

OVERLAP BETWEEN DENTAL ANXIETY AND BLOOD-INJURY FEARS: PSYCHOLOGICAL CHARACTERISTICS AND RESPONSE TO DENTAL TREATMENT

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Summary—The relationship between dental anxiety and blood/body injury (BI) fears was examined in a sample of 1420 adults. Based on their responses to two mail questionnaires, they were classified into one of four groups: Group 1—neither dentally anxious nor BI fearful; Group 2—BI fearful only; Group 3—dentally anxious only; Group 4—both dentally anxious and BI fearful. Overall, only 16% of dentally anxious subjects were BI fearful while 31.6% of those with high levels of BI fears were dentally anxious. While subjects in Group 2 were more fearful of dentistry than those in Group 1, they were substantially less so than subjects in Groups 3 and 4. Moreover, even BI stimuli in the dental setting evoked lower levels of anxiety for subjects in Group 2 compared to Groups 3 and 4. However, rates of fainting or near fainting experiences in the dental situation were similar for all three groups. Groups 3 and 4 were similar in terms of fear evoking stimuli and patterns of anxiety response. Subjects in Group 4 had more agoraphobic symptoms and social interaction fears and had higher scores on the Anxiety Sensitivity Index and Spielberger Trait Anxiety Index. This suggests that Group 4 is comprised of individuals who are more likely to be multiphobic and exhibit generalized anxiety states. Although BI fears are a significant component of dental anxiety, their overall contribution is relatively small. © 1997 Elsevier Science Ltd

INTRODUCTION

Studies of the etiology of dental anxiety suggest that it may be a simple conditioned phobia that arises as a result of direct or vicarious negative dental experiences or part of a more generalized anxiety disorder involving multiple phobias and psychiatric diagnoses. Weiner and Sheehan (1990) refer to these two types as exogenous and endogenous. Support for the latter comes from studies which reveal that some dentally anxious *Ss* exhibit additional severe fears, mood disorders or psychiatric problems (McNeil & Berryman, 1989; Berggren, 1992; Roy-Byrne, Milgrom, Khoon-Mei, Weinstein & Katon, 1994). For example, Fiset, Milgrom, Weinstein and Melnick (1989) reported that 22% of dentally anxious *Ss* have two or more additional severe fears. Similarly, Ost and Hugdahl (1985) found that general anxiety states were characteristic of 25% of a group of dental phobics they studied.

Of some interest in this context are blood and injury (BI) fears since dental treatment is one situation in which BI stimuli, in the form of or stemming from invasive treatments, may be encountered (Kleinknecht & Lenz, 1989). BI fears are one of the more common phobias and may lead to the avoidance of both medical and dental treatment (Kleinknecht & Lenz, 1989).

It is also the case that BI fears seem to be uniquely associated with fainting (Kleinknecht, 1988). Having encountered BI stimuli, BI phobics exhibit a diphasic cardiovascular response leading to syncope (Kleinknecht, Lenz, Ford & DeBerard, 1990). Consequently, patients whose anxiety about dentistry is accompanied by BI fears may exhibit more complex or pronounced responses to treatment and may as a result be more difficult for the dental practitioner to manage.

Finally, Liddell and Hart (1992), studying two samples of students over a 15-yr period, found increases in body injury fears among women. If this represents a broad cultural trend and if BI fears are a significant component of dental anxiety, then rates of dental anxiety may increase particularly among women.

The literature linking dental anxiety and BI fears is somewhat unclear. Marks (1988) was of the opinion that BI phobics rarely have a second phobia. In support of this view Ost (1992) found that only 8.6% of blood phobics and 18.6% of injection phobics were fearful about dental treatment. However, Stouthard, Hoogstraten and Mellenbergh (1995) found a correlation of 0.34 between a BI subscale derived from the Fear Survey Schedule II and scores on a dental anxiety index. McNeil and Berryman (1989) found that mutilation fears were a significant component of dental anxiety, albeit only for women.

It is also unclear whether dentally anxious individuals with and without BI fears differ in terms of evoking stimuli, responses to dental treatment and psychological characteristics and whether they require different management strategies on the part of the dental practitioner. Consequently, this paper seeks to answer the following questions: (1) What is the degree of overlap between dental anxiety and BI fears? (2) Which dental stimuli evoke fear and anxiety in the BI fearful and the dentally anxious? (3) Do dentally anxious individuals with BI fears exhibit different or more complex response patterns? (4) What are the psychological characteristics of BI phobics and dentally anxious Ss with and without BI fears? (5) What contribution do BI fears make to dental anxiety overall?

METHOD

Sample

The data were collected during the baseline phase of a longitudinal, population-based study of the epidemiology of dental anxiety. The target population for the study was all persons aged 18 yr and over living in the city of Etobicoke, one of five municipalities which comprise metropolitan Toronto. The sampling frame was the most recent register of eligible voters. A two-stage random start systematic sampling procedure was used with sampling fractions designed to give a sample of 6360 Ss.

Procedure

Data were collected by means of two mail surveys. Initially, all 6360 Ss sampled were sent a questionnaire on dental anxiety (Locker, Shapiro & Liddell, 1996a). Subsequently, a 60% subsample of those responding were sent a second questionnaire containing a number of psychological measures.

The initial questionnaire was completed by 3055 Ss. This represents 60.4% of the 5061 Ss presumed to be alive and living at the listed address. Of these, 1420 completed the second psychological questionnaire. The mean DAS scores of the 3055 Ss returning the initial questionnaire, the subsample and the 1420 Ss returning the second questionnaire were identical; 8.3, 8.3 and 8.2 respectively. This paper is based on the responses of these 1420 Ss who completed both questionnaires. Census data indicated that, when compared to the target population, these Ss were somewhat older and better educated.

Materials

Dental anxiety. Corah's Dental Anxiety Scale (DAS: Corah, 1969), the Gatchel Fear Scale (Gatchel, 1989) and the single item used by Milgrom, Fiset, Melnick and Weinstein (1988) were used. Any S who scored 13 and above on the DAS, 8 or above on the Gatchel Fear Scale or reported being very afraid or terrified of dental treatment were considered to be dentally anxious. We adopted this approach since each of these measures fails to identify some dentally anxious Ss (Locker, Shapiro & Liddell, 1996b).

Blood/injury fears. A 12-item version of the Mutilation Questionnaire (MQ: Klorman, Hastings, Weerts, Melamed & Lang, 1974) was used. Subjects who responded positively to 9 or more of the items were considered to have high levels of BI fears. This cut-off point represents two standard deviations above the mean.

Other measures. These included the Dental Fear Survey (DFS: Kleinknecht, Klepac & Alexander, 1973), which assesses 15 fear anxiety evoking stimuli in the dental setting and behavioural and physiological responses to these stimuli. Nine of the fear evoking stimuli addressed

BI type events, such as feeling the needle injected and having a tooth out, and six addressed non-BI events, such as sitting in the waiting room and the smell of the dental office. Subjects were asked how anxious or fearful they were with respect to these events using the following response options and associated scores; not at all (1), a little (2), somewhat (3), much (4) and very much (5). Mean anxiety scores for these stimuli were calculated and a count of the number of stimuli giving rise to much or very much anxiety was undertaken. The same response options were also used with six questions concerning physiological responses to dental treatment. Summation of the numerical response values gave rise to an overall physiological response score.

Also used were a 12-item Negative Cognitions Questionnaire derived from Kent and Gibbons (1987). Items had a yes/no response format and a score was obtained by summing positive responses. High scores indicated numerous negative thoughts. The measure included an assessment of the S's ability to control negative thoughts in the form of a visual analogue scale, with 0 indicating that the S was completely unable to control negative thoughts and 100 representing complete control over these thoughts. Fear of Pain was measured using a 4-item scale derived from the index developed by McCracken, Zayfert and Gross (1992). This has a Likert response format ranging from strongly agree, (score 1) to strongly disagree, (score 4), the numerical values being summed to obtain a score. Items were worded so that low scores indicated a fear of pain. Other fears were assessed using a 20-item version of the Fear Survey Schedule II (FSS-II: Geer, 1965). Factor analysis of the FSS-II revealed five factors: death and dying, agoraphobic symptoms, animals, social evaluation and social interaction fears. Overall, and subscale scores for these measures were calculated and used in the analysis.

More general anxiety measures included the Anxiety Sensitivity Index (ASI: Reiss, Peterson, Gursky & McNally, 1986) which assesses the fear of fear, the Spielberger Trait Anxiety Index (Spielberger, Gorsuch & Luchene, 1983) and the 12-item version of the General Health Questionnaire (GHQ: Goldberg & Williams, 1988) which measures the frequency of symptoms indicative of psychiatric disturbance.

Diagnostic groups

For analytic purposes, Ss were divided into four diagnostic groups: Group 1—Ss who were neither dentally anxious nor BI fearful; Group 2—Ss who were BI fearful only; Group 3—Ss who were dentally anxious only; Group 4—Ss who were both dentally anxious and BI fearful. Group 1 can be considered to be a normative or reference group.

Data analysis

In analyzing the data, one-way analysis of variance was used to identify differences in means between these groups and chi-square tests to identify differences in proportions. Since Group 1 had low scores on all measures, there was a significant association between diagnostic groups and all variables examined (most at the $P < 0.0001$ level). Consequently, multiple comparison tests were used to detect which pairs differed from each other. The most common outcome was that Group 1 differed from Groups 2, 3 and 4, and Group 2 differed from Groups 3 and 4. Where this pattern was observed is indicated by an asterisk in the right hand column of the tables. Where this did not apply, the differences between groups are specified. The main comparisons of interest were the similarities and differences between the three groups defined by dental anxiety and BI fears.

RESULTS

Prevalence and overlap of dental anxiety and BI fears

Of the 1420 Ss included in the analysis, 13.6% were classified as dentally anxious on one or more of the three measures used. Women were more than twice as likely to be dentally anxious than men (17.1% vs 8.8%; $P < 0.0001$). The mean DAS score of the sample as a whole was 8.2 (SD = 3.3). The mean score on the 12-item MQ was 3.68 (SD = 2.89) and 6.9% had scores of 9–12 indicating high levels of BI fear. Again, women were more likely than men to have high levels of BI fears (9.7% vs 3.0%; $P < 0.0001$). Of those with high levels of fear, 75.3% reported feeling sick or faint at the sight of blood and 84.7% were bothered by the prospect of having an injection.

Table 1. Distribution and DAS/MQ scores of subjects according to diagnostic group

Group:	1	2	3	4	Significant differences
	Neither DA nor BI	BI only	DA only	DA and BI	
<i>n</i>	1160	67	162	31	—
%	81.7	4.7	11.4	2.2	—
Mean DAS score	7.2	8.0	14.3	13.3	*
Mean MQ score	3.1	9.9	3.9	10.0	1 vs 2, 3, 4; 3 vs 2, 4

*Statistical differences as described in the text.

Correlations between scores on the MQ and the three measures of dental anxiety were significant but low, ranging from 0.23 to 0.29 ($P < 0.001$ in all cases). The dentally anxious had a mean MQ score of 4.87 (SD = 3.23), and the non-anxious a mean score of 3.49 (SD = 2.79; $P < 0.001$). When the overlap between the two classifications was examined, it was found that of the 193 Ss who were dentally anxious, 31 or 16.1% had high BI fears. Looked at the other way round, 31 of the 98 Ss with high BI fear (31.6%) were judged to be dentally anxious.

Table 1 shows the distribution of the sample according to diagnostic group. Only 2.2% of Ss overall had a combination of dental anxiety and high BI fear. The majority of these were women (96.7%) and 70% were younger than 50 yr.

Table 1 also shows the mean DAS and MQ scores for these groups. Although the DAS scores of Groups 1 and 2 were significantly different, they were close at 7.2 and 8.0 respectively. There was no difference in the DAS scores of dentally anxious Ss with and without high BI fears. Similarly, the mean MQ scores of Groups 2 and 4 were virtually identical (9.9 vs 10.0), while Ss in Group 3 had scores of the same magnitude as Group 1.

Fear evoking stimuli in the dental setting

Using responses to the DFS, the mean number of dental stimuli which evoked high levels of anxiety was as follows: Group 1—1.4; Group 2—3.8; Group 3—7.7 and Group 4—7.5. Multiple group comparisons showed that Group 1 was different from all other groups and Group 2 differed from Groups 3 and 4. However, there were no differences between dentally anxious Ss with and without BI fear.

When responses to BI and non-BI dental stimuli were examined separately, both evoked fear in the two groups of dentally anxious Ss. Subjects with high levels of BI fear who were not dentally anxious were fearful of BI associated events but not non-BI type events in the dental setting.

Table 2 shows the percentage of each diagnostic group reporting high levels of anxiety in response to selected BI stimuli and the mean score associated with each. BI stimuli were less likely to evoke anxiety and evoked lower levels of anxiety among Group 2 (BI fears only) than among Group 3 (dentally anxious without accompanying BI fears). For example, seeing the needle evoked high levels of fear in only 34.8% of the former but 68.6% of the latter ($P < 0.0001$). In pair-wise comparisons, there were no differences between the two dentally anxious groups in anxiety provoking stimuli.

Table 2. Percentage reporting much or very much anxiety and mean anxiety score for selected dental stimuli by diagnostic group

Group:	1	2	3	4	Significant differences
	Neither DA nor BI	BI only	DA only	DA and BI	
<i>n</i>	1160	67	162	31	
Seeing the needle:					
%	11.9	34.8	68.6	83.9	*
Mean	2.2	3.1	3.9	4.5	1 vs 2, 3, 4
Feeling the injection:					
%	18.5	52.3	75.5	83.3	*
Mean	2.5	3.6	4.1	4.5	*
Feeling the drill:					
%	13.7	50.0	69.2	75.9	*
Mean	2.3	3.2	4.0	4.5	*
Having a filling:					
%	8.4	26.2	68.6	65.5	*
Mean	2.1	2.8	3.9	4.0	*
Having a tooth out:					
%	36.0	64.4	83.8	79.3	*
Mean	3.0	3.9	4.4	4.4	*

*Statistical differences as described in the text.

Table 3. Behavioural, physiological and cognitive anxiety response patterns by diagnostic group

Group:	1	2	3	4	Significant differences
	Neither DA nor BI	BI only	DA only	DA and BI	
<i>n</i>	1160	67	162	31	
Avoiding dental care (%)	21.0	43.9	79.5	83.3	*
Cancelling appointment (%)	7.4	13.8	44.4	40.9	1 vs 3, 4; 2 vs 3, 4
Mean physiological response score	7.6	8.8	14.0	13.6	*
Mean number of negative thoughts	2.2	3.6	5.2	5.7	*
Controllability of thoughts	81.7	74.4	58.1	56.7	*

*Statistical differences as described in the text.

Anxiety response patterns

Table 3 compares the four groups in terms of three anxiety response patterns; behavioural, physiological and cognitive. The first was assessed using questions concerning avoidance of dental care and the cancellation of dental appointments, the second using the score derived from the six physiological response questions from the DFS and the third using the scores on the Negative Cognitions Questionnaire. The two dentally anxious groups were comparable on all five indicators used. They were more likely to have avoided dental care in the past, more likely to have cancelled appointments, showed a more marked physiological response to dental treatment and had more negative thoughts about dental treatment than the other two groups. Dentally anxious Ss also judged themselves to be less able to control their negative thoughts. Although the anxiety responses of the BI phobics were not as marked as those of the dentally anxious Ss, they did differ significantly from those of the group who were neither dentally anxious nor BI fearful.

An examination of the specific negative thoughts reported by each group revealed some interesting findings. Groups 2, 3 and 4 were equally likely to have negative thoughts about pain associated with injections (62.1%, 67.5% and 75.9% respectively) and equally likely to worry about the drill slipping and cutting the mouth (25.8%, 28.6% and 27.6%, respectively). The only difference to emerge between the two dentally anxious groups was that those with accompanying BI fears were more likely to have negative thoughts about fainting during dental treatment (39.3% vs 12.3%, $P < 0.001$).

Given the propensity of BI fearful individuals to faint in response to BI stimuli, Ss' reports of fainting or near-fainting experiences in the dental situation were examined. The percentage in each group who had felt faint or fainted were as follows: neither dental anxiety nor BI—11.6%; BI fears only—23.9%; dental anxiety only—34.6%; both dental anxiety and BI—38.7% ($P < 0.0001$). When the analysis was confined to the last three groups, differences in proportions with these experiences were not significant. Feeling faint was much more common than actually fainting. The percentages who had fainted were 2.6, 5.8, 5.4 and 14.3 ($P < 0.01$) respectively. Again, differences between the last three groups were not significant.

The impact of these response patterns on use of dental services was also examined. Groups 1 and 2 were very similar with 78.3% and 78.8% respectively reporting that they visited a dentist regularly. The comparable percentages for Groups 3 and 4 were 41.9% and 54.8%.

Table 4. Psychological characteristics by diagnostic groups: mean scores

Group:	1	2	3	4	Significant differences
	Neither DA nor BI	BI only	DA only	DA and BI	
<i>n</i>	1160	67	162	31	
Number of severe fears:	1.42	2.91	2.67	3.81	1 vs 2, 3, 4
Death	0.13	0.21	0.22	0.35	1 vs 4
Agoraphobic	0.31	0.52	0.52	1.0	1 vs 3, 4; 2, 3 vs 4
Animals	0.49	1.19	0.85	1.09	1 vs 2, 3, 4
Social evaluation	0.43	0.82	0.91	0.87	1 vs 2, 3
Social interaction	0.05	0.16	0.17	0.45	1 vs 2, 3, 4; 2, 3 vs 4
ASI	33.1	38.3	38.4	44.2	1 vs 2, 3, 4; 2, 3 vs 4
Fear of pain	11.05	10.42	9.5	9.9	*
Trait anxiety	3.59	5.35	4.93	7.03	1 vs 2, 3, 4; 3 vs 4
GHQ	0.38	0.49	0.82	1.19	1 vs 3, 4

*Statistical differences as described in the text.

Psychological characteristics according to diagnostic group

Group 1 had significantly lower scores than Group 2 on all main measures except for the GHQ. When compared with Groups 3 and 4 all scores were significantly lower (Table 4).

There were no significant differences in the number of severe fears reported by Groups 2, 3 and 4. Nor were there any significant differences in the proportions of these Ss with additional severe fears (Group 2—34.3%; Group 3—35.8%; Group 4—54.8%). However, when FSS subscales were examined some differences emerged. Dentally anxious Ss with accompanying BI fears had more agoraphobic and social interaction fears than the other two groups. They also had higher ASI scores than these groups, indicating a greater level of fear of fear. Their trait anxiety scores were higher than those of dentally anxious Ss without BI fears. There were no differences between the three groups in scores derived from the GHQ.

Overall, the BI phobics and dentally anxious Ss without BI fears appeared to be rather similar in terms of their psychological characteristics. On most variables they had significantly higher scores than Group 1 but significantly lower scores than Group 4. The only difference between them was with respect to fear of pain; the latter were more fearful of pain than the former.

Contribution of BI fears to dental anxiety

In order to determine the contribution of BI fears to dental anxiety, a forward step-wise linear regression analysis was undertaken using the DAS scores of the 1420 Ss as the dependent variable. Independent variables were scores on the following: the MQ, the Fear of Pain Scale, the ASI, the Spielberger Trait Anxiety Index, the GHQ and the five FSS-II subscales.

Five variables had significant independent effects and accounted for 24% of the variance of DAS scores ($F = 80.15$; $P < 0.0001$). In order of entry these were the fear of pain, agoraphobic symptoms, MQ score, ASI score and the number of psychiatric symptoms as revealed by the GHQ. The standardized betas indicated that BI fears as measured by the MQ scores made the second strongest contribution to DAS scores after the fear of pain. However, they accounted for relatively little of the overall variance explained after controlling for other psychological factors.

DISCUSSION

Of those participating in the study, 13.6% were classified as dentally anxious and 6.9% were classified as having high levels of BI fears. This estimate of the prevalence of BI fears is higher than previous ones. For example Agras, Sylvester and Oliveau (1969) found 3.1% of the population to have high BI fear. This may be due to differences in measurement or to cohort differences of the kind reported by Liddell and Hart (1992). They found significant increases in body injury fears among student samples over a period of 10 yr. If the cohort explanation applies, then blood and injury fears are becoming more prevalent.

The results indicate that only a minority of dentally anxious Ss had high levels of BI fears. Where the two fears overlapped, 30 of 31 cases were women and most were relatively young. In finding that almost one-third of those with high levels of BI fear were dentally anxious, the study differed from that of Ost (1992) who reported that less than 10% of a group of blood phobics and 20% of a group of injection phobics were fearful of dental treatment. Along with data derived from the FSS-II, this suggests that Ss with high levels of BI fear do have other severe fears.

Overall, the data indicate that those with BI fears are more anxious about dental treatment than the reference group but substantially less so than dentally anxious individuals with and without BI fears. Their anxieties related almost wholly to BI type events in the dental setting and non-BI events evoked little anxiety. Of some interest was the fact that these BI events gave rise to less anxiety on the part of those with BI fears only than they did with the two dentally anxious groups. This may be due to the fact that these events are not perceived as major BI threats by those with high levels of BI fears. Since there were no differences between dentally anxious Ss with and without BI fears in terms of evoking stimuli, it may be the dental setting itself rather than the BI nature of these events that arouses fear in these groups.

A similar pattern was observed with respect to behavioural, physiological and cognitive anxiety responses. Those with high BI fears only showed more negative responses than the reference group but more muted responses than the two dentally anxious groups. However, they were similar to

the dentally anxious Ss in BI related negative thoughts and in their reports of fainting or near fainting experiences. Their experiences of fainting may reflect their propensity to faint in response to BI stimuli irrespective of the level of fear invoked. Kleinknecht and Lenz (1989) have shown that BI fear and fainting are separate but related phenomena and may occur independently of each other. The data also suggest that fainting or near fainting experiences as a response to dental treatment are not unique to the BI fearful but characteristic of dentally anxious Ss independently of BI fears. This finding conflicts with previous work suggesting that fainting responses are specific to BI fears and not seen with other fears (Thyer, Himle & Curtis, 1985). However, fear and anxiety about dentally-related BI stimuli did not prevent Ss who were BI fearful but not dentally anxious from visiting the dentist on a regular basis. Low rates of use were observed only in the two groups of Ss who were dentally anxious.

In general, there were very few differences between dental anxiety Ss with and without BI fears in evoking stimuli or patterns of anxiety response. This suggests that, in this regard, BI fears do not complicate dental anxiety to any great degree in the sense that they do not appear to give rise to more extreme or unique response patterns. Although actual fainting experiences were more common in Ss with accompanying BI fears than Ss without, the difference was not significant.

When psychological variables were examined, the BI fearful and the dental anxiety Ss without BI fears were very similar. The dental anxiety Ss with BI fears had significantly higher scores than these two groups on most psychological variables. This may indicate that Groups 2 and 3 represent simple conditioned fears while Group 4 are dentally anxious as part of a more generalized anxiety syndrome. In this regard, the data lend some support to the exogenous/endogenous classification of dental anxiety proposed by Weiner and Sheehan (1990). Consequently, treating dental anxiety with accompanying BI fears may be beyond the scope of the average dental practitioner and may mean that treatment for these fears is less successful (Berggren, 1992). Collecting information from patients on their dental and BI fears may be a simple way for dental practitioners to identify those who may need to be referred for behaviour therapy for their dental anxiety.

Finally, the regression analysis supports previous work by McNeil and Berryman (1989) who showed that fear of pain, claustrophobia and BI fears were important components of dental anxiety. These data suggest that dental fears are multi-dimensional as compared to relatively simple fear provoking stimuli such as snakes and spiders. However, both studies indicate that BI fears explain only a small percentage of the variance in dental anxiety scores.

To conclude, BI fears make a significant but relatively small contribution to dental anxiety. Subjects with BI fears alone do not appear to be anxious about dental treatment to any great degree. However, they report fainting and near fainting experiences in dental settings similar to dentally anxious Ss. There were no differences between dentally anxious Ss with and without BI fears in terms of evoking stimuli or patterns of anxiety response. There were, however, differences in psychological characteristics suggesting that the latter are likely to be individuals with multiple phobias and generalized anxiety.

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