Clin Oral Invest (2006) 10: 84–91
DOI 10.1007/s00784-006-0035-6

ORIGINAL ARTICLE

Norbert Enkling · G. Marwinski · P. Jöhren

Dental anxiety in a representative sample of residents of a large German city

Received: 3 December 2004 / Accepted: 4 January 2006 / Published online: 14 February 2006
© Springer-Verlag 2006

Abstract In a demographic survey, 300 residents of a German city were questioned to determine the prevalence of dental anxiety. The correlation between the amount of dental anxiety and the age, sex, and education of the subjects was examined and the reasons for avoiding dentist's appointments, the duration of this avoidance, and what the subjects desire from future dental treatment. The Hierarchical Anxiety Questionnaire (HAQ) was used to measure the amount of dental anxiety. The average level of anxiety was 28.8±10.1 according to the HAQ. Young people were more afraid than older people (p=0.007), and women were more anxious than men (p=0.004). Of the women, 72% go to the dentist regularly, but only 60% of the men do (p=0.020). A painful experience while receiving dental treatment was given by 67% as the main reason for their dental anxiety, followed by a fear of needles (35%). The people wished for the most accurate information available about the dental treatment they receive (69%), followed by a compassionate dentist (62%), and treatment that is free of pain (62%). Of the people, 11% [95% CI: (7.5%; 14.5%)] suffer from dental phobia. All dental phobics were able to state the cause of their fear and more urgently wished for help from the dentist in overcoming their anxiety than the non-phobics (p=0.030). To satisfy the needs of the phobic patients, it appears necessary to screen the phobics out of the group of all patients and then offer them adequate therapy, or refer these patients to specialised treatment centres.

Keywords Dental anxiety/phobia · Prevalence · Hierarchical anxiety questionnaire

N. Enkling · P. Jöhren (✉)
Department of Oral Surgery, Faculty of Dental Medicine, University of Witten/Herdecke, Augusta- Kranken- Anstalt, Bergstrasse 26, 44791 Bochum, Germany
e-mail: hp.joehren@t-online.de
Tel.: +49-234-5839228
Fax: +49-234-5840085

N. Enkling
Department of Oral Surgery, University of Witten/Herdecke, Augusta- Kranken-Anstalt, Bergstrasse 26, 44791 Bochum, Germany

G. Marwinski
Dental office, Alleestrasse 46, 44793 Bochum, Germany

Introduction

Fear of dental treatment is widespread among the populace and appears in varying degrees [2, 27]. The terms "dental anxiety" and "dental phobia" are not used uniformly in the relevant literature, and the border between them is blurred. We, therefore, differentiate between dental anxiety and pathological dental phobia, which are defined in the following:

Dental anxiety is the term used to apply to all psychological and physiological variations of a more or less strong but not pathological feeling of fear in conjunction with a dentist's appointment or stimuli relating to dental treatment.

Pathological dental phobia is characterised by the avoidance of dental treatment in addition to a high level of anxiety [23, 38]. Dental phobia can be classified as a specific phobia according to DSM IV because it demonstrates the following characteristics [1]:

- The person is in constant fear of the described stimulus.
- At some time in the course of the disorder, a confrontation with the specific stimulus triggers an almost immediate, unpreventable fear reaction.
- The triggering stimulus is usually avoided.
- The person's daily routine is greatly affected by the anxiety or pattern of avoidance.
- The person with the disorder realises that the fear is exaggerated and unreasonable.

At a dentist's office, both normal fear and dental phobia are omnipresent and have very significant influence on the dental treatment provided and on the practising dentist [16, 17, 25, 44]. Anxiety before a dentist's appointment and the

resulting inability to provide the patient with preventive care is one of the largest obstacles on the way to achieving ideal dental health [19].

The English dental anxiety scale (DAS) according to Corah [8, 9] is the anxiety scale most commonly used internationally in dental medicine. A disadvantage of the DAS, however, is that no additional information is supplied regarding what the patient specifically fears. This has lead to the development of a number of additional questionnaires for detailed diagnostics of dental anxiety. One example of these questionnaires is the Hierarchical Anxiety Questionnaire (HAQ) according to Jöhren, which is widely used in the German-speaking world. The HAQ has already been validated in the past in comparison with the DAS: a high correlation between the HAQ and the DAS could be demonstrated using the Spearman's correlation coefficient (r=0.88, p<0.01) [20].

Previous studies of dental anxiety give reason to conclude that not all social groups fear dental treatment equally. The age and sex, and the social status, can affect the level of anxiety: younger people are more afraid of dental treatment than older people [10]. Women questioned in previous studies stated higher levels of anxiety than men [7, 8, 18, 41]. In terms of education, there is evidence that suggests there is a correlation between the socio-economic environment and the level of fear of dental treatment [20, 33, 36]. Fear of dental treatment can have many different causes: a traumatic experience in connection with dental treatment is the main reason for the emergence of fear of dental treatment and its development into a pathological form of fear [26]. The family environment (in the sense of the theory of model learning) and stories told by people in their social environment are considered to have an influence on the emergence of fear and its development into the varying degrees of dental anxiety [24]. The Preparedness Theory in which a biological disposition of the affected person causes the person to react earlier with fear in certain situations than other individuals explains why some patients cannot state why they are afraid [28, 32]. According to the data, the prevalence of dental anxiety depends on ethnological factors [14, 37] and the prevalence of persons with high levels of dental anxiety varies between 4% [18, 39] and over 20% [5, 11, 16, 39], with most studies reporting values below 10% [11–13, 34].

The prevalence of dental anxiety and phobia in Germany has barely been studied. Only three surveys have been conducted with patients while at the dentist to receive dental treatment, and these surveys show that approximately 10% of the population suffers from dental phobia and only go to the dentist to get treatment when the pain becomes unbearable [3, 25, 30]. These studies are not representative of the general population because people suffering from dental phobia, who are characterised by their avoidance of situations involving dental treatment if possible, are not taken into account. It is estimated that 7–10% of the German population do not go to the dentist and that 75% of all cases of dental disease are concentrated in 25% of the population [4].

Table 1 Hierarchical Anxiety Questionnaire (HAQ) (with the distribution of answers)

	Relaxed	Nervous	Tense	Anxious	Nauseous from anxiety
How do you feel when you imagine you have to go to the dentist tomorrow?	46.33, n=139	32.00, n=96	10.67, n=32	7.67, n=23	3.33, n=10
You are sitting in the waiting room and are waiting to be called. How do you feel?	40.33, n=121	27.00, n=81	20.67, n=62	7.67, n=23	4.33, n=13
Imagine you are entering the room where treatment will be provided and you can smell the typical odours.	38.67, n=116	25.33, n=76	20.67, n=62	8.00, n=24	7.33, n=22
You are lying in the dentist's chair and the dentist enters the room.	35.67, n=107	26.67, n=80	21.67, n=65	8.67, n=26	7.33, n=22
You and your dentist are looking at the X-rays and discussing what work needs to be done.	45.00, n=135	29.00, n=87	16.70, n=50	6.67, n=20	2.67, n=8
How do you feel when your dentist tells you that he or she will now clean the tartar off your teeth?	34.00, n=102	27.67, n=83	22.33, n=67	12.00, n=36	4.00, n=12
The dentist tells you that you have a cavity and that he or she will now treat it.	16.00, n=48	26.00, n=78	29.00, n=87	21.67, n=65	7.33, n=22
The dentist changes the position of your chair and prepares an injection.	14.67, n=44	23.33, n=70	31.00, n=93	20.33, n=61	10.67, n=32
Imagine you hear the typical sound of a dentist's drill. How do you feel?	7.67, n=23	18.67, n=56	31.67, n=95	27.67, n=83	14.33, n=43
The dentist tells you that the cavity is too deep and the tooth must be removed.	5.33, n=16	10.00, n=30	28.33, n=85	33.33, n=100	23.00, n=69
One of your wisdom teeth is to be removed; the injection has already been given. The dentist picks up the scalpel.	6.33, n=19	8.00, n=24	22.00, n=66	33.67, n=101	30.00, n=90

Please take your time and imagine you are in the situations described above, and then place an "X" in the box of the questionnaire corresponding to how you feel

Aim

This survey is the first representative survey in terms of sex, age, and education level to provide data on the prevalence of dental anxiety and dental phobia in the German population. In addition, the survey also examined the reasons for the anxiety and the avoidance of dental treatment and the expectations of the sample pool in terms of receiving the best possible dental treatment.

Materials and methods

The demographic survey was performed by an independent marketing research institute (Equipe Marktforschung Bochum) by conducting 300 standardised interviews in October 2003 in the pedestrian zone in Bochum, Germany. When the sample size is 300, a two-sided 95% confidence interval for a single proportion using the large-sample normal approximation will extend 0.034 from the observed proportion for an expected proportion of 0.1. The pedestrians were selected to reflect the population structure in terms of sex, age, and education according to the most recent data available from the "Statistisches Bundesamtes" (German National Bureau of Economic Research). Four levels consisting of no leaving certificate, general secondary school certificate (Hauptschule), modern secondary school certificate (Realschule), and senior secondary school certificate (Abitur) were created to specify the level of education.

To avoid shocking pedestrians with high levels of anxiety and exposing their fear, the interview was initiated very gently. During the 15-min interview, a standardised questionnaire containing the following five sections was filled out by all 300 subjects:

1) Duration of avoidance of dental treatment, reasons for avoidance
2) Hierarchical Anxiety Questionnaire
3) Wishes relating to optimal dental treatment
4) Reasons for the anxiety. In this case multiple responses were permitted.

The HAQ consists of 11 questions and contains six treatment situations representing the situations that most often trigger anxiety when treating a patient [15]. These 11 questions can be responded to with one of five different levels of anxiety resulting in a minimum score of 11 and a maximum score of 55 points (see Table 1). The patients are divided into three groups:

Group 1	low level of anxiety to 30 points
Group 2	medium level of anxiety from 31 to 38 points
Group 3	high level of anxiety > 38 points" "

A diagnosis of dental phobia is given for an anxiety score of over 38 points in conjunction with simultaneous anamnestic avoidance of dental treatment for more than 2 years [20, 22].

To determine the reasons for the fear of dental treatment, the pedestrians should answer the question "How did your fear of the dentist arise?". Possible answers were given: "One or both parents are afraid of going to the dentist", due to "Treatment received from an orthodontist", "Painful experiences during an appointment at the dentist", "Fear of needles", "Fear of doctors", "Unknown", "Other". If the subjects stated in the HAQ, that they have no fear, the expected answer was "No reason".

If the avoidance of dental treatment was proven, the pedestrian had to answer the question: "Why don't you go to the dentist regularly?". Possible answers were: "Lack of time", "Fear", "Relocated", "Cost/Money", "Others".

The following two questions were formulated with possible answers provided to determine what the pedestrians desired from optimal dental treatment. The pedestrians should select from the five qualities "always", "usually", "often", "seldom" and "never" in response to each of the suggestions:

"How would you like your dentist to react to your nervousness/anxiety?"

a) He/she should talk to me about my anxiety.
b) He/she should help me stay calm and relaxed.
c) He/she should take breaks.
d) Precise information on the length, type, and overall duration of the treatment.
e) The dentist should treat me without pain.
f) The dentist should be compassionate.
g) He/she should allow me to interrupt treatment.
h) He/she should give me the feeling that I have complete control over what happens when I am in the dentist's chair.
i) He/she should offer me aids to help me overcome my fear.

"Which aids do you have in mind to help overcome your anxiety?"

a) Acupuncture
b) Hypnosis
c) Psychotherapy
d) Premedication/sedative
e) Treatment while under anaesthetic
f) Other aids

The results of the survey were evaluated for the entire sample pool and to compare the phobics to the non-phobics.

The statistical evaluation of the data was performed together with the "Institut für Forschung und Entwicklung Witten" in Germany using the SAS, Release 8.2. Measures of location and of dispersion and absolute and relative frequencies were used to graphically present the data. The Wilcoxon Rank Sum Test, the Kruskal–Wallis Test, and the Chi^2 Test were used to compare the different groups. All statistical tests were used for explorative data analysis. All *p*-values were interpreted in an explorative way.

Results

A total of 144 male (48.0%) and 156 female (52.0%) pedestrians took part in the survey. The pedestrians were divided into age groups spanning 10 years: 66 pedestrians (22.0%) were between 20 and 30 years old, 88 (29.3%) persons were between 31 and 40 years old, 80 (26.7%) were between 41 and 50 years old and 66 (22.0%) subjects were between 51 and 60 years old. Of the people surveyed, 8 (2.7%) did not finish any secondary school, 110 (36.9%) had a general secondary school certificate, 100 (33.6%) had a modern secondary school certificate, and 80 (26.8%) had a senior secondary school certificate.

The level of anxiety of the entire sample pool was an average of 28.8±10.1 with a median of 28 in the HAQ. According to the HAQ, 60% of the people surveyed had a low level of anxiety, 23% a medium level of anxiety, and 17% a high level of anxiety. Six pedestrians received the minimum HAQ score of 11. The estimate of the prevalence of the phobia is 11% [95% CI: (7.5%; 14.5%)].

When divided into the groups "phobics" and "non-phobics", the non-phobics had an average of 26.8±8.7 and a median of 26 in the HAQ. The phobics had an average HAQ value of 45±4.6 with a median of 45 (see Fig. 1).

A correlation between the age of the person and the level of dental anxiety was demonstrated when the entire sample pool was examined: older patients were less fearful (p=0.007). The maximum score of an average of 31.1 was found for the group of 20- to 30-year-olds, the minimum score of 25.5 was found for the group of 51- to 60-year-old pedestrians according to the HAQ. (see Fig. 2).

Women generally claimed to have significantly more anxiety than men. The average value for women in the HAQ was 30.4, while for men it was 27.1 (p=0.004). The level of education, determined by the type of school leaving certificate received, had no demonstrable influence on the level of anxiety before a dentist's appointment.

There were statistically significant (p=0.0199), gender-specific differences in the responses to the question of whether or not the person goes to the dentist regularly (at least once a year): more women (72%, n=113) than men (60%, n=86) stated that they go regularly to the dentist. Of the people surveyed (n=101), 34% stated that they do not visit the dentist regularly and justified this most frequently by a large margin with anxiety (70%, n=71) followed by a lack of time (38%, n=38), and cost/money (17%, n=17). (see Fig. 3). When the correlation between the level of anxiety and the time since the last dental appointment are examined, it can be seen in the HAQ (p<0.0001) that the level of anxiety of dental treatment correlates with the length of the avoidance period: the level of anxiety was the lowest for those whose last dentist's appointment was less than 1 year ago. The level of anxiety rises as the length of time the person has avoided dental treatment increases (see Fig. 4).

The following lists the reasons given for fear of dental treatment in order of decreasing frequency: "Painful experiences during an appointment at the dentist" 67% (n=202), "Fear of needles" 35% (n=105), due to "Treatment received from an orthodontist" 21% (n=62), "One or both parents are afraid of going to the dentist" 15% (n=45), "Fear of doctors" 12% (n=37), "Unknown" 16% (n=47), "Other" 13% (n=40). Figure 5 shows the distribution of the response "always" to the question of what the patients want in future dental treatment.

"Precise information on the length, type, and overall duration of the treatment" with 69% (n=206) followed by

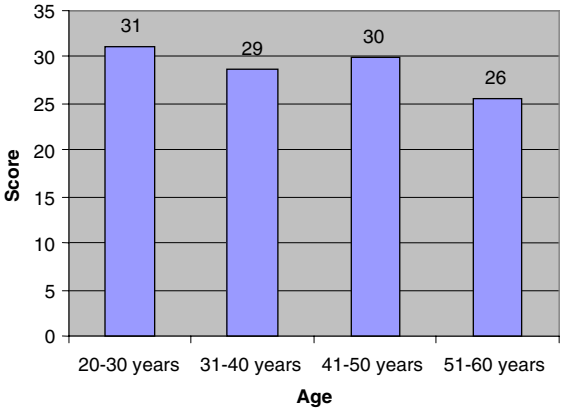

Fig. 2 Mean level of anxiety (HAQ) by age

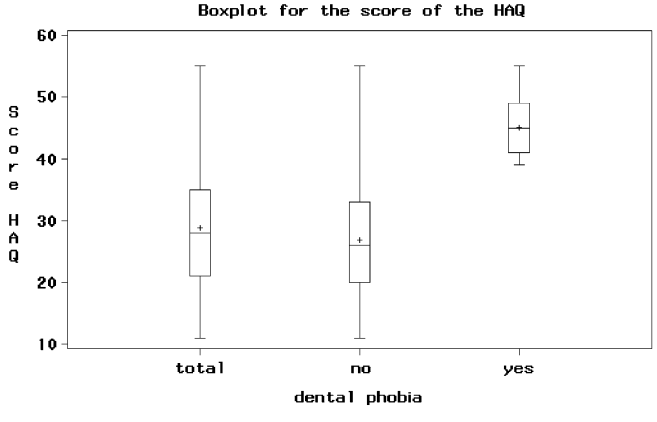

Fig. 1 Box plots of the results of the HAQ for all persons surveyed, divided into phobics and non-phobics

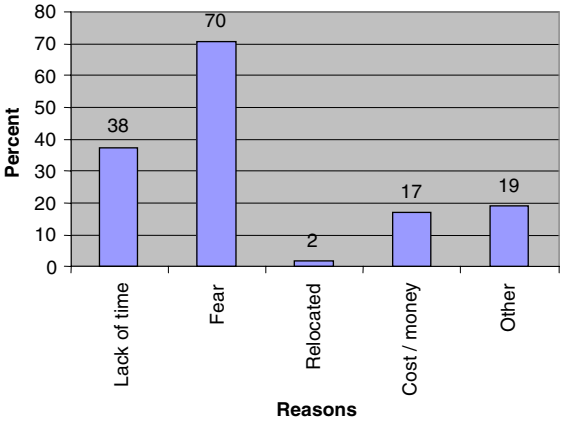

Fig. 3 Reasons for avoidance

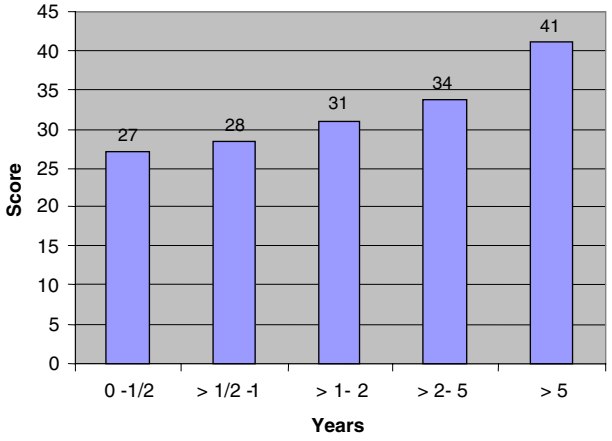

Fig. 4 Mean level of anxiety (HAQ) by time of avoidance

"the dentist should be compassionate" with 62% (n=185), "the dentist should treat me without pain" with 58% (n=174), and "the dentist should help me stay calm and relaxed" with 53% (n=159) were "always" desired by more than half of the people surveyed. In the overall sample pool, only 32% want their dentist to provide tools to reduce anxiety, and only 20% wanted the dentist to take frequent breaks.

The question of what the people surveyed wanted, to help reduce their anxiety, was responded to with "always" with the distribution shown in Fig. 6: Premedication and sedative with 20% (n=60), treatment under general anaesthetic with 18% (n=55), and acupuncture with 15% (n=44) were the most commonly requested types of aid. Hypnosis with 9% (n=27) and psychotherapy with 5% (n=14) were seldom desired, on the other hand. Music was the most frequent response under "Other aids" from the people surveyed (n=20).

When the sample pool was divided into phobics (n=33) and non-phobics (n=267), a statistically significant difference was shown between the two groups in terms of the types of tools desired to overcome their anxiety (p=0.030). The phobics much more strongly desired all aids offered for selection (except for acupuncture) than the non-phobics. The differences were most pronounced in the requests for hypnosis (p=0.0003) and general anaesthetics (p=0.017). The phobics replied with "always" most frequently under "premedication and sedative" (n=13) and "treatment under general anaesthetic" (n=13) followed by "hypnosis" (n=9), "acupuncture" (n=7) and "psychotherapy" (n=5).

Differences between the phobics and non-phobics were also found with respect to the causes of their anxiety. "Trauma" (p=0.008) and "needles" (p<0.0001) were significantly more frequently stated as the reason. The phobics also significantly more frequently stated they had a fear of doctors in general (p=0.006). All 47 pedestrians who could not specify any reason for their fear were non-phobics: n=3 subjects were suffering from high level of dental fear (HAQ>38), n=4 persons had a medium-high level of fear (HAQ 31–38), and n=40 persons had a low level of fear (HAQ<31). On the other hand, all 33 phobics were able to state one cause for their fear of dental treatment, which differentiates them significantly from the non-phobics (p=0.009). Phobics provided more detailed responses as to why they are afraid of dental treatment than non-phobics: 90.9% of the phobics and only 46.1% of the non-phobics provided more than one reason for their fear (p<0.0001).

Discussion

Only six pedestrians received the minimum HAQ score of 11, and therefore 98% of the pedestrians are tense or nervous at some time while receiving dental treatment. Studies [3, 25, 30] that have shown that approximately 10% of the patients in Germany interviewed suffer from high dental anxiety or dental phobia have been confirmed by the present survey: the percentage of people with high dental anxiety was 17% and with dental phobia was 11% [95% CI: (7.5%; 14.5%)] although it should be noted that this study represents the total German population in terms

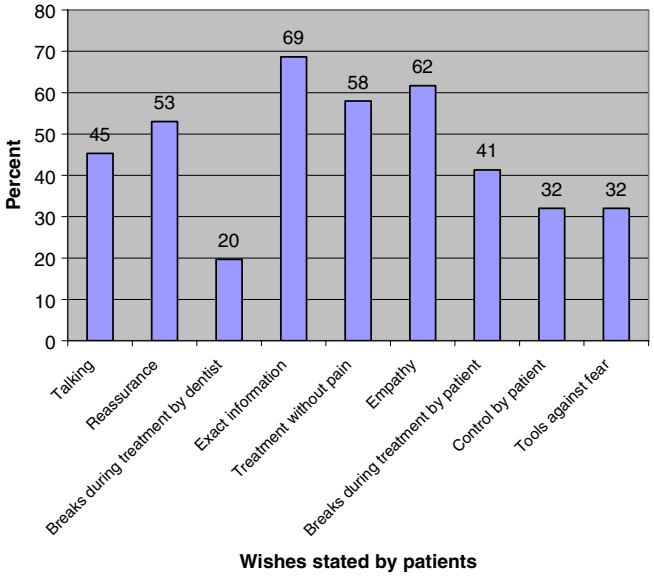

Fig. 5 Wishes of patients for dealing with anxiety by dentist

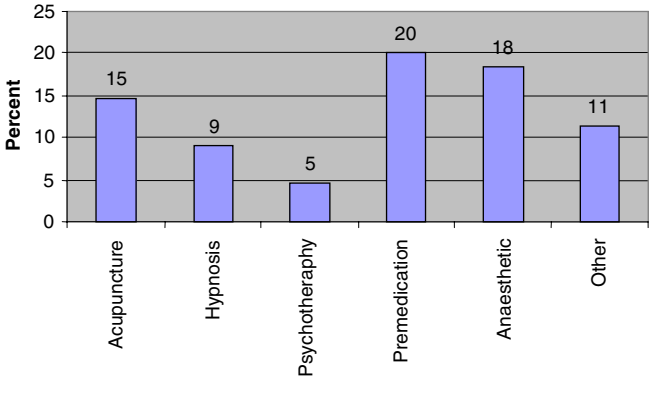

Fig. 6 Tools to overcome anxiety

of sex, age, and education distribution and is not only valid for a certain group of patients. When compared to the prevalence of dental phobia in other western countries, the values determined here are in the upper reference range. The reason for this is that phobics, who are otherwise inaccessible, could also be interviewed due to the design of the study. In our study, we made sure that only pedestrians with a German heritage were interviewed to filter out any special cultural and ethnological differences [14, 37]. The public health system, which was more strongly oriented towards curative measures and not preventative measures in the past (no fluoride in drinking water), has lead to many Germans having experienced extensive dental treatment. The percentage of pedestrians who developed a fear of dental treatment due to orthodontic treatment (21%) can also be explained by our German public health system in which, in the past, every child was offered free orthodontic treatment. The prosthetic restorations performed extensively in the past by crowning a number of teeth, financed by the public health system, have also resulted in traumatic experiences that could explain the high number of highly fearful patients in Germany as compared to the results from studies performed in other countries.

The present study confirms previous results: younger people are more afraid of dental treatment than older people [10]. The group of 20- to 30-year-olds showed the highest level of fear of dental treatment. This is surprising since 20- to 30-year-olds today should have had fewer bad experiences during dental treatment than older people due to the introduction of individual and group preventive measures. In correspondence to the results of previous studies, the women questioned in this study also stated higher levels of anxiety than the men questioned [17, 20, 30]. This result must be evaluated critically, though, as women may simply be more willing to admit and express their feelings of fear in conjunction with dental treatment. The women in this study show higher levels of anxiety, but at the same time they also go regularly to the dentist. This discrepancy in the results could be due to the fact that men are less able to admit to their fear due to the role assigned to them by society [34, 35, 41, 43]. This interpretation is supported by the fact that "fear" was stated as the main reason for not seeing a dentist regularly and that previous studies have shown that fear was mainly responsible for putting off dental treatment [6, 13]. Intercultural studies show that the level of anxiety in women is more likely to have a constant value, while the men provided a wide range of different responses in terms of their level of anxiety depending on their cultural background [14, 37].

Another study [29] confirmed a connection between the state of the persons' oral hygiene and their socio-economic standing in that patients with less education were more likely to have missing, damaged, and carious teeth [42]. This group of people should, therefore, have more reason to be excessively fearful of dental treatment, but in terms of education, no statistically significant differences could be found.

Furthermore, this study also confirms that a traumatic experience in connection with dental treatment is the main reason for the emergence of fear of dental treatment and its development into a pathological form of fear [26]. Even the family environment (in the sense of the theory of model learning) and stories told by people in their social environment are considered to have an influence on the emergence of fear and its development into the varying degrees of dental anxiety [24]. This theory is supported by the 15% of the people surveyed that stated their fear was caused by the fear of at least one parent. It is surprising that 21% (n=62) of the people surveyed gave orthodontists as the reason for the emergence of their fear. Future studies should be conducted to determine which types of treatment by orthodontists triggered the anxiety so that corresponding treatment instructions can be formulated.

One third of the people surveyed specified fear of needles as the reason for their anxiety. This result confirms the results of other studies that determined that the needle is still one of the main stimuli that invokes fear in connection with dental treatment [20]. Another 16% of the sample pool cannot explain their fear. This result supports the Preparedness Theory in which a biological disposition of the affected person causes the person to react earlier with fear in certain situations than other individuals [28, 32]. Of the 47 pedestrians who could not specify any reason for their fear, n=3 subjects were suffering from high levels of dental fear (HAQ>38), n=4 persons had a medium-high level of fear (HAQ 31–38) and n=40 persons had a low level of fear (HAQ<31). The maximum value among the subjects of 55 in the HAQ was obtained by one pedestrian who couldn't state any reason for his fear. All phobics, on the other hand, were able to state a reason for their strong fear: in comparison to the non-phobics, the phobics have a much higher fear of doctors in general, have experienced several traumas and in particular, demonstrate more fear of needles and injections. The development of pathological dental phobia appears to have multiple causes, and the reasons for the development of fear appear to be understood by the affected patients.

The desire of the patients for additional tools such as treatment under a general anaesthetic or for premedication stands in contrast to the fact that it has been proven in various studies that only non-medical, primarily anxiolytic methods are able to provide therapy for, and in the long term, eliminate the dental anxiety that is the basis for the avoidance response [10]. However, only 4% of the people surveyed selected the psychotherapeutic treatments listed as the method of first choice for treating their anxiety. When comparing the responses of the phobics to those of the non-phobics, it can be seen how important it is to provide additional aids to overcome anxiety, especially for the group of patients with dental phobia. In particular, premedication and general anaesthetics, and hypnosis, were requested most frequently by this group and represent the desire to feel as little pain as possible during treatment. The fact that phobics significantly, more frequently, selected psychotherapy as an aid, may allow us to suppose that this group of patients has more closely examined the idea of therapy for their dental anxiety and, therefore, has obtained more information on the subject. The only aid to

overcoming anxiety that the phobics did not request significantly, more frequently, compared to the non-phobics, was acupuncture. The explanation for this may be that the fear of needles and, therefore, of acupuncture needles, was significantly higher among the phobics. In this study it could not be demonstrated that phobics have a higher need for control with respect to dental treatment than the non-phobics. A higher need for control and a discrepancy between the amount of control expected and the actual amount experienced were identified in another study as the main reason why phobics interrupted dental treatment [21].

The high prevalence of dental phobia and the widespread fear relating to dental treatment also demonstrates how important routine fear diagnostics are in dental practises.

The use of an anxiety questionnaire like the HAQ allows for a more explicit case history of the anxiety. Questionnaires can therefore become an important resource to obtain an indication of the level of fear of dental treatment or of the presence of dental phobia.

The desire for "information on the length, type, and overall duration of the treatment" was stated most frequently in this study, followed by the desire for "a compassionate dentist". In addition to the desire for freedom from pain during treatment, the people surveyed also constantly demanded that the dentist be compassionate, and that the fears of the patient are taken into consideration in the dentist's chair. This emotional component of the therapy on the patients has already been designated as "emotional effort" [40]. Patients, therefore, also judge the quality of their dentist according to the quality of his or her interpersonal skills. It has been shown that dentists who have not had any education in psychology often take incorrect, counter-productive measures when they encounter a so-called "problem patient" [31].

According to our studies, persons with dental phobia have different demands and expectations, in terms of what additional aids they desire, to overcome anxiety. However, to satisfy the needs of these patients, it appears necessary to screen the phobics out of the group of all patients and then offer them adequate therapy or refer these patients to specialised treatment centres.

References

1. (1994) Diagnostic and statistical manual IV: diagnostic criteria from DSM-IV. American Psychiatric Association, Washington, D.C
2. Agras S, Sylvester D, Oliveau D (1969) The epidemiology of common fears and phobia. Compr Psychiatry 10:151–156
3. Azrak B, Willershausen B, Keller G (1998) Befragung der Patienten zur Akzeptanz der zahnärztlichen Behandlung in der Universitätsklinik 6:171–186
4. Barkowski D, Bartsch N, Bauch J (1996) Lebenslage, Salutogenese und erhöhtes Kariesrisiko. Prävention 19:103–106
5. Berggren U (1984) Dental fear and avoidance. Thesis, University of Gotenburg, Sweden
6. Berggren U, Carlsson SG (1984) A psychological therapy for dental fear. Behav Res Ther 22:487–492
7. Berggren U, Linde A (1984) Dental fear and avoidance: a comparison of two modes of treatment. J Dent Res 63:1223–1227
8. Corah NL (1969) Development of a dental anxiety scale. J Dent Res 48:596–602
9. Corah NL, Gale EN, Illig SJ (1978) Assesment of a dental anxiety scale. J Am Dent Assoc 97:816–819
10. De Jongh A, Muris P, Ter Horst G, Van Zuuren F, Schoenmakers N, Makkes P (1995) One-session treatment of dental phobia: preparing dental phobics for treatment by reconstructuring negative cognitions. Behav Res Ther 33:947–954
11. Doerr PA, Lang WP, Nyquist LV, Ronis DL (1998) Factors associated with dental anxiety. J Am Dent Assoc 129: 1111–1119
12. Duivenvoorden HJ, Schuurs AH, Thoden v, V, Verhage F, Makkes PC, Eijkman MA (1985) Influence of repression upon the measurement of dental anxiety. Community Dent Oral Epidemiol 13:315–318
13. Fiset L, Milgrom P, Weinstein P, Melnick S (1989) Common fears and their relationship to dental fear and utilization of the dentist. Anesth Prog 36:258–264
14. Fuks AB, Steinbock N, Zadik D (1993) The influence of social and ethnic factors on dental care habits and dental anxiety: a study in Israel. Int J Paediatr Dent 3:3–7
15. Gale EN (1972) Fears of the dental situation. J Dent Res 51:964–966
16. Gatchel RJ, Ingersoll BD, Bowman L, Robertson MC, Walker C (1983) The prevalence of dental fear and avoidance: a recent survey study. J Am Dent Assoc 107:609–610
17. Hakeberg M (1992) Dental anxiety and health. Thesis, University of Gotenburg, Sweden
18. Hakeberg M, Berggren U, Carlsson SG (1992) Prevalence of dental anxiety in an adult population in a major urban area in Sweden. Community Dent Oral Epidemiol 20:97–101
19. Hakeberg M, Gustafsson JE, Berggren U, Carlsson SG (1995) Multivariate analysis of fears in dental phobic patients according to a reduced FSS-II scale. Eur J Oral Sci 103:339–344
20. Jöhren P (1999) Validierung eines Fragebogens zur Erkennung von Zahnbehandlungsangst. Zahnärzteblatt 108:104–114
21. Jöhren P, Enkling N, Sartory G (2005) Prädiktoren des Vermeidungsverhalten bei Zahnbehandlungsphobie. Dtsch Zahnärztl Z 60:161–165
22. Jöhren P, Gängler P (1999) Die Diagnostik der Zahnbehandlungsangst und der Zahnbehandlungsphobie. Zahnärztl Welt 108:668–685
23. Jöhren P, Margraf-Stiksrud J (2002) Zahnbehandlungsangst und Zahnbehandlungsphobie bei Erwachsenen. Stellungnahme der DGZMK. Deutsch Zahnärztl Z 57:9–10
24. Kleinknecht RA, Klepac RK, Alexander DA (1973) Origins and characteristics of fear of dentistry. J Am Dent Assoc 86:842–847
25. Kunzelmann K-H, Dünninger P (1990) Dental fear and pain: effect on patient's perception of the dentist. Community Dent Oral Epidemiol 18:264–266
26. Lindsay SJE, Jackson C (1993) Fear of routine dental treatment in adults: its nature and management. Psychol Health 8:135–153
27. Malamed SF (1993) Pain and anxiety control in dentistry. J Calif Dent Assoc 21:35–39
28. McNally RJ (1987) Preparedness and phobias: a review. Psychol Bull 101:283–303
29. Mehrstedt M, Tönnies S, Eisentraut I (2002) Zahnbehandlungsängste, Gesundheitszustand und Lebensqualität. Verhaltenstherapie und Verhaltensmedizin 23:329–340
30. Micheelis W, Bauch J (1991) Mundgesundheitszustand und -verhalten in der BRD. Deutscher Ärzteverlag, Köln
31. Milgrom P, Fiset L, Melnick S, Weinstein P (1988) The prevalence and practice management consequences of dental fear in a major US city. J Am Dent Assoc 116:641–647

32. Mineka S, Ohman A (2002) Phobias and preparedness: the selective, automatic, and encapsulated nature of fear. Biol Psychiatry 52:927–937
33. Moore R, Birn H, Kirkegaard E, Brodsgaard I, Scheutz F (1993) Prevalence and characteristics of dental anxiety in Danish adults. Community Dent Oral Epidemiol 21:292–296
34. Neverlien PO (1990) Normative data for Corah's Dental Anxiety Scale (DAS) for the Norwegian adult population. Community Dent Oral Epidemiol 18:162
35. Pierce KA, Kirkpatrick DR (1992) Do men lie on fear surveys? Behav Res Ther 30:415–418
36. Ragnarsson E (1998) Dental fear and anxiety in an adult Icelandic population. Acta Odontol Scand 56:100–104
37. Schwarz E, Birn H (1995) Dental anxiety in Danish and Chinese adults—a cross-cultural perspective. Soc Sci Med 41:123–130
38. Slovin M (1997) Managing the anxious and phobic dental patient. N Y State Dent J 63:36–40
39. Stouthard ME, Hoogstraten J (1990) Prevalence of dental anxiety in The Netherlands. Community Dent Oral Epidemiol 18:139–142
40. Strauss A, Fagerhough S, Suczek B, Wiener C (1980) Gefühlsarbeit. Ein Beitrag zur Arbeits- und Berufssoziologie. KZfSS 32:629–651
41. Thomson WM, Stewart JF, Carter KD, Spencer AJ (1996) Dental anxiety among Australians. Int Dent J 46:320–324
42. Wetzel W-E, Hüge I, Ehret R (1984) Soziostrukturelle Einflüsse auf die Gebißgesundheit 13-14 jähriger Schulkinder. Dtsch Zahnärztl Z 39:456–460
43. Willershausen B, Azrak A, Wilms S (1999) Fear of dental treatment and its possible effects on oral health. Eur J Med Res 4:72–77
44. Zerfowski M, Koch MJ, Niekusch U, Staehle HJ (1997) Caries prevalence and treatment needs of 7- to 10-year-old school-children in southwestern Germany. Community Dent Oral Epidemiol 25:348–351