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## The relative contributions of fear and disgust reductions to improvements in spider phobia following exposure-based treatment

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### ABSTRACT

The present study examines the relative contributions of changes in state fear and disgust emotions to improvements in spider phobia observed with exposure-based treatment. Sixty-one treatment-seeking spider fearful individuals underwent a one-session exposure in vivo treatment. Growth curve analyses indicated that treatment was associated with significant improvements in state fear and disgust reactions to a live spider and self-reported trait spider phobia symptoms. Mediation analyses demonstrated that changes over time in state fear and disgust each explained unique variance in improvements in phobic symptoms over time. Examination of the effect size of the mediated pathways suggests that changes in fear *and* changes in disgust are important to reductions in the severity of spider phobia symptoms during exposure-based treatment. The implications of these findings for conceptualizing the role of fear and disgust emotions in the maintenance and treatment of spider phobia are discussed.

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Traditional models of the development and maintenance of spider phobia have emphasized fear-related appraisals, based partially on a predator-defense model (e.g., Öhman, Dimberg, & Öst, 1985). This traditional fear-motivated view draws on the observation that spider phobic individuals often present with the expectation that harm-related consequences will follow exposure to threat-relevant stimuli (Arntz, Lavy, van den Berg, & van Rijsoort, 1993). However, contemporary research suggests that disgust may also play a crucial role in the development and maintenance of spider phobia. For example, Vermon and Berenbaum (2004) found that expectancies about exposure to spiders (e.g., spiders will be dirty) and one's personal reaction to spiders (e.g., I will feel disgust) are often disgust-relevant. Furthermore, studies have shown that spider phobics report feelings of disgust (in addition to fear) when exposed to spiders (Sawchuk, Lohr, Tolin, Lee, & Kleinknecht, 2000; Tolin, Lohr, Sawchuk, & Lee, 1997). Physiological data also indicates that spider fearful individuals respond with greater disgust-specific facial EMG activity (i.e., activity of the *m. levator labii*) than non-fearful individuals when exposed to spiders (de Jong, Peters, & Vanderhallen, 2002).

Available findings suggest the 'phobic structure' consist of appraisals of spiders as uncontrollable, unpredictable, dangerous *and*

disgusting (e.g., Armfield, 2006) and the disgust-evoking property of spiders does not appear to be accounted for by a general negative emotional response to spiders (Vermon & Berenbaum, 2002). It has been proposed that the role of disgust in spider phobia may be understood in the context of a disease-avoidance model (Matchett & Davey, 1991; Olatunji, 2006). This model suggests that aversive, but nonpredatory, animals elicit avoidance due to concerns of contamination (disgust mediated) rather than concerns of physical harm (fear mediated). Although the mechanisms that underlie the disease-avoidance model are not yet clear, empirical evidence has shown that the disgust-related appraisals of spiders may be associated with contamination concerns. In one study, approximately 75% of spider phobics refused to eat a cookie compared to only 30% of a matched sample of nonphobics after it had come into contact with a spider (Mulken, de Jong, & Merckelbach, 1996). The disease-avoidance model would predict that such concerns are highly associated with the fear of contamination (Huijding & de Jong, 2007). Indeed, there is evidence demonstrating that spider phobics score higher than do nonphobics on self-report obsessive-compulsive inventories assessing contamination fears and washing compulsions (Olatunji & Deacon, 2008; Sawchuk et al., 2000).

Recent research has shown that spiders elicit significantly greater fear and disgust than any other arthropod group, and spiders are rated as more dangerous (Gerdes, Uhl, & Alpers, 2009). Furthermore,

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fear and disgust ratings of spiders significantly predict trait spider fear, whereas dangerousness ratings of spiders do not when controlling for other relevant variables. Although basic emotions of fear and disgust appear to be important determinants of spider phobia (Woody & Teachman, 2000), researchers have just begun to examine the distinct functions of the two emotions in spider phobia. Experimental studies have shown that spider phobics may be classified as “primarily fearful” rather than “primarily disgusted” based on a direct comparison of subjective fear and disgust ratings to images of spiders (Sawchuk, Lohr, Westendorf, Meunier, & Tolin, 2002; Tolin et al., 1997). The dominance of fear over disgust in spider fear has led some to posit that the link between disgust and spider phobia may be spurious. For example, Thorpe and Salkovskis (1998) argue that while disgust may be associated with fear of spiders, disgust does not modulate the intensity of that fear. However, studies have shown that both fear and disgust are associated with spider fear and avoidance independently of one another (Olatunji, 2006; Vermon & Berenbaum, 2008).

A more parsimonious view may be that fear and disgust serve different functions in spider phobia. For example, studies have shown that disgust-relevant, rather than fear-relevant processes, predict spider fear (van Overveld, de Jong, & Peters, 2006) and avoidance (Olatunji, Cisler, Meunier, Connolly, & Lohr, 2008; Woody, McLean, & Klassen, 2005; de Jong & Peters, 2007). Distinct characteristics of fear and disgust in spider phobia have also been observed in the context of exposure-based treatment. For example, Smits, Telch, and Randall (2002) found that the decay slope for fear was significantly greater than that for disgust during 30 min of self-directed in vivo exposure to a tarantula among participants displaying marked spider fear. This finding suggests that fear and disgust may be differentially processed during exposure-based treatment. However, it remains unclear if changes in state fear and disgust emotions differentially account for changes in trait spider phobia symptoms during exposure-based treatment. Examination of the relative independence of state disgust (from fear) in mediating treatment outcome has important implications for the view of disgust as a distinct emotional response in spider phobia. Therefore, the present study sought to examine the extent to which reductions in state fear and disgust emotions independently mediate changes in self-reported trait spider phobia severity following exposure-based treatment.

## 1. Method

### 1.1. Participants

Participants were 61 treatment-seeking spider fearful individuals that were recruited through community advertisements. Participants responded to advertisements indicating the availability of free treatment for spider phobia for those willing to participate in scientific research.

### 1.2. Assessment

#### 1.2.1. Spider phobia severity

The *Spider Phobia Questionnaire-Revised* (SPQ-R; Klorman, Hastings, Weerts, Melamed, & Lang, 1974; modified by Olatunji, Woods, et al., 2009) is a 15-item true/false measure of phobic responding to spiders. The SPQ-R is a revision of the Spider Phobia Questionnaire, the most widely used measure of spider phobia severity. The SPQ-R has excellent psychometric properties with an alpha coefficient up to .95 (Olatunji, Woods, et al., 2009).

#### 1.2.2. Behavioral approach fear and disgust

During the behavioral approach test (BAT) participants approached a medium-sized common house spider (*Teegenaria*

*atraca*) in eight steps, ranging from looking at the spider in a closed jar, to having the spider walk on their hands. The steps increased in difficulty and participants were informed that they could stop at any point. Using 0–100 Visual Analogue Scales (VAS) participants indicated their peak *fear* (i.e., BAT Fear) and peak *disgust* (i.e., BAT Disgust) during the last completed BAT step. VAS are commonly employed in this context and they can be valuable when assessing change within individuals (Wewers & Lowe, 1990). All BAT assessments were conducted by an independent evaluator and the therapist was not present during the BAT assessment. BAT assessments were also conducted in a different room with a different spider than the ones used during the treatment. The spider used during the BAT assessments was the same for all participants. In order to interpret the change in severity of state fear and disgust reactions to live spiders, we calculated for each participant the percentage of the total completed BAT steps (i.e., BAT Approach) and used this variable as a (time-varying) covariate in the mediation analyses (see below).

### 1.3. Exposure-based treatment

The exposure treatment was provided by masters-level students who successfully passed an elementary training in behavior therapy. They also received additional training on the treatment protocol employed for the present study and were supervised by doctoral level therapists. The treatment consisted of a one-session (2.5 h) exposure in vivo treatment consistent with the protocol developed by Öst (1989). After assessing the main dimensions of the patients' phobic symptoms, and an explanation on how avoidance and escape behavior maintain phobic symptoms, the therapist explained the rationale for the exposure treatment. It was stressed that the treatment requires a very active role of the patient whereas the therapist would predominantly act as coach, and that nothing would happen against the patient's will. Participants then engaged in exposure exercises of increasing difficulty (from looking at a spider in a jar to prolonged physical contact with several spiders) that were accommodated to each patient's specific phobic concerns. Participants were confronted with several different spiders varying in size during treatment. They were also encouraged to design behavioral experiments to get information on questions that arose during the session. The therapist modeled exercises or experiments as indicated.

### 1.4. Procedure

Participants completed the SPQ-R and the BAT with a real-life medium-sized common house spider. Participants then received a one-session exposure in vivo treatment. After the treatment session, participants again completed the BAT. Participants again completed the SPQ-R and the BAT at a two-month follow-up.

### 1.5. Data analytic overview

Instead of using the causal steps approach to testing mediation (Baron & Kenny, 1986), we directly tested the significance of the mediated pathway as suggested by MacKinnon and colleagues (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; MacKinnon, Lockwood, & Williams, 2004). We employed the distribution of products test (MacKinnon, Fairchild, & Fritz, 2007; MacKinnon et al., 2002) to test the significance of the mediated pathways. The distribution of products test involves multiplying the regression coefficients of the two segments of the mediated pathway and calculating the 95% confidence interval (CI) for this product. CI's that do not include 0 indicate a significant mediated pathway (MacKinnon et al., 2004). The distribution of products test has demonstrated greater power and more accurate Type I error

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