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Disgust Sensitivity and Emotion Regulation Potentiate the Effect of Disgust Propensity on Spider Fear, Blood-Injection-Injury Fear, and Contamination Fear

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Abstract

Research consistently reveals a relation between disgust and specific anxiety concerns, but research has only begun to investigate possible mechanisms by which this relation occurs. The current study tested whether disgust sensitivity (DS; a specific difficulty regulating disgust) and general emotion dysregulation (GED; non-emotion-specific regulation difficulties) moderated the relation between disgust propensity (DP) and spider fear, blood-injection-injury (BII) fear, and contamination fear. 594 undergraduate students completed verbal-report measures of DP, DS, GED, negative affectivity, and spider, BII, and contamination fears. Results suggest that GED potentiates the ability of DP to predict spider and contamination fears, but not BII fears. DS potentiates the ability of DP to predict BII fears, but not spider or contamination fears. These data suggest that GED and DS are possible mechanisms that strengthen the influence of DP on spider, BII, and contamination fears. The present study demonstrates the utility of incorporating emotion regulation into the theory of disgust in certain anxiety disorders

Keywords

disgust; emotion regulation; spider phobia; contamination; blood-injection-injury phobia

1. Introduction

Disgust is defined as a revulsion response towards potential sources of contagion (Rozin & Fallon, 1987; Rozin, Haidt, & McCauley, 2000). Research consistently demonstrates a relation between the emotion of disgust and specific anxiety disorders (Olatunji & Sawchuk, 2005; Woody & Teachman, 2000). Verbal-report measures of disgust (e.g., the Disgust Scale; Haidt, McCauley, & Rozin, 1994) have been found to positively correlate with verbal-report measures of spider fear (Jong & Merckelbach, 1998; Mulkens, de Jong, Merckelbach, 1996), blood-injection-injury fear (BII; de Jong & Merckelbach, 1998; Olatunji, Williams, Sawchuk, & Lohr, 2006), and contamination fear (Olatunji, Cisler, Deacon, Connolly, & Lohr, 2007; Olatunji, Sawchuk, Lohr, & de Jong, 2004; Cisler, Olatunji, Sawchuk, & Lohr, 2008). Participants with high spider, blood-injection-injury, or contamination fears label disorder relevant stimuli as disgusting (Olatunji, Lohr, Sawchuk, & Tolin, 2007; Sawchuk, Lohr, Westendorf, Meunier, & Tolin, 2002). Additionally, elevated disgust is positively related to behavioral avoidance of disorder relevant stimuli among individuals with spider (Olatunji &

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Deacon, 2008; Woody, McLean, & Klassan, 2005), BII (Koch, O'Neill, Sawchuk, & Connolly, 2002), or contamination fears (Olatunji, Lohr, et al., 2007).

Despite the consistent association between heightened disgust and heightened anxiety, research has only just begun to elucidate possible mechanisms by which disgust influences anxiety (e.g., Davey, Bickerstaffe, & MacDonald, 2006). Elucidating the routes by which disgust influences anxiety can add considerable explanatory power to the growing theory of disgust in anxiety (Olatunji & Mckay, 2008). Elucidating these routes could also aid in developing theories of the etiology and maintenance of particular anxious concerns (e.g., spider fear). Finally, research along these lines could also counter previous assertions that disgust is epiphenomenal to fear in disgust-related anxiety disorders (Edwards & Salkovskis, 2006; Thorpe & Salkovskis, 1998). Salkovskis and colleagues (Edwards & Salkovskis, 2006; Thorpe & Salkovskis, 1998) have argued that fear potentiates the experience of disgust; thus, the heightened levels of disgust in these populations is epiphenomenal and non-causal. Identification of routes by which disgust influences anxiety would suggest that the relation between disgust and anxiety is not epiphenomenal; rather, disgust may be a vulnerability factor that confers risk for these anxiety disorders via the identified mechanisms.

Recent research suggests that emotion regulation may be one possible mechanism that strengthens the influence of disgust on anxiety. Emotion regulation can be defined as "the processes by which individuals influence which emotions they have, when they have them, and how they experience and express these emotions" (Gross, 1998a, pg. 275). Researchers have suggested that difficulties in emotion regulation contribute to the development and maintenance of disordered anxiety (Amstadter, 2008; Forsyth, Eifert, & Barrios, 2006; Moses & Barlow, 2006; Olatunji, Forsyth, & Feldner, 2007). Moreover, Barlow's unified treatment for emotional disorders is based largely on teaching adaptive emotion regulation skills (Barlow, Allen, & Choate, 2004; Moses & Barlow, 2006). Two lines of evidence suggest that this general theory of emotion regulation and anxiety can be extended to explain how disgust influences anxiety.

First, recent theoretical (Olatunji & Cisler, 2008) and empirical (Olatunji, Cisler, Deacon, Connolly, & Lohr, 2007; van Overveld, de Jong, Peters, Cavanagh, & Davey, 2006) advances have begun to differentiate 'disgust sensitivity (DS)' from 'disgust propensity (DP).' DS refers to negative reactions towards the experience of disgust (e.g., Item 16 on the Disgust Sensitivity and Propensity Scale-revised [DPPS-R], van Overveld et al., 2006; 'I think feeling disgust is bad for me'). DP, however, refers to the frequency or ease with which individuals respond with disgust (e.g., Item 10 on the DPSS-R; 'I experience disgust'). The refined DS construct is consistent with emotion dysregulation theories of anxiety (e.g., Moses & Barlow, 2006) because it refers to distress resulting from the experience of the emotion itself. DS may also be related to Gratz and Roemer's (2004) conceptualization of emotion dysregulation, which posits several sub-domains of emotion dysregulation, such as emotion non-acceptance and lack of strategies to regulate emotions.

Second, recent research demonstrates that anxiety sensitivity moderates the relation between disgust propensity and contamination fears, such that heightened anxiety sensitivity potentiates the degree to which disgust predicts contamination fears (Cisler, Reardon, Williams, & Lohr, 2007;Cisler, Olatunji, et al., 2008). This suggests that a fear of responding with disgust may serve as an emotional maintenance process for contamination fears. This interpretation is consistent with emotion regulation theories of anxiety (e.g., Barlow, Allen, & Choate, 2004;Moses & Barlow, 2006) that posit emotional avoidance as a central process underlying anxiety. Thus, these data suggest that difficulties in emotion regulation may be a possible mechanism that strengthens the influence of disgust on anxiety.

Accordingly, we have two purposes in the current study. The refined DS construct is predicted to correlate with measures of emotion regulation, but hypotheses of this nature have yet to be tested. The first aim of the study is to test whether DS correlates with a measure of emotion regulation in order to demonstrate construct validity (cf. Cronbach & Meehl, 1955) of DS. The second aim is to test whether the constructs of DS and general emotion dysregulation (GED) moderate the relation between DP and spider fear, BII fear, or contamination fear. We conceptualize DS as a specific difficulty regulating the emotion of disgust. We conceptualize GED as a general (i.e., non-emotion-specific) difficulty in emotion regulation. Analyses examining whether these constructs moderate the relation between DP and certain anxiety disorders allow us to test the hypothesis that these constructs influence the magnitude of the relation between DP and certain anxiety disorders (Baron & Kenny, 1986). Thus, these tests specifically examine if emotion regulation constructs are mechanisms that strengthen the influence of DP on anxiety.

Research suggests that different disgust-related anxiety disorders may have unique maintenance processes (Cisler, Olatunji, et al., *in press*). Accordingly, we examined whether DS and GED moderate the relation between spider, BII, and contamination fears in order to test whether emotion regulation differentially moderates DP across these three anxiety disorders. We also include a measure of negative affectivity in order to demonstrate that the relation between disgust and anxiety is not spurious to negative affectivity (cf. Davey & Bond, 2006).

2. Method

2.1. Participants

Participants were 594 (347 female) undergraduate participants at a large public University. Mean age of the sample was 19.30 (*SD* = 3.02; range = 18–49). 89% of the sample endorsed themselves as Caucasian, 5% were Asian, 3% were Latino, 3% were African-American, and 1% endorsed themselves as ‘other.’ Mean number of undergraduate years completed was 1.67 (*SD* = .87; range = 1–5).

2.2. Measures

The Disgust Scale-Revised (DS-R; Olatunji, Williams, Tolin et al., 2007) is a 25-item verbal-report instrument measuring an individual’s propensity to respond with disgust across seven domains of disgust elicitors (e.g., “If I see someone vomit, it makes me sick”). The DS-R used in the current study employed a 5-point Likert scale. Participants are asked to rate the degree to which the items are true for them (0 = “not at all,” 5 = “very true”). Items are summed into a total score. Prior research has also used the DS-R with a 5-point Likert scale (Cisler, Olatunji, et al., 2008; Connolly et al., *in press*). The DS-R correlates highly with other measures of disgust (e.g., Disgust Propensity and Sensitivity Scale-revised; van Overveld et al., 2006) and predicts behavioral avoidance of disgusting objects/situations (Rozin et al., 1999). Internal consistency in the current study was .91.

The Disgust Propensity and Sensitivity Scale-Revised (DPSS-R; van Overveld et al., 2006) is a 16 item verbal-report measure designed to assess the frequency of disgust experiences (Disgust Propensity*)* and the emotional impact of disgust experiences (Disgust Sensitivity*)*. Subjects endorse items on a 5 point Likert scale (0 = “never” to 5 = “always”). Items comprising the different subscales are summed into total subscale scores. The DPSS-R correlates highly with the DS-R, Disgust and Contamination Sensitivity Questionnaire (Rozin et al., 1984) as well as with theoretically related constructs (e.g., spider fear; van Overveld et al., 2006). The DPSS-R demonstrates acceptable internal consistency with alpha coefficients of .78 for the Disgust Propensity subscale and .77 for the Disgust Sensitivity subscale (van Overveld et al., 2006). Internal consistency in the current study of the DS scale was .83; internal consistency of the DP scale was .88.

The Fear of Spiders Questionnaire (FSQ; Szymanski & O'Donohue, 1995) is an 18-item verbal-report measure of spider fear. Participants rate items pertaining to spider fears (e.g., "If I saw a spider now, I would be afraid of it") on an 8-point Likert scale (0 = "strongly disagree," 7 = "strongly agree"). The items are summed into a total score. The FSQ correlates highly with other self-report measures of spider fear as well as with behavioral avoidance of spiders (Szymanski & O'Donohue, 1995). Internal consistency in the present study was .97.

The Injection Phobia Scale-Anxiety (IPS; Öst, Hellstrom, & Kaver, 1992) is an 18-item verbal-report measure of BII fears. Participants rate how much anxiety they would feel in different situations pertaining to medical procedures and injections using a 5-point Likert scale (0 = "No anxiety," 4 = "Maximum anxiety"). The items are summed into a total score. The IPS correlates highly with self-reported fear and disgust during exposure to phobia-relevant objects (Olatunji, Smits, et al., 2007), and individuals who score high on the IPS rate pictures of surgeries as more fearful and disgusting compared to individuals who score low on the IPS (Sawchuk et al., 2002). Internal consistency in the present study was .96.

The Difficulties in Emotion Regulation Scale (DERS; Gratz & Roemer, 2004) is a 36 item verbal report instrument assessing emotion regulation skills across six domains: emotion non-acceptance, emotion impulsivity, strategies to regulate emotions, emotional awareness, emotional clarity, and difficulty engaging in goal-directed behavior while in negative mood. Participants endorse how often the items apply to them on a 5 pt Likert scale (0 = "almost never," 4 = "always"). Items are summed into a total score, with higher total scores reflecting greater difficulties regulating emotions. Items comprising the subscales are also summed into subscale scores, with higher scores reflecting greater difficulties. The DERS demonstrates sound convergent validity with large correlations with other measures of emotion regulation (i.e., the Negative Mood Regulation Scale; Catanzaro & Mearns, 1990), and the DERS also demonstrates good test-retest reliability (Gratz & Roemer, 2004). Internal consistency of the total score in the current study was .93. All subscales of the DERS demonstrated acceptable internal consistency (all alphas > .77).

The Padua Inventory Revised (PI; Burns, Keortge, Formea, & Sternberger, 1996) contamination subscale is a 10 item verbal-report instrument that measures an individual's aversion towards contamination (e.g., "I feel my hands are dirty when I touch money"). Individuals respond to each item on a 5-point Likert scale indicating the degree to which they would be disturbed by the situations described in the items (0 = "not at all," 4 = "very much"). The total score is computed by summing the 10 items. The complete PI has adequate psychometric properties, and the contamination subscale has high internal consistency (alpha = .85; Burns et al., 1996). The PI contamination scale correlates highly with other measures of contamination fear (Burns et al., 1996; Thordarson et al., 2004). Only the contamination subscale of the PI was administered. Internal consistency in the present study was .88.

The Negative Affectivity (NA) scale of the Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is a 10 item measure of negative mood/affect. Items consist of descriptors of various negative affective states. Participants rate how much each item applies to them using a 5-point Likert scale (1 = "very slightly or not at all," 5 = "extremely"). The items are summed into a total score. Internal consistency in the present study was .89. Only the negative affectivity scale was administered in the present study.

2.3. Procedure

Undergraduate students learned about the current experiment via a university-based psychology website. This website listed available experiments that participants could complete to earn course credit. Participants interested in the current experiment were directed to a secure on-line website (www.surveymonkey.com) where they could complete the experiment. The first page of the on-line experiment provided the participants with informed consent. The participants then completed the questionnaires, followed lastly by a debriefing page. Prior research has demonstrated that on-line administration of anxiety symptom questionnaires correspond well with in-person administration (Coles, Cook, & Blake, 2007).

3. Results

3.1. Correlations and descriptive statistics

Mean scores on each of the measures and correlations are provided in Table 1. All correlations between the measures were significant ($p < .001$) and ranged from small (i.e., .17) to large (i.e., .94).

3.2. Convergent Validity of Disgust Sensitivity versus Disgust Propensity

We first examined the theoretical distinction between DP and DS by testing convergent validity with the DERS. We tested the relations between DS, DP, and DERS using hierarchical simultaneous regressions with 2 steps. The first step controlled for biological sex and negative affectivity in order to demonstrate that the relation between the disgust constructs and emotion regulation constructs were not spurious to sex or negative affectivity (cf. Davey & Bond, 2006). The second step simultaneously regressed DP and DS onto the emotion regulation constructs in order to account for the significant overlap between the disgust constructs[1]. By controlling for the overlap between the disgust constructs, we can test whether only variance unique to the different disgust constructs predicts the emotion regulation constructs. As shown in Table 2, only DS significantly predicted DERS total score when controlling for negative affect and sex. These results suggest that DS correlates with a theoretically related construct, emotion regulation, whereas DP does not.

Emotion regulation as defined by the DERS is a multifaceted construct with 6 sub-factors. We next tested whether DS was related to all components of emotion regulation or only particular components. We again used hierarchical simultaneous regressions controlling for negative affectivity in the first step and regressing DS and DP in the second step. We continued to regress DP even though it did not predict the DERS total score in order to account for the significant overlap between DP and DS. As shown in Table 2, DS significantly predicted emotional non-acceptance, difficulties in impulse control, and difficulties in emotion regulation strategies. DS did not predict emotional clarity, emotion awareness, or difficulties engaging in goal-directed behaviors. DP did not predict any of the DERS subscales, further suggesting conceptual distinctness between DS and DP. The results reveal the convergent validity of DS and suggest that DS can be conceptualized as a specific difficulty in regulating the emotion of disgust.

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[1]The individual β coefficients in multivariate regression analyses reflect variance unique to the individual simultaneously regressed variable (Myers & Well, 2003). Given the substantial significant covariation between DP and the Disgust Scale, ($r = .61$, $p < .05$), the variance unique to either measure is small and would have resulted in diminished β coefficients and reduced probability of significance in these analyses. Moreover, it is precisely the portion of overlap between DP and the Disgust Scale that is of interest here: we aim to measure ‘disgust proneness,’ which is what DP and the Disgust Scale have in common (i.e., shared variance). The variance unique to either DP or the Disgust Scale is theoretically meaningless in the current investigation. Accordingly, we did not include the Disgust Scale in these analyses so that the variance accounted for by DP (i.e., ‘disgust proneness’) would have a ‘fair’ chance of significantly predicting DERS total score and subscale scores. We re-ran the analyses using only the Disgust Scale and not DP. Results revealed a similar, but not identical, pattern of results: the Disgust Scale significantly *negatively* predicted the emotional non-acceptance ($t = -2.46$, $p = .014$) and emotional clarity ($t = -2.08$, $p = .038$) subscales.

Additionally, DP correlated more highly with the Disgust Scale (r = .66) compared to DS (r = .59). With the Disgust Scale as the criterion, a hierarchical regression analysis controlling for sex and negative affectivity in step 1 and simultaneously regressing DS and DP in step 2 revealed that DP (β = .42, t = 9.06, partial r = .35, p < .001) was more robustly related to the Disgust Scale compared to DS (β = .15, t = 3.39, partial r = .14, p = .001). These results suggest DP and the Disgust Scale are more conceptually related than DS, further demonstrating the construct validity of DS.

3.3. GED and DS as moderators of the relation between DP and spider fear, BII fear, and contamination fear

We next tested whether a specific difficulty regulating disgust (i.e., disgust sensitivity) or a general difficulty in regulating emotions (i.e., DERS total score) moderated the relation between DP and spider, BII, or contamination fears. We tested 2-way interactions between DP and DS (i.e., whether DS moderates DP), DP and DERS (i.e., whether DERS moderates DP), as well as a 3-way interaction between DERS total score, DS, and DP in order to account for all possible processes by which the emotion regulation constructs moderate DP. All independent variables were centered prior to analyses and computation of the interaction terms.

We used hierarchical simultaneous regression analyses in which sex and negative affectivity were controlled in step 1, main effects of DERS, DS, and DP were controlled in step 2, all 2-way interactions between DERS, DS, and DP were controlled in step 3, and the DERS × DS × DP 3-way interaction was entered in step 4.

The results for spider fears (see Table 3) revealed a significant interaction between DP and DERS (β = .09, t = 2.08, p = .038, partial r = .09). No other interactions were significant. We employed post-hoc probing (Holmbeck, 2002) of the DP × DERS interaction in order to determine which level of the moderator (i.e., high or low DERS) was potentiating DP. Results revealed that DP more robustly predicts spider fears at high levels (i.e., 1 *SD* above the mean) of DERS (β = .34, t = 4.83, p < .001, partial r = .20) compared to low levels (i.e., 1 *SD* below the mean) of DERS (β = .19, t = 2.77, p = .006, partial r = .11). These results statistically confirm the direction of the interaction: high level of DERS potentiates the ability of DP to predict spider fears.

For BII fears (see Table 3), results revealed a marginally significant interaction between DS and DP (β = .08, t = 1.94, p = .052, partial r = .08). No other interactions were significant. Post-hoc probing of the interaction revealed that DP predicted BII fears at high levels of DS (β = .24, t = 3.54, p < .001, partial r = .15), but DP did not significantly predict BII fears at low levels of DS (β = .12, t = 1.92, p = .06, partial r = .08). These results reveal that high level of DS potentiates the ability of DP to predict BII fears.

For contamination fears (see Table 3), results revealed a significant DP × DERS interaction (β = .10, t = 2.56, p = .011, partial r = .11). No other interactions were significant. Post-hoc probing of the interaction revealed that DP more robustly predicted contamination fears at high levels of DERS (β = .41, t = 6.14, p < .001, partial r = .25) compared to at low levels of DERS (β = .23, t = 3.31, p < .001, partial r = .15). These results reveal that DERS potentiates the ability of DP to predict contamination fears.

4. Discussion

Our tests of the convergent validity of DS and DP revealed that DS significantly predicts DERS total score and the emotion regulation strategies, emotional impulsivity, and emotion non-acceptance subscales. The pattern by which DS predicted the subscales of the DERS suggests that DS is characterized by decreased strategies to regulate disgust, increased impulsivity while experiencing disgust, and decreased acceptance of the subjective feeling of disgust. DS does not appear to be associated with a lack of clarity or awareness of the experience of disgust or difficulties engaging in goal-directed behavior while experiencing disgust. DP predicted neither the DERS total score nor any subscales when DS was entered as a covariate. However, DP was more robustly related to the Disgust Scale compared to DS. The overall results support the recent suggestions to differentiate DS from DP (Olatunji, Cisler, et al., 2007; Olatunji & Cisler, 2008; van Overveld et al., 2006). Accordingly, we conceptualize DP as the propensity to experience disgust, DS as a specific difficulty regulating disgust, and the DERS total score represents general (i.e., non-specific) difficulties with emotion regulation. Based on this conceptualization, we tested different routes by which the emotion regulation constructs affect the relation between DP and spider fear, BII fear, and contamination fear.

Results revealed that only GED moderated the relation between DP and spider fear, such that high level of GED potentiated the ability of DP to predict spider fear. However, DP remained a significant predictor of spider fear even at low levels of GED. Thus, GED strengthens the influence of DP on spider fear, but GED is not a necessary condition for DP to influence spider fears. The direct influence of DP on spider fears may suggest that spiders are a core disgust elicitor. Core disgust refers to disgust elicited from stimuli with contaminating properties (Rozin, Haidt, & McCauley, 2000). Research demonstrates that spider fearful individuals associate spiders with the threat of contamination on implicit association tasks (Huijding & de Jong, 2007) and covariation bias tasks (de Jong & Peters, 2007). Accordingly, heightened DP may result in heightened threat of contamination in response to spiders, which may then result in heightened spider fears. High levels of GED may strengthen the influence of DP on spider fears via difficulties regulating negative emotions in general, and not disgust specifically. This finding is consistent with research demonstrating that spider fearful individuals label spiders as both disgusting *and* frightening (Sawchuk et al., 2002). Accordingly, difficulties only regulating disgust do not potentiate the influence of DP, but difficulties regulating general negative emotions do potentiate the influence of DP. Note that DS marginally predicted spiders fears, suggesting that DS explains a small degree of unique variance in spider fears even though DS does not appear to be a process by which DP contributes to spider fear. GED did not predict spider fear, suggesting that GED only contributes to spider fears via moderation of DP.

DS potentiated the ability of DP to predict BII fears. Moreover, DP did *not* significantly predict BII fear at low levels of DS and only predicted BII fear at high levels of DS, suggesting that DS is a sufficient and possibly necessary condition by which DP is related to BII fears. These results demonstrate that a specific difficulty regulating disgust (i.e., DS) is a mechanism by which DP influences BII fears. Previous research demonstrates that the anxiety sensitivity × DP interaction did not predict BII fears (Cisler, Olatunji, et al., 2008). This differential pattern of moderation suggests specificity, such that a fear of general interoceptive manifestations of anxiety (i.e., anxiety sensitivity) does not influence the relation between DP and BII fears, but a difficulty regulating the specific experience of disgust (i.e., DS) does influence the relation. Indeed, GED neither independently predicted BII fears nor moderated DP to predict BII fears, which further suggests that DS specifically may be a sufficient and necessary mechanism by which DP contributes to BII fears.

The results revealed that GED potentiated the ability of DP to predict contamination fears. However, DP remained a significant predictor of contamination fears at low levels of GED. Thus, GED does not appear to be a necessary mechanism by which DP contributes to contamination fears, but GED appears to strengthen the contribution of DP to contamination fears. The pattern by which DP predicts contamination fears suggests two conclusions. First, that DP predicted contamination fears regardless of level of GED suggests that DP directly influences contamination fears. This assertion is consistent with research demonstrating that contamination fearful individuals display anterior insula activation, a neural region specifically associated with disgust (Phillips et al., 1997), in response to disorder-relevant stimuli (Phillips et al., 2000). Heightened DP increases the degree of disgust elicited by contaminants, thus possibly directly motivating the excessive avoidance and distress characterizing contamination fear. Second, that GED potentiates the influence of DP on contamination fears suggests that difficulties regulating negative emotions in general, and not disgust specifically, increases the probability of heightened DP resulting in the excessive avoidance and distress that characterizes contamination fear. This assertion is consistent with research demonstrating that anxiety sensitivity (i.e., fear of general interoceptive symptoms of anxiety) potentiates the ability of DP to predict contamination fears (Cisler et al., 2007; Cisler, Olatunji et al., 2008). That DS specifically does not moderate DP necessitates the incorporation of general negative affect, in addition to disgust, in the conceptualization of contamination fear. This finding is consistent with the recent demonstration that disgust only partially mediates the relation between negative affect and contamination fears (Olatunji, Williams, et al., 2007), suggesting that disgust is not the only relevant emotional response in contamination fears. Also, DS was a significant independent predictor, suggesting that DS explains unique variance in contamination fears even though it is not a mechanism by which DP influences contamination fear.

The two emotion regulation constructs demonstrated differential contributions to these disgust-related anxiety concerns. GED did not significantly independently predict any of the anxiety concerns investigated and solely functioned as a potentiating factor. DS, however, was both a potentiating factor as well as a significant independent predictor of BII and contamination fear. These results demonstrate specificity of these two constructs and their contribution to these disorders. Additionally, the present results reveal unique maintenance processes across these three anxiety disorders, suggesting that DP, DS, and GED influence different types of fears via different routes. Research would benefit from continued development of specific theories of each of the disgust-related disorders.

The current findings provide evidence that emotion dysregulation is a useful construct to explain the process by which disgust contributes to spider, BII, and contamination fear. Whereas previous research has documented a relation between disgust and certain anxiety disorders (Olatunji & Sawchuk, 2005; Woody & Teachman, 2000), the present results suggest that emotion dysregulation moderates the relation between disgust and certain anxiety disorders. Consistent with Baron and Kenny's (1986, p. 1176) analysis of moderators, GED and DS appear to explain *when* or *where* the DP and anxiety relation will emerge. Thus, the constructs of DS and GED add considerable explanatory power to the growing theory of disgust in anxiety (see Olatunji & McKay, 2008) in that DS and GED appear to explain when DP is related to these anxiety concerns. It is important to note that the current results do not explain *how* heightened disgust causes heightened anxiety. Per Baron and Kenny (1986), mediators explain how a relation between two variables occurs, thus suggesting causality. Moderators, however, only explain when or where a relation will emerge. The present results explain when DP influences certain anxiety disorders, but they do not explain how.

This study is limited by several factors. First, the study used a non-clinical sample, and the relations between DS, GED, DP and the specific anxiety concerns may be different among clinical samples. Second, the results are limited to self-report indices of DS, GED, DP, and the specific anxiety disorders. Third, the cross-sectional nature of the data prevents causal inferences. The present hypotheses could most strongly be tested in an experimental setting using objective measures. For example, the present results suggest that the degree to which spider phobic individuals have difficulty regulating negative emotions proportionately increases the influence of disgust on fear of spiders. Accordingly, it would be predicted that use of a maladaptive regulation strategy (e.g., suppression; Gross, 1998) would result in greater physiological indices of fear (e.g., heart rate) while approaching a spider in high disgust prone individuals relative to low disgust prone individuals. Future research should employ similar experimental designs with objective measures to determine how emotion regulation and disgust interact to potentiate these specific anxiety disorders.

Despite these limitations, the present results suggest that emotion regulation may be a possible factor that potentiates the influence of disgust on spider, BII, and contamination fear. Moreover, the present results suggest specific relations between different types of emotion regulation and the different anxiety disorders. These results begin to fill a gap in the disgust literature by suggesting mechanisms that strengthen the influence of disgust on these anxiety disorders. Future experimental research along these lines may prove beneficial in further elucidating how disgust impacts spider, BII, and contamination fear.

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Table 1

Means (SD's), alphas, and correlation matrix for the DPSS-R, DP, disgust sensitivity, Disgust Scale, FSQ, IPS, NA, PI, and DERS.

Measure	1	2	3	4	5	6	7	8	9
1) DPSS-R	-	.94	.94	.66	.47	.50	.43	.57	.35
2) Disgust Sensitivity		-	.78	.59	.43	.50	.40	.53	.35
3) DP			-	.66	.46	.45	.41	.55	.31
4) Disgust Scale				-	.46	.43	.30	.58	.20
5) FSQ					-	.35	.27	.41	.23
6) IPS						-	.18	.29	.17
7) NA							-	.31	.58
8) PI								-	.26
9) DERS total									-
Alpha	.91	.83	.91	.91	.97	.96	.89	.88	.93
Overall mean	22.23 (10.87)	9.60 (5.79)	12.63 (5.75)	51.86 (18.30)	31.09 (31.91)	19.13 (16.56)	11.89 (6.85)	9.52 (6.88)	47.58 (20.90)
Male mean	17.30 (8.81)	7.24 (4.81)	10.06 (4.80)	40.47 (14.84)	17.14 (23.74)	14.92 (15.02)	10.38 (6.04)	7.00 (5.30)	44.85 (17.98)
Female mean	25.74 (10.85)	11.28 (5.85)	14.46 (5.68)	59.96 (16.10)	41.02 (33.27)	22.12 (16.97)	12.96 (7.18)	11.31 (7.30)	49.52 (22.58)

Note: all correlations significant $p < .001$

Table 2

Results for regressing sex, NA, DP, and DS on DERS total scores and subscale scores.

DERS component			partial *r*	β	*t*
DERS total					
	Step 1	NA	.58	.58	17.16*
		Sex	.01	.01	.05
	Step 2	DP	−.02	−.03	−.52
		DS	.14	.18	3.30*
Emotional clarity					
	Step 1	NA	.42	.42	11.25*
		Sex	.04	.04	1.01
	Step 2	DP	−.06	−.09	−1.55
		DS	.08	.06	1.35
Emotion regulation strategies					
	Step 1	NA	.58	.58	17.15*
		Sex	.01	.01	.12
	Step 2	DP	.03	.02	.51
		DS	.12	.16	2.98*
Emotional awareness					
	Step 1	NA	.05	.05	1.29
		Sex	−.14	−.14	−3.46*
	Step 2	DP	−.03	−.05	−.74
		DS	−.01	−.01	−.06
Emotional impulsivity					
	Step 1	NA	.54	.55	15.76*
		Sex	−.05	−.04	−1.18
	Step 2	DP	−.04	−.05	−.92
		DS	.13	.17	3.10*
Difficulties in goal-directed behavior					
	Step 1	NA	.39	.39	10.30*

DERS component			partial r	β	*t*
		Sex	.15	.14	3.76*
	Step 2	DP	.05	.07	1.20
		DS	.07	.10	1.71
Emotional non-acceptance					
	Step 1	NA	.45	.45	12.20*
		Sex	.02	.02	.45
	Step 2	DP	−.04	−.06	−.96
		DS	.15	.22	3.78*

* *Note*: denotes a significant predictor ($p < .05$).

Table 3

Results for regressing sex, NA, DP, DS, DERS, and interactions between DP, DS, and DERS onto spider (FSQ), BII (IPS), and contamination fear (PI) measures.

Dependent measure	partial *r*	β	*t*
FSQ			
NA	.04	.04	.98
Sex	.23	.22	5.81*
DS	.08	.11	1.95**
DP	.19	.26	4.55*
DERS	.06	.07	1.51
DS × DP	.05	.05	1.13
DP × DERS	.09	.09	2.08*
DS × DP × DERS	−.05	−.06	−1.31
Final model: $F(8, 593) = 28.86$, $R^2 = .27$, $p < .001$			
IPS			
NA	−.05	−.06	−1.26
Sex	.04	.03	.84
DS	.24	.36	6.08*
DP	.13	.18	3.08*
DERS	.03	.04	.81
DS × DP	.08	.08	1.94***
DP × DERS	.01	.01	.27
IPS			
DS × DP × DERS	−.03	−.04	−1.08
Final model: $F(8, 593) = 26.36$, $R^2 = .26$, $p < .001$			
PI			
NA	.05	.05	1.16
Sex	.12	.11	2.98*
DS	.15	.20	3.62*
DP	.24	.32	5.85*
DERS	.04	.05	1.01
DS × DP	.01	.01	.04
DP × DERS	.11	.10	2.56*
DS × DP × DERS	−.01	−.01	−.19
Final model: $F(8, 593) = 40.28$, $R^2 = .35$, $p < .001$			

[*] *Note*: denotes a significant predictor ($p < .05$),

[**] denotes a marginally significant predictor ($p = .051$),

[***] denotes a marginally significant predictor ($p = .052$).