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BRIEF CLINICAL REPORT

Anxiety sensitivity and disgust sensitivity predict blood-injection-injury fears in individuals with dental anxiety

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Abstract

Background: Anxiety sensitivity (AS) and disgust sensitivity (DS) are transdiagnostic vulnerability factors for anxiety. Both correlate with blood-injection-injury (BII) phobia symptoms in several studies; however, there is ambiguity about their relative contributions, and studies investigating this have relied on unselected samples. Furthermore, although DS reliably predicts BII in studies that do not account for AS, this may be limited to domain-specific DS rather than DS more broadly.
Aims: The aims of this study were to examine AS and DS as separate and simultaneous predictors of BII fears in a sample with a wide range of BII symptoms, and with attention to the specificity of DS to BII-relevant domains.
Method: Fifty-three participants who scored above a clinical threshold on a validated measure of dental anxiety, and who represented a wide range of BII severity, completed measures of AS, DS and BII symptoms.
Results: AS and DS were moderately to strongly correlated with BII severity ($r = .40$ and $.47$, $p = .004$ and $<.001$), and both independently predicted BII severity when entered as simultaneous predictors ($\beta = .32$ and $.35$, $p = .045$ and $.015$). Furthermore, after omitting DS about injections and blood draws, domain-general DS was still moderately correlated with BII severity ($r = .33$, $p = .017$). However, domain-general DS did not significantly predict BII severity after accounting for AS ($\beta = .20$, $p = .164$).
Conclusions: AS and DS both predict BII symptoms, and prospective research is warranted to examine them as potential vulnerability factors.

Keywords: anxiety sensitivity; blood-injection-injury phobia; dental anxiety; disgust sensitivity

Introduction

Researchers have examined a range of transdiagnostic vulnerability factors for blood-injection-injury (BII) fears, including anxiety sensitivity (AS) and disgust sensitivity (DS). However, few studies simultaneously consider multiple factors, especially in samples where BII is elevated and there is a broad range of BII symptoms, as is the case among individuals with dental anxiety.

AS is the fear of arousal-related sensations due to the belief that such sensations will lead to adverse physical, cognitive or social consequences (e.g. Reiss *et al.*, 1986). Several studies have reported a small-to-moderate positive relationship between AS and BII symptoms (e.g. Cisler *et al.*, 2008; Winder *et al.*, 2021). DS is the propensity to experience disgust in response to unpleasant stimuli (e.g. Haidt *et al.*, 1994). Studies have consistently found strong correlations

between BII fears and disgust (e.g. Bianchi and Carter, 2012). Additionally, there is evidence that certain domains of disgust may be more strongly associated with BII fears than others. For example, Bianchi and Carter (2012) found that BII phobics evidenced greater DS with regard to injections, blood draws and mutilation (compared with animals, rotting foods, and odours). Thus, in comparison with other fears, BII fears may be uniquely characterized by sensitivity to disgust regarding blood, injections, injury and violations to the body envelope.

Although the aforementioned studies indicate that at least some types of AS and DS correlate with BII symptoms, their relative contributions remain ambiguous. Cisler *et al.* (2008) found that both AS and DS independently predicted BII fears; however, although the interaction of AS and DS predicted contamination fears, it did not predict BII fears. Winder *et al.* (2021) found that DS predicted BII fears after controlling for AS, but AS no longer predicted BII after controlling for DS. This finding not only supports the likely prominence of disgust in BII fears, but it also may provide counterevidence for the centrality of AS in BII. Critically, both studies used unselected non-clinical samples. Furthermore, although DS reliably predicts BII in studies that do not account for AS, this may be limited to domain-specific DS (e.g. Bianchi and Carter, 2012) rather than DS more broadly.

In the current study, we examined AS and DS as separate and simultaneous predictors of BII symptoms in a sample of participants who scored above a clinical threshold on a validated measure of dental anxiety, and who represented a wide range of BII severity. Considering that DS about injections and blood draws is similar to symptoms of BII, we tested both total DS (including DS about injections and blood draws) as well as DS excluding domain-specific DS about injections and blood draws.

Method

Participants

Participants were 53 individuals who scored above a clinical threshold on a validated self-report measure of dental anxiety and participated in a study of attentional processes in dental anxiety (Siev *et al.*, 2020). Exclusion criteria included presence of a psychotic or bipolar disorder, substance abuse or dependence, suicidality or homicidality, as well as evidence of intellectual disability, dementia, brain damage, or other cognitive impairment. Participants were required to be between the ages of 18 and 65 years old, and the mean age was 39.96 years ($SD = 14.89$). Forty-two (79.2%) participants were women and 11 (20.8%) were men. Racially, 31 (58.5%) were white, 11 (20.8%) Black or African-American, 10 (18.9%) Asian or Asian-American, and one (1.9%) multiracial. Forty-three (81.1%) identified as non-Hispanic, and 10 (18.9%) as Hispanic.

Measures

Participants were screened for study eligibility using a validated self-report measure of dental anxiety. As part of a larger study of dental anxiety (Siev *et al.*, 2020), eligible participants completed validated self-report measures of BII symptoms (Injection Phobia Scale-Anxiety; Olatunji *et al.*, 2010; Öst et al., 1992), AS (Anxiety Sensitivity Index-3; Taylor *et al.*, 2007), and DS (Disgust Emotions Scale; Olatunji *et al.*, 2007). In the present study, we used the total score of the DS measure. In order to examine the association between BII and domain-general DS, we also created a DS score omitting items about injections and blood draws, which overlap with the measure of BII symptoms. See the extended report in the Supplementary material for full descriptions of study measures, as well as how missing data were handled.

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Table 1. Means, standard deviations and bivariate correlations among study variables ($n = 53$)

	M	*SD*	IPS-Anx	ASI-3	DES-Total	DES-Inj	DES-NonBII
IPS-Anx	29.51	17.08	—				
ASI-3	22.11	16.96	.40**	—			
DES-Total	59.82	23.94	.47***	.42**	—		
DES-Inj	9.86	6.15	.75***	.36**	.72***	—	
DES-NonBII	49.96	19.96	.33*	.39**	.98***	.56***	—

IPS-Anx, Injection Phobia Scale-Anxiety (possible range: 0–72); ASI-3, Anxiety Sensitivity Index-3 (possible range: 0–72); DES-Total, Disgust Emotion Scale-Total score (possible range: 0–120); DES-Inj, Disgust Emotion Scale-Injections and Blood Draws Scale (possible range: 0–24); DES-NonBII, Disgust Emotion Scale-Total score excluding the Injections and Blood Draws Scale; possible range: 0–96).
*$p < .05$; ** $p < .01$; *** $p < .001$.

Results

Participants' BII symptom scores were elevated and also indicated a broad range of BII symptoms, $M = 29.51$, $SD = 17.08$. As a benchmark, IPS-Anx scores in normative data were $M = 44.84$, $SD = 8.86$ for BII phobics, and $M = 9.20$, $SD = 11.40$ for non-phobic controls (Olatunji *et al.*, 2010). For descriptive data and intercorrelations among study measures, see Table 1.

BII severity correlated with AS ($r = .40$, $p = .004$) and with DS ($r = .47$, $p < .001$). We regressed BII symptom severity on AS (centred), DS (centred), and their interaction. Tests of heteroscedasticity, multicollinearity and the distribution of residuals indicated appropriate normality and sufficient independence of variables. The model accounted for 28% of the variance in BII severity, $F_{3,45} = 5.86$, $p = .002$. Both AS ($\beta = .32$, $t = 2.07$, $p = .045$) and DS ($\beta = .35$, $t = 2.54$, $p = .015$) independently predicted BII symptom severity when controlling for the other variable. Their interaction was not significant, $\beta = -.13$, $t = -0.89$, $p = .379$.

Disgust sensitivity about injections and blood draws may simply be a proxy measure of BII fear, as evidenced by the strong correlation between the DS injections and blood draws subscale and BII symptom measure ($r = .75$, $p < .001$). We therefore omitted DS items about injections and blood draws, and created a composite score of non-BII-related DS using items about mutilation and death, animals, rotting foods, and smells (DS-NonBII). BII severity correlated with this composite, $r = .33$, $p = .017$. We regressed BII symptom severity on AS (centred), DS-NonBII (centred), and their interaction. Again, tests of heteroscedasticity, multicollinearity, and the distribution of residuals were not concerning. Together, the predictors accounted for 22% of the variance in BII severity, $F_{3,45} = 4.23$, $p = .010$. Only AS independently predicted BII symptoms, $\beta = .40$, $t = 2.60$, $p = .013$. Neither DS-NonBII ($\beta = .20$, $t = 1.42$, $p = .164$) nor the interaction between AS and DS-NonBII ($\beta = -.17$, $t = -1.18$, $p = .245$) were significant.

Discussion

In a clinical sample of individuals with dental anxiety and elevated BII fears, AS and DS both independently predicted BII symptoms, but did not interact with each other in so doing. Moreover, in contrast with some studies that implicate only domain-specific DS in BII phobia, our findings implicate domain-general DS (viz. DS omitting items about injections and blood draws) as well, although not after accounting for AS.

Two previous studies of non-clinical samples have reported similar analyses, and our results are consistent with one (Cisler *et al.*, 2008) and stand in contrast to the other (Winder *et al.*, 2021). Specifically, whereas Winder and colleagues found that only DS – but not AS – predicted BII symptoms when entered as simultaneous predictors, in the present sample, both AS and DS

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independently predicted BII symptoms. In fact, only AS predicted BII symptoms when considering only non-BII-related DS, although this may be an issue of power, considering that the effect was in the same direction. However, Winder and colleagues report a negligible and non-significant partial correlation of only .05 between BII fear and AS when covarying DS, whereas in the present study AS was a strong predictor of BII symptoms when covarying DS.

In considering these discrepancies, there are features of the present sample that make it better suited to address these research questions. All participants in the present study scored above a clinical cut-off on a validated measure of dental anxiety, which is related to BII phobia. As a result, they scored considerably higher as a group on BII symptoms compared with non-clinical samples (e.g. Olatunji *et al.*, 2010). Moreover, there was a wide range of BII scores. As a result, this sample is well-suited to examine correlates of BII symptoms because the symptom elevations are clinically meaningful for many participants, and not limited by restricted range, as might be the case in both non-clinical as well as BII phobic samples.

Although AS and DS are generally conceptualized as vulnerability factors for psychopathology, it is important to note that the cross-sectional nature of the present data cannot speak to temporal relationships and thus cannot rule out the possibility that BII symptoms lead to increased AS or DS. This is arguably more likely with DS, where it is conceivable that one develops a disgust response to a phobic stimulus one finds aversive; in contrast, AS is not specific to the phobic stimulus and is therefore unlikely to develop as a response to the feared stimulus. However, it is unlikely that non-domain-specific DS would be an epiphenomenon of BII symptoms, and therefore seems doubtful that DS is simply the result of BII symptoms.

We acknowledge several limitations to the present research. Although the composition of our sample is a strength in several ways, 53 participants was under-powered to detect small effects or test interactions. It is possible that in a larger sample, domain general DS predicts BII symptoms even after controlling for AS, whereas in this study the effect ($\beta = .20$) did not reach significance. In addition, with women composing the large majority of participants in our sample, we were not able to examine possible gender effects related to AS and DS. Finally, cross-sectional data such as these do not permit firm conclusions about causality, temporality or theoretically driven judgements about factors assumed to confer risk or vulnerability.

Supplementary material. To view supplementary material for this article, please visit https://doi.org/10.1017/S1352465823000310

Data availability statement. The dataset is available on the OSF website (https://osf.io/rbzdx).

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Competing interests. The authors declare none.

Ethical standards. This research was conducted in accordance with the Declaration of Helsinki, and with the approvals of the Institutional Review Boards at Nova Southeastern University (protocol 12041203) and the University of Illinois at Chicago (protocol 2014-0005). All participants provided informed consent.

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