

RESEARCH ARTICLE

The Hierarchical Anxiety Questionnaire - 20 Years of Experience in The Diagnosis of Dental Anxiety and Dental Phobia. A Systematic Literature Search

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Abstract

Objectives: The present paper presents the most important studies in the last 20 years on the diagnosis of dental anxiety using the Hierarchical Anxiety Questionnaire.

Material and Methods: 8929 articles that were selected for the development of the German guidelines for “Dental Anxiety in Adults” in PubMed, Web of Science, Embase and Medpilot were filtered for diagnosis of DA disorder. The focus for this review was on the use of the Hierarchical Anxiety Questionnaire (HAQ) to measure DA levels. The most important studies are presented together with their materials and methods, discussions of the results, and summaries.

Results: The HAQ is not only suitable for diagnosis of anxiety in adults patients, but is also suitable for adolescents over 14 years of age. However, a decisive advantage in terms of the therapy to be planned is that it is possible with the HAQ to formulate the tentative diagnosis of dental phobia, i.e. pathological dental anxiety. Patients with an anxiety score over 38 who have also avoided dental treatment for more than 2 years very likely have an anxiety disorder, and a psychologist/behavioral therapist should be consulted accordingly in such cases.

Conclusions: The questionnaire is a highly validated instrument for measuring the level of dental anxiety of patients during the anamnesis prior to dental treatment. It is necessary in this context to differentiate between non-pathological dental anxiety and dental phobia.

Clinical Relevance: The anamnesis conducted in the context of the initial examination of a new patient should always include diagnostics for the assessment of dental anxiety.

Keywords: Dental Anxiety; Dental Anxious; Dental Phobia; Dental Phobics; Dento Phobia; Dental Fear; Oral Phobia

Introduction

Fear of dental treatment is still considered by many patients, but also by dentists, as an unavoidable evil, and the real magnitude of this fear is usually unknown when starting therapy. However, dentists are under more stress and exhibit greater stress reactions precisely when treating patients with high levels of fear or pathological anxiety disorders [1]. Providing anxious patients with dental treatment is characterized by time-consuming procedures, difficult interactions, and easily scared patients in combination with a higher risk of accidents, feelings of being inadequate on the part of the dentist, and higher costs as a result of appointments that are frequently missed [2].

For this reason, adequate and significantly less stressful treatment of the anxious patient is only possible if the extent of his or her anxiety is taken into account in the anamnesis in addition to the somatic disorders. Even asking the patient if they may have an anxiety disorder before treatment can help alleviate anxiety since patients generally feel more comfortable in the dental practice or clinic. Knowledge of the existence of additional comorbid anxiety disorders is also an important foundation in this context for the success of further treatment [3].

Because anxiety is a cognitive, emotional, and physical reaction to a dangerous situation or to the expectation of a dangerous or threatening situation, the patient's fear response spans three levels – the physiological, the subjective, and the motoric or behavioral level [4]. For this reason, anxiety can be diagnosed at all three of these levels in terms of the complex response pattern [5].

Nowadays, though, it is generally agreed that the most reliable method for determining the level of anxiety before dental treatment in everyday dentistry is to question the patients affected [1,6]. This subjective level includes the anxiety experienced by the affected individual: apprehension, feelings of helplessness, the feeling of being at the dentist's mercy, thought patterns generated by anxiety, and therefore the associated subjective anxiety experience ("something bad is going to happen"). Even just imagining anxiety-inducing situations in the past or in the future or perceiving stimuli as potentially dangerous leads to physical reactions or behavior patterns. Systematic and comparative research of dental anxiety began with the development of standardized questionnaires. Questionnaires to determine the level of dental anxiety should be designed so that they document the level of anxiety continuously over time and independent of the interview situation. According to Glanzmann, this appears to be possible using a prospective questionnaire that describes specific situations to the patients ("Imagine you are ...") [7,8].

The Hierarchical Anxiety Questionnaire (HAQ, in German HAF), which has been in use for almost 20 years in Germany to diagnose anxiety in adults and to differentiate between anxiety and phobia, and which in the meantime is also being used to study anxiety in adolescents between the ages of 12 and 17, will be presented in the following [9,10,14].

Literature search

The systematic literature search was based on the 8929 articles used for the S3 guideline "Dental anxiety in adults". The following key words were used for the search connected with an "OR" or an "AND": "hierarchical anxiety questionnaire", "HAQ", "HAF", "Dental anxiety scale" and "dental anxiety questionnaire". The literature search was carried out in the PubMed, Web of Science (Core collection) and Embase databases. In consultation with each other, two reviewers carried out the electronic literature search. The literature management program Endnote was used to search and manage existing studies.

For the systematic literature review to draft the German Guideline "Dental Anxiety in adults" that was published in October 2019 [33].

The terms for the guideline and the present study were linked with "AND" or "OR" and the search was conducted for articles published until Oct 22th, 2015 without further date restrictions. Only requirement for inclusion was the availability of an abstract written in English or German language.

The literature search for the guideline was carried out in the databases PubMed, Web of Science (Core collection), and Embase. Two reviewers (CB, EF) carried out the electronic literature search using the literature administration program Endnote (Web of Science Group, Philadelphia, USA). The electronic search was complemented by manually browsing the bibliographies of the selected full texts, other systematic reviews and current meta-analyses.

In addition, publications in German language were searched with the help of “Medpilot” using the terms *Zahnarztangst* (dental fear), *Zahnbehandlungsangst* (dental treatment fear), *Zahnbehandlungsphobie* (dental treatment phobia), *Zahnarztphobie* (dentist phobia) and *Oralphobie* (oral phobia = generic term for all phobias related to the oral cavity).

Inclusion criteria

- Studies were included with patients who had “dental anxiety disorder or high dental fear”. These included:
 - DSM-IV [34] 300.29 (F40.23x) Blood-injection-injury (e.g., needles, invasive medical procedures) or
 - ICD-10 [35] F40.2 Specific (isolated) phobias
 - Definition of a cut-off score for high anxiety (questionnaire for dental anxiety; e.g.: *Dental Anxiety Score* (DAS) >15) [36]
- Studies involving patients with “unspecified dental fear/anxiety” but who did not meet the criteria for dental phobia (i.e. moderately anxious patients) or who did not have a homogeneous highly anxious sample based on an anxiety scale were also included.
- Randomised controlled trials (RCT):
 - Studies comparing interventions with control group (placebo, psychological placebo, waiting list)
- Studies comparing interventions with reference therapy
 - The reference therapy was defined as a therapy that has been shown to be effective in preliminary studies compared to a control group.
- Naturalistic open studies with comparison before- and after intervention
- Sample size: at least 10 evaluable patients per group (for a non-inferiority comparison, a minimum of 50 evaluable patients per study arm was required)
- Adults
- Use of scales that measure dental anxiety (e.g. DAS) or state anxiety in situations directly related to the dental treatment or the visit to the dentist (e.g. *State-Trait Anxiety Inventory-State* or *Visual Analogue Scale* (VAS) to assess the intensity of anxiety during dental treatment) [37,38]:
 - Studies whose results contribute to answering at least one of the above-mentioned guideline questions.
 - Match of quality criteria: For this purpose, a systematic approach was used, which is also found in the World Federation of Societies of Biological Psychiatry (WFSBP) guidelines [39]

Exclusion criteria:

- Reviews and case reports
- Insufficient study quality

- Lack of information on the results
- Lack of information on statistical parameters
- Insufficient statistical evaluation
- Studies in which one or more study groups contained less than 10 evaluable subjects
- Studies with unsuitable groups of subjects:
 - Studies with children and/or adolescents.
 - Studies with subgroups only (seniors/etc.)
- Study not related to dental fear/anxiety

All titles found were inspected and thematically relevant titles were subsequently subjected to an abstract screening. Any disagreements among the reviewers regarding article selection were clarified by discussion until agreement was reached.

A total of 8929 titles were identified. After sorting out the duplicates, these were reduced to a number of 5770 and after evaluation of the headings, 751 abstracts were rated eligible.

Concerning the HAQ the following key words were used for the search connected with an “OR” or an “AND”: “hierarchical anxiety questionnaire”, “HAQ”, “HAF”, “dental anxiety scale “ and “dental anxiety questionnaire”. The literature search was carried out in the PubMed, Web of Science (Core collection) and Embase databases. In consultation with each other, two reviewers carried out the electronic literature search. The literature management program Endnote was used to search and manage existing studies.

Additionally, clinical studies investigating the HAQ were identified electronically (MEDLINE database) with the same keywords. All studies published up to the end of January 2020 were included. Besides the MEDLINE search also a Cochrane Library search was performed. Moreover, the most relevant dental and psychologic journals as well as the reference lists of all relevant articles were hand searched. Full articles were obtained for all relevant papers. Twenty-two papers were found electronically, ten by hand search. All papers were read.

As the HAQ is a primary German instrument to screen patients with anxiety or even phobia, twenty-one articles were found using this questionnaire.

Results:

After sorting out the duplicates 21 publications using the HAQ were found. All publications are listed in the table below:

The Hierarchical Anxiety Questionnaire (Jöhren 1999)

The most well-known and certainly the most frequently used anxiety questionnaire for the diagnosis in adults is the Corah Dental

article (author/year)	type of study	Outcome
Jöhren P (1999) Validierung eines Fragebogens zur Erkennung von Zahnbehandlungsangst [9]	clinical prospective study	Reliability and validity of a hierachic dental fear questionnaire. The reliability with regard to the self-assessment of the anxiety class was confirmed with Cronbach's α 0.936 = “excellent”.
Jöhren P, Gängler P (1999) Zahnbehandlungsangst, Zahnbehandlungsphobie – Definitionen, Ätiologie. Diagnostik und Therapie [26]	overview labor	Definition and aetiology of dental anxiety, therapeutic procedures in dental anxiety, therapy and treatment; recommended diagnostic questionnaires: HAQ.
Jöhren P, Margraf-Stiksrud J (2002) Zahnbehandlungsangst und Zahnbehandlungsphobie bei Erwachsenen, Statement DGZMK [3]	overview labor	Defintion of dental anxiety/phobia, diagnostic options, therapy; recommended diagnostic questionnaires: HAQ, DAS.

Enkling N, Jöhren P, Sartory G (2005) Zahnbehandlungsangst, Zahnbehandlungsphobie, Zahnärztliche Mitteilungen [2]	overview labor	Definition and aetiology of dental anxiety, therapeutic procedures in dental anxiety, therapy and treatment; recommended diagnostic questionnaires: HAQ, DAS, STAI, DFS, DCQ, DAI, VAS.
Enkling N, Marwinski G, Jöhren P (2006) Dental anxiety in a representative sample of residents of a large German city [10]	intervention study	The Hierarchical Anxiety Questionnaire was used to measure the amount of dental anxiety.
Staehele I, Wolowski A, Doering S, Jöhren P (2006) Psychosomatik in der Zahn-, Mund- und Kieferheilkunde, Leitfaden der Bundeszahnärztekammer [21]	overview labor	Diagnostic basics, patient guidance from a psychosomatic point of view, mental and psychosomatic disorders in the dental office; recommended diagnostic questionnaires: HAQ, OHIP.
Sartory G, Heinen R, Pundt I, Jöhren P (2006) Predictors of behavioral avoidance in dental phobia: The role of gender, dysfunctional cognitions and the need of control, Anxiety, Stress & Coping [15]	intervention study	The HAQ was used to measure the amount of dental anxiety. (also used: DAS, STAI, BDI, BSQ, DCQ)
Jöhren P, Enkling N, Heinen R, Sartory G (2007) Clinical outcome of a short-term psychotherapeutic intervention for the treatment of dental phobia [28]	intervention study	The HAQ was used to measure the amount of dental anxiety.
Lahmann C, Schoen R, Henningsen P, Ronel J, Muehlbacher M, Loew T, Tritt K, Nickel M, Doering S (2008) Brief relaxation versus music distraction in the treatment of dental anxiety [31]	r a n d o m i z e d controlled clinical trial	Questionnaires to measure the amount of dental anxiety: HAQ, STAI.
Sartory G, Heinen R, Wannemüller A, Lohrmann T, Jöhren P (2009) The modulated startle-response in dental phobia [19]	intervention study	The HAQ was used to measure the amount of dental anxiety. (also used: DAS, IDCI, STAI, BDI)
Sartory G, Wannemüller A (2010) Zahnbehandlungsphobie – Fortschritte der Psychotherapie [25]	overview labor	Questionnaires to measure the amount of dental anxiety: HAQ, DAS, DFS, DCQ, IDCI-R
Höfert HW, Jöhren P (2010) Zahnbehandlungsangst erkennen und behandeln, Diagnostik, Therapie, Praxismanagement [1]	overview labor	Definition of dental anxiety/dental phobia, fluid transition, aetiological models, diagnostic options, therapeutic approaches; recommended diagnostic questionnaires: DAS, HAQ, DFS, DCQ, VAS, STAI, SDFQ, DBS.
Wannemueller A, Jöhren P, Haug S, Hatting M, Elsesser K, Sartory G (2011) A practice-based comparison of brief cognitive behavioural treatment, two kinds of hypnosis and general anaesthesia in dental phobia [32]	intervention study	The HAQ was used to measure the amount of dental anxiety.
Jöhren P, Parastar S, Sartory G (2011) Psychotherapie vs. Sedierung und Behandlung in ITN bei Patienten mit Zahnbehandlungsphobie [29]	retrospective study	The HAQ was used to measure the amount of dental anxiety.
Elsesser K, Wannemüller A, Lohrmann T, Jöhren P, Sartory G (2012) Mental Retrieval of Treatment Context in Dental Phobia [8]	intervention study	Questionnaires of phobic anxiety administered before and after treatment indicated significant improvement. Questionnaires for measuring dental fear: HAQ, DAS, ICDI, STAI, BDI.
Lenk M, Berth H, Joraschky P, Petrowski K, Weidner K, Hannig C (2013) Fear of Dental Treatment - an underrecognized symptom in people with impaired mental health [18]	intervention study	212 patients of our psychosomatic service and 95 healthy controls were studied with the Hierarchical Anxiety Questionnaire to determine the intensity of their fear of dental treatment.
Wannemüller A, Jöhren P, Sartory G, Margraf J (2015) Ein Fünf-Sitzungsprogramm zur Behandlung von Zahnbehandlungsangst [30]	intervention study	Questionnaires to measure the amount of dental anxiety: HAQ, DAS, DCQ, IDCI, IDCI-R.
Hofer D, Thoma MV, Schmidlin PR, Attin T, Ehlert U, Nater UM (2016) Pre-treatment anxiety in a dental hygiene recall population [22]	cross-sectional study	Questionnaires to measure the amount of dental anxiety: STAI, HAQ, VAS, MDMQ.
Wannemüller A, Jöhren P, Borgstädt A, Bosch J, Meyers M, Völse M, Scholten S, Maegrat J (2016) Large Group Exposure Treatment: A Feasibility Study of exposure combined with diaphragmatic breathing in highly dental fearful individuals [27]	intervention study	The HAQ was used to measure the amount of dental anxiety.

Wannemüller A Adolph D Jöhren P Blackwell S Margraf J (2017) Psychophysiological reactivity of currently dental phobic-, remitted dental phobic- and never-dental phobic individuals during exposure to dental-related and other affect-inducing materials [5]	intervention study	Questionnaires to measure the amount of dental anxiety: DAS, HAQ, DCQ, IDCI-R.
Weifenbach N, Schaper K, Jöhren P (2019) Validation of a questionnaire for the recognition of dental anxiety in adolescents [14]	clinical prospective study	This pilot study has shown that the HAQ in the way it is built is generally highly applicable to adolescents. It is recommended that younger adolescents (12–14 years) should be guided when completing in the HAQ. The reliability with regard to the self-assessment of the anxiety class was confirmed with Cronbach's α (always > 0.9 = "excellent") for both t0 and t1. An additional comparison of HAQ results with ratings by the treating dentists and his assistant resulted in "good" to "very good" kappa values.

Table 1: Chronological order of studies from the year 1999 until today with and about the Hierarchical Anxiety Questionnaire

Anxiety Scale [11]. With this questionnaire, which consists of 4 questions, it is possible to obtain a reliable diagnosis of the scale of the anxiety. It documents the level of anxiety before dental treatment independent of the interview situation as a constant variable over time, and thus meets the requirement of Glanzmann [7].

However, additional questions in the anamnesis interview during the diagnostic phase are essential to obtain more specific information on the reasons for the anxiety and the specific fear stimulus. For this reason, it makes sense to include prospective estimates from the people surveyed of their anxiety in possible treatment situations.

For this reason, in addition to the four questions of the Corah questionnaire, the HAQ (Fig. 1) also contains seven dental treatment situations that are presented in a hierarchically structured sequence. The hierarchy was constructed according to a study conducted by Gale [12] and puts the patients in various, increasingly fear-inducing situations, from tartar removal to the removal of wisdom teeth. The patient can choose between five levels of anxiety, from relaxed (0 points), to anxious to the point of feeling ill (5 points). With a total of 11 questions, a maximum score of 55 points is possible.

Validation

The HAQ was validated in 1998 [9] by surveying 199 adults using the well-known questionnaires of the DAS and the State Trait Anxiety Inventory (STAI) [13] in combination of self-estimation of their level of anxiety based on a Visual Analog Scale (VAS) ranging from 0 (no anxiety) to 100 (maximum anxiety) at the dental polyclinic of the Witten/Herdecke University. Additionally, the relationship between dental anxiety, age, duration of avoidance, DMF/T index, and social background were evaluated.

The survey confirmed Gale's *hierarchy* of anxiety-provoking stimuli (Tab. 2). As an incidental finding, *women* had a significant higher HAQ score (33.6) and were more fearful compared to *men* (score = 25.9) (t-test, $p < 0.0001$). The other questionnaires obtained the same results.

Correlation and reliability

The Spearman rank correlation yielded a very high correlation between the HAQ and the DAS of 0.89 ($p < 0.0001$), the STAI

	Relaxed	Nervous	Tense	Anxious	Nauseous from anxiety
How do you feel when you imagine you have to go to the dentist tomorrow?					
You are sitting in the waiting room and are waiting to be called. How do you feel?					
Imagine you are entering the room where treatment will be provided, and you can smell the typical odors.					
You are lying in the dentist's chair and the dentist enters the room.					
You and your dentist are looking at the X-rays and discussing what work needs to be done.					
How do you feel when your dentist tells you that he or she will now clean the tartar off your teeth?					
The dentist tells you that you have a cavity and that he or she will now treat it.					
The dentist changes the position of your chair and prepares an injection.					
Imagine you hear the typical sound of a dentist's drill. How do you feel?					
The dentist tells you that the caries is too deep and that the tooth has to be extracted.					
One of your wisdom teeth is to be removed; the injection has already been given. The dentist picks up the scalpel.					

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.

Figure 2: The Hierarchical Anxiety Questionnaire according to Jöhren 1999

Item 11	The dentist picks up the scalpel	725
Item 10	The dentist tells you that the tooth has to be extracted	697
Item 9	Imagine you hear the typical sound of a dentist's drill	620
Item 8	The dentist prepares an injection	584
Item 7	The dentist will now treat a cavity	521
Item 2	Waiting to be called	508
Item 4	The dentist enters the room	503
Item 1	Imagine you have to go to the dentist tomorrow	485
Item 3	Smell the typical odor	482
Item 6	The dentist tells you that he or she will clean the tartar off your teeth	437
Item 5	Looking and discussing the X-rays	378

Table 2: Sum of the anxiety scores across all subjects beginning with the situations in which the people surveyed were determined to have the most anxiety.

of 0.72 ($p < 0.0001$), and the VAS of 0.85 ($p < 0.0001$) (Tab. 3). Furthermore, the HAQ offered an excellent reliability (Cronbachs alpha = 0.936).

Anxiety levels

	DAS	STAI	HAQ	VAS
Corah		0.72/0.0001	0.89/0.0001	0.85/0.0001
STAI	0.72/0.0001		0.66/0.0001	0.70/0.0001
HAQ	0.88/0.0001	0.66/0.0001		0.81/0.0001
VAS	0.85/0.0001	0.70/0.0001	0.81/0.0001	

Table 3: Spearmann rank correlation between the anxiety measurements methods applied: Dental Anxiety Scale (DAS) according to Corah, State Trait Anxiety Inventory (STAI) according to Spielberger, HAQ according to Jöhren 1999, and the Visual Analog Scale (VAS).

With the HAQ, a reliable diagnose dental anxiety is possible. In analogy to Corah's DAS levels in anxiety (low ($n=118$), medium ($n=21$), and high ($n=60$)), the HAQ also categorizes anxiety in different levels when taking the standard deviations of the average values of the HAQ are into account:

1. Low level of anxiety, up to a score of 30
2. Medium level of anxiety, 31-38
3. High level of anxiety, > 38

The study also determined that in cases where treatment was also avoided for a period of more than 2 years and the patient had an anxiety score greater than 38 (high level of anxiety), it was possible to make a tentative diagnosis of dental phobia.

The HAQ and diagnosing anxiety in young people between the ages of 12 and 17

In a clinical prospective study, the "Hierarchical Anxiety Questionnaire" (HAQ) according to Jöhren was examined in terms of its applicability in the determination of dental anxiety in adolescents. Voluntarily providing information about oneself by filling out a questionnaire requires certain age-dependent intellectual and cognitive skills. For this reason, the question therefore arises whether the HAQ is applicable in the case of adolescents [14]. Therefore, 210 adolescent test subjects were categorized by age (12-14, 15-17 years old) as well as by gender. In addition to examining the internal validity based on the test-retest reliability (t_0 , t_1), the HAQ was validated externally by comparing the results obtained using similar instruments for obtaining information from the patients themselves and based on an assessment of the patient's behavior by the dentist and the dental assistant (Dental Anxiety Scale, Modified Dental Anxiety Scale, Visual Analog Scale).

More than half of the adolescent subjects stated that they had *low anxiety* (distribution across the survey methods and survey times: 54-68%), while 7-12% said they had *high anxiety*. The reliability of the information provided on the level of anxiety was confirmed by determining Cronbach's α (always > 0.9 = "excellent") for t_0 and t_1 . When viewed individually, the level of agreement of the responses to the 11 questions were "moderate" to "good" (kappa coefficient, Tab. 3). The agreement of the results of the HAQ and the methods for external validation yielded a high correlation according to Spearman ($r > 0.7$). Bland-Altman analyses also confirmed that all methods used to determine the level of fear of the subjects were interchangeable at both times. The level of agreement was also substantiated by a minimum kappa value of "good". The estimate of the level of anxiety by the dentist and dental assistant providing treatment yielded "good" to "very good" kappa values. The age (correlation coefficient for t_0 $r = 0.290$; for t_1 $r = 0.285$) and gender (for t_0 $r = 0.097$; for t_1 $r = 0.130$) had no influence on the applicability of the HAQ.

In the group of 12-14 year olds, the questionnaire was filled out improperly 14 times.

	HAQ	DAS	VAS
HAQ		<i>0.844</i>	<i>0.896</i>
DAS	<i>0.903</i>		<i>0.876</i>
VAS	<i>0.915</i>	<i>0.895</i>	
Dentist	<i>0.675</i>	<i>0.665</i>	<i>0.713</i>
Dental assistant	<i>0.607</i>	<i>0.605</i>	<i>0.646</i>

Table 4: Assignment of the kappa value regarding the overlap of each two the dental fear measures at t0 (underlined) and t1 (n = 210). Significant vales are bold and in italics

Conclusion

The study determined that the HAQ, in its existing form, is generally very applicable to adolescents. Adolescents in the group of 12-14 year olds should not fill out the questionnaire without adult supervision, though. Additional studies on the use of the HAQ for adolescents that take the level of education into account are recommended.

The HAQ and its application in diagnosing dental phobia

A high level of anxiety before receiving dental treatment that is not pathological must be differentiated from dental phobia, which is an anxiety disorder [3]. These patients are also characterized in that they completely avoid regular visits to the dentist, and therefore fulfill the DSM-V criteria of the American Psychiatric Association for a specific phobia. Furthermore, Sartory et al. reported that 16% of the phobics they studied suffered from affective disorders (dysthymia, major depression) [15]. In a representative study conducted in Finland on just under 6000 persons, Pohjola et al. [16] determined that anxiety and depressive disorders occurred with greater frequency in the group of people with a high level of dental anxiety ("Very" response in a self-assessment containing the question "How afraid are you of visiting a dentist?" with the possible responses "Not at all", "Somewhat", and "Very"). The most frequent disorder was major depression (7.6%). Bernson et al. also confirmed a relationship between dental anxiety, depression, and general anxiety. [17].

Lenk et al. [18] determined higher levels of dental anxiety (measured with the Hierarchical Anxiety Questionnaire) in 30.5% of 212 patients at a psychosomatic clinic in comparison to healthy control subjects.

In a study conducted by the work group led by Sartory and Jöhren and funded by the German Research Foundation (DFG), it was examined if people with dental phobia are characterized by an exaggerated startle reaction to phobia-relevant background stimuli and if it is possible to detect this during dental treatment [19].

Patients fulfilling the criteria of a specific phobia according to DSM IV [20] were compared to patients who exhibited a low level of anxiety according to the HAQ. All study participants were presented with noises associated with dental treatment (sound of a drill, ultrasound, scraping on the teeth with a probe) and, as a control condition, birdsong, which was always immediately followed by a startle stimulus (white noise, intensity 105 dB(A), duration 50 ms). The eyeblink EMG response, the heart rate, and the electrodermal activity (EDA) were measured as the reaction to the stimuli.

For all subjects tentatively diagnosed with dental phobia by the dentists participating in the study based on the HAQ and the duration of avoidance, the participating psychologists confirmed 100 percent of the tentative diagnoses based on DSM IV. Beside

the fact that noises associated with dental treatment were considered more frightening by both groups than the sounds of birds, phobics exhibited an accelerated heart rate in reaction to the stimuli, while the control group exhibited a slower heart rate, and therefore inhibition of the startle reaction.

Based on the HAQ and the duration of avoidance of treatment, it is possible for the dentist providing treatment to diagnose dental phobia. This confirms the statement from the German Society of Dentistry and Oral Medicine (DGZMK) in “Dental fear and phobia in adults” (Dental anxiety and dental phobia in adults) [3] and the guideline “Psychology and Psychosomatics” (Psychology and Psychosomatics) from the German Dental Association (BZÄK) [21] that dental phobia can be suspected in patients with a HAQ value greater than 38 and simultaneous avoidance of treatment for more than 2 years.

Discussion

The general anamnesis must be expanded promptly with the addition of anxiety diagnostics to detect anxiety in patients as early as possible and adapt its therapy accordingly to the level of anxiety. In a study conducted by Hofer et al., the HAQ was used at the University of Zurich to determine how afraid a group of 46 adults was to go a recall appointment [22]. The study showed that one third of the adults exhibited stress reactions before the dental hygiene appointment, and the work group called for the early detection of dental anxiety. For this reason, an extension of the dental anamnesis and diagnostics is a condition sine qua non to the evaluation of psychological and social aspects. This psychological diagnostic is also essential because in Germany, the fundamentals of psychosomatics are not part of the dental education curriculum at universities, in contrast to the curricula for medical doctors. For this reason, the “Psychology and Psychosomatics” working group of the DGZMK introduced a structured, professional training program titled “Psychological and Psychosomatic Fundamentals” that is held at the Academy for Practice and Science (APW).

The following step-by-step plan is taught in this curriculum: It would seem reasonable to integrate a Visual Analog Scale into the anamnesis questionnaire to determine the level of dental anxiety. Patients should receive it directly upon arrival at the reception desk before they enter a treatment room. This scale is not graduated and is bounded by its starting point at 0% anxiety and its end point at 100% anxiety (the maximum level of anxiety imaginable) [23].

For a VAS anxiety score of over 50% of the total length of the VAS, additional screening questions should be asked in the form of an anxiety questionnaire, for example the HAQ, DAS, etc. [24].

This is followed by the general anamnesis and an open interview with a discussion of the specific anxiety anamnesis as well as of anamneses from other doctors based on letters from doctors and diagnoses made elsewhere. If a tentative diagnosis of dental phobia is made, then a psychologist / psychotherapist should be consulted. In a separate study by Wannemüller et al., people with dental phobia who participated in a therapy study had an average of 3 deteriorated teeth and 9 teeth that required treatment, and the average period of avoidance of treatment was 8.7 years [25]. In particular, 1 of every 2 patients also exhibited an additional psychological abnormality with pathological significance, and 75% of these patients had never received dental treatment of any kind.

As shown in the study by Sartory et al. [19], the survey of the patients according to the three activation levels of Lang [4] is not a substitute for the observation of the patients during treatment or during an attempt to provide treatment where it is possible to recognize the physical signs of fear as well as behavior typical of fearfulness (for example avoiding eye contact, hesitant responses, startle reactions, etc.). Everyday life in clinics has shown again and again that patients have a tendency not to speak the truth in terms of their anxiety. For example, twitching or wincing when adjusting the dentist chair or pretending a tooth with a root canal or a dead tooth is still healthy due to a fear of possible pain during treatment is an indication of the presence of a phobia [26].

As the study on diagnosing anxiety in adolescents showed, this applies especially to the use of the HAQ on non-adult patients. There is no anxiety questionnaire available at the present time that was studied on both adolescent patients and adult patients. However,

since the group of 12-14 year olds in particular have been shown to exhibit uncertainty when responding to a questionnaire, such questionnaires can never replace the responsibility of the entire team before, during, and after treatment with respect to the ability to cooperate and the intellectual capabilities of a patient, regardless of whether they are especially young, old, or disabled [14].

Physicians and psychologists as well should pay particular attention to the condition of the patient's teeth when providing treatment to patients with psychosomatic disorders. Almost 1 of every 3 patients in a study of 212 patients with psychosomatic disorders conducted by Lenk et al. suffered from pathologically high dental anxiety as measured with the HAQ, and 24 patients had avoided dentist's appointments for more than one year. Patients with post-traumatic stress disorder were 10 times more likely (42% vs. 4.2%) to suffer from dental anxiety than healthy people. For this reason, Lenk also called for expanding the anamnesis when diagnosing dental anxiety by including the VAS and HAQ for patients with post-traumatic stress disorders, anxiety disorders, and depressive disorders [18].

Furthermore, in terms of therapy, recent studies show that in comparison to short-term psychotherapeutic intervention, group exposure is a possibility to treat dental fear in good way [27]. A large-group one session treatment, combining coping with exposure elements proved feasible in highly dental-fearful participants. However, studies investigating the effects of small-group multiple-session treatments or one-session single-treatments on subjective dental reported larger effects than Wannemueller et al found in large-group one session treatment [28,29,30].

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