

Psychological trauma exposure and trauma symptoms among individuals with high and low levels of dental anxiety

**Ad de Jongh, Jolanda Fransen,
Floor Oosterink-Wubbe, Irene
Aartman**

Department of Social Dentistry and Behavioral
Sciences, Academic Center for Dentistry
Amsterdam, the Netherlands

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This questionnaire-based study investigated the traumatic background and trauma-related symptomatology among 141 treatment-seeking individuals with high levels of dental anxiety and among a low-anxious reference group consisting of 99 regular dental patients. The highly anxious individuals reported a significantly higher number of traumatic events, both within and outside the dental or medical setting, than those in the reference group (73% vs. 21%). Horrific experiences in the dental setting were the most common traumatic events reported. Of the highly anxious individuals, 46.1% indicated suffering from one or more of the post-traumatic stress disorder (PTSD) symptom clusters (re-experiencing, avoidance, loss of interest, and insomnia), while in the reference group this percentage was 6%. Severity of dental anxiety was significantly associated with number of screening criteria for specific phobia and the extent to which the anxious subjects displayed symptoms of post-traumatic stress. Two variables were uniquely predictive for positive diagnostic screens for dental phobia and PTSD: having experienced a horrific dental treatment and having been a victim of a violent crime. In conclusion, post-traumatic symptoms are common accompaniments of severe forms of dental anxiety and are experienced even when dental treatment is not imminent.

Ad de Jongh, PhD, Department of Social
Dentistry and Behavioral Sciences, Academic
Center for Dentistry Amsterdam, Universiteit
van Amsterdam, Louwesweg 1, 1066 EA
Amsterdam, the Netherlands

Telefax: +31–20–5188233
E-mail: a.de.jongh@acta.nl

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The defining characteristic of a traumatic event is its capacity to provoke fear, helplessness, or horror in response to a threat of injury or death. Individuals who are exposed to such events are at an increased risk of developing post-traumatic stress disorder (PTSD) (1). One of the key features of PTSD is the re-experiencing of images, thoughts, or perceptions of the event in the form of nightmares or flashbacks. Other characteristic symptoms include persistent avoidance of stimuli associated with the trauma and the experience of hyperarousal associated with hypervigilance, difficulty falling asleep, irritability, and impaired concentration (2). PTSD is a notable mental health problem that is strongly associated with impairment, decreased well-being, and compromised health (3, 4).

Although PTSD can occur following a variety of life-threatening events and situations, such as violent physical assaults, motor vehicle accidents, airplane crashes, and earthquakes, there is a growing body of research indicating that individuals exposed to less life-threatening types of distressing events are also at increased risk for developing PTSD. For example, the results of a recent study showed that certain life events (e.g. a burglary, marital conflict, chronic illness, or the death of

a loved one) were as likely as extremely traumatic events to cause symptoms typical of PTSD (5). Moreover, evidence from studies in medical situations suggests that childbirth (6), and certain treatments (7, 8), have a capacity to confront the individual with horror, fear and helplessness, and can create a pattern of symptoms similar to those seen in individuals with PTSD.

PTSD is not the only condition that may occur following a frightening or aversive event (9). A wide array of studies exist that report a relationship between exposure to distressing events and the subsequent development of fears and specific phobias (10). To this end, dental phobia – the persistent and unreasonable version of the fear of dental objects and situations – can be considered as a clear example of the latter (11, 12). Its onset has been found to be associated with a variety of disturbing events, including those involving serious pain, loss of control (e.g. severe physical restraint or having experienced a panic attack during treatment), extremely negative (e.g. humiliating) behavior of the dentist, and treatment failures (e.g. having undergone a treatment in which a healthy tooth was extracted or a tooth broke off) (13, 14). However, other (non-dental) traumatic experiences may also contribute to the development of this condition (15).

Although it is not always clear to what extent traumatic dental and medical experiences fulfill the criteria for a 'traumatic event', previous studies have shown that dentally high-anxious individuals, who had been exposed to horrific dental events in their past, endorsed trauma-related sequelae (e.g. intrusive memories and avoidance of reminders of past dental events), typically observed in individuals suffering from PTSD (14, 16).

An important limitation of the aforementioned studies was that the etiology of these symptoms was not examined. Accordingly, it is not clear whether the PTSD symptomatology displayed by highly anxious dental patients is the result of confrontations with dental stressors, other types of trauma exposure, or the combination of both. Another limitation is the fact that the patients were studied prior to a dental visit. This makes it difficult to ascertain whether the high level of intrusive symptoms reported by the dentally anxious patients reflect not just general distress or anticipatory anxiety. Therefore, in the present study, data of treatment-seeking individuals with high levels of dental anxiety were obtained outside the dental office. The results were compared with a reference group consisting of ordinary dental patients with average levels of dental anxiety. More specifically, the present study had four aims. The first aim was to assess the prevalence of previous trauma exposure and types of traumatic backgrounds. The second aim was to characterize and determine the prevalence of trauma-related symptoms among both groups. The third aim was to examine the association between severity of dental anxiety level and PTSD symptoms. It was postulated that severity of dental anxiety and number of screening criteria for specific phobia would both be associated with level of post-traumatic sequelae. The fourth aim was to predict positive diagnostic screens for dental phobia and PTSD using sociodemographic variables and types of traumatic background as independent variables.

Material and methods

Subjects and procedure

This study included two samples of patients. The first sample consisted of 141 individuals suffering from high levels of dental anxiety, who were on a waiting list of a dental fear clinic (Center for Special Dental Care) in Amsterdam. The majority had been referred by dentists because they had demonstrated excessive and persistent anxiety about dental treatment and conventional dental treatment had failed, appeared impossible or was refused by the patient. Their ages ranged from 19 to 79 yr and averaged 38.5 yr [standard deviation (SD) = 11.5]. A questionnaire booklet, along with a request to participate in this study and to fill out the questionnaires at home, was sent to the first 200 patients of the waiting list (response rate 70.5%). Patients were adequately informed of the aims of the study by an accompanying letter in which it was explained that the answers to the questions remained confidential and that he/she was at liberty to abstain from participation in the study by not filling out the questionnaire booklet.

A sample consisting of 99 patients from three ordinary dental practices served as a reference group. These patients, who ranged in age from 16 to 77 yr (male = 38.6; SD = 12.7), and who generally complied with a schedule of

dental check-ups every 6 months, were recruited on the day of their appointment in the waiting room of the dental practice. Every patient attending the dentist during the recruitment phase was screened. Patients were excluded if they were under the age of 16 yr or had insufficient command of the Dutch language. The researcher asked each eligible patient whether he/she was willing to participate. After reading the informed consent letter, patients were handed the same questionnaire booklet as the patients of the dental fear clinic. After completion, the questionnaire was put in an envelope and sealed to ensure privacy. Five patients refused to take part in the study (response rate 94%).

Diagnostic assessment

The questionnaire booklet included demographic questions concerning age, gender, marital status, and country of birth of the participants. The booklet also contained self-report measures, tapping symptoms, and diagnostic criteria of dental anxiety, specific phobia and other types of anxiety disorders, including PTSD.

Dental anxiety was measured by the Dental Anxiety Scale (DAS) (17). This four-item scale, measuring dental anxiety, is the questionnaire most widely used in studies on dental anxiety. Responses are scored from one to five, giving total scores ranging from 4 (not anxious at all) to 20 (extremely anxious). DAS scores of ≥ 13 are considered indicative of high dental trait anxiety (18). Cronbach's alpha for the DAS in the present sample was 0.96.

For the purpose of assessing whether a patient met the diagnostic criteria of specific phobia, a separate screening instrument was used which was adopted from a study conducted by FREDRIKSON and colleagues (19). A specific phobia (i.e. dental phobia) was assumed to be present if the patient answered all of the following questions in the affirmative: (i) 'I have a fear of dental treatment'; (ii) 'I avoid or give up things because of this fear'; (iii) 'This fear is excessive or greater than justified'; and (iv) 'I cannot control this fear'. Cronbach's alpha for this instrument in the present sample was 0.91.

Psychopathological assessment was further based on a brief screening instrument used earlier in the National Anxiety Disorder Screening Day 1997 (NADSD) (20,21). It was designed to screen for anxiety disorders in mental health and primary care settings with the objective of rapidly and reliably identifying individuals who may be in need of treatment, and it has been proven to have adequate psychometric properties in terms of sensitivity (0.70), specificity (0.79), and kappa values (0.34–0.50) (20). Items refer to symptoms experienced in the past month and are based on the diagnostic criteria for the Diagnostic and Statistical Manual of Mental Disorders 4th edition, DSM-IV (2). The screening instrument first assesses the presence of the trauma criterion using the following question: 'Have you ever had an extremely frightening, traumatic, or horrible experience in your life?'. After this screening question, a list consisting of seven types of specified events was presented:

- (i) being a victim of a violent crime;
- (ii) being seriously injured in an accident;
- (iii) being sexually assaulted;
- (iv) seeing someone seriously injured or killed;
- (v) having been a victim of a natural disaster;
- (vi) having experienced a horrific dental treatment; and
- (vii) having experienced a horrific medical treatment.

In addition, an open-ended question about any other traumatic event was used. Next, the instrument assesses four symptom clusters of PTSD: re-experiencing ('Did you relive the experience through recurrent dreams, pre-occupations, or flashbacks?'); withdrawal/loss of interest ('Did you seem less interested in important things, not "with it", or unable to experience or express emotions?'); insomnia ('Did you have problems sleeping or concentrating?'); and avoidance ('Did you avoid any place or anything that reminded you of the original horrible event'). Finally, the individual must state whether he or she has had the above problems for at least 1 month. Cronbach's alpha of the PTSD cluster in the present study was 0.82.

Statistical methods

Statistical tests included the Student's *t*-test and one-way analysis of variance (ANOVA) to identify differences in means, chi-square tests to identify differences in proportions, and Pearson correlations to determine the nature and degree of relationships between quantitative variables. The strength of the associations between anxiety level and trauma symptoms/occurrence of traumatic events was measured by the odds ratio (95% confidence intervals are reported). Multivariable logistic regression analyses were used to examine the unique relationship between dental phobia or PTSD status, sociodemographic variables, and different types of trauma exposure, while controlling for all other factors in the model. Goodness-of-fit chi-square (Hosmer-Lemeshow) was used to estimate the efficacy of the models.

Results

Descriptive data and group differences with regard to dental anxiety and dental phobia

Table 1 shows the demographic data of the dentally high-anxious and the low-anxious groups. There were a few missing values with regard to gender, country of birth, and marital status in the high dental anxiety group.

Table 1

Demographic data of the high dental anxiety group and the low dental anxiety group

Characteristic	High dental anxiety group		Low dental anxiety group		Chi-square result
	No.	%	No.	%	
Gender					3.9*
Female	88	63.3	50	50.5	
Male	51	36.7	49	49.5	
Country of birth					0.6
Dutch	128	92.8	88	89.8	
Other	10	7.2	10	10.2	
Marital status					7.1*
Never married	39	28.2	18	18.2	
Married/living together	87	62.1	77	77.8	
Separated/widowed/divorced	14	10.0	4	4.0	

*Significant at $P < 0.05$.

The mean DAS score of the high dental anxiety sample was 16.9 (SD = 3.0; range 9–20), and the mean DAS score of the low anxious group was 7.9 (SD = 3.0; range 4–20; $t(238) = 22.7$, $P < 0.001$). DAS scores of both the highly anxious subjects [$t(137) = -2.2$, $P < 0.05$] and the low anxious subjects [$t(99) = -2.3$, $P < 0.05$] differed by gender, with women having higher scores than men. Of the high dental anxiety sample, 87.2% had DAS scores of ≥ 13 (high dental trait anxiety; ref. 18), while in the low anxious group this was only 8.1%. Eighty-five (60.3%) patients in the highly anxious group fulfilled all diagnostic criteria of specific (i.e. dental) phobia. A strong correlation was found between the DAS scores and number of screening criteria for specific phobia ($r = 0.89$; $P < 0.001$). A significantly higher proportion of the dentally high anxious individuals fulfilled all criteria for dental phobia than individuals in the low anxious reference group [59.6% vs. 2.0%; chi-square = 83.8, degrees of freedom (d.f.) = 1, $P < 0.001$].

Prevalence of trauma exposure

In total, 73.1% of the highly anxious individuals reported having experienced at least one traumatic incident at some time during their life. Chi-square analyses indicated no differences on gender, country of birth, and marital status between those with a history of traumatic events and those with no such history. Percentages of the lifetime prevalence of trauma exposure are presented in Table 2. The two most commonly reported traumatic events among the highly anxious individuals were a traumatic dental treatment and a horrific medical treatment. The third most commonly reported type of trauma exposure was the category 'other', which included a variety of distressing experiences, including physical abuse, neglect, intimidation, cancer, psychotic episodes, panic attacks, and the experience of being trapped in an elevator. The most commonly reported traumatic event in the low anxious reference group was witnessing someone being seriously injured or killed. Using odds ratio (OR) as a measure of the strength of the association of anxiety level with the occurrence of traumatic experiences it was found that the highly anxious individuals were about 10 times more likely than individuals in the reference group to have ever experienced a traumatic event in their life.

Trauma-related sequelae

Chi-square analyses showed that the proportion of individuals reporting re-experiencing symptoms was significantly higher among subjects of the high dental anxiety group than among those of the reference group [chi-square = 30.7, d.f. = 1, $P < 0.001$; OR = 6.79; 95% CI: 3.26–14.13]. In addition, highly anxious patients suffered more frequently from withdrawal/loss of interest [chi-square = 28.7, d.f. = 1, $P < 0.001$; OR = 19.80; 95% CI: 4.66–84.19], insomnia [chi-square = 36.4, d.f. = 1, $P < 0.001$; OR = 7.17; 95% CI: 3.60–14.72], and symptoms of avoidance [chi-square = 44.5, d.f. = 1, $P < 0.001$; OR = 22.36; 95% CI: 6.76–74.02].

Table 2

Lifetime prevalence of trauma experience in the high and low dental anxiety group and strength of associations [odds ratios (OR)] between traumatic event and anxiety level

Trauma	High dental anxiety group		Low dental anxiety group		OR	95% CI
	No.	%	No.	%		
Any trauma	103	73.1	21	21.2	10.1***	5.48–18.51
Dental trauma	75	53.2	6	6.1	17.6***	7.24–42.86
Medical trauma	23	16.3	1	1.0	19.1***	2.53–43.99
Violent crime	16	11.3	4	4.0	3.0*	1.18–9.39
Sexual assault	12†	8.5	4†	4.0	2.2	0.69–7.06
Serious injury in accident	10	7.1	4†	4.0	1.8	0.55–5.96
Witness of injury or dead	7	5.0	8	8.1	0.6	0.21–1.70
Natural disaster	1	0.7	0	0.0		
Other trauma	22	15.6	3	3.0	5.0**	1.72–20.36

95% CI, 95% confidence interval.

* $P < 0.05$; ** $P < 0.01$; *** $P < 0.001$.

†Gender difference significant at the 0.05 level, two tailed test.

Associations between severity of dental anxiety, number of screening criteria of specific phobia, and level of PTSD symptomatology

To establish a severity variable for PTSD symptomatology, a subject was included in data analyses if he or she reported having experienced at least one traumatic event and reported at least one symptom lasting at least 1 month. It appeared that of the highly anxious persons, 14.2% reported all four symptom clusters (symptoms of re-experiencing, avoidance, withdrawal/loss of interest, and insomnia) while of the low dental anxiety group no-one displayed symptoms of all four symptom clusters.

A significant difference was found among the DAS scores of the highly anxious patients who did not report any of the four PTSD symptom clusters, those who reported one, two or three symptom clusters, and those who reported all four clusters [$F = 6.37$, d.f. = 2, 138, $P < 0.002$]. This was not the case in the reference group [$F = 0.92$, d.f. = 1, 97, $P < 0.341$]. Post hoc analysis in the high dental anxiety group revealed that those who reported all four PTSD symptom clusters

($n = 20$) had significantly higher levels of dental anxiety than those who reported fewer than all four symptoms. The number of PTSD symptom clusters showed a positive and significant correlation with the DAS scores ($r = 0.53$; $P < 0.001$) and with number of screening criteria for specific phobia ($r = 0.54$; $P < 0.001$). When examined separately for men and women, these patterns were not substantially different. The distribution of the patients with different categories of PTSD symptoms and the mean DAS scores are presented in Table 3.

Prediction of dental phobia and post-traumatic symptomatology

Table 4 displays the results of multiple logistic regression analyses that were used to predict positive diagnostic screens for specific phobia and PTSD, using the three demographic variables and the seven different types of traumatic events as independent variables. The same two variables were uniquely predictive of dental phobia (goodness-of-fit chi-square = 12.1, d.f. = 8, $P < 0.15$)

Table 3

Post-traumatic stress disorder (PTSD) symptoms in the high and low dental anxiety group and related dental anxiety (DAS) score

	High dental anxiety group			Low dental anxiety group		
	No.	%	Mean DAS score (SD)	No.	%	Mean DAS score (SD)
PTSD symptoms						
Re-experiencing	61	43.3	17.6 (2.6)	10	10.1	8.0 (3.1)
Avoidance	58	41.1	18.0 (2.3)	3	3.0	11.3 (4.6)
Withdrawal/loss of interest	40	29.0	17.9 (2.3)	2	2.0	7.0 (2.8)
Insomnia	70	50.0	17.3 (3.0)	12	12.2	8.3 (2.7)
Duration > 1 month	67	48.2	17.5 (2.7)	7	7.1	9.3 (3.3)
No PTSD symptoms	76	53.9	16.4 (3.2)	93	93.9	7.7 (3.0)
One to three PTSD symptoms	45	31.9	16.8 (2.9)	6	6.1	9.0 (3.5)
All four PTSD symptoms	20	14.2	19.1 (1.4)	0	0.0	–

SD, standard deviation.

Table 4

Results of multivariable logistic regression analyses with the two factors that were uniquely predictive for positive diagnostic screens for dental phobia and post-traumatic stress disorder (PTSD)

Trauma	Dental phobia		PTSD	
	OR	95% CI	OR	95% CI
Horrific dental treatment	4.92	2.52–9.60	9.02	2.44–33.41
Violent crime	5.59	1.61–19.46	10.59	2.57–43.63

CI, confidence interval; OR, odds ratio.

and PTSD (goodness-of-fit chi-square = 6.2, d.f. = 8, $P < 0.62$), while controlling for all other independent variables in the equations. These were having experienced a horrific dental treatment and having been a victim of a violent crime. These two factors accounted for 29.5% of the variance of specific phobia and for 32.8% of PTSD.

Discussion

Dental fear and phobia have both been found to be associated with striking psychosocial impairment as a result of the avoidance of regular dental care and, consequently, deteriorating oral health (22, 23). The aim of this study was to determine the traumatic background and trauma-related sequelae among this population. With regard to trauma exposure, the results showed that of all 141 highly anxious individuals, $\approx 73\%$ indicated having experienced at least one traumatic event at some time in their life. About half, and somewhat less than half of the dental phobics, reported a traumatic dental history. Traumatic events typically associated with the onset of PTSD were much less frequently reported, with exposure to a violent crime being the most commonly reported traumatic event outside the dental or medical setting. Reports of traumatic experiences among patients in the reference group appeared to be significantly less frequent (21%) and in agreement with the prevalence rate of trauma found in representative samples within Europe (e.g. 21.4%) (24).

The finding that among the dentally anxious sample traumatic experiences in the dental setting were more common than other types of traumatic events is not surprising and is in line with the conditioning account of dental anxiety (13). Yet, the relatively high proportion of individuals who reported dentally and medically related distressing events (53% of the high dental anxiety sample and 6% of the reference sample) reveals an apparent difference with the results of some community epidemiological surveys, which show very low rates or no indication of any dental or medical traumas (24, 25). The relative disproportion of dental trauma, as compared with epidemiological samples, may best be explained by the fact that dental or medical treatments are not the type of qualifying events commonly included in surveys inquiring about traumatic stressors, leading to an

under-reporting, and therefore to an underestimation, of the prevalence of these types of traumatic experiences. On the other hand, it should be noted that nearly half of the treatment-seeking group did not report any horrific dental history. This supports the notion that there are multiple pathways in the acquisition of dental phobia and that its onset can also be ascribed to the impact of an accumulation of less severe dental experiences, vicarious learning, negative information, or events outside the dental office.

The second finding is that subjects in the high dental anxiety sample displayed a high level of trauma-related symptoms typical of PTSD, particularly re-experiencing symptoms (43%) and avoidance symptoms (41%). Overall, it appeared that about half of this sample indicated suffering from PTSD symptoms, while $\approx 14\%$ reported all four types of PTSD symptoms captured by the screening questionnaire used in this study. The third result concerns the statistically significant relationship among severity of dental anxiety, number of screening criteria of dental phobia, and the extent to which the anxious subjects displayed symptoms of post-traumatic stress. It was found that the higher the level of dental anxiety, and the more that criteria of specific phobia were met, the greater the number of symptoms of PTSD that were experienced.

These findings corroborate with two previous studies demonstrating high prevalence rates of exposure to traumatic incidents, high levels of post-traumatic stress-related phenomena, and strong associations between the intensity of these sequelae and severity of dental anxiety (14, 16). However, the dentally anxious patients in these studies were assessed in anticipation of dental treatment. The importance of the current study may be that the presence of PTSD symptoms of the participants was assessed in a context that was temporally and physically distinct from potentially anxiety eliciting cues. Thus, it would seem that many anxious individuals suffer from intrusions and avoidance reactions, even when dental treatment is not imminent.

The results of the present study should be interpreted in the light of several limitations. First, we could not control for any bias that might have been introduced from selection procedures and, as this may limit the generalizability of the findings, the results should be interpreted with caution. Second, the self-report and retrospective nature of the study makes it subject to potential biases, including selective remembering and distortion of events. Third, it should be noted that, albeit the specificity and sensitivity of the PTSD module of the screening questionnaire is acceptable, PTSD was not in fact diagnosed. Therefore, the results warrant replication with use of structured diagnostic interviews such as the Clinician-Administered PTSD Scale (CAPS-1) to establish a formal PTSD diagnosis in terms of DSM-IV (26). The fourth limitation refers to the cross-sectional nature of the study. Accordingly, the data does not allow us to distinguish whether PTSD symptoms developed before or after dental anxiety, or whether the relationships between traumatic experiences, on the one hand, and dental anxiety and PTSD symptoms, on the other, are, or

are not, causal. A fifth limitation of this study is that many aspects of possible comorbidity remained unidentified, as other comorbid anxiety disorders may have influenced the severity of symptoms of dental anxiety. This relates to the question of whether the presence of anxiety, avoidance, and re-experiencing symptoms in anxious dental patients, similarly to individuals diagnosed with PTSD, should be considered as patterns of distinct clinical entities or as components of a common underlying impairment in psychological functioning. Support for the latter notion comes from epidemiological research suggesting that existing psychopathology makes a person more vulnerable to the development of PTSD symptoms. For example, there is evidence to suggest that particular mental disorders precede both traumatic events and PTSD more often than others (24). While other anxiety disorders occur approximately simultaneously, and mood disorders secondary to the onset of traumatic events or PTSD, specific phobia (more than any other mental disorder) seem to be most likely to occur prior to the onset of PTSD (24). In other words, prior dental fears may increase vulnerability for exposure to traumatic events and subsequent onset of trauma-related conditions such as PTSD. This would also accord with the results of the regression analysis which showed that positive screens for dental phobia and PTSD were associated with the same combination of traumatic experiences, both related and unrelated (i.e. being victim of a violent crime) to the dental setting. Thus, the present findings suggest that dental phobia in its severe form has many characteristics of PTSD (or may be considered as a mild form of PTSD), and that this condition is not only the result of dental trauma, but that other types of traumatic incidents significantly contribute to the development of its symptomatology.

Given that the appropriate treatments for PTSD symptoms [e.g. imaginal exposure, or eye movement desensitization and reprocessing (EMDR) (27)] differ from the one that is considered as most appropriate for the treatment of dental phobia (i.e. exposure *in vivo*) (28), the findings also have clinical implications. For example, that dentists need to recognize that post-traumatic symptoms may be common accompaniments of severe forms of dental fear and avoidance. As untreated PTSD symptoms appear to be associated with higher hostility, disability, depression, abnormal illness behavior and a poor prognosis (3, 4), the results of this study highlight the importance of referring anxious dental patients who suffer from trauma-related symptoms to mental health professionals for proper screening and treatment aimed to target these symptoms.

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