Assessment of dental fear

A comparison of two psychometric instruments

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Johansson P, Berggren U. Assessment of dental fear. A comparison of two psychometric instruments. Acta Odontol Scand 1992;50:43–49. Oslo. ISSN 0001-6357.

To analyze further dental fear and its presentation in dental patients, two psychometric instruments were distributed among 50 patients attending a dental emergency clinic (EMC) and 44 patients applying for treatment at a specialized dental fear clinic (FEC). The Dental Fear Survey (DFS) was compared with the Corah Dental Anxiety Scale (DAS). After separating the EMC patients into high- and low-fear individuals in accordance with DAS scores, analysis showed that DFS values also clearly distinguished between these groups and between the FEC group and EMC groups. The dental fear levels were in correspondence with previous results, and the correlation between the DAS and the DFS was high ($r = 0.92$). In contrast to the DFS avoidance and arousal dimensions, the difference between the mean item scores on the dental situation dimension was not significantly different between high-fear EMC and FEC individuals. This indicated that the evaluation and appraisal of the dental situation among high-fear EMC and FEC patients may have been corresponding, whereas the behavioral and physiologic effects were different. Thus, in spite of this similar appraisal of the dental situation, FEC patients were interpreted as showing a more phobic behavior, and this was better captured in the DFS than in the DAS. □ *Behavioral dental science; phobic disorders; psychometrics*

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Dental fear belongs to the most frequent and clinically important fears and phobias (1–4). During the past 3 decades knowledge about fear reactions in dentistry has gained increased interest, and knowledge about acquisition and treatment has substantially improved (4–13).

A prerequisite for building up of new knowledge is the assessment of dental fear. According to Lang (14), fear is experienced in any combination of three response systems, including physiologic, verbal/cognitive, and behavioral reactions. These systems are independently manipulated by environmental factors and demands and do not necessarily covary. While observing an overt behavior or behavioral change may be an intuitively comprehensible method used in both behavioral avoidance tests and recordings of utilization and non-utilization of dental appointments (15–19), both the other response systems suffer from several difficulties (20–22).

Self-administered dental fear questionnaires are of both clinical and scientific importance. Knowledge of a patient's level of anxiety before treatment can be an aid to the dentist in being prepared for what to expect from a patient and makes it possible to take measures to help alleviate the patient's anxiety. In addition, assessment of levels of dental fear is a necessity in research, both as as indicator of fear and for treatment outcome studies. Although it has been shown that the response to the simple question 'Generally, how fearful are you of dentistry?' was highly correlated ($r = 0.89$) to the scoring on a dental fear scale (15), there are both clinical and research needs for a broader range of information.

Most studies of dental fear use verbal tests and psychometric methods to tap verbal/cognitive components of dental fear. At a National Institute for Dental Research symposium at Bethesda, Maryland, USA, in 1985 several papers called for the use of

uniform measures (23–25). Several scales have been constructed and used in different settings (6, 7, 13, 15, 26, 27). There is an obvious need for the investigation of each instrument in different settings. In addition to collection of normative data, there is also a need for investigation of an instrument's functions and metric properties after translation.

The most commonly used instruments are the Dental Anxiety Scale (DAS (26, 28)) and the Dental Fear Survey (DFS (7, 29)). The DAS was translated into Swedish some 15 years ago and has been used in several Scandinavian studies (8, 13, 17, 30–34). The DAS is a reliable, valid, and useful predictor of patient distress in the dental office (26, 28). However, our previous research has indicated that this predictive ability is related only to unrestricted populations and does not apply to groups of individuals with extreme or high dental fear (31). It has also been shown that the DAS is an excellent measure of gross treatment effects (11, 17, 19). In response to a remaining need for a less restricted and more detailed instrument, the DFS was recently translated at our research clinic and incorporated into our test battery.

There has, however, also been a debate about limitations to these widely used instruments. These problems are related to conceptual issues and to the state–trait distinction (23). Thus, a difference beween the DAS and the DFS may be related to different conceptual framework, and the functioning of the intruments may be quite disparate. Whereas the DAS is a general measure with an overall strategy of assessment, the DFS distinguishes between different reactions to different stimulations. This paper reports a study of these two strategies of dental fear assessment in two samples of Swedish adult dental patients. This was also a first evaluation of our translated version of the DFS, and the results were compared with those for the DAS, which has been used and investigated in several previous studies among Swedish dental-fearful adults.

Materials and methods

Subjects and procedures

The subjects were 44 self-referred patients applying for treatment at a specialized dental fear clinic (FEC) and 50 patients attending a dental emergency clinic (EMC) in Göteborg, Sweden. Both samples were consecutively selected and excluded totally edentulous individuals. On entering one of the clinics all patients were asked to participate and to answer some short questionnaires before seeing the dentist. No patient refused to participate. All FEC patients were new to the clinic and investigated at their first visit to the fear clinic during a period of 3 months. Data from EMC patients was collected during 3 days within the same 3-month period, and these patients were also first-time visitors.

According to a normative DAS value of dental emergency patients of 10.5 (30), the EMC group was separated into a high-fear (DAS = 11 or higher; 15 patients) and a low-fear group (DAS = 10 or lower; 35 patients). As can be seen in Table 1, the sex distribution was even, and ages ranged from 19

Table 1. Sex, age, and distribution of emergency clinic (EMC) patients high and low in dental fear and fear clinic (FEC) patients by regularity in dental visits and years since last dental visit

		Sex, *n*		Age, years			Dental visits, *n*		Years since last dental visit, *n*				
	n	Men	Women	$\bar{x}$	SD	Range	Regular	Irregular	–1	1–2	3–5	6–10	11–
EMC	50	26	24	33.4	9.6	19–51	29	21	31	9	8	0	2
Low fear	35	17	18	34.8	9.9	19–51	22	13	22	6	6	0	1
High fear	15	9	6	30.3	8.5	20–49	7	8	9	3	2	0	1
FEC	44	22	22	30.8	6.3	19–49	8	36	7	8	13	11	5

to 49 years in FEC patients and from 19 to 51 and 20 to 49 years among low- and high-fear EMC patients, respectively.

Instruments

In addition to a questionnaire collecting data on sex, age, and dental care habits, the Corah DAS and the DFS were distributed to the participants.

The Corah DAS (26) was a direct translation into Swedish of the original scale. It consists of four items concerning reactions to imagined dental situations including 'appointment tomorrow' and three segments of treatment. On each item there is a 1 to 5 scale from calm (1) to terrified (5). The score for all four items thus adds up to a total varying from 4 to 20. The DAS has in our and other Scandinavian previous research been shown to be valid and reliable, and normative means have been shown to vary from 7.3 to 9.0 in different Scandinavian samples of dental patients (30–33) with high correspondence to American normative data (30).

The DFS (7, 15) was translated into Swedish and then back-translated by an experienced bilingual dental professional. The DFS has been extensively investigated in the USA and was found to have good validity and reliability (15, 29). Thus, the test–retest reliability was calculated at 0.74, and a factor analysis identified three distinct areas of fear reactions (29). It consists of 20 items and offers broader and more detailed information of the dental fear reaction by the three factors avoidance reactions, autonomic arousal, and feared situations and stimuli. The questionnaire is of the Likert type and has a representative five-point scale for rating of each item from high (5) to low (1) intensity of reaction. American normative test mean score has been reported at 36.6 (29). Scandinavian normative data are still lacking, but mean test score values in clinical

Table 2. Group means ($\bar{x}$) and standard deviations (SD) for the dental fear survey (see text for explanation of group labeling)

	EMC low ($n = 35$)		EMC high ($n = 15$)		FEC ($n = 44$)	
	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
Avoidance of dentistry						
1. Put off making appointments	1.4	0.7	3.1	1.5	4.6	1.0
2. Cancel or fail to appear	1.1	0.5	1.9	1.3	3.8	1.5
Autonomic arousal during dentistry						
3. Muscle tension	1.6	0.8	3.4	1.2	4.4	1.0
4. Increased breathing rate	1.2	0.5	2.8	1.4	3.8	1.3
5. Perspiration	1.2	0.5	2.8	1.6	4.0	1.3
6. Nausea	1.2	0.6	2.1	1.4	3.3	1.5
7. Heart beat faster	1.2	0.5	2.3	1.6	3.7	1.4
Fear of situations and stumuli						
8. Making an appointment	1.1	0.2	2.5	1.7	3.4	1.7
9. Approaching dental office	1.1	0.6	3.0	1.3	3.5	1.5
10. Sitting in the waiting room	1.1	0.3	3.0	1.3	3.6	1.4
11. Sitting in the dental chair	1.1	0.5	3.5	1.1	4.1	1.2
12. Smell of dental office	1.3	0.6	3.3	1.2	3.8	1.5
13. Seeing the dentist	1.1	0.2	2.7	1.2	2.7	1.4
14. Seeing the anesthetic needle	2.0	1.3	3.2	1.3	3.6	1.6
15. Feeling the anesthetic needle	2.1	1.4	3.5	1.3	3.8	1.5
16. Seeing the drill	1.5	0.7	3.7	1.3	4.0	1.2
17. Hearing the drill	1.7	1.0	4.0	1.3	4.3	1.0
18. Feeling the drill	2.1	1.1	4.5	0.7	4.7	0.7
17. Having the teeth cleaned	1.2	0.4	2.8	1.6	3.0	1.4
20. Overall fear of dentistry	1.3	0.6	3.1	1.6	4.6	0.7

populations of fearful or phobic dental patients have been reported at levels ranging from 75.8 to 88.8 (34, 35).

Statistical methods

The continuous variables were analyzed with one-way analyses of variance (ANOVAS) with subsequent Tukey's honestly significant difference (HSD) tests (36). The discrete variables (sex and regular/irregular dental visits) were tested by using chi-square analysis, including partitioning the degrees of freedom for inter-group analysis (37). To test the internal consistency reliability of the translated DFS, Cronbach's alpha coefficients (38) were calculated for the total scale and for subdimensions. The Spearman rank-order correlation coefficients were calculated among sex, age, DAS, DFS, DFS factors, and dental care habits.

Results

Sex, age, and dental care habits are shown in Table 1. Although there were some differences in accordance with sex and age, these differences were small and statistically non-significant. Reported irregular dental visits were significantly more frequent among FEC patients than among EMC patients (chi-square = 15.5; $p < 0.001$), but there was no statistically significant difference among high- and low-fear EMC patients. The median time of avoidance of dentistry by number of years was 1 year or less in both EMC groups and 3–5 years in FEC patients ($F(2,91) = 15.7$; $p < 0.001$).

In Table 2 the DFS mean item scores and standard deviations are shown. The mean scores of EMC low-fear patients were mostly below 2, with the exception of items related to the anesthetic needle and feeling the drill, whereas the mean scores of the other two groups were considerably higher. 'Feeling the drill' was in all groups constantly given the highest mean score. Among EMC high-fear patients this was followed by hearing and seeing the drill, and in the FEC group the means for putting off making appointments and overall fear followed.

The mean overall dental anxiety rating according to Corah's DAS showed three distinct levels in accordance with group (Table 3). These differences in score levels among groups were significant ($F(2,91) = 160.2$; $p < 0.001$). Tukey's HSD tests showed this difference between FEC patients and both EMC groups and also between EMC groups. The same was found for total DFS scores ($F(2,91) = 143.5$; $p < 0.001$) and for the DFS factors avoidance behavior ($F(2,91) = 91.6$; $p < 0.001$) and autonomic arousal ($F(2,91) = 96.6$; $p < 0.001$). For the DFS factor feared situations the ANOVA also showed a significant difference ($F(2,91) = 104.0$; $p < 0.001$), but application of the Tukey HSD test to check these differences among groups showed that the difference between the high-fear EMC group and the FEC group was *not* significant at a probability level better than 0.05 ($p = 0.08$).

Table 3. Means ($\bar{x}$) and standard deviations (SD) on Corah's dental anxiety scale (DAS) and the dental fear survey (DFS) and its subdimensions

				DFS							
		DAS sum		Sum		Avoidance		Arousal		Situations	
	n	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD	$\bar{x}$	SD
EMC	50	8.9	4.4	37.7	19.0	3.3	2.0	8.5	4.9	26.0	13.6
Low fear	35	6.4	1.8	27.7	7.3	2.5	1.0	6.3	2.0	18.8	5.8
High fear	15	14.5	3.2	60.9	17.5	5.0	2.7	13.5	5.9	42.8	11.6
FEC	44	16.8	2.9	76.6	14.3	8.4	2.2	19.3	4.6	48.9	10.8

Table 4. Spearman rank order correlations between dental visit pattern, years since last dental visit, Corah's dental anxiety scale (DAS), and the dental fear survey (DFS) and its subdimensions. All correlations were significant ($p < 0.001$)

	Dental visits regular/irregular	Last dental visit	Corah's DAS	DFS sum	DFS avoidance	DFS arousal
Last dental visit	0.58					
Corah's DAS	0.38	0.49				
DFS sum	0.38	0.45	0.92			
DFS avoidance	0.44	0.49	0.78	0.82		
DFS arousal	0.32	0.43	0.84	0.82	0.81	
DFS situations	0.36	0.43	0.91	0.98	0.74	0.81

Thus, the main effect was related to difference only between the EMC low-fear group and the two other groups.

The Cronbach internal consistency reliability of the total DFS scale was calculated at an alpha of 0.89. The individual alpha coefficients for the subdimensions were 0.51 for avoidance, 0.71 for the arousal factor, and 0.86 for feared dental situations. To investigate correlations between investigated variables, all patients were combined into one group of 94 individuals. The only significant correlation found between sex and age and any other variable was that men tended to have a more irregular attendance pattern ($r = 0.18$; $p < 0.05$). Table 4 shows the correlation matrix of tests and dental care habits. All correlations shown were statistically highly significant ($p < 0.001$). The correlation between the DAS and the DFS was 0.92, and the intercorrelations between DFS sum and DFS factors were also very high (r ranging from 0.74 to 0.98).

Discussion

The present investigation evaluated a Swedish translation of the DFS as compared with the Corah DAS in patients applying for treatment at an EMC and among self-referred patients entering a FEC unit. The results indicated that both instruments clearly distinguished between groups and that these test score differences were paralleled by different dental care habits. The DFS also showed an extended basis of information available both for clinical use and research purposes as compared with the more general DAS.

In the present study the mean DAS scores for EMC and FEC patients were lower than previously reported for congruent groups (30). Among FEC patients this may be explained by group selection (self-referred patients) and the even sex distribution. Ordinarily, the fear clinic population shows a significant predomination of women, who also tend to score significantly higher than men on the fear scales (8).

The DFS mean score for EMC patients was in agreement with American normative values (29, 39), whereas FEC patients corresponded to other dentally phobic groups (34, 35, 39). The distinction between groups by DAS scores was paralleled in DFS scores, validating the clinical usefulness of the DFS in our Swedish translation. The significant correlations of the DAS and the DFS with regard to irregularity of dental visits and time elapsed from the last dental visit confirmed the relationship between high dental fear and avoidance.

Scott & Hirshman (27) correlated the DAS to the DFS and two other dental fear instruments in a population of college students and found high intercorrelations among instruments except for the DAS to the other scales. This was explained as an expression of the DAS dealing with a more overall dental anxiety assessment and that the DAS has a more restricted range of scores. However, recent studies comparing

the DAS and the DFS have shown high correlations. In Britain, Frazer & Hampson (40) used regular attenders and new dental patients with total DAS and DFS means of 10.9 and 51.0, respectively, and reported a correlation of $r = 0.85$. In a group of 80 self-referred dental phobic patients Moore et al. (35) found a correlation of $r = 0.67$. Among the present combined group of EMC and FEC patients the correlation was high ($r = 0.92$). As discussed by Moore et al. (35), this may be due to a more apparent state anxiety function of the instruments in a phobic population and especially before starting treatment. This was also argued by Frazer & Hampson (40) with regard to ordinary dental patients.

With regard to DFS factors it was shown that the low-fear EMC group was in every aspect clearly and significantly separated from the other two groups. In spite of the very high intercorrelation between DFS dimensions, the high-fear EMC group was significantly separated from FEC patients only by the avoidance and arousal factors, whereas there was not a significant difference with regard to fear of specific situations when Tukey's HSD test was applied. Although the level of probability was close to significant, this statistical difference may indicate that there is a cognitive and behavioral difference between the long-time avoiders at the fear clinic and other high-fear individuals at the emergency clinic. Even though both groups verbally expressed similar subjective evaluation of the dental situation, the individual appraisal and effects were different. The fear clinic patients seemed to be more aroused and to have a more pronounced avoidance behavior. This may also indicate that, although self-referred and thus highly motivated, the FEC patients were more phobic than the high-fear EMC patients.

In conclusion, this study confirmed the usefulness of both the DAS and the DFS as clinical tools and as research instruments. The high correspondence between the instruments indirectly validated the DFS. However preliminary and small, the present study also indicated a difference between phobic avoiders and other fearful individuals.

Acknowledgements.—The present study was supported by The National Institute for Dental Research, National Institutes of Health, grant DE 08296, and the Swedish Dental Society.

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Received for publication 5 July 1991