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Pathological forms of dental anxiety : aetiology, prevalence and fear evoking aspects

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CHAPTER 2

PREVALENCE OF DENTAL FEAR AND PHOBIA RELATIVE TO OTHER FEARS AND PHOBIA SUBTYPES¹

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Prevalence of dental fear and phobia relative to other fears and phobia subtypes. *Eur J Oral Sci*
2009; **117**: 135-143.

Introduction

Fear is a commonly studied phenomenon and has received much attention in the literature (1-4). The results of earlier studies show wide variations in prevalence rates of fears, ranging from 7.7% (3) to 58.0% (4). The most frequently reported fears are fear of animals (12.6 - 39.0%), heights (19.1 - 30.7%), storms (5.7 - 21.1%) and flying (6.9 - 13.2%) (1-4). Most studies found higher prevalence rates for women than for men (1, 4).

One highly prevalent type of fear is dental fear. Epidemiological studies, which examined the point prevalence of dental fear, found prevalence rates of 19.8% (3) and 13.1% (4). Gender differences were not reported. It has been established that fear of dentistry-related objects and situations often leads to a heightened threshold for seeking care for diseased teeth, a deteriorating oral condition and elevated levels of severity of fear, imposing a threat to a person's both mental and general health as well as quality of life (5-8).

Estimates based on survey data indicate that as many as 3-7% of the population suffer from debilitating high levels of dental fear and avoidance (9-12). A review based on two online search engines (PubMed and PsychInfo, see Table 1) shows the results of studies, that have attempted to establish an estimate of the prevalence of high levels of dental fear in the general population (9, 13-21).

The results are not consistent, largely because of the considerable variability in methods, measures and criteria used (9, 13-21). Another problem relates to the use of measures that leave the interpretation of what 'fear' is up to the individual. It has been argued that this easily leads to the inclusion of general concerns or worries in respondents' responses (22). Therefore, a number of studies applied a validated measure of dental trait anxiety to determine the severity of dental fear in a more reliable fashion, using, for instance the criterion of a score of ≥ 13 or ≥ 15 on the Dental Anxiety Scale (DAS) (23). However, self-report measures, such as the DAS, are

developed to identify people who need special attention, and to tap symptom severity as well as treatment effects (24). Because no studies have used the performance of such measures as a diagnostic tool for the assessment of excessive, pathological or phobic mental health conditions (i.e. dental phobia), their use for diagnostic purposes on individual or population level is problematic. Moreover, assessments based on specific measures of dental fear pose a problem when comparing its prevalence and severity with that of other types of fears and phobias.

An agreed scientific solution to address these concerns is the use of widely-established systems for classifying mental illnesses, such as the International Classification of Diseases (ICD-10) (25), or the Diagnostic and Statistical Manual of Mental Disorders (DSM) (26). According to the most recent DSM version, the DSM-IV-TR, a person suffers from a mental health condition termed 'specific phobia' when he or she fulfils the following criteria: (i) the fear is elicited by a specific and limited set of stimuli (e.g. snakes, injections), (ii) confrontation with these stimuli results in intense fear and avoidance behaviour, (iii) the fear is unreasonable and (iv) is excessive to a degree that it interferes with daily life (26). Epidemiological studies, that have attempted to estimate the prevalence of specific phobia within the general population show that this condition is more prevalent than any other group of psychiatric disorders studied, with life-time prevalence rates of around 10% (3, 27-30). The most frequently-reported phobia subtypes are animal phobia (1.1-7.9%), height phobia (0.5-7.5%), phobia of enclosed spaces (3.2-4.0%) and lightning/thunder phobia (2.0-2.1%) (31, 32). To date, only two studies have examined the point prevalence of dental phobia and prevalence rates of 2.4% (31) and 2.1% (32) have been reported. The latter study, conducted by FREDRIKSON *et al.* (32), used a randomly selected sample of about 700 subjects 18 - 70 yr of age.

Table 1 *Studies on the prevalence of dental phobia in the general population, screening instruments, criteria and main results*

Author	Year	Area	N	Sample characteristics	Instrument	Gender	Prevalence %	Prevalence % by gender	Cut-off score
GATCHEL <i>et al.</i> (20)	1983	Dallas USA	105	Randomly selected sample by random digit dialing	10 point Dental Anxiety Scale	F 62 M 43	11.7	F 16.4 M 2.8	Score 8-10 high fear
HALLSTROM & HALLING (18)	1984	Gothenburg Sweden	784	Representative systematic sample	Semi structured interview	F 784	4.3	F 100	Degree anxiety and avoidance behaviour
STOUTHARD & HOOGSTRATEN (17)	1990	The Netherlands	648	A weekly surveyed panel representative of the Dutch population	Dental Anxiety Questionnaire	F 328 M 320	3.9	F 64.2 M 35.8	Stanine 9 (score > 142)
LOCKER & LIDDEL (13)	1991	Ontario Canada	580	Community sample of people age 50 year and over	Dental Anxiety Scale	F 32 M 217	7.8	F 9.4 M 5.1	>13
LIDDEL & LOCKER (19)	1997	Toronto Canada	2,609	Sample randomly selected from the voters list	Dental Anxiety Scale	F 1481 M 1128	10.7	Not reported	>13
WOODMANSEY (16)	2005	USA	100	Patients university clinic	Dental Anxiety Scale	Not reported	4.0	Not reported	>15
EITNER <i>et al.</i> (14)	2006	Germany	374	Adult male soldiers	Dental Anxiety Scale	M 374	4.6	M 100	>15
ENKLING <i>et al.</i> (15)	2006	Bochum Germany	300	Pedestrians	Hierarchical Anxiety Questionnaire (HAQ)	F 174 M 126	11	Not reported	>38
NICOLAS, <i>et al.</i> (9)	2007	France	2,725	Convenience sample	Dental Anxiety Scale	Not reported	7.3	Not reported	>15
ARMPFIELD <i>et al.</i> (21)	2008	Australia	3,937	Sample from a stratified national sample of Australians	Global question	F 2052 M 1880	3.9	Not reported	Extremely stressed or afraid

Although this study has probably generated the most reliable estimate of dental phobia prevalence in the general population, it also has a number of limitations, which need to be acknowledged. First, the sample was limited to one urban area in Sweden (Stockholm). Secondly, the researchers asked their subjects to rate the presence of 'fear of dentists'. This could easily have been misinterpreted by the respondents, as the dentist has proven to be one of the least fear-evoking aspects of the dental-treatment situation (33). As a matter of fact, in a study carried out to establish a hierarchy of anxiety-provoking capacities of 67 potentially fear evoking dental stimuli, the dentist as a person was ranked 66th and was reported as extremely anxiety-provoking by only 0.3% of those questioned (33). An even more important limitation of the study of FREDRIKSON *et al.* (32) is that the screening questionnaire did not contain an explicit question pertaining to the diagnostic criterion of impairment in terms of significant interference with daily functioning. Thus, it would seem that reliable information on the prevalence of dental phobia in the European population is still lacking.

The purpose of the present study was to determine the prevalence of fear and phobia of dental treatment using DSM-IV-TR criteria in a large population sample. These prevalence rates were compared with prevalence rates of 10 other common fears and phobias (i.e. injections, snakes, spiders, thunder, enclosed spaces, physical injuries, darkness, flying, heights and blood). Data were also analysed to examine potential differences with regard to gender, age, and severity of the present fear, as some of these variables have not been examined in depth in previous research. An additional aim pertained to the extent to which one suffers from trauma-related symptoms. A previous study showed that 43.3% of the individuals with high levels of dental anxiety indicated that they suffered from intrusive re-experiencing of earlier events, a key feature of post-traumatic stress disorder (PTSD) (34). Because it has not been investigated whether this is a characteristic of dental fear alone, or also a feature displayed by individuals suffering from other types of common fears, the present

study assessed the severity of the present fears also in terms of presence of intrusive recollections of distressing events associated with having that fear.

Method

Assessment A questionnaire booklet was used that contained a number of self-report measures. In the first part of the booklet, data on demographic variables (i.e. age, gender, marital status and country of origin) of the participants were gathered. The second part of the questionnaire consisted of questions pertaining to the presence or absence of 11 common fears (i.e. fear of dental treatment, injections, snakes, spiders, thunder, enclosed spaces, physical injuries, darkness, flying, heights and blood). In order to optimize comparison of results, each of the fears was adopted from the earlier study conducted by FREDRIKSON *et al.* (32) while one fear (of blood) was added. When the participants responded in the affirmative to one or more of these fears, they were invited to complete the third part of the questionnaire. This part consisted of the Phobia Checklist, which focused on the question of whether the present fears met the diagnostic criteria for specific phobia in terms of the DSM-IV-TR (26). Four DSM-IV criteria for specific phobia were used: (i) the sight of the feared object or experiencing the situation evokes an excessive fear response, (ii) the fear is greater than justified, (iii) avoidance or giving up things because of the fear, (iv) avoidance of the situation or object causes daily impairment. The first three criteria were adopted from the Swedish study conducted by FREDRIKSON *et al.* (32); the fourth was added in this study in order to achieve a better coverage of the set of DSM-IV-TR criteria. When all four criteria were met, a specific phobia subtype was presumed to be present.

In a pilot study, the Phobia Checklist was validated for dental phobia against the Structured Clinical Interview for DSM-IV (35) in a sample of 22 patients with dental

phobia and 133 patients without dental phobia. In the validation process, all patients completed the Phobia Checklist and were assessed using the anxiety disorder section of the Structured Clinical Interview for DSM-IV. The results revealed excellent sensitivity (0.95) and specificity (0.99) with an overall hit rate (proportion of persons accurately classified) of 97%. Accordingly, the Phobia Checklist was considered a valid screening tool for specific phobias.

One separate question of the third section pertained to the presence of re-experiences of traumatic distressing experiences. Subjects were asked to indicate whether they were bothered by intrusions, that is, re-experiences of a traumatic event related to the specific fear, which were hard to suppress. The last section of the third part of the questionnaire assessed the severity of present fears, using visual analogue scale (VAS) measures with 0 indicating 'no fear at all' and 100 indicating 'terrified'. Participants with a Structured Clinical Interview for DSM-IV based diagnosis of a phobia of dental treatment showed significantly higher scores on the VAS than participants without this specific phobia subtype (Mean=81.29, standard deviation (SD)=15.6 vs. Mean=60.21, SD=24.3; $t(475)=7.05$, $P<0.001$), which supports the validity of this measure (more detailed information about the questionnaire as well as information pertaining to its validation can be obtained from the first author).

Sample A large sample was taken from the Dutch population, which consists of about 16.3 million people (36). In order to provide respondents sufficient opportunity to complete the questionnaire, two types of locations were selected in advance: public transport means and public places. That is, all potential participants (N=2,968) were identified among travellers using trains and intercity buses covering tracks between most major cities across the Netherlands (i.e. Den Helder, Meppel, Zwolle, Groningen, Amsterdam, Leiden, Den Haag, Rotterdam, Dordrecht, Roermond, Arnhem, Nijmegen and Vlissingen), or were visitors of a wide range of public places (supermarkets, cafes, parks and shopping malls, etc.) across the Netherlands. To

obtain a geographically diverse sample (e.g. urban as well as rural areas) we also added visitors of a wide range of public places in both cities (Roermond, Amersfoort, Gouda, Oosterhout, Drachten, Groningen, Meppel, Zwolle, Emmeloord, Apeldoorn, Zierikzee and Amstelveen) and villages (Bemelen, Leersum, Schelluinen, Drimmelen, Haule, Kiel-Windeweer, Rolde, Albergen, Tollebeek, Stokkum, Nieuwerkerk and Den Hoorn) were included. Subjects were approached between 7:00 am to 23:00 pm in order to include both working people and non-working people in the study.

Of the 2,968 persons approached initially, 1,969 agreed to participate. Seven questionnaires were incomplete and three questionnaires were completed by participants under the age of 18, leaving 1,959 questionnaires for subsequent analyses. Reported reasons for refusal to participate were: being busy with something else (N=346), don't feel like it (N=281), insufficient command of the Dutch language (N=31), leaving the train or intercity bus in a moment (N=60), being too tired (N=49), age under 18 (N=85), claiming not being scared (N=46), feeling ill (N=2) or forgot reading glasses (N=1).

Procedure Potential participants were approached by an advanced graduate student and invited to participate in a study on fears and phobias. After this introduction, participants were invited to complete the questionnaire booklet if they had reached the age of 18 and had sufficient command of the written Dutch language. Verbal informed consent was obtained in all cases. The decision to use face-to-face administration, rather than telephone, mail or internet administration was based on considerations related to coverage properties, accuracy of the screening, response rate and length of the survey/respondent burden (37).

The study was supported by the Academic Centre for Dentistry Amsterdam (ACTA) and approved by the Netherlands Institute for Dental Sciences (IOT).

Statistical analyses Chi-square analyses were used to detect gender differences regarding the point prevalence rates of the 11 fears and phobias and intrusive reports of recollections of fear-related events. In addition, for the prevalence rates 95% confidence intervals (CI) were calculated. Gender differences in mean severity ratings of different types of fears were tested using Student's t-tests. For these analyses Bonferroni corrections were applied to correct for type I errors (38) using an alpha level of 0.004. All data were analysed using the Statistical Package for the Social Sciences (SPSS) version 15.0 (Chicago, IL, USA).

Results

Participants Women represented 49.6% (N=971) of the sample. The age of the participants varied from 18 to 93 yr (Mean=35.8, SD=15.5). The marital status of the participants revealed that 25.4% were single, 48.6% were married or cohabiting, 20.7% were dating and 5.3% were either divorced or widowed. The distribution of place of origin showed that 88.1% were Dutch, 2.0%, were Surinamese, 1.3% were Turkish, 1.3% were Moroccan, 0.9% were Antillean, while 6.3% reported another country of origin. These distributions of gender, age, marital status, urbanicity and country of origin are an adequate reflection of the 2005 data on the Dutch population, published by the Dutch Central Bureau of Statistics (36). The prevalence rates for marital status and origin are clearly not sufficient to support subgroup analyses.

Prevalence of fears Of the 1,959 participants in the study, 399 (20.4%) reported no fear at all. Of these people 114 (28.6%) were female and the age varied from 18 to 89 yr (Mean=36.1, SD=15.0). At least one fear was reported by 1,560 (79.6%) of the participants. Prevalence rates of the various types of fears ranged from 8.3 to 34.8%. Figure 1 shows that fear of dental treatment was present in 24.3% of the individuals.

Fear of snakes was the most commonly reported fear, while fears of heights and physical injuries were ranked second and third. Among the least commonly reported fears were thunder, blood and darkness.

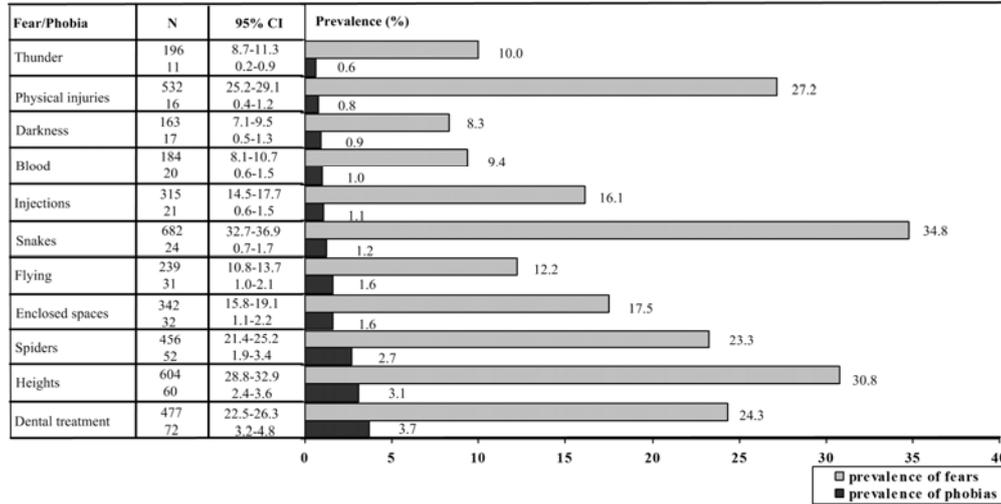


Figure 1 Prevalence of fears and phobias. 95% CI, 95% confidence interval, N, number of subjects

Prevalence of phobias Of the 1,959 participants in the study 102 (11.8%) met all DSM-IV-TR criteria for at least one subtype of specific phobia. Prevalence rates of the various subtypes of specific phobias ranged from 0.6 to 3.7%. Figure 1 shows that specific phobia of dental treatment was most prevalent, followed by phobia of heights and spiders. Least prevalent were phobias of darkness, physical injuries and thunder.

Severity of fears Table 2 shows that the mean severity ratings for the 11 different fears ranged from 50.33 to 63.35 and that fears of dental treatment, flying and thunder were rated as most severe. Fears of physical injuries, blood and enclosed spaces were reported as least severe.

Intrusive reports of recollections of fear-related events Rates for reports of recollections of fear-related events for the 11 different fears ranged from 5.4 to 49.4%. Table 3 demonstrates that the fear with the highest prevalence rate for intrusive re-experiencing was fear of dental treatment (49.4%). Among individuals suffering from other fears (e.g. spiders, flying and snakes), this symptomatology was much less prevalent.

Gender differences With regard to the prevalence rates of fears, a significant gender difference was found for fear of dental treatment ($P < 0.001$). Women reported this fear more often than men. Significant gender differences were also found for fears of injections, snakes, spiders, enclosed spaces, flying, blood, darkness, and thunder (all P -values < 0.004). Each of these fears was reported more frequently by women than by men (see Table 4). No significant gender differences were found with regard to the prevalence of dental phobia, severity ratings of dental fear and intrusive reports of recollections of dental fear-related events (all P -values > 0.004). The only significant gender differences for phobias were found for the prevalence rates of spider phobia and phobia of enclosed spaces. Women reported these phobia subtypes more often than men ($P < 0.004$, see Table 4). With regard to the severity of fears, females fearful of snakes rated their fear as more severe than their male counterparts ($P < 0.001$, see Table 2). Finally, two gender differences were found with regard to intrusive reports of recollections of fear-related events: one for fear of physical injuries and one for fear of snakes (see Table 3).

Age distribution of fears Figure 2 shows the plots of prevalence across age for the four most prevalent fears (i.e. fear of snakes, physical injuries, heights and dental treatment). From 21 yr of age, the distributions of these fears demonstrate comparable patterns across age with a stable or increasing fear curve during adulthood, being maximal at about 60 yr, followed by a decline in the older age groups.

Table 2 Mean Severity Ratings (MSR), rank order of fears and gender differences

Type of fear	Total			Gender			t
	N	MSR (SD)	MSR (SD)	Men		Women	
				MSR (SD)	MSR (SD)		
Dental treatment	477	63.35 (24.4)	60.40 (22.5)	65.58 (25.5)		-2.31	
Flying	239	62.30 (24.4)	61.19 (26.5)	62.98 (23.2)		-0.55	
Thunder	196	60.23 (20.6)	55.71 (24.3)	61.38 (19.4)		-1.56	
Snakes ¹	682	60.16 (23.4)	49.27 (24.8)	61.27 (23.3)		-4.60	
Heights	604	59.39 (22.7)	57.69 (21.6)	60.84 (23.4)		-1.70	
Spiders	456	58.43 (24.2)	59.29 (22.9)	60.64 (23.6)		-0.70	
Injections	315	57.40 (21.4)	56.28 (21.8)	58.00 (21.2)		-0.68	
Darkness ²	163	56.97 (23.1)	49.39 (24.5)	58.82 (22.4)		-2.09	
Enclosed spaces	341	56.50 (22.8)	51.24 (20.9)	58.72 (23.2)		-2.79	
Blood	184	53.08 (24.3)	51.30 (24.1)	54.20 (24.5)		-0.79	
Physical injuries ²	532	50.33 (23.7)	50.51 (23.2)	50.16 (24.2)		0.17	

¹ Using Bonferroni correction, $P < 0.004$, significant gender difference (women > men)

² Using Bonferroni correction, $P < 0.004$, significant gender difference (younger > older)

Table 3 Prevalence rates (%), 95% Confidence Intervals (CI), rank order and gender differences in the report of recollections of fear-related events

	Total		Gender			$\chi^2(1)$
	%	CI	N	Men	Women	
Dental treatment	49.4	49.2 - 49.6	235	49.3	49.4	0.01
Thunder	29.1	28.4 - 29.8	57	30.0	28.8	0.02
Enclosed spaces	28.2	27.8 - 28.6	96	23.8	30.0	1.37
Darkness	26.5	25.6 - 27.4	43	18.8	28.5	1.24
Physical injuries ¹	26.2	25.9 - 26.5	139	33.3	19.1	13.91
Blood	21.7	20.9 - 22.5	40	26.8	18.6	1.71
Injections	20.6	20.1 - 21.1	65	24.8	18.4	1.74
Heights	13.3	13.0 - 13.6	80	14.4	12.3	0.56
Spiders	11.4	11.0 - 11.8	52	14.8	10.3	1.63
Flying	8.8	8.1 - 9.5	21	12.2	6.8	2.08
Snakes ²	5.4	5.1 - 5.7	37	9.1	3.4	9.78

¹ Using Bonferroni correction, $P < 0.004$, significant gender difference (women > men)

² Using Bonferroni correction, $P < 0.004$, significant gender difference (men > women)

Table 4 Gender differences in the prevalence of fears and specific phobias

	Fears			Phobias		
	men	women	$\chi^2(1)$	men	women	$\chi^2(1)$
	%	%		%	%	
Snakes ¹	24.5	45.3	93.54	0.8	1.6	2.84
Heights	28.1	33.6	6.79	2.4	3.7	2.70
Physical injuries	26.8	27.5	0.11	0.7	0.9	0.29
Dental treatment ¹	20.7	28.0	14.03	2.6	4.7	6.13
Spiders ^{1 2}	10.9	35.8	170.1	1.0	4.3	20.81
Enclosed spaces ^{1 2}	10.2	24.8	72.41	0.7	2.6	10.61
Injections ¹	11.0	21.2	37.63	0.8	1.3	1.29
Flying ¹	9.2	15.2	16.63	1.1	2.1	2.82
Thunder ¹	4.0	16.1	78.55	0.3	0.8	2.37
Blood ¹	7.2	11.6	11.40	1.1	0.9	0.17
Darkness ¹	3.2	13.5	67.48	0.4	1.3	4.97
≥ 1 fear / ≥ 1 phobia ^{1 2}	71.2	88.3	88.35	8.2	15.6	25.36 ¹

¹ Using Bonferroni correction, $P < 0.004$, significant gender difference in fears (women > men)

² Using Bonferroni correction, $P < 0.004$, significant gender difference in phobias (women > men)

Discussion

The results of this study using a large and representative sample of the Dutch population suggest that, while dental fear is not the most common fear, this fear is more severe and more strongly associated with intrusive re-experiencing than any of the other fears evaluated. With a prevalence rate of somewhat $\leq 25\%$, dental fear ranked fourth, with fear of snakes as the most prevalent fear in the general Dutch population followed by the fear of heights and the fear of physical injuries. The finding that dental treatment is a common source of fear is consistent with findings of previous community surveys (4, 10-12, 15). Also, the ranking of these prevalence rates is in line with previous findings in this area, suggesting that the order of the prevalence of fears is relatively robust and stable across populations (1, 4, 39).

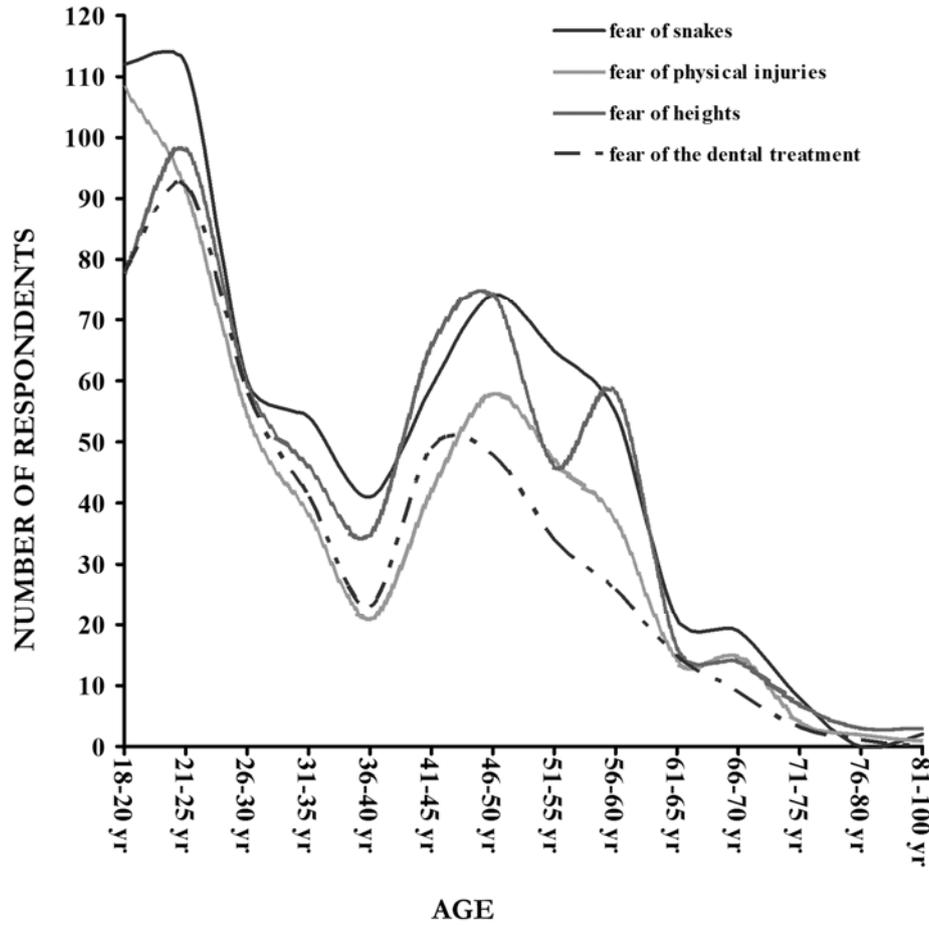


Fig. 2 Distribution of the most prevalent fears, according to age

One study, which assessed multiple fears among more than 1000 residents of Seattle, found dental fear to be even the most common fear out of the 10 different fears surveyed (4). With a prevalence estimate of 22.6% this figure comes close to the one found in the present study.

The present study was guided by DSM-IV-TR criteria to establish an estimation of the prevalence of a variety of subtypes of specific phobia in the population. Interestingly, the findings suggest that dental phobia is the most prevalent

subtype of specific phobia. The prevalence of 3.7% for dental phobia, based on the DSM-IV-TR criteria applied in this study, parallels prior estimates (ranging from 3.0 to 5.0%) of the prevalence rate of excessive forms of dental fear in other western societies, despite the fact that those were based on less stringent criteria (17, 18, 40). Considering this high prevalence rate, it is difficult to understand why in previous epidemiological studies on the prevalence of specific phobias, phobia of dental treatment has seldom been a topic of investigation. The most plausible explanation for this may be that a phobic form of anxiety about dental treatment has generally not yet been considered to be a common mental health condition. It should be noted that the prevalence rates found for dental phobia in the two studies that did include this phobia subtype were generally lower (2.4% and 2.1% respectively) than those in the current study (31, 32). Possibly, this can be attributed to the fact that dental phobia has previously been operationalised as a phobia of 'the dentist'. Because the dentist as a person has been found to be one of the least fear-evoking aspects of the dental treatment situation (33) this may have led to significant underreporting, and consequently underestimation, of the incidence of this phobia subtype from these studies.

The relatively high prevalence of dental phobia, as well as the high severity ratings for dental fear in the present study, does raise the question as to what distinguishes dental phobia from other phobia subtypes. One explanation is that, as a consequence of the often long-term avoidance of dental treatment, the (oral) health of an individual is at stake, and will not only eventually lead to pain and distress (41), but also increase the likelihood of potentially invasive treatments. This prospect may further reinforce existing avoidance behaviour, thereby increasing the deterioration of oral health state, and instigating a vicious cycle of avoidance behaviour, anticipatory anxiety and suffering in terms of pain and reduction of quality of life (42). In view of these consequences, individuals suffering from dental phobia should be regarded as

high-risk patients who need attention and regular dental appointments to decrease the risk of oral health problems and to improve their quality of life (8).

A possible explanation for the observation that dental fear is of a debilitating severity is that a large proportion of the dentally-anxious individuals suffer from trauma-related sequelae, which are less likely to be found in many other subtypes of specific phobia (43). The relatively high prevalence (of about 50%) of intrusive reports of recollections of dental fear-related events among those suffering from dental fear corroborates previous studies, in which also half of the dentally-anxious people reported to suffer from intrusive memories and avoidance of reminders of past dental events (44). These findings underline the notion that the dental treatment situation is potentially harmful and that distressing events, particularly those involving extreme pain and helplessness, are not uncommon. Exposure to such events not only appears to increase the likelihood of developing dental anxiety and dental phobia, but also of evoking symptomatology typically found in patients suffering from PTSD (44, 45).

Although the findings on the prevalence rates of the various subtypes of specific phobia are generally consistent with previous studies carried out in the USA with prevalence rates varying from 0.5 to 6.1% (1, 3, 46), the rates found in the present study were relatively low (range 0.4- 3.4%) compared with 1.6-7.5% found in the study conducted by FREDRIKSON *et al.* (32). These differences may be attributable to several methodological issues as indicated in our Introduction.

The present results corroborate previous findings, showing that women generally report fears more often than men (47). Analyses of the gender differences regarding the prevalence rates of dental fear, revealed a similar pattern. Although no such statistically significant differences were detected with regard to the prevalence rates of dental phobia, due to the stringent Bonferroni corrections that were applied, most trends were in the same, gender-specific direction. To this end, the findings are consistent with the current view on gender differences in anxiety disorders, predicting that women are both biologically and socially driven to avoid threats more often than

men (1, 47). However, the findings may also reflect exposure among women and men to different genetic and environmental risk factors for the development of phobias (48).

Even though it is apparent that the prevalence of fears may vary as a function of age, virtually all studies of dental anxiety have been based on restricted age ranges or a limited number of age groups (e.g. young people, middle-aged adults and elderly people). For example, FREDRIKSON *et al.* (32) used a median-split approach with an average age of 29 yr in the younger group, and of 53 yr in the older group, but found no differences in the prevalence of fears between the groups. LOCKER & LIDDELL (13), using a sample of the Canadian population, employed three age categories (<50, 50-64 and 65+ yr) and found their younger groups to be equally fearful, while those aged 75 yr and over were found to have significantly lower fear scores. The picture that emerged in the present study was similar, showing a heightened fear built up in childhood and adolescence until the age of around 21 yr, a fairly stable pattern across the adult life span, followed by a decrease of fear in the older age groups. The findings regarding the latter part of this curve parallels robust decreases in negative affect in older age, documented in other studies (13, 49), and are attributed to interference of fear problems with other forms of discomfort, diseases, and health problems, which have been found to grow with increasing age (49). Another explanation for the decrease in anxiety in older age is that older adults tend to use emotional coping skills acquired over their life span, whereby potentially negative interactions are avoided (50).

The results of this study should be seen in the context of its limitations. First, with regard to the data collection, the problem with the use of non-probability samples is that there is no evidence that they are representative, and consequently are likely to have limitations in terms of generalisability of data (51). However, as far as it was possible to check, the sample appeared, by and large, to be comparable with the general population in terms of gender distribution, age and ethnicity as reported by

the Dutch Central Bureau of Statistics (36). Second, although virtually all fear curves displayed a similar age-related picture, interpretation of findings on differences between individuals of different ages on the basis of cross-sectional data should be interpreted with caution (51). Third, the current study used a questionnaire to assess fears and phobias. In view of the sample size, respondent burden, time and logistical constraints involving resources required, clinical interviews are often not feasible. However, the Phobia Checklist for dental treatment phobia used in the present study was directly compared with the Structured Clinical Interview for DSM-IV (35) as the 'gold standard', and the results suggest an adequate ability to estimate the population prevalence accurately. Fourth, the present study relied upon the subject's own evaluation of whether or not the fears they experienced were greater than justified or whether they caused daily impairment. The central element of a specific phobia diagnosis in terms of DSM is the criterion that the severity of the fear should significantly interfere with the person's normal functioning. However, the DSM-specific phobia algorithm provides no gold standard of fear severity or clear threshold indicating when a fear of an object or situation meets the criteria 'marked', 'persistent', 'excessive' or 'significantly interfering'. This makes it difficult to differentiate a fear from a phobia in clinical situations, particularly because individuals with specific phobias adjust their lifestyle so that they can completely avoid or at least minimize the contact with their phobic stimulus. The variations in the way cases are defined also have the potential to affect, adversely estimates of prevalence in epidemiological studies. For example, in the study of AGRAS *et al.* (3), most of the phobias were classified as mildly disabling, and when phobias were classified as 'severe' the prevalence rate dropped from 7.9 to 0.2%.

In conclusion, dental fears and phobias are seemingly familiar, prevalent phenomena, which begin in middle childhood and persist into middle and older adulthood. The observations of dental phobia being the most prevalent phobia subtype, and dental fear not only being the most severe fear, but also the fear most

strongly associated with re-experiencing, are intriguing, and warrant replication in other populations.

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