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The role of disgust and fear of contamination in responses to pictorial versus live stimuli

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THE ROLE OF DISGUST AND FEAR OF CONTAMINATION IN RESPONSES TO
PICTORIAL VERSUS LIVE STIMULI

by

Valerie Vorstenbosch

B.Sc., Wilfrid Laurier University, June 7, 2007

A thesis

presented to Ryerson University

in partial fulfillment of the

requirements for the degree of

Master of Arts

in the Program of

Psychology

Toronto, Ontario, Canada, 2009

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The Role of Disgust and Fear of Contamination in Responses to Pictorial versus Live Stimuli

Master of Arts 2009

Valerie Vorstenbosch

Psychology

Ryerson University

Abstract

Disgust appears to play a role in certain animal fears and not others. The present study investigated the extent to which pictorial and live stimuli arouse fear and disgust responses during a brief encounter with spider-relevant and dog-relevant stimuli and whether individual differences in disgust sensitivity and fear of contamination are responsible for differential responding. Participants with a high fear of spiders ($n = 20$) or dogs ($n = 19$) completed measures of spider fear, dog fear, disgust sensitivity, contamination fear, and trait anxiety, and four behavioural approach tasks. Results suggest that pictorial stimuli may be effective for eliciting fear and disgust responses for individuals with a high fear of spiders but not individuals with a high fear of dogs. Individual differences in disgust-relevant factors were not responsible for these differences. These results may inform the use of pictorial stimuli in the treatment of specific phobias.

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The Role of Disgust and Fear of Contamination in Responses to Pictorial versus Live Stimuli

Specific phobias are characterized by a persistent and unreasonable fear of specific objects or situations that are avoided or endured with marked distress (American Psychiatric Association, 2000). The Diagnostic and Statistical Manual of Mental Disorders, fourth edition, text revision (DSM-IV-TR; American Psychiatric Association, 2000) differentiates specific phobias based on the following five types: Animal (e.g., spider, dog), Natural Environment (e.g., storms, heights), Blood-Injection-Injury (e.g., needles, blood), Situational (e.g., flying, enclosed spaces) and Other (e.g., costumed characters) (American Psychiatric Association, 2000). The lifetime prevalence of specific phobias is approximately 9.4%, with animal phobias being among the most prevalent at 4.7% (Stinson et al., 2007).

Etiology

Traumatic Conditioning

According to Mowrer's (1939) two-stage model, phobias develop when a previously neutral stimulus becomes paired with an aversive stimulus and a conditioned fear response develops to that neutral stimulus. The model proposes that phobias are maintained through operant conditioning as individuals learn that their conditioned fear response can be reduced by avoiding the phobic stimulus, or any other stimulus that may be associated with the feared object or situation. One animal fear that is often conceptualized in terms of classical conditioning is the fear of dogs. For example, when individuals with a fear of dogs are asked to recall the onset of their fear, they more often report events that suggest that their fear was acquired via classical conditioning than via vicarious acquisition or informational transmission (Doogan & Thomas, 1992). In fact, in one study it was found that 56% of individuals with a fear of dogs reported that

a traumatic conditioning experience (i.e., being bitten) preceded the onset of their fear (Di Nardo et al., 1988).

Traumatic conditioning experiences may contribute to the development of some animal phobias, like dog phobias; however, other animal phobias, like spider phobia, are often not associated with such conditioning experiences. That is, many individuals who suffer from other animal phobias cannot recall the factors that led to the onset of their phobia. For example, very few individuals with spider phobia report a traumatic experience as the trigger for the onset of their fear (Davey, 1992a). Rather, these individuals tend to report that they have “always been afraid of spiders” (Merckelbach, Muris & Schouten, 1996). Therefore, given that different animal fears appear to develop in different ways, researchers have developed other, alternative models, which may provide an explanation for why some animal fears develop.

Predator-Defense Model

Ohman, Dimberg and Öst (1985) proposed that small animal fears may be conceptualized via a predator-defense model, such that the fear of small animals may be understood as a primitive defensive response to a perceived predator. Initial support for this model was provided by Arntz, Lavy, van den Berg and van Rijsoort (1993), who found that some individuals with a fear of spiders believe that spiders may attack them or bite them, despite the fact that they have never actually been attacked or bitten by a spider.

However, there are number of phenomena related to spiders that have been difficult to explain using the predator-defense model. For example, given that very few of the world's current spiders are potentially dangerous to human beings (Isbister et al., 2005), it is difficult to believe that this would have been any different for our early ancestors. In addition, recent research has found that the fear of spiders covaries not only with fears of animals classified as

fear evoking (e.g., rats and snakes) but also with fears of animals classified as disgust evoking (e.g., maggots and slugs; Davey, 1992a).

Disease-Avoidance Model

Thus, it appears as though the fear of spiders may be better conceptualized via Matchett and Davey's (1991) disease-avoidance model. The essence of the disease-avoidance model is that certain animals (e.g., spiders) may be avoided because of their perceived disgust, contamination and disease characteristics, rather than the expectation that one may be attacked or physically harmed during a confrontation with the animal. For example, some individuals with a fear of spiders may be motivated to avoid physical contact with spiders in order to protect themselves from disease, rather than from physical attack.

Davey (1992b) provided three potential explanations for why certain animals may have acquired their disgust relevance and become fear-relevant. First, some animals, such as rats or cockroaches, may be directly or indirectly linked to the spread of disease, infection or contamination of food; second, some animals, such as snakes and slugs, may possess physical characteristics that resemble disgust evoking stimuli (e.g., mucus or feces); and third, some animals, such as maggots and spiders, may be contingently associated with dirt, disease or contamination or may be an indicator of dirt, disease or infection (i.e., animals in the third category may have been historically believed to be associated with contamination and the spread of disease, when they were never actually associated with such outcomes). Spiders, for example, are one type of animal that have been historically associated with disease and infection but generally are neither poisonous nor carriers of illnesses (Davey, 1994b). Previous research has provided support for the disease avoidance model, as *disgust* and *fear of contamination* are two

factors that have been proposed to contribute to the acquisition and/or maintenance of spider fears (Sawchuk, Lohr, Tolin, Lee & Kleinknecht, 2000; Tolin, Lohr, Sawchuk & Lee, 1997).

Disgust. Accumulating evidence has suggested that disgust may play an important role in spider fear, as previous research has shown that when individuals with a high fear of spiders are presented with pictures of spiders or are exposed to a fake but realistic looking tarantula, they not only report greater levels of fear but also greater levels of disgust, as compared to individuals with a low fear of spiders (Olatunji & Deacon, 2008; Sawchuk, Lohr, Westendorf, Meunier & Tolin, 2002). In addition, previous research has shown that the perceptions that children with a high fear of spiders have about the disgustingness of spiders decrease following treatment (de Jong, Andrea, & Muris, 1997), which suggests that these disgust perceptions may play an important mediating role in spider fears. Lastly, individuals with a high fear of spiders tend to not only report that spiders are their most feared object, but also the object that they find most disgusting (Thorpe & Salkovskis, 1998).

If disgust does contribute to the fear of spiders, then disgust sensitivity, which is defined as a trait-like predisposition to become disgusted in response to a wide range of stimuli, should also be associated with the fear of spiders. Accordingly, many studies have shown that (1) a significant positive relationship exists between disgust sensitivity and fear of spiders (de Jong & Merckelbach, 1998; Sawchuk et al., 2000); and (2) individuals with spider phobia score significantly higher on measures of disgust sensitivity than do individuals who do not have a spider phobia (Merckelbach, de Jong, Arntz & Schouten, 1993; Mulkens, de Jong & Merckelbach, 1996; Tolin et al., 1997). Additionally, Muris, van der Heiden and Rassin (2008) investigated the relationship between disgust sensitivity and psychopathological symptoms in non-clinical children and found that a significant relationship exists between disgust sensitivity

and symptoms of specific phobias (including spider phobia), which suggests that disgust sensitivity may play a potential role in the acquisition and/or maintenance of child psychopathology. Furthermore, the relationship between disgust sensitivity and fear of spiders has been found to be relatively unaffected after controlling for variance associated with the effects of other trait variables such as neuroticism, introversion and trait anxiety, which suggests that this relationship may be relatively unique (Davey & Bond, 2006; Mulkens et al., 1996; Muris et al., 2008).

In addition, given that only some animals have been found to be associated with the emotion of disgust, previous research has also investigated the relationship between disgust sensitivity and different types of animal fears (Davey, 1994a; Ware, Jain, Burgess, & Davey, 1994). Overall, the results of these studies suggest that disgust sensitivity mediates the fear of some animals but not others. For example, when animals are labeled as (1) predatory (e.g., tiger), which means that they evoke fear and are likely to attack or physically harm human beings or (2) fear-relevant (e.g., spider), which means that they evoke fear but are not as likely to actually attack or physically harm human beings, it has been found that disgust sensitivity is only significantly correlated to fear of animals in the fear-relevant category, and not to fear of animals in the predatory category (Ware et al., 1994). Thus, these findings provide additional support for the idea that different animal fears may be better conceptualized in terms of somewhat different mechanisms.

Furthermore, although the present study was not designed to address the causal role of disgust in the development of specific phobias, previous research by Davey and colleagues has investigated disgust as a potential causal factor in the development of certain animal fears. For example, Webb and Davey (1992) manipulated undergraduate students' levels of disgust and

then asked them to rate their level of fear to different categories of animals (i.e., High Fear/High Predatory animals, High Fear/Low Predatory animals, High Revulsion animals, and neutral animals) before and after watching a violent, disgusting or neutral video. Results of this study provided preliminary support for a causal relationship between disgust and fears of certain animals, such that participants who watched the disgust video showed increased levels of fear to High Fear/Low Predatory animals and High Revulsion animals, whereas participants who watched the violent video showed increased levels of fear to High Fear/High Predatory animals. However, given the methodological limitations of this study (i.e., the disgust video may have been as likely to elicit anxiety as disgust and there was an absence of mood manipulation checks), results of this study should be interpreted with caution.

In a more controlled study of disgust induction, Marzillier and Davey (2005) investigated the relationship between disgust and anxiety by using a number of mood-induction procedures (e.g., guided imagery vignettes and music, video clips, and autobiographical recall and music) and mood measures (e.g., visual analogue scales, free-label questionnaires, and emotional scales). Results of this study indicated that, independent of type of mood induction and type of mood measure, anxiety produced increases in reported levels of disgust, whereas disgust did not produce increases in reported levels of anxiety. Therefore, these results suggest that if disgust is to play a causal role in the development of anxious psychopathology, such as specific phobia, then the causal role may not be mediated by individuals experiencing heightened levels of disgust (Marzillier & Davey, 2005).

However, given that there was no target stimulus being evaluated in Marzillier and Davey's (2005) study, but there was in Webb and Davey's (1992) study, it is possible that disgust may be able to facilitate anxiety, but only when there is a target stimulus that is disgust

evoking. Davey, MacDonald and Brierley (2008) tested this hypothesis by investigating whether an experimental disgust induction had a differential effect on subsequent levels of anxiety to fear-relevant, disgust-relevant and fear-irrelevant stimuli in a sample of non-clinical students. Surprisingly, results of this study indicated that disgust was associated with increased levels of anxiety to a number of stimuli, regardless of whether they were disgust-relevant. Thus, although these studies were unable to determine whether disgust does play a specific causal role in the development of certain animal fears, previous research has suggested that disgust may play an important role in certain animal fears, such as fear-relevant animal fears. In addition, other disgust-relevant factors, such as fear of contamination, have also been considered important factors in certain animal fears, such as the fear of spiders.

Fear of contamination. Initial support suggesting an association between fear of contamination and fear of spiders was provided by Sawchuk et al. (2000), who found that individuals with a high fear of spiders scored higher on measures of contamination concerns, as compared to individuals with a low fear of spiders. In one study, individuals with a high fear of spiders reported that they were much less eager than individuals with a low fear of spiders to eat an unopened chocolate bar after a spider had walked across it (de Jong & Muris, 2002). Given that the chocolate bar in this example was still in its package, this finding supports the idea that individuals with a high fear of spiders may have elevated levels of contamination concerns. Previous research has suggested that this fear of being contaminated by a disgusting object is the best predictor of spider fear when compared to the subjective probability of spiders doing harm (de Jong & Muris, 2002). Recent research has continued to provide support for a role of fear of contamination in spider fear, as it has shown that contamination-related implicit associations discriminate strongly between individuals with spider phobia and individuals without spider

phobia (Huijding & de Jong, 2007). Additionally, de Jong and Peters (2007) also found that individuals with a high fear of spiders were more likely to display a contamination-relevant outcome expectancy bias towards images of spider stimuli, whereas individuals with a low fear of spiders were more likely to experience a harm-relevant outcome expectancy bias. These results provide further empirical support for a potential role of fear of contamination in spider fear.

In Vivo Exposure

Given that some animal fears may be maintained by different mechanisms, different treatment strategies for these fears may be required in order to maximize treatment effectiveness. The current “gold standard” treatment for specific phobia, including animal phobias, is *in vivo* exposure, the systematic and controlled confrontation of feared objects and situations. In vivo exposure is usually conducted in a graduated or hierarchical manner, such that individuals begin with easier tasks and work up to increasingly challenging tasks that involve exposure to the more fear provoking aspects of their feared stimulus. In order for in vivo exposure to be effective in reducing an individual’s level of fear, it has been proposed that the individual’s fear structure (i.e., fear memory) must be activated by the stimulus that they are being exposed to (Foa & Kozak, 1986). If, however, an individual’s fear structure is not activated by a stimulus, according to Foa and Kozak’s theory, the fear structure will not be available for modification. This might indicate that the stimulus may not be effective for reducing the individual’s level of fear. Thus, in order to maximize the effectiveness of in vivo exposure, each stimulus within the individual’s hierarchy should ideally be fear evoking for that individual.

Given that individuals usually start with easier (i.e., less fear provoking) tasks before moving onto more difficult (i.e., more fear provoking) tasks, it may be common practice to

present clients with photographs of their feared object as an initial task before they are exposed to the live version of their feared object. This assumption, however, may be problematic as the use of photographs for certain specific phobias may not effectively activate an individual's emotional response. For example, other factors, aside from fear evoking status may help to determine the extent to which different stimulus formats (e.g., pictures versus live) activate an individual's emotional response. Specifically, these other factors may help to explain an individual's emotional reaction to fear-relevant animals (e.g., spiders). As previously mentioned, spiders are quite distinct from predatory animals (i.e., animals that may attack or physically harm humans) in the sense that they are often perceived as both fear and disgust evoking. In addition, the fear of spiders has also been found to be associated with the fear of contamination. Thus, it may be that these additional elements of disgust and contamination trigger more reasons for individuals with a fear of spiders to avoid spider-relevant stimuli. In other words, it may be that these disgust and contamination properties promote a lower threshold for avoidance for individuals with animal fears in the fear-relevant category (e.g., spider fears), as compared to individuals who fear animals that may attack or physically harm humans (e.g., dogs). As a result of this lower threshold, individuals with these types of fears may be more reactive to a range of different stimuli (e.g., pictorial and live stimuli) as compared to individuals who have a fear of animals often associated with attack or physical harm. Following this rationale, it was proposed that both pictorial and live stimuli would be effective for eliciting an emotional response for fears of fear-relevant animals, whereas live stimuli would be much more effective than pictorial stimuli for eliciting an emotional response for fears of animals that may attack or physically harm humans. Currently, however, there are no known investigations regarding this proposed discrepancy. Thus, the present study was designed to investigate the extent to which different

stimulus formats activate an emotional response for individuals with a high fear of spiders and individuals with a high fear of dogs. Furthermore, the study also investigated the extent to which potential differences in responding were associated with elements of disgust and contamination.

Present Study

The aims of the present study were two-fold. The first aim was to test whether there are differences across fearful animals (i.e., spider versus dog) with respect to the extent to which particular stimulus formats (i.e., pictures versus live) are able to activate an emotional reaction (i.e., a fear response or a disgust response) during a brief encounter with spider-relevant and dog-relevant stimuli. In addition, the present study also tested the extent to which individuals typically fear being physically harmed (i.e., injured) by a spider or a dog. The second aim was to determine whether individual differences in disgust-relevant factors, such as disgust sensitivity and fear of contamination, are responsible for differential responding to spider-relevant and dog-relevant stimuli. In the proposed study, individuals with a high fear of spiders and low fear of dogs and individuals with a high fear of dogs and low fear of spiders were compared on their responses to dogs and spiders presented pictorially and live.

Hypotheses

Five hypotheses were tested in the present study:

1. It was hypothesized that participants with a high fear of spiders would display a more pronounced fear reaction (as indexed by self-reported fear) to a picture of a spider and a live spider, when compared to a picture of a dog and a live dog. Participants with a high fear of dogs, on the other hand, were hypothesized to display a more pronounced fear reaction to a picture of a dog and a live dog, when compared to a picture of a spider and a live spider.

Related to this, it was hypothesized that the difference between the mean fear responses that

participants with a high fear of spiders experienced while viewing a picture of a spider versus a picture of a dog would be much larger than the difference between the mean fear responses that participants with a high fear of dogs experienced while viewing a picture of a spider versus a picture of a dog.

2. It was hypothesized that both participants with a high fear of spiders and participants with a high fear of dogs would display a more pronounced disgust reaction (as indexed by self-reported disgust) to a picture of a spider and a live spider, when compared to a picture of a dog and a live dog. Participants with a high fear of spiders, however, were hypothesized to display a more pronounced disgust reaction to a picture of a spider and a live spider, when compared to participants with a high fear of dogs.
3. It was hypothesized that individuals with a high fear of spiders would be able to approach a picture of a dog and a live dog more closely than they would a picture of a spider or a live spider. Similarly, it was also hypothesized that participants with a high fear of dogs would be able to approach a picture of a spider and a live spider more closely than they would a picture of a dog or a live dog. Related to this, it was hypothesized that participants with a high fear of dogs would be able to approach a picture of a dog more closely than participants with a high fear of spiders would be able to approach a picture of a spider.
4. It was hypothesized that participants with a high fear of dogs would report a more pronounced fear of being physically harmed (i.e., injured) by a dog than participants with a high fear of spiders. Participants with a high fear of spiders, however, were hypothesized to report a similar level of fear of being physically harmed (i.e., injured) by a spider, as participants with a high fear of dogs.

5. It was hypothesized that disgust sensitivity and fear of contamination would be stronger predictors of responding to spider-relevant stimuli than of responding to dog-relevant stimuli. In particular, it was hypothesized that disgust sensitivity and fear of contamination would be stronger predictors of responding to a picture of a spider than to a picture of a dog and would be less relevant for predicting responding to a live spider versus a live dog because disgust sensitivity and fear of contamination were expected to be responsible for participants' differential responding to the pictorial stimuli. In addition, disgust sensitivity and fear of contamination were also predicted to remain significantly correlated with responding to a picture of a spider even when type of animal fear and trait anxiety were controlled for.

Method

Participants

Thirty-nine participants (28 women, 11 men) were recruited for participation in this study. Introductory psychology students, non-introductory psychology students, and individuals in the Greater Toronto Area (GTA) were recruited for this study using a number of different recruitment methods. First, students in an introductory psychology course were invited to complete two screening measures (i.e., the *Fear of Spiders Questionnaire* [FSQ; Szymanski & O'Donohue, 1995] and the *Dog Phobia Questionnaire* [DPQ; Hong & Zinbarg, 1999]) online, as part of winter and spring mass testing. The cutoff scores that were used for this study were determined based on students' responses during winter mass testing. Cutoffs were set at the top and bottom third of the distribution of scores for the 492 introductory psychology students who completed the FSQ and DPQ during winter mass testing. Based on students' responses to these two screening measures, participants were classified into two mutually exclusive groups. Individuals who scored in the bottom third of the distribution of DPQ scores (42 and below) and in the top third of the distribution of FSQ scores (48 and above) were invited to participate in the high fear of spiders and low fear of dogs group. Individuals who scored in the bottom third of the distribution of FSQ scores (12 or below) and in the top third of the distribution of DPQ scores (60 and above) were invited to participate in the high fear of dogs and low fear of spiders group. The cutoff scores that were used for the FSQ in the present study are similar to those reported in previous research; for example, Huijding and de Jong (2006) categorized participants as having a low fear of spiders if they scored less than 11 on the FSQ and as having a high fear of spiders if they scored greater than 55 on the FSQ. Given that there are no published studies using the DPQ,

the cutoff scores for the DPQ could not be compared to previous research. Fourteen first year introductory psychology students received course credit for participating in the present study.

Non-introductory psychology students and individuals in the GTA were also recruited through poster advertisements, which were posted throughout Ryerson University, University of Toronto and on public bulletin boards throughout the GTA. The recruitment flyer included a webpage address, which is where individuals completed the screening measures. If participants met the previously mentioned cutoffs, then they were invited via email or telephone to participate in the study. In addition, other non-introductory psychology students were recruited on a voluntary basis at an information booth that was set up on the ground floor of Jorgenson Hall at Ryerson University. Students, who met the previous cutoffs, were invited by email to participate in the study. Twenty-five non-introductory psychology students and individuals in the GTA received \$10 compensation for participating in the present study. There were no significant differences between introductory psychology students and non-introductory psychology students or individuals recruited from the GTA when compared on age, $t(37) = -0.05$, $p = .96$, and gender, $p = .71$ (Fisher's exact test).

Twenty participants (16 women, 4 men) were recruited for the high fear of spiders and low fear dogs group and 19 participants (12 women, 7 men) were recruited for the high fear of dogs and low fear of spiders group. Forty percent of participants with a high fear of spiders ($n = 8$) reported symptoms consistent with a DSM-IV diagnosis of spider phobia and 37% of participants with a high fear of dogs ($n = 7$) reported symptoms consistent with a DSM-IV diagnosis of dog phobia. In terms of other specific phobias, 20% of participants with a high fear of spiders ($n = 4$) and 21% of participants with a high fear of dogs ($n = 4$) reported symptoms that met criteria for other DSM-IV specific phobias (e.g., heights, injections). DSM-IV diagnoses

were determined using the specific phobia section of the *Structured Clinical Interview for DSM-IV* (SCID-IV; First, Spitzer, Gibbon & Williams, 1996). Participant age ranged from 18 to 47 years ($M = 23.95$ years; $SD = 6.01$ years), overall. The mean age of participants with a high fear of spiders was 23.40 years ($SD = 6.38$ years) and the mean age of participants with a high fear of dogs was 24.47 years ($SD = 5.76$ years). There were no significant differences between participants with a high fear of spiders and participants with a high fear of dogs when compared on age, $t(37) = -0.55, p = 0.59$, gender, $\chi^2(1) = 1.88, p = .17$, or recruitment source, $\chi^2(1) = 1.36, p = .24$.

The majority of participants in the overall sample completed at least some college or university (64 % completed some college or university, 26% completed college or university and 3% completed a graduate degree). The remaining 8% of participants completed high school. The breakdown of participants' ethnicity was as follows: 10% Black, 13% East Asian, 3% Hispanic, 3% Middle Eastern, 18% South Asian, 5% Southeast Asian, and 51% White.

Measures

Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995). The FSQ is an 18-item self-report questionnaire that assesses severity of spider phobia. Participants respond by indicating how much they agree with each statement on an eight-point Likert-type scale that ranges from 0 (totally disagree) to 7 (totally agree). Total scale scores range from 0 to 126. The FSQ has demonstrated good psychometric properties, including excellent internal consistency ($\alpha = .92$; Szymanski & O'Donohue, 1995) and excellent test-retest reliability ($r = .91$; Muris & Merckelbach, 1996). In the present study, the alpha coefficient for the FSQ was .98.

Dog Phobia Questionnaire (DPQ; Hong & Zinbarg, 1999). The DPQ is a 27-item self-report questionnaire that assesses symptoms of dog phobia. Participants respond by indicating

the degree to which they agree or disagree with each statement using a seven-point Likert-type scale that ranges from 1 (strongly disagree) to 7 (strongly agree). There are four reversed scored items (e.g., “I do *not* try to avoid dogs”). Total scale scores range from 27 to 189. The DPQ has demonstrated good psychometric properties, including high internal consistency ($\alpha = .92$; Boivin, Gifford, McCabe, Antony & Swinson, 2007). In the present study, the alpha coefficient for the DPQ was .98.

Structured Clinical Interview for DSM-IV – Specific Phobia Section (SCID-IV; First et al., 1996). The specific phobia section of the SCID-IV is a semi-structured diagnostic interview that assesses the DSM-IV criteria for specific phobia. Participants were given this interview to assess whether their symptoms met diagnostic criteria for spider phobia or dog phobia.

Disgust Scale - Revised (DS-R; Haidt, McCauley & Rozin, 1994, modified by Olatunji et al., 2007). The DS-R is a 25-item self-report questionnaire that assesses disgust sensitivity across three different dimensions: Core Disgust, which includes food, animals and body products; Animal-Reminder Disgust, which includes death and envelope violations (e.g., dead bodies and mutilation of the body); and Contamination Disgust, which includes concerns about interpersonal transmission of essences. Participants respond to the first 14 items by indicating the degree to which they agree or disagree with each statement using a five-point Likert-type scale that ranges from 0 (strongly disagree) to 4 (strongly agree). Participants respond to the last 13 items by indicating the degree to which they find each experience disgusting using a five-point Likert-type scale that ranges from 0 (not disgusting at all) to 4 (extremely disgusting). Two items (12 and 16) are considered “catch” questions, which can be used to identify and exclude data from individuals who may not have been attending to the item content; these items are not included in the scoring of the DS-R. There are three reversed scored items (e.g., “I might be willing to try

eating monkey meat, under some circumstances”). An overall score for disgust sensitivity is obtained by summing responses to the 25 items. Total scale scores range from 0 to 100. Internal consistency for the overall scale, as well as the three subscales, has been found to be acceptable ($\alpha_{\text{DS-R}} = .87$; $\alpha_{\text{CORE}} = .80$; $\alpha_{\text{ANIMAL}} = .82$; and $\alpha_{\text{CONTAMINATION}} = .71$; Olatunji et al., 2007). The total scale score was used as a measure of disgust sensitivity for the present study. In the present study, the alpha coefficient for the total scale score of the DS-R was .96.

Padua Inventory – Washington State University Revision (Contamination Fear subscale) (PI-WSUR Contamination Fear subscale; Burns, Keortge, Formea & Sternberger, 1996). The PI-WSUR Contamination Fear subscale includes 10-items that assess contamination obsessions and washing compulsions. Participants respond by indicating the degree of disturbance that each item creates on a five-point Likert-type scale that ranges from 0 (not at all) to 4 (very much). Total Contamination Fear subscale scores range from 0 to 20. The PI-WSUR Contamination Fear subscale has demonstrated good psychometric properties, including high internal consistency ($\alpha = .85$) and good test-retest reliability ($r = .75$; Burns et al., 1996). In the present study, the alpha coefficient for the PI-WSUR Contamination Fear subscale was .91.

State-Trait Inventory for Cognitive and Somatic Anxiety – Trait version (STICSA-T; Ree, MacLeod, French & Locke, 2008). The STICSA-T is a 21-item self-report questionnaire that assesses cognitive and somatic symptoms as they pertain to an individual’s general mood state. Participants respond by indicating the degree to which each statement is, in general, true of them using a four-point Likert scale that ranges from 1 (not at all) to 4 (very much so). The STICSA-T consists of two subscales: cognitive symptoms of anxiety (10 items) and somatic symptoms of anxiety (11 items). A total scale score is obtained by summing the 21 items. Total scale scores range from 21 to 84. In addition, a Cognitive subscale score can be obtained by summing the 10

items that assess cognitive symptoms of anxiety and a Somatic subscale score can be obtained by summing the 11 items that assess somatic symptoms of anxiety. Cognitive subscale scores range from 10 to 40 and Somatic subscale scores range from 11 to 44. The STICSA-T has demonstrated good psychometric properties, including excellent total scale internal consistency ($\alpha = .91$) and good subscale internal consistency ($\alpha = .87$ for both the cognitive and somatic subscales; Grös, Antony, Simms & McCabe, 2007). The total scale score was used as a measure of trait anxiety for the present study. In the present study, the alpha coefficient for the total scale score of the STICSA-T was .65.

Behavioural Approach Tasks (BATs). Each participant performed four separate behavioural approach tasks. The purpose of these tasks was to measure participants' subjective and behavioural reactions while they confronted spider-relevant and dog-relevant stimuli. The specific stimuli that were used include (1) an 8 x 10 inch picture of a Chilean rose tarantula; (2) an 8 x 10 inch picture of a black Labrador retriever; (3) a live, Chilean rose tarantula; and (4) a live, black Labrador retriever.

The two *pictorial* BATs consisted of a series of six increasingly difficult steps ranging from standing 10 feet from the photograph to rubbing the object depicted in the photograph. The experimenter introduced each pictorial BAT using the following instructions: "To get an impression of how close you are willing to approach a photograph of a spider [dog], I am going to ask you to perform a number of steps. We do not expect that everyone will be able to perform each step; we just want to see how far you would actually be willing to go. Once you are ready to begin, I will uncover the photograph and give you directions for each step. In order to successfully complete a step, you will be required to perform the step for 5 consecutive seconds. Try to begin each step immediately following my instructions. You will have 30 seconds to

successfully perform each step. If you are having difficulty performing a particular step, just let me know, and we will stop the task. Do you have any questions regarding this procedure?" The photograph for each pictorial BAT was propped up on a table 10 feet away from the participant. When the participant was ready to begin, the photograph was uncovered and the experimenter provided verbal instructions for each of the following six steps: (1) walk toward the photograph of the spider [dog] as near as you can; (2) touch the back of the photograph of the spider [dog]; (3) touch the area behind the spider [dog] on the photograph; (4) touch the area in front of the spider [dog] on the photograph; (5) touch the spider [dog] with your index finger; and (6) rub your hand over the spider [dog]. Following each instruction, the experimenter asked the participant whether he or she was willing to carry out the step. If the participant indicated that he or she could not attempt one of the steps, then the experimenter repeated the instructions once more for that specific step. Each pictorial BAT was terminated once the participant failed to perform one of the required steps, or when the participant completed all six steps. Two distance of approach scores were calculated for each pictorial BAT. The first score measured the actual number of steps that participants completed during the BAT, which could range from 0 (distance to spider/dog is 10 feet) to 6 (rub your hand over the spider/dog). The second score was a finer measurement of the extent to which participants completed each step during the BAT (see Appendix A). This second score, which ranges from 0 to 15, was used as the distance of approach score for the statistical analyses.

Similarly, the procedure for the two live BATs consisted of a series of six increasingly difficult steps. The experimenter introduced each live BAT using the following instructions: "To get an impression of how close you are willing to approach a live spider [dog], I am going to ask you to perform a number of steps. We do not expect that everyone will be able to perform each

step; we just want to see how far you would actually be willing to go. Once you are ready to begin, I will bring the spider [dog] into the room and give you directions for each step. In order to successfully complete a step, you will be required to perform the task for 5 consecutive seconds. Try to begin the step immediately following my instructions. You will have 30 seconds to successfully perform each step. If you are having difficulty performing a particular step, just let me know, and we will stop the task. Do you have any questions regarding this procedure?"

Once the participant was ready to begin, the experimenter brought the spider, which was in a glass aquarium, or the dog, which was on a leash, into the room. The spider remained in the glass aquarium and the dog remained on its leash for the live BATs. The experimenter then provided verbal instructions for each of the six steps. Unlike the pictorial BATs, the six steps for the two live BATs were customized for each animal. The six steps for the live spider BAT included: (1) walk towards the spider as near as you can; (2) touch the container; (3) touch the inside floor of the container; (4) touch the spider with a pencil; (5) touch the spider with your index finger; and (6) hold the spider in the palm of your hand. The six steps for the live dog BAT included: (1) walk towards the dog as near as you can; (2) touch the floor (i.e., mat) beside the dog; (3) touch the dog's leash; (4) touch the dog's back with an oven mitt; (5) touch the dog's back with your hand; (6) stroke the fur on the dog's head. Following each instruction, the experimenter asked the participant whether he or she was willing to carry out the step. If the participant indicated that he or she could not attempt one of the steps, then the experimenter repeated the instructions once more for that specific step. Each live BAT was terminated once the participant failed to perform one of the required steps, or when the participant completed all six steps. Two distance of approach scores were calculated for each live BAT. The first score measured the number of actual steps that participants completed during the BAT, which could range from 0 (distance to

spider/dog is 10 feet) to 6 (hold the spider in the palm of your hand/rub the fur on the dog's head). The second score was a finer measurement of the extent to which participants completed each step during the BAT (see Appendices B and C). This second score, which ranges from 0 to 15, was used as the distance of approach score for the statistical analyses.

Behavioural Task Rating Scale (BTRS; Olatunji, Lohr, Sawchuk & Tolin, 2007). The BTRS assesses participants' subjective, physiological, motoric and cognitive appraisals of fear and disgust in response to the BAT. Participants are asked to rate their level of agreement for eight statements on an 11-point scale that ranges from 0 (not at all true) to 10 (very true). The BTRS contains four fear-related responses and four disgust-related responses. The four fear-related responses include: (1) This task makes me feel afraid; (3) This task makes me feel like running away; (5) This task makes my heart pound; and (7) This task makes me feel like I am in danger. The four disgust-related responses include: (2) This task makes me feel disgusted; (4) This task makes me feel like pushing the stimulus away from me; (6) This task makes me feel sick to my stomach; and (8) This task makes me feel like I might be contaminated or infected. Previous research has shown that the BTRS has good psychometric properties, including excellent internal consistency for the four fear-related items ($\alpha = .97$) and excellent internal inconsistency for the four disgust-related items ($\alpha = .94$; Olatunji & Deacon, 2008). Participants' responses to the four fear-related items were summed to measure their fear reaction and their responses to the four disgust-related items were summed to measure their disgust reaction. In the present study, the alpha coefficients for the four fear-related items and the four disgust-related items ranged from .80 to .99.

Procedure

Once participants were in the lab, they completed a consent form (Appendix D) and then they were administered the specific phobia section of the SCID-IV. Next, participants were asked to complete a series of self-report questionnaires on the computer, which included a demographic questionnaire and measures of disgust sensitivity (DS-R), fear of contamination (PI-WSUR Contamination Fear subscale) and trait anxiety (STICSA-T). The FSQ and DPQ were also re-administered in order to confirm participants' levels of spider fear and dog fear, respectively. Finally, participants were also asked to estimate the extent to which they typically fear being physically harmed (i.e., injured) by a spider or dog using an 11-point scale that ranges from 0 (no fear) to 10 (extreme fear). After completion of these questionnaires, participants were invited to complete four consecutive BATs. Since it was anticipated that the live BATs would be more difficult and fear evoking than the pictorial BATs, the two pictorial BATs were completed first to prevent the live BATs from confounding the results of the pictorial BATs. The presentation order of the spider and dog stimuli was balanced between participants, such that the following four presentation orders were balanced between participants: (1) picture of spider, picture of dog, live spider, live dog; (2) picture of spider, picture of dog, live dog, live spider; (3) picture of dog, picture of spider, live spider, live dog; and (4) picture of dog, picture of spider, live dog, live spider. Participants completed a BTRS questionnaire after the termination of each BAT. After completing the final BTRS, participants were debriefed.

Results

Sample Characteristics

Data were analyzed using a sample of 23 participants (16 women, 7 men) and a significance level of $p < .05$ was used for all statistical tests. Given that there was a significant difference between the pre-screen and in-session FSQ scores when participants were grouped based on their pre-screen scores (high fear of spiders group [$n = 18$]: $t_{\text{FSQ}}[17] = 0.50, p = .63$, $t_{\text{DPQ}}[17] = -1.47, p = .16$; high fear of dogs group [$n = 13$]: $t_{\text{FSQ}}[12] = -2.40, p = .03$, $t_{\text{DPQ}}[12] = -1.72, p = .11$)¹, it was decided that group membership should be based on participants' in-session FSQ and DPQ scores, rather than their pre-screen FSQ and DPQ scores. Therefore, 14 participants (11 women, 3 men) with a high fear of spiders and 9 participants (5 women, 4 men) with a high fear of dogs were included in the analyses. When group membership was determined using participants' in-session scores, there were no significant differences between pre-screen and in-session FSQ or DPQ scores: (high fear of spiders group: $t_{\text{FSQ}}[13] = -0.91, p = .38$, $t_{\text{DPQ}}[11] = 0.67, p = .52$; high fear of dogs group: $t_{\text{FSQ}}[8] = -1.91, p = .09$, $t_{\text{DPQ}}[8] = -0.66, p = .53$).

Forty-three percent of participants with a high fear of spiders ($n = 6$) reported symptoms consistent with a DSM-IV diagnosis of spider phobia and 44% of participants with a high fear of dogs ($n = 4$) reported symptoms consistent with a DSM-IV diagnosis of dog phobia. In terms of other specific phobias, 14% of participants with a high fear of spiders ($n = 2$) and 22% of participants with a high fear of dogs ($n = 2$) reported symptoms consistent with other DSM-IV specific phobias (e.g., heights, injections). Participant age ranged from 18 to 47 years ($M = 24.70$ years; $SD = 7.07$ years), overall. The mean age of participants with a high fear of spiders was

¹ Six participants with a high fear of dogs and two participants with a high fear of spiders were excluded from these analyses because their pre-screen FSQ or DPQ scores were considered invalid.

28.86 years ($SD = 7.53$ years) and the mean age of participants with a high fear of dogs was 26.00 years ($SD = 6.50$ years). There were no significant differences between the high fear of spiders group and the high fear of dogs group when compared on age, $t(21) = -0.70$, $p = .49$, gender, $p = .36$ (Fisher's exact test), or recruitment source, $p = 1.00$ (Fisher's exact test).

The majority of participants with a high fear of spiders completed at least some college or university (79 % completed some college or university, 7% completed college or university and 7% completed a graduate degree). The remaining 7% of participants completed high school. The majority of participants with a high fear of dogs also completed at least some college or university (33% completed some college or university and 56% completed college or university). The remaining 11% completed high school. The breakdown of ethnicity for participants with a high fear of spiders was 14% Black, 7% East Asian, 7% South Asian and 71% White; and the breakdown of ethnicity for participants with a high fear of dogs was 11% Black, 11% Hispanic, 11% Middle Eastern, 11% South Asian, 11% Southeast Asian and 44% White.

Means and Standard Deviations for Study Measures

Table 1 presents the means and standard deviations for each of the measures that were administered to participants with a high fear of spiders and participants with a high fear of dogs. Mean scores on the FSQ were 91.00 for the high fear of spiders group and 6.00 for the low fear of spiders group. The FSQ scores for the high fear of spiders group were comparable to those of a spider phobic sample ($M = 89.00$; Muris & Merckelbach, 1996) and the FSQ scores for the low fear of spiders group were comparable to those reported in past research that included individuals with a low fear of spiders ($M = 5.2$; de Jong & Peters, 2007). Mean scores on the DPQ were 107.39 for the high fear of dogs group and 31.00 for the low fear of dogs group. As shown in Table 1, there were significant differences between participants with a high fear of spiders and

Table 1

Means and Standard Deviations for Measures Administered to Participants with a High Fear of Spiders (n = 14) and Participants with a High Fear of Dogs (n = 9)

Measure	High Fear of Spiders		High Fear of Dogs		df	t	d
	Mean	SD	Mean	SD			
FSQ	91.00	17.99	6.00	4.00	21	13.85*	6.52
DPQ	31.00	4.71	107.89	24.43	21	-11.59*	-4.37
STICSA-T	40.36	13.93	35.67	9.87	21	0.88	0.39
PI-WSUR Contamination Fear	7.48	7.73	13.89	10.43	21	-1.69	-0.70
DS-R	50.77	15.24	52.56	13.76	21	-0.28	-0.12

Note: FSQ = Fear of Spiders Questionnaire; DPQ = Dog Phobia Questionnaire; STICSA-T = State-Trait Inventory for Cognitive and Somatic Anxiety - Trait version; PI-WSUR Contamination Fear = Padua Inventory - Washington State University Revision Contamination Fear subscale; DS-R = Disgust Scale - Revised.

* $p < .001$.

participants with a high fear of dogs on the FSQ and the DPQ; however, there were no significant differences between the two groups of participants when compared on the STICSA-T, PI-WSUR Contamination Fear subscale or the DS-R.

Means and Standard Deviations for Level of Responding

Table 2 presents the means and standard deviations for level of responding (i.e., fear BAT responses, disgust BAT responses and distance of approach scores) to the pictorial and live stimuli. As shown in Table 2, there were significant differences between participants with a high fear of spiders and participants with a high fear of dogs on responding to a picture of a spider, a live spider and a live dog. There were no significant differences in terms of responding to a picture of a dog.

Correlations between Study Measures

Bivariate correlational analyses were used to test for a relationship between (1) animal fear (i.e., spider fear or dog fear) and trait anxiety; (2) animal fear and disgust sensitivity; and (3) animal fear and fear of contamination (see Table 3 for a summary of correlations between study measures). As shown in Table 3, there were significant positive relationships between (1) dog fear and fear of contamination and (2) disgust sensitivity and fear of contamination, and there was also a significant negative relationship between spider fear and dog fear. No other relationships were significant.

Hypothesis Testing

Fear Responding

For Hypothesis 1, it was anticipated that participants with a high fear of spiders would display a more pronounced fear reaction (as indexed by self-reported fear) to a picture of a spider and a live spider, when compared to a picture of a dog and a live dog. Participants with a high

Table 2

Means and Standard Deviations for Responding for Participants with a High Fear of Spiders (n = 14) and Participants with a High Fear of Dogs (n = 9)

	High Fear of Spiders		High Fear of Dogs				
Measure	Mean	SD	Mean	SD	<i>df</i>	<i>t</i>	<i>d</i>
Pictorial BATs							
Spider Fear	16.64	13.52	0.33	0.71	21	3.58*	1.70
Spider Disgust	14.50	12.73	0.11	0.33	21	3.36*	1.60
Spider Approach	12.29	3.89	15.00	0.00	21	-2.07*	-0.99
Dog Fear	0.14	0.53	3.11	8.96	21	-1.25	-0.47
Dog Disgust	0.00	0.00	3.33	10.00	21	-1.26	-0.47
Dog Approach	15.00	0.00	14.78	0.67	21	1.26	0.46
Live BATs							
Spider Fear	33.21	8.36	11.22	10.00	21	5.71**	2.39
Spider Disgust	24.14	12.13	10.33	12.70	21	2.62*	1.11

	High Fear of Spiders		High Fear of Dogs				
Measure	Mean	SD	Mean	SD	<i>df</i>	<i>t</i>	<i>d</i>
Live BATs							
Spider Approach	4.14	1.92	10.33	3.46	21	-5.54**	-2.21
Dog Fear	0.29	1.07	15.89	13.03	21	-4.52**	-1.69
Dog Disgust	0.00	0.00	8.78	11.96	21	-2.78*	-1.04
Dog Approach	15.00	0.00	8.67	6.87	21	3.49*	1.30

Note. Pictorial BATs = Pictorial Behavioural Approach Tasks; Live BATs = Live Behavioural Approach Tasks.

* $p < .05$. ** $p < .001$.

Table 3

Correlations between Study Measures (N = 23)

	FSQ	DPQ	STICSA-T	PI-WSUR	DS-R
				Contamination Fear	
FSQ	-				
DPQ	-.88**	-			
STICSA-T	.25	-.12	-		
PI-WSUR	-.19	.47*	-.03	-	
Contamination Fear					
DS-R	.02	.20	-.08	.56**	-

Note. FSQ = Fear of Spiders Questionnaire; DPQ = Dog Phobia Questionnaire; STICSA-T =

State-Trait Inventory for Cognitive and Somatic Anxiety - Trait version; PI-WSUR

Contamination Fear = Padua Inventory - Washington State University Revision Contamination

Fear subscale; DS-R = Disgust Scale - Revised.

* $p < .05$. ** $p < .01$.

fear of dogs, on the other hand, were hypothesized to display a more pronounced fear reaction to a picture of a dog and a live dog, when compared to a picture of a spider and a live spider.

Related to this, it was anticipated that the difference between the mean fear responses that participants with a high fear of spiders experienced while viewing a picture of a spider versus a picture of a dog would be much larger than the difference between the mean fear responses that participants with a high fear of dogs experienced while viewing a picture of a spider versus a picture of a dog. Participants' fear reactions were measured by summing their responses to the four fear-related items on the BTRS questionnaires.

A 2 (Type of animal fear: spider fear, dog fear) x 2 (Type of stimulus format: picture, live) x 2 (Type of target animal: dog, spider) mixed Analysis of Variance (ANOVA) was conducted to compare participants with a high fear of spiders to participants with a high fear of dogs on their responses to the four fear-related items on the BTRS questionnaires. The results of the mixed ANOVA are presented in Table 4. Results of the ANOVA indicated significant main effects of type of animal fear, type of stimulus format and type of target animal, and significant interactions between (1) type of target animal and type of animal fear, (2) type of stimulus format and type of target animal, and (3) type of stimulus format, type of target animal and type of animal fear.

The three-way interaction between type of stimulus format, type of target animal and type of animal fear was investigated using two 2 (Type of stimulus format: picture, live) x 2 (Type of target animal: dog, spider) repeated measures ANOVAs after sorting for type of animal fear. Results of the 2 x 2 ANOVA conducted for participants with a high fear of spiders revealed significant main effects of type of stimulus format, $F(1, 13) = 30.43, p < .001$, partial $\eta^2 = .70$, and type of target animal, $F(1, 13) = 88.69, p < .001$, partial $\eta^2 = .87$, and a significant

Table 4

*2 x 2 x 2 Mixed Analysis of Variance of Fear Responding to Spider-Relevant and Dog-Relevant**Stimuli (n = 14 High Fear of Spiders; n = 9 High Fear of Dogs)*

Source	df	F	Partial η^2	p
Between subjects				
Animal Fear	1	5.19*	.20	.03
Error	21	(102.80)		
Within subjects				
Stimulus Format	1	43.72***	.68	< .001
Stimulus Format x Animal Fear	1	1.30	.06	.27
Error (Stimulus Format)	21	(51.08)		
Target Animal	1	22.13***	.51	< .001
Target Animal x Animal Fear	1	40.61***	.66	< .001
Error (Target Animal)	21	(109.09)		
Stimulus Format x Target Animal	1	10.36**	.33	.004
Stimulus Format x Target Animal x Animal Fear	1	16.44***	.44	< .001
Error (Stimulus Format x Target Animal)	21	(27.96)		

Note. Values enclosed in parentheses represent mean square errors.

* $p < .05$. ** $p < .01$. *** $p < .001$.

interaction between type of stimulus format and type of target animal, $F(1, 13) = 32.08, p < .001$, partial $\eta^2 = .71$.

The interaction between type of stimulus format and type of target animal was examined using a Bonferroni adjusted simple effects analysis holding the alpha level at .05. Consistent with Hypothesis 1, results of the simple effects analysis indicated that participants with a high fear of spiders displayed a more pronounced fear reaction to a picture of a spider ($M = 16.64, SE = 3.61$), $F(1, 13) = 20.96, p < .001$, partial $\eta^2 = .62$, and a live spider ($M = 33.21, SE = 2.23$), $F(1, 13) = 217.11, p < .001$, partial $\eta^2 = .94$, when compared to a picture of a dog ($M = 0.14, SE = 0.14$) and a live dog ($M = 0.29, SE = 0.29$; see Figure 1). These results indicate that the picture of the spider and the live spider elicited greater fear reactions than the picture of the dog or the live dog for participants with a high fear of spiders; thus, suggesting that pictorial and live stimuli may be effective for eliciting a fear response in individuals with a high fear of spiders.

Results of the 2 x 2 ANOVA conducted for participants with a high fear of dogs revealed a significant main effect of type of stimulus format, $F(1, 8) = 15.39, p < .01$, partial $\eta^2 = .66$, such that participants reported more pronounced fear reactions to the live stimuli ($M = 13.56, SE = 2.91$) than the pictorial stimuli ($M = 1.72, SE = 1.54$). However, there was no significant main effect of type of target animal, $F(1, 8) = 0.96, p = .36$, partial $\eta^2 = .11$, and there was no significant interaction between type of stimulus format and type of target animal, $F(1, 8) = 0.31, p = .59$, partial $\eta^2 = .04$, which indicates that there were no significant differences between mean fear ratings for the pictorial stimuli and the live stimuli for participants with a high fear of dogs.

Finally, given the absence of variability in scores in response to the picture of the dog for participants with a high fear of spiders, a Fisher r to z transformation could not be conducted to test whether the difference between the mean fear responses that participants with a high fear of

Figure 1: Fear Responses for Pictorial and Live Stimuli for Participants with a High Fear of Spiders

spiders displayed while viewing a picture of a spider versus a picture of a dog was significantly larger than the difference between the mean fear responses that participants with a high fear of dogs displayed while viewing a picture of a spider versus a picture of a dog.

Disgust Responding

For Hypothesis 2, it was hypothesized that both participants with a high fear of spiders and participants with a high fear of dogs would display a more pronounced disgust reaction (as indexed by self-reported disgust) to a picture of a spider and a live spider, when compared to a picture of a dog and a live dog. Participants with a high fear of spiders, however, were hypothesized to display a more pronounced disgust reaction to a picture of a spider and a live spider, when compared to participants with a high fear of dogs. Participants' disgust reactions were measured by summing their responses to the four disgust-related items on the BTRS questionnaires.

A 2 (Type of animal fear: spider fear, dog fear) x 2 (Type of stimulus format: picture, live) x 2 (Type of target animal: spider, dog) mixed ANOVA was conducted to compare participants with a high fear of spiders to participants with a high fear of dogs on their responses to the four disgust-related items on the BTRS questionnaires. The results of the mixed ANOVA are presented in Table 5. Results of the ANOVA indicated significant main effects of type of stimulus format and type of target animal, and significant interactions between (1) type of target animal and type of animal fear and (2) type of stimulus format and type of target animal. No other main effects or interactions were statistically significant.

The two-way interactions between (1) type of target animal and type of animal fear, and (2) type of stimulus format and type of target animal were investigated using Bonferroni adjusted simple effects analyses holding the alpha level at .05. Results of the first simple effects analysis

Table 5

2 x 2 x 2 Mixed Analysis of Variance of Disgust Responding to Spider-Relevant and Dog-Relevant Stimuli (n = 14 High Fear of Spiders; n = 9 High Fear of Dogs)

Source	df	F	Partial η^2	p
Between subjects				
Animal Fear	1	2.55	.11	.13
Error	21	(138.90)		
Within subjects				
Stimulus Format	1	19.76**	.48	< .001
Stimulus Format x Animal Fear	1	1.12	.05	.30
Error (Stimulus Format)	21	(44.40)		
Target Animal	1	13.45*	.39	.001
Target Animal x Animal Fear	1	15.99**	.43	< .001
Error (Target Animal)	21	(139.20)		
Stimulus Format x Target Animal	1	12.38*	.37	.002
Stimulus Format x Target Animal x Animal Fear	1	1.41	.06	.25
Error (Stimulus Format x Target Animal)	21	(23.01)		

Note. Values enclosed in parentheses represent mean square errors.

* $p < .01$. ** $p < .001$.

investigating the interaction between type of target animal and type of animal fear indicated that participants with a high fear of spiders displayed more pronounced disgust reactions to the spider-relevant stimuli ($M = 19.32$, $SE = 2.64$) than to the dog-relevant stimuli ($M = 0.00$, $SE = 1.71$), $F(1, 21) = 37.54$, $p < .001$, partial $\eta^2 = .64$, whereas participants with a high fear of dogs reported similar disgust reactions to the spider-relevant stimuli ($M = 5.22$, $SE = 3.30$) and the dog-relevant stimuli ($M = 6.06$, $SE = 2.14$), $F(1, 21) = 0.04$, $p = .83$, partial $\eta^2 = .002$ (see Figure 2). These results indicate that participants with a high fear of spiders found the spider-relevant stimuli to be more disgusting than the dog-relevant stimuli, whereas participants with a high fear of dogs reported comparable mean disgust responses for the spider-relevant stimuli and the dog-relevant stimuli. Note, all participants in the high fear of spiders group scored 0 out of 40 on the disgust measures that were completed for the picture of the dog and the live dog; thus there was no variability in disgust responses for the dog stimuli for participants in the high fear of spiders group.

Results of the second simple effects analysis investigating the interaction between type of stimulus format and type of target animal were consistent with Hypothesis 2, such that participants, in general, reported more pronounced disgust reactions for a picture of a spider ($M = 7.31$, $SE = 2.14$), $F(1, 21) = 5.02$, $p = .04$, partial $\eta^2 = .19$, and a live spider ($M = 17.24$, $SE = 2.64$), $F(1, 21) = 19.49$, $p < .001$, partial $\eta^2 = .48$, when compared to a picture of a dog ($M = 1.67$, $SE = 1.32$) and a live dog ($M = 4.39$, $SE = 1.58$; see Figure 3). Participants with a high fear of spiders, however, reported more pronounced disgust reactions to the picture of a spider and live spider, when compared to participants with a high fear of dogs, which is also consistent with Hypothesis 2 (see Table 2).

Figure 2: Interaction between Type of Target Animal and Type of Animal Fear for Disgust

Responses

Furthermore, given that participants with a high fear of dogs reported elevated levels of disgust to a live dog, when compared to participants with a high fear of spiders (see Table 2 above), an independent samples *t*-test was conducted to determine whether participants with a high fear of dogs reported a significantly less pronounced mean disgust reaction to a live dog than participants with a high fear of spiders reported to a live spider. Results of the independent samples *t*-test revealed that although participants with a high fear of dogs reported a more pronounced disgust reaction to a live dog than participants with a high fear of spiders, their mean disgust reaction ($M = 8.78$, $SD = 11.96$) was significantly less pronounced than the mean disgust reaction that participants with a high fear of spiders reported for a live spider ($M = 24.14$, $SD = 12.13$), $t(21) = 2.98$, $p = .01$, Cohen's $d = -1.28$.

Distance of Approach

For Hypothesis 3, it was hypothesized that individuals with a high fear of spiders would be able to approach a picture of a dog and a live dog more closely than they would a picture of a spider or a live spider. Similarly, it was also hypothesized that participants with a high fear of dogs would be able to approach a picture of a spider and a live spider more closely than they would a picture of a dog or a live dog. Related to this, it was anticipated that participants with a high fear of dogs would be able to approach a picture of a dog more closely than participants with a high fear of spiders would be able to approach a picture of a spider. Participants' distance of approach was measured using the finer BAT scoring scheme (i.e., the scoring scheme ranging from 0-15).

A 2 (Type of animal fear: spider fear, dog fear) x 2 (Type of stimulus format: picture, live) x 2 (Type of target animal: spider, dog) mixed ANOVA was conducted to compare participants with a high fear of spiders to participants with a high fear of dogs on their distance

of approach scores to a picture of a spider, a picture of a dog, a live spider, and a live dog. The results of the mixed ANOVA are presented in Table 6. Results of the ANOVA indicated significant main effects of type of stimulus format and type of target animal, and significant interactions between (1) type of target animal and type of animal fear, (2) type of stimulus format and type of target animal, and (3) type of stimulus format, type of target animal and type of animal fear. No other main effects or interactions were statistically significant.

The three-way interaction between type of stimulus format, type of target animal and type of animal fear was investigated using 2 (Type of stimulus format: picture, live) x 2 (Type of target animal: spider, dog) repeated measures ANOVAs after sorting for type of animal fear. Results of the 2 x 2 ANOVA conducted for participants with a high fear of spiders revealed significant main effects of type of stimulus format, $F(1, 13) = 126.08, p < .001$, partial $\eta^2 = .91$, and type of target animal, $F(1, 13) = 85.20, p < .001$, partial $\eta^2 = .87$, and a significant interaction between type of stimulus format and type of target animal, $F(1, 13) = 126.08, p < .001$, partial $\eta^2 = .91$.

The interaction between type of stimulus format and type of target animal was examined using a Bonferroni adjusted simple effects analysis holding the alpha level at .05. Consistent with Hypothesis 3, results of the simple effects analysis indicated that participants with a high fear of spiders were able to approach a picture of a dog ($M = 15.00, SE = 0.00$), $F(1, 13) = 6.81, p = .02$, partial $\eta^2 = .34$, and a live dog ($M = 15.00, SE = 0.00$), $F(1, 13) = 449.63, p < .001$, partial $\eta^2 = .97$, more closely than a picture of a spider ($M = 12.29, SE = 1.04$) or a live spider ($M = 4.14, SE = 0.51$; see Figure 4).

Results of the 2 x 2 ANOVA conducted for participants with a high fear of dogs revealed a significant main effect of type of stimulus format, $F(1, 8) = 14.19, p = .01$, partial $\eta^2 = .64$,

Table 6

2 x 2 x 2 Mixed Analysis of Variance of Distance of Approach Scores for Spider-Relevant and Dog-Relevant Stimuli (n = 14 High Fear of Spiders; n = 9 High Fear of Dogs)

Source	df	F	Partial η^2	p
Between subjects				
Animal Fear	1	0.61	.03	.44
Error	21	(12.37)		
Within subjects				
Stimulus Format	1	60.10**	.74	< .001
Stimulus Format x Animal Fear	1	1.17	.05	.29
Error (Stimulus Format)	21	(8.16)		
Target Animal	1	20.54**	.49	< .001
Target Animal x Animal Fear	1	35.98**	.63	< .001
Error (Target Animal)	21	(9.10)		
Stimulus Format x Target Animal	1	12.91*	.38	.002
Stimulus Format x Target Animal x Animal Fear	1	26.44**	.56	< .001
Error (Stimulus Format x Target Animal)	21	(4.76)		

Note. Values enclosed in parentheses represent mean square errors.

* $p < .01$. ** $p < .001$.

Figure 4: Distance of Approach Scores for Pictorial and Live Stimuli for Participants with a High Fear of Spiders

such that participants with a high fear of dogs were able to approach the pictorial stimuli ($M = 14.89$, $SE = 0.11$) more closely than the live stimuli ($M = 9.50$, $SE = 1.46$). However, there was no significant main effect of type of target animal, $F(1, 8) = 0.69$, $p = .43$, partial $\eta^2 = .08$, and there was no significant interaction between type of stimulus format and type of target animal, $F(1, 8) = 0.49$, $p = .50$, partial $\eta^2 = .06$, which indicates that there were no significant differences between distance of approach scores for the pictorial stimuli and the live stimuli for participants with a high fear of dogs.

An independent samples t -test was conducted to determine whether participants with a high fear of dogs were able to approach a picture of a dog more closely than participants with a high fear of spiders were able to approach a picture of a spider. Results of the independent samples t -test were consistent with Hypothesis 3, such that participants with a high fear of dogs were able to approach a picture of a dog ($M = 15.00$, $SD = 0.00$) more closely than participants with a high fear of spiders were able to approach a picture of a spider ($M = 12.29$, $SD = 3.89$), $t(13) = -2.61$, $p = .02$, Cohen's $d = 0.99$, which suggests that the pictorial stimulus may have been more effective for individuals with a high fear of spiders, when compared to individuals with a high fear of dogs.

Fear of Being Physically Harmed

For Hypothesis 4, it was hypothesized that participants with a high fear of dogs would report a more pronounced fear of being physically harmed (i.e., injured) by a dog than participants with a high fear of spiders. Participants with a high fear of spiders, however, were anticipated to report a similar level of fear of being physically harmed (i.e., injured) by a spider, as participants with a high fear of dogs. Two questions, which required participants to report

using an 11-point scale ranging from 0 (no fear) to 10 (extreme fear), the extent to which they typically fear being physically harmed by a spider or a dog were used for these analyses.

Two independent samples *t*-tests were conducted to test this hypothesis. The first independent samples *t*-test compared participants with a high fear of dogs to participants with a high fear of spiders on fear of being physically harmed by a dog. Consistent with Hypothesis 4, participants with a high fear of dogs reported a more pronounced fear of being physically harmed by a dog ($M = 6.87, SD = 2.67$) than participants with a high fear of spiders ($M = 0.21, SD = 0.43$), $t(21) = -9.30, p < .001$, Cohen's $d = 3.48$.

The second independent samples *t*-test compared participants with a high fear of spiders to participants with a high fear of dogs on fear of being physically harmed by a spider. Contrary to Hypothesis 4, participants with a high fear of spiders reported a more pronounced fear of being physically harmed by a spider ($M = 6.79, SD = 3.14$) than participants with a high fear of dogs ($M = 1.22, SD = 0.97$), $t(21) = 5.12, p < .001$, Cohen's $d = 2.40$.

Disgust Sensitivity and Fear of Contamination as Predictors of Responding

For Hypothesis 5, it was hypothesized that disgust sensitivity and fear of contamination would be stronger predictors of responding to spider-relevant stimuli than of responding to dog-relevant stimuli. In particular, it was hypothesized that disgust sensitivity and fear of contamination would be stronger predictors of responding to a picture of a spider than to a picture of a dog and would be less relevant for predicting responding to a live spider versus a live dog because disgust sensitivity and fear of contamination were expected to be responsible for participants' differential responding to the pictorial stimuli. Level of responding was assessed using (1) the four fear-related items on the BTRS questionnaires, (2) the four disgust-related items on the BTRS questionnaires, and (3) the finer BAT coding scheme. In addition, disgust

sensitivity and fear of contamination were also predicted to remain significantly correlated with responses to a picture of a spider even when type of animal fear and trait anxiety were controlled for.

Bivariate correlational analyses were conducted between study measures to determine the extent to which type of animal fear (i.e., spider fear or dog fear), trait anxiety, fear of contamination and disgust sensitivity were correlated with responding for a picture of a spider, a picture of a dog, a live spider and a live dog (see Table 7 for a summary of the correlations between study measures and responding). As shown in Table 7, spider fear and dog fear were correlated in the expected direction with fear BAT responses, disgust BAT responses and distance of approach for spider-relevant stimuli and disgust sensitivity was marginally negatively correlated with distance of approach for a live spider. No other correlations were significant for spider-relevant stimuli. In terms of dog-relevant stimuli, dog fear was correlated in the expected direction with fear BAT responses, disgust BAT responses and disgust of approach for both a picture of a dog and a live dog. In addition, while spider fear was negatively correlated with fear BAT responses and disgust BAT responses and positively correlated with distance of approach to a live dog, fear of contamination was positively correlated with fear BAT responses and disgust BAT responses and negatively correlated with distance of approach for a live dog. Disgust sensitivity was marginally negatively correlated with distance of approach for a live dog. No other correlations were significant for dog-relevant stimuli. Given that disgust sensitivity and fear of contamination were not significantly correlated with responding for spider-relevant stimuli, hierarchical regression analyses were not conducted to examine the specific contribution

Table 7

Correlations between Study Measures and Responding (N = 23)

	FSQ	DPQ	STICSA-T	PI-WSUR Contamination Fear	DS-R
Spider Picture					
BAT Fear	.68***	-.55***	.28	.03	-.07
BAT Disgust	.69***	-.53***	.16	.09	.09
Distance of Approach	-.49***	.36*	-.12	-.23	-.11
Dog Picture					
BAT Fear	-.24	.45***	-.06	.22	.14
BAT Disgust	-.25	.46**	-.11	.24	.16
Distance of Approach	.25	-.45***	.11	-.24	-.16
Live Spider					
BAT Fear	.81***	-.74***	.17	-.08	.07
BAT Disgust	.65***	-.45***	.09	.20	.19

	FSQ	DPQ	STICSA-T	PI-WSUR Contamination Fear	DS-R
Live Spider					
Distance of Approach	-.80***	.63***	-.24	-.002	-.36*
Live Dog					
BAT Fear	-.67***	.86***	-.15	.65***	.30
BAT Disgust	-.49***	.70***	-.21	.60***	.27
Distance of Approach	.58***	-.74***	.03	-.73***	-.39*

Note. FSQ = Fear of Spiders Questionnaire; DPQ = Dog Phobia Questionnaire; STICSA-T = State-Trait Inventory for Cognitive and Somatic Anxiety - Trait version; PI-WSUR Contamination Fear = Padua Inventory - Washington State University Revision Contamination Fear subscale; DS-R = Disgust Scale – Revised; BAT Fear = Fear responding for the Behavioural Approach Task; BAT Disgust = Disgust responding for the Behavioural Approach Task.

* $p < .10$. ** $p < .05$. *** $p < .01$

of these variables to fear BAT responses, disgust BAT responses and distance of approach for a picture of a spider, a picture of a dog, a live spider and a live dog.²

Summary of Results

Results of the hypothesis testing are summarized in Table 8. In general, results of the present study suggest that pictorial stimuli may be effective for eliciting an emotional reaction in individuals with a high fear of spiders, but ineffective for eliciting an emotional reaction in individuals with a high fear of dogs. For example, as shown in Table 2, the picture of the spider elicited more pronounced fear and disgust reactions for participants with a high fear of spiders, when compared to participants with a high fear of dogs. However, the picture of the dog elicited similar levels of fear and disgust for participants with a high fear of spiders and participants with a high fear of dogs. Live stimuli, on the other hand, appeared to be effective for eliciting an emotional reaction in both individuals with a high fear of spiders and individuals with a high fear of dogs. For example, as shown in Table 2, both the live spider and the live dog elicited more pronounced fear and disgust reactions for participants with a high fear of spiders and participants with a high fear of dogs, respectively.

² Analyses presented in the results section were re-run comparing participants with a high fear of spiders to participants with a high fear of dogs when group membership was determined using participants' pre-screen FSQ and DPQ scores (see Appendix E for a summary of these additional analyses).

Table 8

Summary of Results

Hypothesis	Results
<p>1. It was hypothesized that participants with a high fear of spiders would display a more pronounced fear reaction to a picture of a spider and a live spider, when compared to a picture of a dog and a live dog. Participants with a high fear of dogs were hypothesized to display a more pronounced fear reaction to a picture of a dog and a live dog, when compared to a picture of a spider and a live spider. Related to this, it was hypothesized that the difference between the mean fear responses that participants with a high fear of spiders experienced while viewing a picture of a spider versus a picture of a dog would be much larger than the difference between the mean fear responses that participants with a high fear of dogs experienced while viewing a picture of spider versus a picture of a dog.</p>	<p>Results partially supported Hypothesis 1. Participants with a high fear of spiders reported a more pronounced fear reaction to the picture of the spider and the live spider, when compared to the picture of the dog and the live dog. However, participants with a high fear of dogs reported a similar level of fear to the picture of the dog and the live dog, when compared to the picture of the spider and the live spider. Given the absence of variability in scores in response to the picture of the dog for participants with a high fear of spiders, the hypothesis regarding the difference between the mean responses for the picture of the spider and the picture of the dog was not tested.</p>

Hypothesis	Results
<p>2. It was hypothesized that both participants with a high fear of spiders and participants with a high fear of dogs would display a more pronounced disgust reaction to a picture of a spider and a live spider, when compared to a picture of a dog and a live dog. Participants with a high fear of spiders were hypothesized to display a more pronounced disgust reaction to a picture of a spider and a live spider, when compared to participants with a high fear of dogs.</p>	<p>Results supported Hypothesis 2. Participants, in general, reported a more pronounced disgust reaction to a picture of a spider and a live spider, when compared to a picture of a dog and a live dog. Additionally, participants with a high fear of spiders reported a more pronounced disgust reaction to a picture of a spider and a live spider, when compared to participants with a high fear of dogs.</p>
<p>3. It was hypothesized that individuals with a high fear of spiders would be able to approach a picture of a dog and a live dog more closely than they would a picture of a spider or a live spider. Participants with a high fear of dogs were hypothesized to be able to approach a picture of a spider and a live spider more closely than they would a picture of a dog or</p>	<p>Results partially supported Hypothesis 3. Participants with a high fear of spiders approached the picture of the dog and the live dog more closely than the picture of the spider and the live spider. However, participants with a high fear of dogs approached the picture of the spider and the live spider as close as they did the picture of the dog and the live dog.</p>

Hypothesis	Results
<p>a live dog. It was hypothesized that participants with a high fear of dogs would be able to approach a picture of a dog more closely than participants with a high fear of spiders would be able to approach a picture of a spider.</p>	<p>Additionally, consistent with Hypothesis 3, participants with a high fear of dogs were able to approach the picture of the dog more closely than participants with a high fear of spiders were able to approach the picture of the spider.</p>
<p>4. It was hypothesized that participants with a high fear of dogs would report a more pronounced fear of being physically harmed (i.e., injured) by a dog than participants with a high fear of spiders. Participants with a high fear of spiders were hypothesized to report a similar level of fear of being physically harmed (i.e., injured) by a spider, as participants with a high fear of dogs.</p>	<p>Results partially supported Hypothesis 4. Participants with a high fear of dogs reported a more pronounced fear of being physically harmed by a dog, when compared to participants with a high fear of spiders. However, participants with a high fear of spiders reported a more pronounced fear of being physically harmed by a spider, when compared to participants with a high fear of dogs.</p>
<p>5. It was hypothesized that disgust sensitivity and fear of contamination would be stronger predictors of responding to</p>	<p>Results did not support Hypothesis 5. Disgust sensitivity and fear of contamination were not significantly correlated with</p>

Hypothesis	Results
<p>spider-relevant stimuli than of responding to dog-relevant stimuli. It was hypothesized that disgust sensitivity and fear of contamination would be stronger predictors of responding to a live spider versus a live dog because disgust sensitivity and fear of contamination were expected to be responsible for participants' differential responding to the pictorial stimuli. Disgust sensitivity and fear of contamination were also hypothesized to remain significantly correlated with responding to a picture of a spider even when type of animal fear and trait anxiety were controlled for.</p>	<p>fear BAT responses, disgust BAT responses or distance of approach for the spider-relevant stimuli. Thus, individual differences in disgust responding and fear of contamination were not responsible for differential responding to pictorial stimuli in the present study.</p>

Discussion

The primary goal of the present study was to test whether there are differences across fearful animals (i.e., dog versus spider) with respect to the extent to which different stimulus formats (i.e., pictures versus live) are able to activate an emotional reaction (i.e., a fear response or a disgust response) during a brief encounter with spider-relevant and dog-relevant stimuli. The results of the present study suggest that there may be differences across dogs and spiders with respect to the extent to which pictorial and live stimuli are able to arouse a fear or disgust response in individuals with a high fear of spiders and individuals with a high fear of dogs. Results supporting differential responding can be summarized as follows: First, consistent with Hypotheses 1 and 2, participants with a high fear of spiders reported a more pronounced fear reaction to a picture of a spider and a live spider, when compared to a picture of a dog and a live dog and participants, in general, reported a more pronounced disgust reaction to a picture of a spider and a live spider, when compared to a picture of a dog and a live dog. The fear and disgust reactions that participants with a high fear of spiders reported for a picture of a spider and a live spider, however, were more pronounced than those reported by participants with a high fear of dogs. Second, contrary to Hypothesis 1, participants with a high fear of dogs reported similar fear reactions for a picture of a dog and a live dog, when compared to a picture of a spider and a live spider. When compared to participants with a high fear of spiders, participants with a high fear of dogs reported similar fear and disgust reactions for a picture of a dog, but more pronounced fear and disgust reactions for a live dog. Third, consistent with Hypothesis 3, participants with a high fear of spiders were able to approach a picture of a dog and a live dog more closely than a picture of a spider and a live spider; however, contrary to Hypothesis 3, participants with a high fear of dogs were able to approach a picture of a dog and a live dog as

closely as a picture of the spider and a live spider. Participants with a high fear of dogs were able to approach a picture of a spider and a live spider more closely than participants with a high fear of spiders, and participants with a high fear of spiders were able to approach a live dog more closely than participants with a high fear of dogs. There were no differences in terms of distance of approach scores for a picture of a dog. When taken together, these results suggest that pictorial stimuli may be effective for eliciting an emotional response (i.e., a fear response and a disgust response) in individuals with a high fear of spiders, but ineffective for eliciting an emotional response in individuals with a high fear of dogs. Live stimuli, on the other hand, appear to be effective for eliciting an emotional response in both individuals with a high fear of spiders and individuals with a high fear of dogs.

Furthermore, the results of the present study also suggest that participants with a high fear of spiders and participants with a high fear of dogs may differ in terms of the types of emotional responses (i.e., fear responses and disgust responses) they experience when confronting their feared stimulus. For example, participants with a high fear of spiders reported higher levels of both fear and disgust after confronting a picture of a spider and a live spider, when compared to participants with a high fear of dogs. This is consistent with previous research, which found that participants with a high fear of spiders reported elevated levels of fear and disgust in response to pictures of spiders (Tolin et al., 1997) and a fake but realistic looking tarantula (Olatunji & Deacon, 2008), when compared to participants with a low fear of spiders. Although participants with a high fear of dogs also reported elevated levels of disgust to a live dog, when compared to participants with a high fear of spiders, the mean disgust reaction that they reported in response to a live dog was not as pronounced as the mean disgust reaction that participants with a high fear of spiders reported in response to a live spider. Thus, these results

suggest that while spiders and dogs both appear to be fear evoking, spiders also appear to be disgust evoking. Although these results are consistent with past research (Olatunji & Deacon, 2008; Sawchuk et al., 2002), future research needs to be conducted, with a larger number of participants, to determine the extent to which participants' disgust reactions influence their willingness to approach spider-relevant stimuli. For example, a correlational design could be used to determine whether disgust responding is related to distance of approach for spider-relevant versus dog-relevant stimuli.

The second goal of the present study was to investigate the extent to which individual differences in disgust-relevant factors (i.e., disgust sensitivity and fear of contamination) are responsible for the differential responding that occurred between participants with a high fear of spiders and participants with a high fear of dogs. Surprisingly, participants with a high fear of spiders did not differ from participants with a high fear of dogs on measures assessing disgust sensitivity or fear of contamination. These results were unexpected, as prior research has shown that individuals with a high fear of spiders report higher levels of disgust sensitivity and fear of contamination, when compared to participants with a low fear of spiders (Olatunji & Deacon, 2008). Additionally, given that past research has suggested that disgust sensitivity may be more related to certain animal fears (i.e., fear-relevant animal fears) and not others (i.e., predatory animal fears; Ware et al., 1994), it was surprising that individuals with a high fear of spiders did not report elevated levels of disgust sensitivity when compared to participants with a high fear of dogs. Given that (1) there were no discrepancies between participants with a high fear of spiders and participants with a high fear of dogs on measures assessing disgust-relevant factors (i.e., disgust sensitivity and fear of contamination) and (2) fear of contamination was found to be

correlated with dog fear, these results suggest that dogs may not be best conceptualized as predatory animals; however, these results require replication with a larger sample.

Furthermore, it was surprising that disgust sensitivity and fear of contamination were not significantly correlated with spider fear or level of responding (i.e., fear responding, disgust responding, and distance of approach) for spider-relevant stimuli, as these results are inconsistent with previous research (de Jong & Merckelback, 1998; Sawchuk et al., 2000; Olatunji & Deacon, 2008). Additionally, it was also surprising that fear of contamination was correlated with dog fear and level of responding (i.e., fear responding, disgust responding and distance of approach) for a live dog. Given that these results were not predicted, future research should be conducted to replicate these findings. However, one potential reason why some of the results of the present study may have been inconsistent with previous research is that the measures that were used in the present study differed from those used in previous research. For example, past research has typically used the State-Trait Anxiety Inventory - Trait version (STAI-T; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983) to assess trait anxiety; however, given the criticism that the STAI-T has received regarding its inability to discriminate between anxiety and depression (Bieling, Antony, & Swinson, 1998; Grös et al., 2007), the present study opted to use the STICSA-T (i.e., a purer measure of anxiety symptomatology) to assess trait anxiety. Therefore, the lack of correlation that was found between trait anxiety and animal fear (i.e., spider fear and dog fear) may suggest that individuals with specific phobias are not typically anxious, unless they are confronted with their feared object or situation (Bieling et al., 1998). Additionally, previous research has also used the Spider Questionnaire (SPQ; Klorman et al., 1974), rather than the FSQ when assessing spider fear; however, given that some of the items on the DPQ were modified from the FSQ and the FSQ has been found to be as reliable as the SPQ (Muris &

Merckelbach, 1996), the present study opted to use the FSQ to assess spider fear. Therefore, although the aforementioned results were unexpected, it is possible that they may have differed from previous research because the present study included the STICSA-T and the FSQ, rather than the STAI-T and the SPQ. However, given that the present study consisted of a relatively small sample, it is recommended that future research be conducted using a larger sample in order to replicate these findings.

Given that spider fear is often conceptualized based on a disease-avoidance model (Matchett & Davey, 1991), which states that fear-relevant animals are avoided because of their perceived disgust, contamination and disease characteristics, rather than the expectation that one may be attacked or physically harmed during a confrontation with the animal, the present study asked participants to report the extent to which they fear being physically harmed (i.e., bitten) by a spider or a dog. Surprisingly, participants with a high fear of spiders reported a more pronounced fear of being physically harmed by a spider, as compared to participants with a high fear of dogs, which appears to be inconsistent with the disease-avoidance model. However, since the present study did not directly ask participants to report the extent to which fear and disgust motivate their avoidance of dogs or spiders, it is possible that individuals with a high fear of spiders may not only be afraid of being physically harmed by a spider, but may also be motivated to avoid spiders because they associate spiders with high levels of disgust. This would be consistent with previous research, which has found that individuals with a high fear of spiders often report spiders as being the object that they fear the most and the object that they find most disgusting (Thorpe & Salkovskis, 1998). Furthermore, given that the results of the present study indicated that participants with a high fear of spiders experienced more pronounced fear and disgust responses after they confronted spider-relevant stimuli, these results support the idea that

both emotions may play an important role in spider fear. Future research, however, is required to determine the extent to which fear and/or disgust motivate an individual to avoid spider-relevant stimuli.

Participants with a high fear of dogs, on the other hand, also reported a more pronounced fear of being physically harmed by dogs, when compared to participants with a high fear of spiders, which is not surprising, given that past research has shown that 56% of individuals with a high fear of dogs report a traumatic conditioning experience (i.e., being bitten) as preceding the onset of their fear (Di Nardo et al., 1988). Although traumatic conditioning experiences have been found to play a role in the development of dog fear, they are rarely reported as preceding the onset of spider fears. In fact, previous research has found that traumatic conditioning experiences occur in less than 10% of cases of spider fear (Davey, 1992a). Therefore, given that individuals with a high fear of spiders do not often report traumatic conditioning experiences as preceding the onset of their fear and it is unlikely that spiders would actually physically harm human beings, it is possible that there are other factors, aside from fear of being physically attacked or harmed, that may play a role in the development and/or maintenance of spider fear.

Implications

The current “gold-standard” treatment for animal phobias is *in vivo* exposure, which is usually conducted in a hierarchical manner, such that individuals begin with easier tasks and work up to increasingly challenging tasks that involve exposure to the more fear provoking aspects of their feared stimulus. In order to maximize the effectiveness of *in vivo* exposure, Foa and Kozak (1986) have proposed that each stimulus within the hierarchy needs to be able to activate an individual’s fear structure and be fear evoking for that individual. Thus, given that pictorial stimuli may only be able to activate an emotional reaction for individuals with certain

animal fears (e.g., spiders), and not others (e.g., dogs), the results of the present study could be used to inform the usefulness of pictorial stimuli in exposure practices for animal phobia.

Furthermore, by better understanding characteristics that individuals with spider or dog fear consider distressing could help clinicians better conceptualize individual differences in spider and dog fear and develop more effective exposure practices. In addition to disgust, past research has suggested that an individual's perception of the uncontrollability, unpredictability, dangerousness and loomingness of a spider may influence the extent to which he/she fears spiders (Armfield & Mattiske, 1996; Riskind, Moore, & Bowley, 1995); however, the extent to which these variables influence an individual's fear of dogs has yet to be empirically tested. Given that clinicians develop exposure hierarchies that are unique to their client's fear, it is important for empirical research to investigate different characteristics that may influence a person's level of fear or disgust, as these characteristics may be important to target during exposure practices.

Therefore, since the present study was unable to determine why pictorial stimuli appeared to be more effective for individuals with a high fear of spiders, when compared to individuals with a high fear of dogs, future research should be conducted to investigate potential factors that may help to explain why this differential responding pattern occurred. In the present study, it was proposed that other factors aside from fear evoking status (i.e., disgust-relevant factors) may be important for determining the extent to which pictorial and live stimuli are able to activate an individual's fear response. For example, the present study proposed that pictorial stimuli may be more effective for spiders but not dogs because spiders are often perceived as both fear and disgust evoking and are often associated with the fear of contamination. Thus, it was hypothesized that these disgust and contamination properties may promote a lower threshold for

avoidance for individuals with a high fear of spiders, as compared to individuals with a high fear of dogs. Some results of the present study, however, were unexpected. Specifically, individuals with a high fear of spiders did not differ from individuals with a high fear of dogs on measures assessing disgust sensitivity or fear of contamination. In addition, disgust sensitivity and fear of contamination were not related to responding for the spider-relevant stimuli. However, given that the results of the present study are inconsistent with previous research and the present study included a relatively small sample, it is recommended that future research be conducted using a larger sample to further investigate the extent to which disgust-relevant factors may be responsible for the differential responding that occurred between participants with a high fear of spiders and participants with a high fear of dogs.

Limitations and Future Directions

Finally, it is important to discuss some limitations of the present study, as they may have influenced some of the aforementioned findings. First, it should be noted that the sample in the present study was not a clinical sample; rather participants were undergraduate psychology students from Ryerson University and individuals from the GTA who reported a high fear of spiders and low fear of dogs or a high fear of dogs and low fear of spiders. Participants did not have to report symptoms that met DSM-IV diagnostic criteria for specific phobia of spiders or dogs in order to be included in the present study. Additionally, the cutoffs that were used in the present study were set at the top and bottom third of the distribution of FSQ and DPQ scores, which is less stringent than some prior research that used cutoffs that were one standard deviation above or below participants' respective gender means on a spider fear questionnaire (i.e., the SPQ; Olatunji & Deacon, 2008). Therefore, the results of the present study cannot be generalized to individuals who report symptoms consistent with a diagnosis of spider phobia or

dog phobia. In order to be able to generalize these findings to a clinical population, the present study would need to be replicated using participants with a clinical diagnosis of specific phobia of spiders or dogs. Additionally, given that the sample size of the present study was relatively small, it will be important that this study be replicated using a larger sample to determine the stability of these results.

Furthermore, there was also some concern regarding the spider and dog stimuli (i.e., the tarantula and the Labrador retriever) that were used in the present study, as the live spider appeared to be a scarier stimulus than the live dog. For example, given that the Labrador retriever that was used in the present study was quite calm and slow moving, it may not have been a valid representation of the type of dog that people with a high fear of dogs typically fear and thus, may have influenced participants level of fear. That is, while participants with a high fear of spiders reported a mean fear rating of 33.21 (out of 40) in response to a live spider, participants with a high fear of dogs reported a mean fear rating of 15.89 (out of 40) in response to a live dog. Participants with a high fear of dogs also reported a similar mean fear rating (11.22 out of 40) for a live spider, when compared to a live dog.

Additionally, there was also some concern regarding the pictorial stimuli that were used in the present study. That is, the photographs of the spider and the dog were both 8 x 10 inches in size and the dog was smaller in the photograph, when compared to real-life, whereas the spider was larger in the photograph, when compared to real-life. Thus, the picture of the dog may have been unable to elicit an emotional reaction in participants with a high fear of dogs because when presented in the photograph, the dog was much smaller (and potentially less frightening) than in real-life. In order to determine whether stimulus size affects participants' reactions to

photographs, this study should be replicated using different sizes of photographs (i.e., normal 8 x 10 photographs versus large, life-size photographs).

Thirdly, there were also limitations with respect to the recruitment strategies that were used in the present study. For example, introductory psychology students were recruited using winter and spring mass testing, whereas community participants were recruited using poster advertisements that were located throughout Ryerson University, University of Toronto and the GTA. Because different recruitment methods were used, participants that were recruited via the community were provided with more information about the study before they completed the pre-screen measures online, as compared to participants who were recruited through introductory psychology courses. Additionally, there were also some technical problems with the pre-screen measures that community participants completed, which have may have influenced the reliability of participants' FSQ and DPQ scores that were completed during the pre-screen. Lastly, given that the pre-screen measures were completed online for both introductory psychology participants and community participants, there was some concern that their pre-screen scores may not have been as reliable of a measure as their in-session scores. Given the aforementioned limitations with the recruitment strategies, participants' in-session FSQ and DPQ scores, rather than their pre-screen FSQ and DPQ scores, were used to determine group assignment.

Lastly, it should be noted that this is the first study to the author's knowledge that has investigated the extent to which different stimulus formats (i.e., pictures versus live) are able to activate an emotional reaction for individuals with a high fear of spiders and individuals with a high fear of dogs. Thus, given that this was the first empirical study investigating this question and a relatively small number of participants were used, it is suggested that this study be considered a pilot study and it is recommended that future research be conducted with a larger

sample to confirm the findings. It is also recommended that future research be conducted to further investigate disgust-relevant factors, as well as other possible factors, that may determine why pictorial stimuli appear to be more effective for individuals with a fear of spiders, when compared to individuals with a fear of dogs.

Additionally, given that a great deal of research has shown that disgust sensitivity is related to spider fear, it will be important for future research to investigate the extent to which disgust sensitivity is causally related to spider phobia. Furthermore, given that there were no significant differences between participants with a high fear of spiders and participants with a high fear of dogs for disgust sensitivity and fear of contamination in the present study, it will be important for future research to investigate the extent to which disgust-relevant factors may play a role in other animal fears (e.g., the fear of dogs). It will also be important for future research to determine what characteristics individuals with spider or dog fear find disgusting, as these characteristics may be important for helping clinicians develop effective exposures. Furthermore, by better understanding what characteristics individuals find disgusting may also help explain why pictorial stimuli were more effective for participants with a high fear of spiders, when compared to participants with a high fear of dogs. Finally, given that accumulating research has suggested that spiders elicit both fear and disgust reactions, future research should investigate the benefits of placing greater attention on disgust in exposure treatments for individuals with spider phobia.

Despite the limitations of the present study, the results suggest that there may be differences across spiders and dogs with respect to the extent to which pictorial and live stimuli are able to arouse a fear or disgust response in individuals with a high fear of spiders and individuals with a high fear of dogs. Although disgust-relevant factors, such as disgust sensitivity

and fear of contamination, were hypothesized to be responsible for the differential responding that occurred between the two groups of participants, the results of the present study did not support this hypothesis. The results of this study have clinical implications for the treatment of individuals with specific phobia, such that they suggest that pictorial stimuli may be able to elicit an emotional response for certain animal fears and not others. Future research is required to determine what factors may help to explain why pictorial stimuli appear to be effective for some animal fears and not others. By better understanding these factors, clinicians will be better informed about the clinical usefulness of pictorial stimuli in exposure practice.

Appendix A

Pictorial Behavioural Approach Task Coding Scheme

Step 1: Walk toward the photograph of the spider [dog] as near as you can

- 0 = Distance is 10 m
- 1 = Distance is between 7 and 9.99 m
- 2 = Distance is between 4 and 6.99 m
- 3 = Distance is between 1 and 3.99 m
- 4 = Distance is between 0.5 and .99 m
- 5 = Distance is between 0 and .49 m

Step 2: Touch the back of the photograph of the spider [dog]

- 0 = Not willing to touch the back of the photograph of the spider [dog]
- 1 = Partially* touch the back of the photograph of the spider [dog]
- 2 = Touch the back of the photograph of the spider [dog] for 5 consecutive seconds

Step 3: Touch the area behind the spider [dog] in the photograph

- 0 = Not willing to touch the area behind the spider [dog] in the photograph
- 1 = Partially touch the area behind the spider [dog] in the photograph
- 2 = Touch the area behind the spider [dog] in the photograph for 5 consecutive seconds

Step 4: Touch the area in front of the spider [dog] in the photograph

- 0 = Not willing to touch the area in front of the spider [dog] in the photograph
- 1 = Partially touch the area in front of the spider [dog] in the photograph
- 2 = Touch the area in front of the spider [dog] in the photograph for 5 consecutive

Step 5: Touch the spider [dog] with your index finger

- 0 = Not willing to touch the spider [dog] with your index finger
- 1 = Partially touch the spider [dog] with your index finger
- 2 = Touch the spider [dog] with your index finger for 5 consecutive seconds

Step 6: Rub your hand over the spider [dog]

- 0 = Not willing to rub your hand over the spider [dog]
- 1 = Partially rub your hand over the spider [dog]
- 2 = Rub your hand over the spider [dog] for 5 consecutive seconds

* "Partially" is defined as an individual attempting to complete a step but being unable to perform it for 5 consecutive seconds.

Live Spider Behavioural Approach Task Coding Scheme

Step 1: Walk toward the spider as near as you can

- 0 = Distance is 10 m
- 1 = Distance is between 7 and 9.99 m
- 2 = Distance is between 4 and 6.99 m
- 3 = Distance is between 1 and 3.99 m
- 4 = Distance is between 0.5 and .99 m
- 5 = Distance is between 0 and .49 m

Step 2: Touch the container

- 0 = Not willing to touch the container
- 1 = Partially* touch the container
- 2 = Touch the container for 5 consecutive seconds

Step 3: Touch the inside of the container

- 0 = Not willing to touch the inside of the container
- 1 = Partially touch the inside of the container
- 2 = Touch the inside of the container for 5 consecutive seconds

Step 4: Touch the spider with a pencil

- 0 = Not willing to touch the spider with a pencil
- 1 = Partially touch the spider with a pencil
- 2 = Touch the spider with a pencil for 5 consecutive

Step 5: Touch the spider with your index finger

- 0 = Not willing to touch the spider with your index finger
- 1 = Partially touch the spider with your index finger
- 2 = Touch the spider with your index finger for 5 consecutive seconds

Step 6: Hold the spider in the palm of your hand

- 0 = Not willing to hold the spider in the palm of your hand
- 1 = Partially hold the spider in the palm of your hand
- 2 = Hold the spider in the palm of your hand for 5 consecutive seconds

* "Partially" is defined as an individual attempting to complete a step but being unable to perform it for 5 consecutive seconds.

Appendix C

Live Dog Behavioural Approach Task Coding Scheme

Step 1: Walk toward the dog as near as you can

- 0 = Distance is 10 m
- 1 = Distance is between 7 and 9.99 m
- 2 = Distance is between 4 and 6.99 m
- 3 = Distance is between 1 and 3.99 m
- 4 = Distance is between 0.5 and .99 m
- 5 = Distance is between 0 and .49 m

Step 2: Touch the floor beside the dog

- 0 = Not willing to touch the floor beside the dog
- 1 = Partially* touch the floor beside the dog
- 2 = Touch the floor beside the dog for 5 consecutive seconds

Step 3: Touch the dog's leash

- 0 = Not willing to touch the dog's leash
- 1 = Partially touch the dog's leash
- 2 = Touch the dog's leash for 5 consecutive seconds

Step 4: Touch the dog's back with an oven mitt

- 0 = Not willing to touch the dog's back with an oven mitt
- 1 = Partially touch the dog's back with an oven mitt
- 2 = Touch the dog's back with an oven mitt for 5 consecutive

Step 5: Touch the dog's back with your hand

- 0 = Not willing to touch the dog's back with your hand
- 1 = Partially touch the dog's back with your hand
- 2 = Touch the dog's back with your hand for 5 consecutive seconds

Step 6: Stroke the fur on the dog's head

- 0 = Not willing to stroke the fur on the dog's head
- 1 = Partially stroke the fur on the dog's head
- 2 = Stroke the fur on the dog's head for 5 consecutive seconds

* "Partially" is defined as an individual attempting to complete a step but being unable to perform it for 5 consecutive seconds.

Appendix D

Consent Form

Ryerson University Consent Agreement

The Role of Disgust and Fear of Contamination in Responses to Pictorial versus Live Stimuli

You are being asked to participate in a research study. Before you give your consent to be a volunteer, it is important that you read the following information and ask as many questions as necessary to be sure you understand what you will be asked to do.

Investigators:

Valerie Vorstenbosch, B.Sc., M.A. Clinical Psychology Student

Martin Antony, Ph.D., C.Psych., Department of Psychology, Ryerson University, Supervisor

Naomi Koerner, Ph.D., Department of Psychology, Ryerson University

Purpose of the Study:

The purpose of this study is to investigate the extent to which disgust sensitivity and fear of contamination influence how an individual responds to a picture of a dog, a picture of a spider, a live dog, and a live spider. Disgust sensitivity refers to the tendency to become disgusted in response to a wide range of objects or situations. Participants were selected based on their responses to questionnaires that were completed online via mass testing. Sixty participants will complete this study.

Description of the Study:

You will take part in a short interview, which asks questions regarding your fear of spiders or your fear of dogs. Next, you will be asked to complete questionnaires on disgust sensitivity, fear of contamination, trait anxiety, fear of spiders and fear of dogs. In addition, you will also be given the option to state your age, gender, ethnicity and level of education. Next, you will be asked to state the extent to which you typically fear being physically harmed by a spider or dog. You will then be asked to engage in 4 short, 5 to 10 minutes, behavioural approach tasks (BATs). For these tasks, you will be asked to approach a 8 x 10 photograph of a spider, a 8 x 10 photograph of a dog, a live spider and a live dog as close as you possibly can. Before beginning each BAT and after finishing each BAT, you will be asked to complete a short questionnaire about the task. You will also be asked to wear a heart-rate monitor throughout the study to obtain a measure of your physiological reaction to the picture of the dog, picture of the spider, live dog and live spider. This study is a one-session study that will take approximately 1.5 hours to complete.

What is Experimental in this Study:

None of the procedures or questionnaires used in this study are experimental in nature. The only experimental aspect of this study is the gathering of information for the purpose of analysis.

Risks or Discomforts:

You may experience some unpleasant emotions and/or discomfort as you are completing the questionnaires and the behavioural approach tasks (BATs). As part of the live BATs, you may be asked to hold a spider and/or touch a dog. If so, there is a small possibility that you may be bitten by the spider or dog; however, this is quite unlikely. You are free to stop completing the questionnaires and the BATs at any time and you are free to omit the answer to any questions.

Benefits of the Study

You will have the opportunity to take part in research on your respective animal fear. This investigation will benefit individuals with specific phobias, as it will help to inform the use of different stimulus formats (e.g., photographs of animals versus live animals) when treating animal phobias.

Confidentiality:

Confidentiality will be maintained during this study. Your name will not appear on any of the research materials. Data will be stored in a locked filing cabinet in a locked room with no identifying information. Electronic data will be organized by an identification number and will be stored in a password protected file. Only the principal investigator, the co-investigators and an undergraduate research assistant will have access to this data. Data will be analyzed as a whole and you will not be identified in scientific presentations or publications of this research. Raw data will be appropriately discarded seven years after publication of the study.

Incentives to Participate:

For participating in this study, you will receive 2.0% towards your final grade in the introductory psychology course or \$10 cash. If you withdraw from the study prior to its completion, you will still receive the 2.0% or \$10.

Voluntary Nature of Participation:

Participation in this study is voluntary. Your choice of whether or not to participate will not affect your academic standing or relationship with Ryerson University. If you decide to participate, you are free to withdraw your consent and to stop your participation at any time without penalty or loss of benefits to which you are allowed.

At any particular point in the study, you may refuse to answer any particular question or stop participation.

Questions about the Study:

If you have any questions about the research now, please ask. If you have questions later about the research, you may contact:

Valerie Vorstenbosch
416-979-5000 ext. 2184.

Dr. Martin Antony, Ph.D., C.Psych., Thesis Supervisor
Department of Psychology, Ryerson University
416-979-5000 ext. 2631

If you have questions regarding your rights as a human subject and participation in this study, you may contact the Ryerson University Research Ethics Board for information.

Research Ethics Board
c/o Office of the Vice President, Research and Innovation
Ryerson University
350 Victoria Street
Toronto, ON M5B 2K3
416-979-5042

Agreement:

Your signature below indicates that you have read the information in this agreement and have had a chance to ask any questions you have about the study. Your signature also indicates that you agree to be in the study and have been told that you can change your mind and withdraw your consent to participate at any time. You have been given a copy of this agreement.

You have been told that by signing this consent agreement you are not giving up any of your legal rights.

Name of Participant (please print)

Signature of Participant

Date

Signature of Investigator

Date

Dr. Martin Amann, Ph.D., C. Reg. P., C. Reg. S., C. Reg. T., C. Reg. V., C. Reg. W., C. Reg. X., C. Reg. Y., C. Reg. Z., C. Reg. AA, C. Reg. AB, C. Reg. AC, C. Reg. AD, C. Reg. AE, C. Reg. AF, C. Reg. AG, C. Reg. AH, C. Reg. AI, C. Reg. AJ, C. Reg. AK, C. Reg. AL, C. Reg. AM, C. Reg. AN, C. Reg. AO, C. Reg. AP, C. Reg. AQ, C. Reg. AR, C. Reg. AS, C. Reg. AT, C. Reg. AU, C. Reg. AV, C. Reg. AW, C. Reg. AX, C. Reg. AY, C. Reg. AZ, C. Reg. BA, C. Reg. BB, C. Reg. BC, C. Reg. BD, C. Reg. BE, C. Reg. BF, C. Reg. BG, C. Reg. BH, C. Reg. BI, C. Reg. BJ, C. Reg. BK, C. Reg. BL, C. Reg. BM, C. Reg. BN, C. Reg. BO, C. Reg. BP, C. Reg. BQ, C. Reg. BR, C. Reg. BS, C. Reg. BT, C. Reg. BU, C. Reg. BV, C. Reg. BW, C. Reg. BX, C. Reg. BY, C. Reg. BZ, C. Reg. CA, C. Reg. CB, C. Reg. CC, C. Reg. CD, C. Reg. CE, C. Reg. CF, C. Reg. CG, C. Reg. CH, C. Reg. CI, C. Reg. CJ, C. Reg. CK, C. Reg. CL, C. Reg. CM, C. Reg. CN, C. Reg. CO, C. Reg. CP, C. Reg. CQ, C. Reg. CR, C. Reg. CS, C. Reg. CT, C. Reg. CU, C. Reg. CV, C. Reg. CW, C. Reg. CX, C. Reg. CY, C. Reg. CZ, C. Reg. DA, C. Reg. DB, C. Reg. DC, C. Reg. DD, C. Reg. DE, C. Reg. DF, C. Reg. DG, C. Reg. DH, C. Reg. DI, C. Reg. DJ, C. Reg. DK, C. Reg. DL, C. Reg. DM, C. Reg. DN, C. Reg. DO, C. Reg. DP, C. Reg. DQ, C. Reg. DR, C. Reg. DS, C. Reg. DT, C. Reg. DU, C. Reg. DV, C. Reg. DW, C. Reg. DX, C. Reg. DY, C. Reg. DZ, C. Reg. EA, C. Reg. EB, C. Reg. EC, C. Reg. ED, C. Reg. EE, C. Reg. EF, C. Reg. EG, C. Reg. EH, C. Reg. EI, C. Reg. EJ, C. Reg. EK, C. Reg. EL, C. Reg. EM, C. Reg. EN, C. Reg. EO, C. Reg. EP, C. Reg. EQ, C. Reg. ER, C. Reg. ES, C. Reg. ET, C. Reg. EU, C. Reg. EV, C. Reg. EW, C. Reg. EX, C. Reg. EY, C. Reg. EZ, C. Reg. FA, C. Reg. FB, C. Reg. FC, C. Reg. FD, C. Reg. FE, C. Reg. FF, C. Reg. FG, C. Reg. FH, C. Reg. FI, C. Reg. FJ, C. Reg. FK, C. Reg. FL, C. Reg. FM, C. Reg. FN, C. Reg. FO, C. Reg. FP, C. Reg. FQ, C. Reg. FR, C. Reg. FS, C. Reg. FT, C. Reg. FU, C. Reg. FV, C. Reg. FW, C. Reg. FX, C. Reg. FY, C. Reg. FZ, C. Reg. GA, C. Reg. GB, C. Reg. GC, C. Reg. GD, C. Reg. GE, C. Reg. GF, C. Reg. GG, C. Reg. GH, C. Reg. GI, C. Reg. GJ, C. Reg. GK, C. Reg. GL, C. Reg. GM, C. Reg. GN, C. Reg. GO, C. Reg. GP, C. Reg. GQ, C. Reg. GR, C. Reg. GS, C. Reg. GT, C. Reg. GU, C. Reg. GV, C. Reg. GW, C. Reg. GX, C. Reg. GY, C. Reg. GZ, C. Reg. HA, C. Reg. HB, C. Reg. HC, C. Reg. HD, C. Reg. HE, C. Reg. HF, C. Reg. HG, C. Reg. HH, C. Reg. HI, C. Reg. HJ, C. Reg. HK, C. Reg. HL, C. Reg. HM, C. Reg. HN, C. Reg. HO, C. Reg. HP, C. Reg. HQ, C. Reg. HR, C. Reg. HS, C. Reg. HT, C. Reg. HU, C. Reg. HV, C. Reg. HW, C. Reg. HX, C. Reg. HY, C. Reg. HZ, C. Reg. IA, C. Reg. IB, C. Reg. IC, C. Reg. ID, C. Reg. IE, C. Reg. IF, C. Reg. IG, C. Reg. IH, C. Reg. II, C. Reg. IJ, C. Reg. IK, C. Reg. IL, C. Reg. IM, C. Reg. IN, C. Reg. IO, C. Reg. IP, C. Reg. IQ, C. Reg. IR, C. Reg. IS, C. Reg. IT, C. Reg. IU, C. Reg. IV, C. Reg. IW, C. Reg. IX, C. Reg. IY, C. Reg. IZ, C. Reg. JA, C. Reg. JB, C. Reg. JC, C. Reg. JD, C. Reg. JE, C. Reg. JF, C. Reg. JG, C. Reg. JH, C. Reg. JI, C. Reg. JJ, C. Reg. JK, C. Reg. JL, C. Reg. JM, C. Reg. JN, C. Reg. JO, C. Reg. JP, C. Reg. JQ, C. Reg. JR, C. Reg. JS, C. Reg. JT, C. Reg. JU, C. Reg. JV, C. Reg. JW, C. Reg. JX, C. Reg. JY, C. Reg. JZ, C. Reg. KA, C. Reg. KB, C. Reg. KC, C. Reg. KD, C. Reg. KE, C. Reg. KF, C. Reg. KG, C. Reg. KH, C. Reg. KI, C. Reg. KJ, C. Reg. KK, C. Reg. KL, C. Reg. KM, C. Reg. KN, C. Reg. KO, C. Reg. KP, C. Reg. KQ, C. Reg. KR, C. Reg. KS, C. Reg. KT, C. Reg. KU, C. Reg. KV, C. Reg. KW, C. Reg. KX, C. Reg. KY, C. Reg. KZ, C. Reg. LA, C. Reg. LB, C. Reg. LC, C. Reg. LD, C. Reg. LE, C. Reg. LF, C. Reg. LG, C. Reg. LH, C. Reg. LI, C. Reg. LJ, C. Reg. LK, C. Reg. LL, C. Reg. LM, C. Reg. LN, C. Reg. LO, C. Reg. LP, C. Reg. LQ, C. Reg. LR, C. Reg. LS, C. Reg. LT, C. Reg. LU, C. Reg. LV, C. Reg. LW, C. Reg. LX, C. Reg. LY, C. Reg. LZ, C. Reg. MA, C. Reg. MB, C. Reg. MC, C. Reg. MD, C. Reg. ME, C. Reg. MF, C. Reg. MG, C. Reg. MH, C. Reg. MI, C. Reg. MJ, C. Reg. MK, C. Reg. ML, C. Reg. MM, C. Reg. MN, C. Reg. MO, C. Reg. MP, C. Reg. MQ, C. Reg. MR, C. Reg. MS, C. Reg. MT, C. Reg. MU, C. Reg. MV, C. Reg. MW, C. Reg. MX, C. Reg. MY, C. Reg. MZ, C. Reg. NA, C. Reg. NB, C. Reg. NC, C. Reg. ND, C. Reg. NE, C. Reg. NF, C. Reg. NG, C. Reg. NH, C. Reg. NI, C. Reg. NJ, C. Reg. NK, C. Reg. NL, C. Reg. NM, C. Reg. NN, C. Reg. NO, C. Reg. NP, C. Reg. NQ, C. Reg. NR, C. Reg. NS, C. Reg. NT, C. Reg. NU, C. Reg. NV, C. Reg. NW, C. Reg. NX, C. Reg. NY, C. Reg. NZ, C. Reg. OA, C. Reg. OB, C. Reg. OC, C. Reg. OD, C. Reg. OE, C. Reg. OF, C. Reg. OG, C. Reg. OH, C. Reg. OI, C. Reg. OJ, C. Reg. OK, C. Reg. OL, C. Reg. OM, C. Reg. ON, C. Reg. OO, C. Reg. OP, C. Reg. OQ, C. Reg. OR, C. Reg. OS, C. Reg. OT, C. Reg. OU, C. Reg. OV, C. Reg. OW, C. Reg. OX, C. Reg. OY, C. Reg. OZ, C. Reg. PA, C. Reg. PB, C. Reg. PC, C. Reg. PD, C. Reg. PE, C. Reg. PF, C. Reg. PG, C. Reg. PH, C. Reg. PI, C. Reg. PJ, C. Reg. PK, C. Reg. PL, C. Reg. PM, C. Reg. PN, C. Reg. PO, C. Reg. PP, C. Reg. PQ, C. Reg. PR, C. Reg. PS, C. Reg. PT, C. Reg. PU, C. Reg. PV, C. Reg. PW, C. Reg. PX, C. Reg. PY, C. Reg. PZ, C. Reg. QA, C. Reg. QB, C. Reg. QC, C. Reg. QD, C. Reg. QE, C. Reg. QF, C. Reg. QG, C. Reg. QH, C. Reg. QI, C. Reg. QJ, C. Reg. QK, C. Reg. QL, C. Reg. QM, C. Reg. QN, C. Reg. QO, C. Reg. QP, C. Reg. QQ, C. Reg. QR, C. Reg. QS, C. Reg. QT, C. Reg. QU, C. Reg. QV, C. Reg. QW, C. Reg. QX, C. Reg. QY, C. Reg. QZ, C. Reg. RA, C. Reg. RB, C. Reg. RC, C. Reg. RD, C. Reg. RE, C. Reg. RF, C. Reg. RG, C. Reg. RH, C. Reg. RI, C. Reg. RJ, C. Reg. RK, C. Reg. RL, C. Reg. RM, C. Reg. RN, C. Reg. RO, C. Reg. RP, C. Reg. RQ, C. Reg. RR, C. Reg. RS, C. Reg. RT, C. Reg. RU, C. Reg. RV, C. Reg. RW, C. Reg. RX, C. Reg. RY, C. Reg. RZ, C. Reg. SA, C. Reg. SB, C. Reg. SC, C. Reg. SD, C. Reg. SE, C. Reg. SF, C. Reg. SG, C. Reg. SH, C. Reg. SI, C. Reg. SJ, C. Reg. SK, C. Reg. SL, C. Reg. SM, C. Reg. SN, C. Reg. SO, C. Reg. SP, C. Reg. SQ, C. Reg. SR, C. Reg. SS, C. Reg. ST, C. 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Appendix E

Additional Analyses

Thirty-one participants (23 women, 8 men) were included when group membership was determined using participants' pre-screen FSQ and DPQ scores. Eighteen participants (14 women, 4 men) were included in the high fear of spiders and low fear of dogs group and 13 participants (9 women, 4 men) were included in the high fear of dogs and low fear of spiders group. Thirty-nine percent of participants with a high fear of spiders ($n = 7$) reported symptoms consistent with a DSM-IV diagnosis of spider phobia and 23% of participants with a high fear of dogs ($n = 3$) reported symptoms consistent with a DSM-IV diagnosis of dog phobia. In terms of other specific phobias, 22% of participants with a high fear of spiders ($n = 4$) and 8% of participants with a high fear of dogs ($n = 1$) reported symptoms consistent with other DSM-IV specific phobias (e.g., heights, injections). Participant age ranged from 18 to 40 years ($M = 23.61$ years; $SD = 5.01$ years), overall. The mean age of participants with a high fear of spiders was 22.17 years ($SD = 3.31$ years) and the mean age of participants with a high fear of dogs was 25.62 years ($SD = 6.31$ years). There were no significant differences between participants with a high fear of spiders and participants with a high fear of dogs when compared on age, $t(29) = -1.98$, $p > .05$, Cohen's $d = -0.68$, and gender, $p = .69$ (Fisher's exact test).

Results of the additional analyses were similar to results that were reported when group membership was determined using participants' in-session FSQ and DPQ scores. However, the following discrepancies were found between analyses: First, although results were similar for the 2 (Type of animal fear: spider fear, dog fear) $\times$ 2 (Type of stimulus format: picture, live) $\times$ 2 (Type of target animal: spider, dog) mixed ANOVA that was conducted to compare participants with a high fear of spiders to participants with a high fear of dogs on their responses to the four

fear-related items on the BTRS questionnaires, there was an additional interaction between type of stimulus and type of animal fear when group membership was determined using participants' pre-screen scores. Second, although results were similar for the 2 (Type of animal fear: spider fear, dog fear) x 2 (Type of stimulus format: picture, live) x 2 (Type of target animal: spider, dog) mixed ANOVA that was conducted to compare participants with a high fear of spiders to participants with a high fear of dogs on distance of approach scores, there was an additional interaction between type of stimulus and type of animal fear when group membership was determined using participants' pre-screen scores. Third, although there were some discrepancies between the bivariate correlational analyses that were conducted between study measures and responding for the picture of a spider, the picture of a dog, the live spider and the live dog, the correlations that were found when group membership was determined using participants' pre-screen scores appeared to follow the same trend as those that were reported when group membership was determined using participants' in-session scores. The main differences between the bivariate correlational analyses were that there no longer were significant relationships between (1) dog fear and distance of approach for the picture of the spider, (2) dog fear and distance of approach for the picture of the dog, (3) dog fear and BAT disgust for the live spider and (4) distance of approach and disgust sensitivity for the live spider. Additionally, when group membership was determined using participants' pre-screen scores, there were negative relationships between (1) distance of approach and disgust sensitivity for the picture of the dog and (2) distance of approach and fear of contamination for the picture of the spider and there also was a positive relationship between fear of contamination and BAT disgust for the live spider. No other discrepancies were found between analyses.

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