Disgust Sensitivity, Blood–Injection–Injury Fear, and Dental Anxiety

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The present studies evaluated whether high disgust sensitivity is associated with high levels of blood–injection–injury (BII) fear. The first study found no evidence for a connection between disgust sensitivity and BII fear in a sample of undergraduate students (N = 166). In contrast, the second study did find a significant correlation between disgust sensitivity and BII fear in a mixed sample of dental anxious patients and undergraduate students (N = 96), but the magnitude of this correlation was rather modest. The third study relied on a sample of patients with clinical dental phobia (N = 36). Although these patients displayed heightened disgust sensitivity scores, no significant associations were found between disgust sensitivity and BII fear or fainting. Taken together, the present data indicate that disgust sensitivity plays only a minor role in BII-related fears such as dental anxiety. Copyright © 1999 John Wiley & Sons, Ltd.

INTRODUCTION

Blood–injection–injury (BII) fear is a relatively common fear in the general population (Costello, 1982). This is also true for the more radical version of this fear, i.e. BII phobia. For example, the recent community survey by Fredrikson et al. (1996) found a point-prevalence of 3.0% for BII phobia.

Several authors (e.g. Rachman, 1990; Page, 1994) have emphasized that BII fear is an atypical fear in that it is often accompanied by emotional fainting (i.e. vasovagal syncope) in the presence of BII cues. Indeed, the large majority of patients with BII phobia reports a history of fainting (Thyer et al., 1985). Even in the normal population, fainting or almost fainting in response to blood- or injection-related stimuli is not uncommon (Kleinknecht et al., 1996).

As to the aetiology of BII fear, it is likely that both learning experiences (e.g. conditioning; Öst, 1991; Kleinknecht, 1994) and genetic vulnerability (Marks, 1988) play a role in the origins of this fear. A more principal point is whether BII phobia is an anxiety disorder in the strict sense of the word. Referring to the prominent feature of emotional fainting in BII phobia, several researchers (e.g. Page, 1994; Kleinknecht et al., 1996) have suggested that the basic emotion of disgust is heavily involved in the aetiology of this condition. For example, Page (1994, p.452) speculated that ‘vasovagal syncope has little to do with fear. Fainting may be subserved by the same psychological and physiological processes as those that underlie disgust’. Indirect evidence for this position comes from two sources. To begin with, in their factor analytic study, Kleinknecht and Thorndike (1990) found that the Mutilation Questionnaire, which is an instrument for assessing BII fears, contains a factor that can be characterized as repulsion and revulsion of blood, injury, and mutilation. Possibly, this factor is related
to disgust. Secondly, in a sample of undergraduate students, Matchett and Davey (1991) examined correlations between disgust sensitivity, on the one hand and self-reported fear of BII items and fear of small animals (e.g. spiders), on the other hand. To assess disgust sensitivity, these authors employed the Disgust Sensitivity Questionnaire (Rozin et al., 1984). Based on the assumption that disgust refers to the rejection of stimuli that are bodily products or have been contaminated by these products, this questionnaire measures the tendency to avoid desirable food items that have contacted offensive stimuli (e.g. a fly swatter). Matchett and Davey (1991) found that high disgust sensitivity is associated with fear of BII stimuli and fear of small animals, although the correlations were rather modest \( r = 0.33 \) and \( r = 0.29 \), respectively. While a large number of subsequent studies have confirmed the relationship between disgust sensitivity and small animal fears (e.g. Merckelbach et al., 1993; Ware et al., 1994; Mulkins et al., 1996; de Jong and Merckelbach, 1998; Muris et al., 1999) and even have yielded suggestive evidence that disgust is involved in the aetiology of these fears (e.g. Webb and Davey, 1992; Davey et al., 1993), few studies have examined the connection between disgust sensitivity and BII fear in more detail. Moreover, the studies that did look at this connection have come up with results that are difficult to reconcile. For example, De Jongh et al. (1998) failed to find a connection between disgust sensitivity and BII fear in a sample of dental anxious patients (see also de Jong and Merckelbach, 1998). In contrast, Tolin et al. (1997) noted that undergraduates scoring high on a BII-fear scale have elevated levels of disgust sensitivity and also report higher levels of acute disgust when confronted with BII stimuli compared to spider fearful or nonfearful controls.

With these discrepancies in mind, the present studies were conducted. More specifically, we investigated to what extent disgust sensitivity and BII fear co-vary in normal and dental anxious subjects. The latter group was included because, according to the DSM-IV criteria (APA, 1994), dental phobia represents a special case of BII phobia.

**Method**

**Subjects**

Subjects were 166 undergraduate volunteers (25 men). Half of them had a medical or biological background, whereas the other half attended courses in Mental Health Sciences. Their mean age was 21.2 years (range: 19–40 years). Subjects were paid for their participation in the study.

**Assessment**

Subjects were tested in small groups of 10–15 persons. They completed a set of questionnaires. Among these questionnaires were the Disgust Sensitivity Questionnaire (DSQ) and two questionnaires measuring BII fear and BII fainting (see below). The DSQ is a 24-item self-report instrument that is widely used to measure disgust sensitivity (e.g. Rozin et al., 1984; Matchett and Davey, 1991; Merckelbach et al., 1993). The DSQ focuses on food rejection tendencies. The lower the DSQ score, the higher the disgust sensitivity (range: 24–216). The DSQ is a reliable instrument (e.g. Merckelbach et al., 1993; Mulkins et al., 1996) and there is also evidence that DSQ scores are related to behavioural indices of disgust (Mulkins et al., 1996). To measure BII fear, a 10-item questionnaire was constructed. This questionnaire contained the five BII items from the Fear Questionnaire (FQ; Marks and Mathews, 1979) and five non-overlapping BII items from the Fear Survey Schedule (FSS; Wolpe and Lang, 1964). Both FQ and FSS have been widely used and have reasonable psychometric properties (Arrindell et al., 1984). The items were rated on a 5-point scale, with 1 indicating ‘no fear’ and 5 indicating ‘extreme fear’. BII fainting was determined by giving subjects the same FQ and FSS items and asking them to rate on a 3-point scale how often they had fainted in the presence of these items (1 = never; 2 = sometimes; 3 = often). Cronbach alpha coefficients for the DSQ, BII-fear and BII-fainting measures were 0.96, 0.82, and 0.73, respectively.

**Results and Discussion**

Mean DSQ, BII-fear, and BII-fainting scores were 133.4 (SD = 34.3), 18.4 (SD = 5.7), and 10.4 (SD = 1.1), respectively. Pearson product–moment correlations between DSQ, on the one hand, and BII fear and BII fainting, on the other hand, were close to zero (\( r = -0.01 \) and \( r = 0.05 \), respectively). Clearly, these results do not confirm the suggestion that disgust sensitivity is heavily involved in BII fear or fainting (e.g. Page, 1994). However, before
jumping to the conclusion that disgust sensitivity plays no role in BII fear, one critical remark is in order. A substantial proportion of the subjects in the present study (83 out of 166 subjects, i.e. 50%) were medical or biology students. One could argue that as a result of self-selection and/or exposure to blood-related stimuli, BII fear and fainting may be relatively uncommon in such a subsample. The low mean scores and small standard deviations of BII fear and fainting support this line of reasoning. Consequently, it may well be the case that the sample in Study 1 was biased against the association between disgust sensitivity and BII fear and fainting.

To explore this possibility, correlational analyses were repeated for a subsample \( (n = 83) \) from which the undergraduates with a medical or biological background were removed. It is important to note that this subsample of Mental Health Sciences students, indeed, displayed higher levels of BII fear \( (M = 19.9, \text{SD} = 5.6) \) and disgust sensitivity (i.e. lower DSQ scores; \( M = 128.9, \text{SD} = 35.3 \)) compared to the subsample of medicine and biology undergraduates \( (M = 17.0, \text{SD} = 5.4, t(164) = 3.4, p < 0.01 \) for BII fear, and \( M = 138.3, \text{SD} = 32.8, t(164) = 1.8, p < 0.10 \) for disgust sensitivity). It should be stressed that the mean disgust score of the non-medical sample comes close to the undergraduates with a medical or biological background. Their mean age was 35.3 years (range: 17–65 years).

\section*{Method}

\subsection*{Subjects}

Sample 1 consisted of 44 undergraduate psychology students \( (11 \text{ men}) \). Their mean age was 19.1 years (range: 18–21 years). They completed the questionnaires (see below) in small groups of 10–15 persons. Sample 2 consisted of 52 consecutive patients \( (17 \text{ men}) \) who were referred to a dental practice that is specialized in the treatment of anxious patients. The patients in Study 2 feared dental treatment, but did not meet the full criteria of a specific phobia, blood–injection–injury type. Their mean age was 35.3 years (range: 17–65 years).

\subsection*{Assessment}

Undergraduates completed the DSQ, the BII-fear questionnaire (see Study 1), and the Spider Phobia Questionnaire (SPQ; Klorman \textit{et al.}, 1974). The SPQ is a widely used self-report questionnaire that measures fear of spiders. Sample 2 completed the DSQ, the BII fear questionnaire (see Study 1) as well as the Dental Anxiety Scale (DAS; Corah \textit{et al.}, 1978). The DAS is a validated 4-item self-report scale, which measures one specific aspect of BII fear, namely dental anxiety. Patients completed the questionnaires before they underwent dental treatment.

In the undergraduate sample, Cronbach alpha coefficients for DSQ, BII questionnaire, and SPQ were 0.94, 0.84, and 0.93, respectively. In the dental patient sample, alpha coefficients for DSQ, BII questionnaire, and DAS were 0.94, 0.83, and 0.87, respectively.

\section*{Results and Discussion}

Mean SPQ score in the undergraduate sample and mean DAS score in the dental anxious sample were 10.1 (SD = 17.9) and 13.4 (SD = 3.6), respectively. As expected, students reported less BII fear than patients \( (M = 18.9, \text{SD} = 6.2 \text{ and } M = 25.2; \text{SD} = 7.6, \text{respectively}; t(94) = 4.4, p < 0.01) \). In addition, students had lower disgust sensitivity levels (i.e. higher DSQ scores) than patients \( (M = 133.8; \text{SD} = 32.4 \text{ and } M = 106.7; \text{SD} = 37.9, \text{respectively}; t(94) = 3.7, p < 0.05) \). Furthermore, undergraduate students were significantly younger than dental patients \( (t(94) = 10.4, p < 0.01) \). For the combined student and patient sample \( (N = 96) \), the Pearson correlation between disgust sensitivity and BII fear reached significance: \( r = -0.35, p < 0.01 \).
When controlling for age, the partial correlation between disgust sensitivity and BII fear remained significant: $r = -0.27$, $p < 0.01$. That is, the higher the disgust sensitivity, the higher the scores on the BII scale. It should be noted, though, that the magnitude of this association was rather modest.

Table 1 shows Pearson product–moment correlations between DSQ, BII fear, and SPQ for the undergraduate sample ($n = 44$).

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<th>BII fear</th>
<th>SPQ</th>
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<tr>
<td>DSQ</td>
<td>-0.28*</td>
<td>-0.43†</td>
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<tr>
<td>BII fear</td>
<td>0.40†</td>
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* $p < 0.05$; † $p < 0.01$.

Table 2 presents correlations between disgust sensitivity (DSQ), BII fear, and dental anxiety (DAS) for the dental patients ($n = 52$).

<table>
<thead>
<tr>
<th></th>
<th>BII fear</th>
<th>DAS</th>
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<tbody>
<tr>
<td>DSQ</td>
<td>-0.23*</td>
<td>-0.23*</td>
</tr>
<tr>
<td>BII fear</td>
<td>0.39†</td>
<td></td>
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* $p < 0.05$; † $p < 0.01$.

When controlling for age, the partial correlation between disgust sensitivity and BII fear remained significant: $r = -0.27$, $p < 0.01$. That is, the higher the disgust sensitivity, the higher the scores on the BII scale. It should be noted, though, that the magnitude of this association was rather modest.

Table 1 shows Pearson product–moment correlations between DSQ, BII fear, and SPQ for the student sample. The predicted pattern of correlations emerged. That is, disgust sensitivity was significantly associated with both BII and spider fear.

Table 2 presents correlations between DSQ, BII fear, and DAS for the dental patients sample. Again, the association between disgust sensitivity and BII fear attained (one-tailed) significance. The same was true for the correlation between disgust sensitivity and one specific aspect of BII fear, namely dental anxiety (DAS). As expected, the correlation between BII fear and DAS also reached significance.

In sum, then, Study 2 provides some support for a specific connection between disgust sensitivity and BII fear. Small but significant correlations between the DSQ and indices of BII fear and dental anxiety were found.

**STUDY 3**

One obvious limitation of Study 2 is that BII fear rather than BII faintness was measured. The reason for this was the low frequency of BII faintness in undergraduate samples (see Study 1). Yet, it remains possible that disgust sensitivity is, as Page (1994) proposed, more predictive of feelings of faintness than of BII fear. Therefore, Study 3 focused on the connection between disgust sensitivity and BII faintness in a sample of dental phobic patients.

**Method**

**Subjects**

Subjects were 36 patients (13 men) referred to the Dental Fear Department of the Centre for Special Dental Care, University of Amsterdam. Patients were dental phobias who met the DSM-IV criteria for specific phobia, blood–injection–injury type. On average, phobics had avoided dental treatment for 8.5 years (SD = 9.0). Their mean age was 36.3 years (range: 18–64 years).

**Assessment**

One week before they received dental treatment, patients were sent a booklet containing questionnaires. They were asked to complete and return these questionnaires. Measures included were DSQ, DAS, BII-fear questionnaire, and a short questionnaire asking for faintness in medical and dental situations. The faintness scale used here deviated from that employed in Study 1 in that it focused more on dental treatment and also asked for the tendency to faint. It contained six items; three of them referred to fainting in the presence of blood, dental treatment or injections, while three items pertained to the tendency to faint in these situations. Items were scored on a 3-point scale, with 1 indicating ‘I have never experienced that’ and 3 indicating ‘I have more than two times experienced that’. Cronbach alpha coefficients for DSQ, DAS, BII fear, and the faintness scale were 0.97, 0.87, 0.87 and 0.78, respectively.

**Results and Discussion**

Mean scores of this sample for DSQ, DAS, BII fear, and faintness were 90.6 (SD = 46.2), 15.4 (SD = 3.2), 26.7 (SD = 9.5), and 8.5 (SD = 2.7). To examine the connection between fainting and disgust sensitivity, two patient groups were formed: patients who reported that they sometimes or often had fainted (or had experienced the tendency to faint) in medical settings ($n = 24$) were compared to patients who never had had such experiences ($n = 12$). A t-test showed that these two groups did not differ in terms of disgust sensitivity, means being 93.7 (SD = 42.5) for patients reporting faintness and 84.3 (SD = 54.3) for patients without faintness ($t(34) < 1.0$). Interestingly, patients reporting faintness had higher BII-fear scores than patients without faintness ($t(34) = 2.0$, $p < 0.05$), means being 28.9 (SD = 9.8) and 22.3.
respectively. Meanwhile, dental anxious and dental phobic patients did differ in terms of the more specific DAS measure ($t(85) = 2.7, p < 0.01$).

A 3 (groups) $\times$ 2 (sex) ANOVA with age as a covariate performed on the DSQ scores revealed a main effect of groups ($F(2, 291) = 10.7, p < 0.01$), while the main effect of sex and the interaction effect of groups and sex remained non-significant ($F(1, 291) = 2.4, p = 0.12$ and $F(2, 291) < 1.0$, respectively). Follow-up $t$-tests indicated that undergraduates had significantly lower disgust sensitivity levels than either dental anxious ($t(260) = 5.1$, $p < 0.01$) or dental phobic patients ($t(244) = 6.7, p < 0.01$), means being 134.0 (SD = 33.9), 106.7 (SD = 37.9), and 90.6 (SD = 46.2), respectively. In addition, while dental anxious patients tended to have lower disgust sensitivity levels than dental phobic patients, this difference was only borderline significant ($t(86) = 1.8, p < 0.08$).

The Pearson correlation between DSQ and BII fear computed for the collapsed samples was significant ($r = -0.28, N = 294, p < 0.01$). When the contributions of age and sex were partialled out, the correlation between DSQ and BII fear remained significant, although its magnitude was not particularly impressive ($r = -0.18, p < 0.01$).

OVERALL ANALYSES

Our failure to obtain significant associations between disgust sensitivity and indices of BII fear in dental phobic patients may have to do with the fact that this was an extreme sample in which restriction-of-range phenomena may have reduced sensitivity to detect such associations. To address this potential problem, data of Study 1, 2, and 3 were subjected to an omnibus analysis of variance (ANOVA) and overall correlational analyses. To begin with, a 3 (groups) $\times$ 2 (sex) ANOVA with age as a covariate was performed on the BII-fear scores of undergraduates in Study 1 and Study 2 ($n = 210$), dental anxious patients in Study 2 ($n = 52$), and dental phobic patients in Study 3 ($n = 36$). This yielded a significant main effect of groups ($F(2, 291) = 16.2, p < 0.01$). The main effect of sex attained only borderline significance ($F(1, 291) = 3.7, p = 0.06$), while the interaction of groups and sex fell short of significance ($F(2, 291) < 1.0$). Follow-up $t$-tests showed that undergraduates had significantly lower BII-fear scores than either dental anxious ($t(260) = 6.9, p < 0.01$) or dental phobic patients ($t(244) = 7.0, p < 0.01$), means being 18.5 (SD = 5.8), 25.2 (SD = 7.6), and 26.7 (SD = 9.5), respectively. Meanwhile, dental anxious and dental phobic patients did not differ in this respect ($t(86) < 1.0$). The latter finding may seem surprising, but it should be kept in mind that the BII measure is a broad index of blood–injection–injury fear. Dental anxious and dental phobic patients did differ in terms of the more specific DAS measure ($t(85) = 2.7, p < 0.01$).

GENERAL DISCUSSION

Over the past years, the role of disgust sensitivity in the aetiology of specific phobias has attracted considerable attention (e.g. Matchett and Davey, 1991; Page, 1994; Merckelbach et al., 1996; Merckelbach and de Jong, 1997; Phillips et al., 1998). In particular, small animal phobias and BII phobia have been linked to disgust sensitivity. There is now abundant evidence to support the idea that small animal phobias such as spider phobia are accompanied by elevated levels of disgust sensitivity (Merckelbach et al., 1993; Mulkens et al., 1996). There are also reasons to believe that disgust sensitivity plays an antecedent role in small animal phobias (e.g. Webb and Davey, 1992). In contrast, relatively little is known about the association between disgust sensitivity and BII fear. The present studies investigated to what extent such an association exists and more specifically, whether disgust sensitivity is related to the faintness component of BII fear. On the whole, the current findings are disappointing in that they provide no
convincing evidence for a robust connection between disgust sensitivity and BII fear. Admittedly, Study 2 as well as the overall analyses found a significant association between disgust sensitivity and BII fear in a mixed sample of students and dental anxious patients. In addition, dental phobics in Study 3 tended to have higher disgust sensitivity than dental anxious patients in Study 2 who, in turn, displayed higher disgust sensitivity levels than undergraduates. Yet, as noted already, the effect sizes of these significancies were not particularly impressive. Most importantly, Study 3 failed to find a connection between disgust sensitivity and fainting in dental phobics. This casts doubts on the more articulated hypothesis proposed by Page (1994), namely, that disgust sensitivity mediates the faintness component fo BII phobia.

It should be acknowledged that each of the three studies were subject to some limitations. Thus, in Study 1, the frequency of BII fear and, especially, faintness was found to be low and this might have worked against the hypothesis that there is a connection between disgust sensitivity and BII fear and faintness. Study 2 assessed BII fear in undergraduates and dental patients. However, no measure of BII fainting was administered in that study. Study 3 relied on a rather small sample. Furthermore, both Study 2 and Study 3 employed a brief and simple measure of dental fear (i.e. the DAS). Although unlikely, it cannot be ruled out that with more extensive measures (e.g. the Dental Fear Survey; Kleinknecht et al., 1973), the correlation between disgust sensitivity and dental fear would have been more robust.

Another issue that deserves some comment is the fact that in the present studies, disgust sensitivity was measured with the DSQ, a 24-item instrument focusing on concerns about food contamination (Rozin et al., 1984). Recently, a new disgust sensitivity scale has become available (Haidt et al., 1994). One obvious advantage of this new measure is that it taps several domains of disgust sensitivity (e.g. food, animals, body products etc.). Perhaps, then, this measure represents a better index of general disgust sensitivity than the DSQ employed in the current studies. However, as this new measure also contains items referring to blood–injection–injury (e.g. ‘It would bother me to be in a science class, and to see a human hand preserved in a jar’), finding a correlation between BII fear and the new disgust index might be tautological (see, for a detailed discussion, de Jong and Merckelbach, 1998). Note also that previous studies (e.g. Ware et al., 1994) as well as the current findings (Study 2) clearly demonstrate that there is a connection between disgust sensitivity as indexed by the older DSQ and small animal fears. So it appears that as a measure of disgust, the DSQ is broad enough to relate it to aspects of phobic behaviour.

While each of the studies reported above had its specific limitations, they converge to the conclusion that the correlation between disgust sensitivity and BII fear or fainting is a modest one and plays, at best, a minor role in dental fear and phobia. Meanwhile, it should be emphasized that dental fear and phobia constitute a highly specific class of fears. While a substantial proportion of dental phobic patients in Study 3 reported that they had had the experience of fainting, this type of phobia may not be representative of other BII phobias (e.g. injection phobia, blood phobia). The relatively small overlap between dental anxiety and other BII fears (Locker et al., 1997) as well as suggestive evidence that conditioning experiences play a more prominent role in dental phobia than in other BII phobias (Ost, 1987) add further weight to this idea. A case in point is a study by Moore et al. (1991) who found that fear of blood is relatively uncommon among dental phobic patients. As well, the large majority of their dental phobic patients ascribed their complaints to aversive dental experiences in childhood. This suggests that the contribution of disgust sensitivity to the aetiology of dental anxiety might be less pronounced. Accordingly, the present findings do not rule out the possibility that disgust sensitivity plays a more prominent role in other types of BII phobia than dental phobia (e.g. blood or injection phobia). Clearly, this point warrants further investigation.

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REFERENCES


