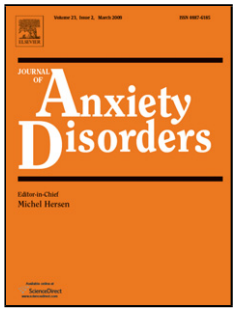

Title: The prevalence of dental anxiety across previous distressing experiences

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The prevalence of dental anxiety across previous distressing experiences

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Abstract

Aims: To compare the prevalence of high dental anxiety across a variety of past distressing experiences with a previously reported Dutch sample.

Method: University students from the UK (N=1024) completed an online survey containing; the Modified Dental Anxiety Scale, and the Level of Exposure-Dental Experiences Questionnaire (LOE-DEQ). Adjusted odds ratios (OR) were calculated to assess the association of self-reported distressing experiences and dental anxiety.

Results: The percentage of respondents with high dental anxiety (HDA) (total MDAS score ≥19) was 11.2%. Significant prevalence of HDA across several distressing experiences was shown in both UK and Dutch samples notably: extreme helplessness during dental treatment, lack of understanding of the dentist and extreme embarrassment during dental treatment. There were little or no effects of non dental trauma, with the exception of sexual abuse in the UK sample. **Conclusions:** Trauma from various past experiences may be implicated in an increased risk of high dental anxiety.

Key words: dental anxiety; trauma; survey; prediction

1 Introduction

Dental fear and anxiety are both widespread problems, with approximately 25% of UK adults and 20% of US adults reporting delays in visiting the dentist due to dental fear (Boyle, Newton, & Milgrom, 2009; Smith & Heaton, 2003). Similarly, there have been numerous studies that have reported high dental anxiety levels in approximately 10 to 20% of their participants (Locker, Liddell, Dempster, & Shapiro, 1999; Locker, Liddell, & Shapiro, 1999; Humphris, Dyer, & Robinson, 2009; Sohn & Ismail, 2005). Dentally anxious individuals frequently experience negative thoughts, feelings and fears, the fright response, sleep disturbances, and impaired social functioning in work and personal life (Cohen, Fiske, & Newton, 2000). Such individuals often avoid dental treatment and suffer detrimental effects to their oral health (Berggren & Meynert, 1984; Richard & Lauterbach, 2007).

The role of previous dental experiences has been one of the major factors to explain dental anxiety. Such experiences have been linked to increased perception of pain and negative cognitions regarding dental treatment (De Jongh, Adair, & Meijerink-Anderson, 2005). Moreover, this group of authors confirmed individuals with high dental anxiety (HDA) reported significantly more traumatic past experiences (including those in the dental setting) than individuals with lower dental anxiety (73% vs. 21%) (De Jongh, Fransen, Oosterink-Wubbe, & Aartman, 2006). Distressing experiences in the dental setting were the most frequently reported traumatic event, and 41% of HDA individuals indicated suffering from at least one of the post-traumatic stress disorder (PTSD) symptom clusters (insomnia, avoidance, etc). This demonstrates that dental trauma does

not simply affect oral health through avoidance of treatment, but can also impact mental health negatively with the development of PTSD. Therefore, it appears that previous distressing experiences play a major role in the development of dental anxiety and consequently require serious consideration.

Oosterink *et al.* reviewed a number of studies and concluded that distressing experiences that are linked to the dental setting should be categorized as: "…dental treatment-related-distressing experiences…" or "…distressing experiences which fulfill the DSM-IV-TR stressor criterion and are not related to the dental setting *per se*.." (Oosterink, de Jongh, & Aartman, 2009) (p451). They also suggest that exemplars from the first category may involve: invasive dental treatments (injection, root canal); pain; distress resulting from dentist behavior; emotional distress in response to dental treatment (e.g., feelings of loss of control); and distressing stories told by others who are regarded as important. Distressing experiences which are *not* related to the dental setting may include: sexual abuse; war trauma; severe traffic accidents; distressing medical experience; and physical assault (Oosterink et al., 2009).

Furthermore, the *degree* of exposure to a negative dental event should be investigated when examining the event's relation to subsequent anxiety. Hence Oosterink *et al* developed the 23 item Level of Exposure-Dental Experiences Questionnaire (LOE-DEQ). This was designed to assess an individual's degree of exposure for events occurring within and outside the dental setting (Oosterink et al., 2009). At present the originators of this scale have only quoted data from their local Dutch population and investigated the relationship of the scale with their own preferred dental anxiety assessments. As previous experiences are confirmed to be a major

antecedent factor in the development of dental anxiety it would be important to compare the findings presented by the Amsterdam group with a separate UK sample to improve generalizability. Hence the aim of this study was to compare levels of dental anxiety across distressing experiences taken from the Level of Exposure-Dental Experiences Questionnaire (LOE-DEQ) in a UK sample.

2 Method

2.1 Sampling

Ethical approval was obtained from the University Teaching and Ethics Committee (UTREC) at the University of St Andrews, Fife. Undergraduate and taught postgraduate students voluntarily participated via an online "Dental Anxiety Questionnaire" link on the WebCT 6.0 virtual learning program. Further advertising was included within the weekly university messages including a pop-up window in the WebCT 'Campus Announcements' menu. Entry into two £25 voucher prize draws, separately conducted on 31st January, 2009, and 31st March, 2009, was offered upon participation and submission of contact details. Data was collected from December, 2008 until March, 2009.

2.2 Questionnaire

The online questionnaire consisted of the Modified Dental Anxiety Scale (MDAS) and the LOE-DEQ. Questions relating to demographic variables, self-reported dental attendance patterns and treatment preferences were also included. All questions were presented in a multiple-choice response format.

The MDAS is a five-item self-report measure designed to assess levels of anxiety associated with an upcoming dental visit, the dentist's waiting room, tooth drilling, teeth scaling and local anaesthetic injection. Responses are rated with a 5-point scale, ranging from *Not Anxious* (score of 1) to *Extremely Anxious* (score of 5) and then summed to produce a total score. Total scores can range from 5 to 25, with an empirically determined cut-off value of 19 and above indicating high dental anxiety (Humphris,

Morrison, & Lindsay, 1995).

The LOE-DEQ (Oosterink, de Jongh, & Aartman, 2008) is a 23-item questionnaire designed to investigate the development of dental anxiety and to identify those with increased susceptibility for experiencing it. The LOE-DEQ items are based on a literature review examining almost every experience previously reported with dental anxiety onset (Oosterink et al., 2008). The first 16 items refer to typical dental experiences (i.e., root canal treatment, tooth drilling, extraction, injection). The seven additional items relate to general traumatic life events (i.e., sexual abuse, severe car accident, violent crime). This measure has been tested on highly dentally anxious patients, general dental patients, students, psychiatric outpatients and oral surgery patients. Results indicated satisfactory internal consistency (Cronbach's alpha values from 0.69 to 0.85) and sufficient test-retest reliability (intra-class correlation coefficient = 0.78) (Oosterink et al., 2008).

2.3 Procedure

This cross-sectional survey could be accessed via a link ('Dental Anxiety Questionnaire') on participants' WebCT course lists. The introductory page contained participant information, including the statement that completion of the questionnaire would act as their informed consent. Two links were provided underneath entitled, "Complete Questionnaire Now!" and "Debriefing Form & Prize Entry." Participants clicked on the first link, completed the questionnaire, returned to the introduction page and submitted their details via the second link if they wished to do so. Contact details for the project supervisor were presented on the introduction page. Contact details of the University

student support service, local GPs and other professional organizations were included on the debriefing webpage.

2.4 Statistical analysis

SPSS v17 was employed. Frequency distributions of high dental anxiety (HDA: MDAS score ≥19) versus low dental anxiety (<19) were calculated for each demographic variable (gender, age, faculty of study and region of origin). Cross-tabulations were conducted for MDAS scores (divided into low dental anxiety: <19, and HDA: ≥ 19) and each LOE-DEQ item (1 = yes, 0 = no). Associations between the LOE-DEQ items and HDA were estimated via calculation of adjusted odds ratios (OR) and 95% confidence intervals (95% CI). LOE-DEQ items significantly related to HDA were entered into a forward stepwise logistic regression model, with HDA as the outcome variable.

3 Results

3.1 Response rate

1068 questionnaires were submitted, 44 had missing data and were excluded from data analysis. The remaining sample contained 1024 full time undergraduate and taught postgraduates, representing 15.4 percent (%) of the total undergraduate and taught postgraduate population (N = 6649) enrolled at the University of St Andrews, 2008-2009.

3.2 Sample Characteristics

Table 1 shows the gender breakdown of the sample. The frequency of participants within the following age groups was 16-25 years (93.8%), 26-40 years (4.0%), 41-60 years

(2.1%) and 60+ years (0.1%). The representation from each faculty of study was: Arts (52.8%), Science (39.1%), Divinity (2.7%) and Medicine (5.4%) and selected regions including; UK (70.5%), EU (excluding UK) (10.4%), US/Canada (12.4%), and elsewhere (6.7%). One participant refused to answer (0.1%).

3.3 Levels of Dental Anxiety shown by the MDAS

The internal consistency (Cronbach's Alpha) was found to be high (0.93). Overall 11.2 % of the sample indicated high dental anxiety (HDA) with total scores above the 19 cut-off value. Females reported a higher dental anxiety level than males (t = 5.41, df = 1022, $p < 0.00001$). Divinity students reported higher dental anxiety (28.6 % reporting levels above the cut-off) compared with medical students (9.1%) who had the lowest dental anxiety level (χ^2 = 8.83, df = 1, p = 0.003). The US/Canadian participants had the lowest percentage of scores exceeding the cut-off (3.9%) in comparison to those from other countries and continents (χ^2 = 12.75, df = 3, p = 0.005).

The drilling and local anesthetic injection items attracted the highest anxiety ratings overall, with females selecting *extremely anxious* (19% and 21% respectively) more frequently than males (10% and 11% respectively). The future visit, waiting room and scale/polishing items also showed greater extreme anxiety levels amongst females (4%, 4%, and 3 %, respectively) than males (1%, 1% and 2%, respectively).

Another study, as mentioned previously, testing the LOE-DEQ (Oosterink et al., 2009) employed a sample of 1464 healthy dental patients, with 865 females and 597 males

(59.1% and 40.8%, respectively). This is similar to the gender breakdown of the current sample. Comparisons were made between LOE-DEQ results of both samples (Oosterink et al., and present study) to gain further insight into the relationship between distressing experiences and dental anxiety.

The strongest relationship between HDA and past experience was found to be 'extreme helplessness during dental treatment' in the present study and also the Oosterink et al study. Furthermore the lowest ranked odds ratios, for both studies, was the experience of 'a natural disaster or war'. In summary there was a high similarity in the rank order of OR between the two studies, as shown by a Spearman rank correlation of 0.86. In contrast to Oosterink *et al*. (2009), this study found significant prevalence of HDA with those reporting past experiences of sexual assault (OR = 2.28, $p = 0.030$), and those previously exposed to media information about dentistry (OR = 2.42, $p < 0.0001$). Unlike Oosterink *et al*., the probability of HDA was not significantly linked to previous experience of root canal treatment (OR = 1.79, $p = 0.068$).

Logistic regression performed to predict HDA status (0 = not HDA, 1 = HDA) and including only those experiences that were univariately significant found that those with past experience of helplessness during dental treatment were two and a half times more likely to experience HDA (OR = 2.56, $p < 0.001$). The multivariate approach ensured that this effect was independent of other reported experiences. Likewise those with previous exposure to media information about dentistry were twice as likely to experience HDA (OR = 2.07, $p = 0.003$), and those who experienced tooth drilling (OR =

1.70, $p = 0.034$), injection (OR = 1.72, $p = 0.018$) or a lack of understanding from the dentist (OR = 1.88, $p = 0.005$) were approximately one and three quarters more likely to experience HDA.

4 Discussion

The representativeness of the student sample was assessed through comparison of gender breakdown to the whole student population based at St Andrews University. The sample contained 688 females and 336 males (67.2% and 32.8%, respectively). The total population enrolled during the 08-09 academic year contained 3837 females and 2812 males (57.7 % and 42.3%, respectively). The female: male ratio of the current study thus contained moderately more females than exists in the total population.

The aim of this study was to report levels of dental anxiety across previous distressing experiences assessed by the Level of Exposure-Dental Experiences Questionnaire (LOE-DEQ), with those from a previous study (Oosterink et al., 2009). Comparisons revealed that virtually all of the LOE-DEQ experiences affected the likelihood of HDA. Overall, both studies showed that distressing dental experiences had greater predictive power than those outside the dental setting for subsequent HDA. Consistent with Oosterink *et al*., this study showed that extreme helplessness during treatment was the most influential experience affecting anxiety levels. This was followed by other dental experiences such as; embarrassment, nausea, lack of understanding from the dentist, and tooth drilling. However, the data from the UK study showed that sexual assault was the only general distressing experience to significantly affect levels of subsequent HDA ($p < 0.05$). This did not occur within Oosterink *et al*.'s findings ($p = 0.180$), which only revealed significant effects related to distressing dental experiences. The UK study showed that sexual assault victims were almost two and a half times more

likely to experience HDA in comparison to those who had not been assaulted. It has been estimated that about 20% of female patients seeking dental care may have experienced child sexual abuse (Leeners et al., 2007). Of those that have it is clear that many of the situations in the dental surgery that are likely to cause duress (e.g. dentist working in the mouth) are reported more vividly compared to control women. Recognition of the high prevalence of child sexual abuse and its possible implications for the health care provider and in particular the dental team has recently been recognized (Dougall & Fiske, 2009; Stalker, Russell, Teram, & Schacter, 2005). Hence the present study supports the view that those who claim sexual abuse are likely to exhibit raised levels of dental anxiety.

Similar differences occurred amongst those previously exposed to media information about dentistry. This UK study showed that such individuals were almost two and a half times more likely to experience HDA than the rest of the sample. However Oosterink *et al*. found no significant effects between those who had been exposed to such information and those who had not. Finally, Oosterink *et al*. identified that a distressing root canal treatment were significantly more likely to develop HDA than those without this experience, a finding not shared by the more recent sample. To summarize, both studies have shown that sexual assault, media information regarding dentistry and root canal treatment all increase an individuals' risk for development of HDA. However, discrepancies of effects suggest additional factors are implicated.

The present study also included simultaneously the significant LOE-DEQ items to predict prevalence of HDA. This resulted in five independent distressing experiences

being identified, namely: helplessness during treatment, exposure to media information relating to dentistry, lack of understanding from the dentist, reception of an injection, and tooth drilling. Helplessness during treatment was confirmed to have the strongest predictive power for HAD controlling for other predictors. Individuals who have experienced this are two and a half times more likely to experience HDA than those who have not independent of other experiences. This feeling of helplessness is strongly related to the sense of confinement reported by others (Seeman & Molin, 1976). The inability to communicate easily while treatment is being conducted exacerbates these feelings. One possible explanation is that individuals' perception of helplessness links to other psychological processes, e.g., a sense of lost control, rather than the dental setting per se. This may also explain the significant impact of sexual assault upon anxiety, since experiences of helplessness, loss of control (Cramer, Nickels, & Gural, 1997) and embarrassment (Moore, Brodsgaard, & Rosenberg, 2004) would almost certainly occur alongside this event. Furthermore, the fact that helplessness is associated with various anxiety-provoking situations (e.g., exams, driving) suggests that it may be a general prelude to several, if not all types of anxiety (Miller, Seligman, & Kurlander, 1975). Additionally, the finding that dental experiences are most related to HDA supports Litt's model (1996) suggesting that that dental anxiety is partly dependent on situational factors (e.g., tooth drilling within dental settings). This supports the use of the MDAS by dentists because it refers specifically to situational factors that strongly affect anxiety levels in the dental setting. Similarly, the LOE-DEQ may prove to be a useful tool for assessing dental patients' backgrounds to be completed in the waiting room prior to seeing the dentist. The use of touch screen technology and software may be exploited to

highlight or 'red flag' vulnerable patients and increase dental staff's awareness to focus the dental team in their treatment planning.

4.1 Limitations

A study limitation was that all participants were university students. Moreover, the ages of participants were unevenly distributed so that almost 94% of the sample was aged 16-25 years, yet only one person (0.1%) indicated being over 60 years of age. A second limitation is that the study instrument assesses past distressing experience from memory. Various biases are likely which may diminish or inflate traumatic events, hence caution is required in interpreting these results. Improved confidence in these findings would be shared by investigators if additional measures obtained prospectively through diary completion, for instance, by participants attending for dental care. The scope however would remain restricted as constraints on survey length (limited to a small number of years perhaps). Positively, this sample shares similar size and demographic characteristics with one of the previous LOE-DEQ samples (Oosterink et al., 2009). The comparison of this study's findings with theirs has proven to be useful because it further supports the usefulness of the LOE-DEQ. Overall, the degree of exposure to distressing events significantly affects susceptibility to dental anxiety.

4.2 Conclusion

This UK study confirms that the development of dental anxiety is significantly linked with exposure to past distressing dental experiences (Oosterink et al., 2008). A novel finding was discovered that a non-dental experience (sexual assault) significantly increased the likelihood of subsequent dental anxiety.

Table 1 Demographic breakdown with percent at MDAS cut-off and above

	N	%	% 19+
Total	1024	100	11.2
Gender			
Male	336	32.8	6.6
Female	688	67.2	13.2
Age (years)			
16-25	961	93.8	11.0
26-40	41	4.0	9.8
41-60	21	2.1	19.0
60+	1	0.1	
Faculty of study			
Arts	540	52.8	10.7
Science	400	39.1	10.8
Divinity	28	2.7	28.6
Medicine	55	5.4	9.1
Refused	1	0.1	
Region of Origin			
UK	722	70.5	13.0
EU (excluding UK)	106	10.4	5.7
US/Canada	127	12.4	3.9
Elsewhere	68	6.7	13.2
Refused	1	0.1	

Table 2 *Distressing experiences and the likelihood (OR) of high dental anxiety shown with Level of Exposure-Dental Experiences Questionnaire (LOE-DEQ) results from the Oosterink et al. (2009) and Humphris & King studies.*

	Oosterink *et al*. Study			**Humphris & King study**		
Type of distressing experience	**OR**	**95 CI**	***p*-Value**	**OR**	**95 CI**	***p*-Value**
A tragic death or illness of a loved one	1.13	0.77-1.67	**0.540**	1.13	0.74-1.72	**0.570**
An horrific medical treatment	1.24	0.84-1.82	**0.270**	1.46	0.75-2.86	**0.267**
Extreme pain after a dental treatment	2.39	1.59-3.58	<0.001	1.90	1.27-2.84	0.002
Frightening or horrific stories about dental experiences	2.50	1.68-3.71	<0.001	1.63	1.10-2.42	0.014
A tooth drilled	3.37	2.45-5.05	<0.001	2.96	1.89-4.65	<0.001
Witnessing someone being seriously injured or killed	0.96	0.64-1.43	**0.820**	0.59	0.30-1.15	**0.119**
A tooth extracted	2.54	1.73-3.74	<0.001	1.87	1.26-2.80	0.002
Extreme helplessness during dental treatment	8.17	5.22-12.78	<0.001	4.07	2.70-6.15	<0.001
An injection	3.13	2.12-4.61	<0.001	2.49	1.64-3.76	<0.001
A root canal treatment	1.99	1.35-2.95	0.001	1.79	0.96-3.38	**0.068**
An impolite or rude dentist	3.22	2.19-4.75	<0.001	2.21	1.48-3.31	<0.001
A dentist not providing sufficient information about invasive treatments	2.92	1.98-4.30	<0.001	2.82	1.85-4.30	<0.001
Information in the media regarding dentistry	1.34	0.88-2.05	**0.170**	2.42	1.53-3.83	<0.001
Seriously getting injured in an accident	1.25	0.80-1.95	**0.320**	0.31	0.10-1.28	**0.086**
Lack of understanding of the dentist	4.35	2.92-6.48	<0.001	3.16	2.11-4.72	<0.001
A criticizing dentist	2.57	1.68-3.91	<0.001	1.62	1.10-2.40	0.015
Witnessing a treatment of an extremely anxious patient	1.56	0.96-2.53	**0.070**	1.10	0.62-1.92	**0.750**
Almost suffocation during dental treatment	2.91	1.89-4.48	<0.001	1.87	1.05-3.34	0.032
Extreme nausea during dental treatment	5.25	3.49-7.90	<0.001	2.62	1.70-4.03	<0.001
Extreme embarrassment during dental treatment	5.46	3.60-8.27	<0.001	3.10	2.01-4.80	<0.001
A violent crime	1.61	0.97-2.69	**0.070**	0.90	0.35-2.33	**0.832**
A natural disaster or war	0.43	0.19-0.99	**0.050**	0.10	0.12-8.05	**0.998**
Sexual assault	1.68	0.78-3.61	**0.180**	2.28	1.06-4.89	0.030

Bold *p*-values indicate insignificant ORs. OR=adjusted odds ratio.

Table 3 *Results of the forward stepwise logistic regression analysis using significant LOE-DEQ items and high dental anxiety (1 = yes, 0 = no).*

Type of distressing experience	B	S.E.	Wald	OR	95.0% CI	*p*-Value
A tooth drilled	0.53	0.25	4.51	1.70	1.04-2.78	0.034
Extreme helplessness during dental treatment	0.94	0.23	16.38	2.56	1.62-4.03	<0.001
Reception of an injection during dental treatment	0.54	0.23	5.57	1.72	1.10-2.70	0.018
Exposure to information in the media regarding dentistry	0.73	0.25	8.55	2.07	1.27-3.38	0.003
Lack of understanding by the dentist	0.63	0.23	7.87	1.88	1.21-2.92	0.005

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Research Highlights

- This UK study replicates a Dutch survey of dental patients.
- Reports the relationship of dental anxiety with previous trauma.
- Dental and non-dental related trauma is associated with dental anxiety.