ from controls in the manner in which they attended to disgust or threatening stimuli. Findings of this study do help to better understand how participants attend to negatively valenced stimuli, which likely constitutes a risk factor for the development of anxiety disorders. The results indicate that individuals with spider, BI, and contamination fears do not attend preferentially to disgust stimuli over traditionally threatening or neutral stimuli but do exhibit slowed disengagement. Recent research has begun to evaluate the efficacy of attention training procedures as an intervention (or adjunct to cognitive-behavioral therapy) for anxiety disorder (e.g., Koster, Fox, & MacLeod, 2009); however, results of this study do not necessarily support

this type of intervention as no differences were observed among those with anxiety/fears and controls.

Additionally, it is important to note that special attention should be taken when designing studies examining attentional bias, especially when choosing negatively valenced stimuli. Previous research has employed word, pictures, and facial representations in effort to represent or evoke negative emotional states (e.g., anger, fear, etc.); however, researchers rarely acquire ratings from participants to better understand the participants' experience of the stimuli. For instance, stimuli obtained from IAPS (Lang, Bradley, & Cuthbert, 2008) is normed based on ratings of arousal, valence, and dominance, but one does not know if participants find these pictures disgust evoking or threatening. Thus, systematically investigating the role of emotional valence, emotional arousal, and gender in attentional bias in anxious and nonanxious individuals may foster understanding of the etiology and treatment of anxiety disorders.

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APPENDIX A
COPY OF THE CENTER FOR THE STUDY OF EMOTION AND ATTENTION
AGREEMENT

Dear Colleague: This email regards your request to receive the affective ratings in the International Affective Picture System (IAPS), data that have been collected, analyzed and distributed by researchers at the NIMH Center for the Study of Emotion and Attention at the University of Florida.

Please read the following important points regarding download and use of the IAPS pictures:

1. The IAPS was conceived as a catalog of pictures that represents the entire range of emotional reactions potentially obtainable in this medium. Therefore, users are advised that it contains some images of violence, as well as some images that are judged to be erotic, fear evoking, disgusting, and/or repellent by some viewers. The IAPS is intended exclusively for the research use of applicant investigators. In downloading the IAPS, the investigator is assuming personal responsibility for the download and use of these materials and their subsequent exposure to participant populations.

2. In publications, if possible, we encourage authors to include in a footnote the catalog numbers of the IAPS pictures used in the experiment, as this assists in replication and extension.

3. IAPS pictures should not be published in any print format -- including JOURNALS, newspapers, magazines, etc. -- or in any other media format (TV, films, etc.) and can not be posted on the Internet in any form. IAPS pictures are not in the public domain, and permission can not be given to use IAPS pictures in any published venue. Prior to distributing the IAPS, we ask researchers to sign a statement indicating the pictures will not be published or posted in any format, but we are increasingly receiving more and more requests for permission to publish IAPS pictures in various venues; on the other hand, they often just appear in journals etc., without permission. Therefore, we would like to remind you that IAPS pictures should not be published in any venue.

If you would like to include examples of the type of pictures used in your experiments in journal publications (or in videos shot in your laboratories for TV/film/internet purposes), we recommend that you download pictures with similar content (e.g., babies, food, violence, etc.) that are in the public domain on the Internet and use these pictures as examples in media outlets. There is nothing unique about the specific PICTURES in the IAPS set. Rather, it is the inclusion of the normative ratings that we have collected, obtained from hundreds of participants, which allows researchers to select pictures with known hedonic valence and arousal properties, as well as the availability of a stimulus set that different researchers can use in their experiments. Because of this, using pictures in the public domain to demonstrate the type of pictures used in an experiment is quite reasonable. There are many other reasons for why the IAPS pictures themselves should not be published or shown on TV, not the least of which is to retain

their integrity for use in experimental studies.

We appreciate your attention to these important issues regarding the use of IAPS pictures.

Below, you will find a link and a time-limited (1 week) username and password that enables you to download the IAPS. You will be asked to fill out a brief form prior to the actual download. Please do not share your password with other people.

Thank you,
Margaret Bradley & Peter Lang
NIMH-CSEA Media Core

link: <http://csea.php.ufl.edu/downloadiaps.html>

APPENDIX B ADDITIONAL ANALYSES

To date, no study has found differences in selective attention among those thought to be especially vulnerable to the experience of disgust (e.g., individuals with spider, BI, or contamination-related fears or disorders). As a result, additional analyses were carried out in which participants with spider, BI, and contamination fear were collapsed into one group and compared to the nonfearful group. Preliminary analyses indicated no significant differences between the combined anxiety group and nonfearful controls on the basis of ethnicity [$\chi^2(4) = 2.16, p = .707$] or age [$F(1, 124) = 3.18, p = .077$]. There was a significant difference due to gender [$\chi^2(1) = 8.14, p < .01$].

Analyses to assess attention biases were carried out in the same manner as the primary analyses within this dissertation. Accordingly, vigilance-avoidance, orienting, and disengagement indices were calculated and analyzed. A 2 (Group: anxiety, control) x 3 (Picture type: disgust, threat, neutral) mixed factorial ANOVA, with picture type as the repeated measure, was conducted in order to compare groups on vigilance index scores for the three picture types. The main effect and interaction were not significant. For the orienting index, a 2 (Group) x 2 (Picture type: disgust, threat) mixed factorial ANOVA, with picture type as the repeated measure, was conducted. A significant main effect for Picture Type was found, [$F(1, 123) = 8.25, p = .005$, partial $\eta^2 = .06$], in which all participants responded faster to disgust stimuli than threatening stimuli. A 2 (Group) x 2 (Picture type: disgust, threat) mixed factorial ANOVA, with picture type as the repeated measure, was also conducted for the disengagement index. Neither the main effect nor interaction were significant. Overall, the results of combining the anxiety groups yielded the same pattern of results as those presented in the primary analyses. Thus, no group differed in regards to vigilance-avoidance, orienting, and disengagement to disgust and

threatening stimuli. Additionally, participants demonstrated a pattern of slowed disengagement versus orienting to emotionally laden stimuli (i.e., evidenced by positive disengagement scores).

APPENDIX C
INSTITUTIONAL REVIEW BOARD APPROVAL FORMS

ACTION ON PROTOCOL APPROVAL REQUEST



Institutional Review Board
Dr. Robert Mathews, Chair
131 David Boyd Hall
Baton Rouge, LA 70803
P: 225.578.8692
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irb@lsu.edu | lsu.edu/irb

TO: Thompson Davis
Psychology

FROM: Robert C. Mathews
Chair, Institutional Review Board

DATE: January 18, 2013
RE: IRB# 3342

TITLE: Differential Examination of Disgust in Spider, Blood-Injection, and Contamination Fear: Self-Reported and Attention-Based Assessment of Differences

New Protocol/Modification/Continuation: New Protocol

Review type: Full Expedited **Review date:** 1/22/2013

Risk Factor: Minimal Uncertain Greater Than Minimal

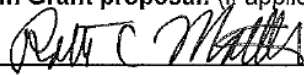
Approved **Disapproved**

Approval Date: 1/22/2013 **Approval Expiration Date:** 1/21/2014

Re-review frequency: (annual unless otherwise stated)

Number of subjects approved: 750

Protocol Matches Scope of Work in Grant proposal: (if applicable)

By: Robert C. Mathews, Chairman 

PRINCIPAL INVESTIGATOR: PLEASE READ THE FOLLOWING –
Continuing approval is CONDITIONAL on:

1. Adherence to the approved protocol, familiarity with, and adherence to the ethical standards of the Belmont Report, and LSU's Assurance of Compliance with DHHS regulations for the protection of human subjects*
2. Prior approval of a change in protocol, including revision of the consent documents or an increase in the number of subjects over that approved.
3. Obtaining renewed approval (or submittal of a termination report), prior to the approval expiration date, upon request by the IRB office (irrespective of when the project actually begins); notification of project termination.
4. Retention of documentation of informed consent and study records for at least 3 years after the study ends.
5. Continuing attention to the physical and psychological well-being and informed consent of the individual participants, including notification of new information that might affect consent.
6. A prompt report to the IRB of any adverse event affecting a participant potentially arising from the study.
7. Notification of the IRB of a serious compliance failure.
8. SPECIAL NOTE:

**All investigators and support staff have access to copies of the Belmont Report, LSU's Assurance with DHHS, DHHS (45 CFR 46) and FDA regulations governing use of human subjects, and other relevant documents in print in this office or on our World Wide Web site at <http://www.lsu.edu/irb>*

Application for Approval of Projects Which Use Human Subjects

This application is used for projects/studies that cannot be reviewed through the exemption process.



Institutional Review Board
 Dr. Robert Mathews, Chair
 131 David Boyd Hall
 Baton Rouge, LA 70803
 P: 225.578.8692
 F: 225.578.5983
 Irb@lsu.edu
 lsu.edu/irb

Applicant, Please fill out the application in its entirety and include two copies of the completed application as well as parts A-E, listed below. Once the application is completed, please submit to the IRB Office for review and please allow ample time for the application to be reviewed. Expedited reviews usually takes 2 weeks. Carefully completed applications should be submitted 3 weeks before a meeting to ensure a prompt decision.

- A Complete Application Includes All of the Following:
 - (A) Two copies of this completed form and two copies of part B thru F.
 - (B) A brief project description (adequate to evaluate risks to subjects and to explain your responses to Parts 1&2)
 - (C) Copies of all instruments to be used.
 - *If this proposal is part of a grant proposal, include a copy of the proposal and all recruitment material.
 - (D) The consent form that you will use in the study (see part 3 for more information.)
 - (E) Certificate of Completion of Human Subjects Protection Training for all personnel involved in the project, including students who are involved with testing or handling data, unless already on file with the IRB. Training link: (<http://phrp.nihtraining.com/users/login.php>)
 - (F) IRB Security of Data Agreement: (<http://research.lsu.edu/files/item26774.pdf>)

1) Principal Investigator*: Rank

*PI must be an LSU Faculty Member

Dept: Ph: E-mail:

2) Co Investigator(s): please include department, rank, phone, and e-mail for each

Whitney Jenkins, M.A.
 Graduate student, Psychology
 wjenk12@tigers.lsu.edu
 352-294-4968

3) Project Title:

4) Proposal Start Date: 5) Proposed Duration Months:

6) Number of Subjects Requested: 7) LSU Proposal #:

8) Funding Sought From:

RD# 3342 LSU Proposal #

Full

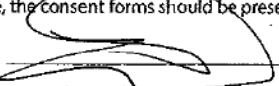
Expedited

Human Subjects Training

Complete Application

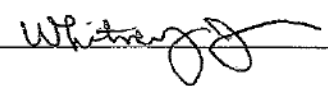
Study Approved By:
 Dr. Robert C. Mathews, Chairman
 Institutional Review Board
 Louisiana State University
 203 B-1 David Boyd Hall
 225-578-8692 | www.lsu.edu/irb
 Approval Expires: 1/21/2014

ASSURANCE OF PRINCIPAL INVESTIGATOR named above
 I accept personal responsibility for the conduct of this study (including ensuring compliance of co-investigators/co-workers) in accordance with the documents submitted herewith and the following guidelines for human subject protection: The Belmont Report, LSU's Assurance (FWA00003892) with OHRP and 45 CFR 46 (available from <http://www.lsu.edu/irb>). I also understand that copies of all consent forms must be maintained at LSU for three years after the completion of the project. If I leave LSU before that time, the consent forms should be preserved in the Departmental Office.

Signature of PI  Date 12/7/12

ASSURANCE OF STUDENT/PROJECT COORDINATOR named above. If multiple Co-Investigators, please create a "signature page" for all Co-Investigators to sign. Attach the "signature page" to the application.

I agree to adhere to the terms of this document and am familiar with the documents referenced above.

Signature of Co-PI (s)  Date 12/12/2012



VITA

Whitney Shay Jenkins earned her Bachelor of Science degree in psychology in May 2007 from Florida State University in Tallahassee, Florida. She later earned a Master of Arts degree in clinical psychology from Louisiana State University in Baton Rouge, Louisiana, in May 2010. Whitney is currently a candidate for the degree of Doctor of Philosophy at Louisiana State University and Agricultural and Mechanical College in Baton Rouge, Louisiana. Her area of specialization is child clinical psychology under the direction of Thompson E. Davis III, Ph.D. Whitney has pursued a number of research interests, including brief cognitive behavioral interventions for specific phobias, cognitive aspects of anxiety such as attentional biases, and the phenomenology of anxiety disorders such as specific phobia, obsessive-compulsive disorder, and posttraumatic stress disorder. Whitney completed her pre-doctoral internship in clinical and health psychology at the UF Health/Shands Medical Center at the University of Florida in Gainesville, Florida. There, she provided clinical services to youth with a variety of psychological and medical conditions through the Psychology Clinic and Behavioral Health Unit in the Psychiatry Department. Whitney has since been employed with the Behavioral Health Unit at UF Health/Shands where she serves as a clinical supervisor and works with youth and adults with a wide range of anxiety and mood disorders.