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Treating highly anxious dental patients in a dental fear clinic

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Chapter 4

RELIABILITY AND VALIDITY OF THE SHORT VERSION OF THE DENTAL ANXIETY INVENTORY¹

¹ This chapter has been published as: Aartman, I.H.A. (1998). Reliability and validity of the short version of the Dental Anxiety Inventory. *Community Dentistry and Oral Epidemiology*, 26, 350-354.

Introduction

Dental phobia, which often results in deteriorating oral health, poses a problem for many people in many different countries (Hakeberg, Berggren, & Gröndahl, 1993; Milgrom, Fiset, Melnick, & Weinstein, 1988). Accurately assessing dental phobia is important, and, therefore, all components of dental anxiety have to be taken into account. Schuurs and Hoogstraten (1993) gave an extensive review of the most important dental anxiety questionnaires. They concluded that in dental anxiety research more than one questionnaire should be used, because none of the extensively used questionnaires completely covers the concept of anxiety (e.g., Dental Anxiety Scale; Corah, 1969). Three newly developed questionnaires appeared promising, and, therefore, the present study focuses on a short version of one of these instruments, the Dental Anxiety Inventory (DAI; Stouthard, Hoogstraten, & Mellenbergh, 1995; Stouthard, Mellenbergh, & Hoogstraten, 1993). This questionnaire was developed as a more comprehensive instrument than other dental anxiety scales.

The DAI consists of 36 items and uses a facet design. The facet elements are three different kinds of situations that may evoke dental anxiety, four time elements in which anxiety may be provoked, and three reactions (subjective feelings, physical reactions, and cognitive reactions).

Although the DAI satisfied psychometric requirements, a shorter version that would be easier to administer in general dental practice than the original 36-item DAI was needed. Furthermore, the short form is also valuable in dental fear clinics, where patients often have to fill out many questionnaires. Therefore, the Short version of the Dental Anxiety Inventory (S-DAI) was constructed; it consists of nine of the original DAI-items and yields a score for overall dental anxiety. The S-DAI was developed on the basis of a representative sample of 648 adults of the general Dutch population (Stouthard, 1989; Stouthard, Groen, & Mellenbergh, 1994). One group ($n=216$) was used for selecting items, the other ($n=432$) for assessing psychometric properties. In this version, the original DAI-facet elements were combined in such a way that the facet structure was not lost (Stouthard et al., 1993). Furthermore, the psychometric properties of the DAI-items were taken into account. The S-DAI was highly correlated with the original DAI ($r=0.90$) and reliability analysis suggested good internal consistency (Cronbach's $\alpha=0.93$). Scalability of the S-DAI items was medium

($H=0.49$)². This psychometric information suggests that the S-DAI is an acceptable alternative to the DAI.

The short version has not yet been evaluated thoroughly. Therefore, the aim of the present study was to assess its psychometric properties in a sample of highly anxious dental patients applying for treatment at a dental fear clinic in The Netherlands. The reliability in terms of internal consistency will be estimated and its validity discussed.

Material and methods

Subjects

The subjects were 321 highly anxious dental patients (118 men, 203 women), mostly self-referred, who applied for treatment at a dental fear clinic in Amsterdam, The Netherlands. Age varied from 17 to 69 years ($M=34.2$ years; $SD=10.2$). Average avoidance in this clinic was 6.8 years ($SD=9.1$, range 0-34).

Procedure

Highly anxious dental patients who applied for treatment at the dental fear clinic filled out several questionnaires at home, including measures on dental anxiety, health, and psychological complaints. As soon as the patients sent these questionnaires back to the clinic, they were put on a waiting list. After a waiting period of approximately 4 months patients were phoned for a first appointment with one of the dentists at the clinic. Patients in this study either were still on the waiting list or had just started treatment.

Instruments

The Short version of the Dental Anxiety Inventory (Stouthard, 1989) is based on the Dental Anxiety Inventory which covers the whole range of dental anxiety and takes into account the multicomponent nature of dental anxiety (Stouthard et al., 1993). The short version contains nine items that are answered on a 5-point Likert type scale: items 1, 6, 7, 14, 21, 22, 27, 29 and 35 of the DAI. Total scores on this questionnaire range from 9 to 45.

² H is interpreted as an index for the degree to which subjects can be accurately ordered by means of the item(s) (Molenaar et al., 1994).

The Dental Anxiety Scale (DAS; Corah, 1969) is a 4-item dental anxiety questionnaire with total scores ranging from 4 (not anxious at all) to 20 (extremely anxious). Studies using the DAS indicate reasonable reliability and stability over time and moderate validity (Schuurs & Hoogstraten, 1993). Cronbach's α in the present sample was 0.83.

Patients could indicate on a 10-point Likert-scale how anxious they were to visit the dentist. Scores on this 10-point scale range from 1 (not anxious) to 10 (extremely anxious).

Finally, the Dutch version of the Revised Symptom Checklist (SCL-90; Arrindell & Ettema, 1986) was used to assess the number of psychological complaints. This multidimensional psychopathology indicator consists of 90 items that provide an indication of psychological dysfunctioning on eight dimensions: agoraphobia (7 items), somatization (12 items), anger-hostility (6 items), depression (16 items), interpersonal sensitivity and paranoid ideation (18 items), anxiety (10 items), cognitive-performance difficulty (9 items), and sleep disturbance (3 items). Patients are requested to indicate on a 5-point scale the number of complaints they experienced during the previous week (1=none; 5=very many). The total ('psycho neuroticism') score, composed of the aforementioned subscales and nine non-scalable items, varies between 90 and 450. Research with several samples showed sufficient reliability and validity of the scales (Arrindell & Ettema, 1986; Aartman, De Jongh, & Van der Meulen, 1997); for data concerning the present sample see Aartman et al. (1997).

Data analysis

First, mean scores and standard deviations were computed for each item of the S-DAI separately. Next, t-tests were used to compare the means of men and women. Differences between men and women on these items and the total score were tested, with an overall significance level of 0.05 using a Bonferroni-Holm correction for the number of tests (Holland & Diponzo Copenhagen, 1988). We used two measures of internal consistency (Cronbach's α and average inter-item correlation) to estimate the reliability of the S-DAI and calculated corrected item-total correlations. Factor analysis was done to determine whether the items represent one dimension, and Mokken Scale Analysis to assess the item-order principle (Molenaar, Debets, Sijtsma, & Hemker,

1994). Finally, correlations with other self-report measures of dental anxiety indicated the convergent validity, itself an indication of the construct validity.

Results

Mean scores and standard deviations for each item of the S-DAI are shown in Table 1. There were no differences between men and women with regard to the separate items. Total S-DAI mean score was 39.9 (SD=6.2, range 9-45). The mean score for women (M=40.5, SD=5.7) was significantly higher ($t(306)=2.35$, $p=0.019$) than for men (M=38.8, SD=6.9). In addition, in Table 1 the items are ordered by their means. As can be seen from this table, highly anxious dental patients were most anxious about tooth extraction, followed by the thought the dentist has to drill.

Cronbach's α for the reliability of the S-DAI in the present sample was 0.88 (0.87 for women and 0.88 for men). The average inter-item correlation was 0.45 (0.41 for women and 0.49 for men); corrected item-total correlations were all 0.32 or higher (see Table 1), which is satisfactory.

Factor analysis revealed one factor with an eigenvalue greater than 1. This factor explained 52.7% of the variance of the items. The factor loadings are shown in Table 1. The loading of item 5 "As soon as the dentist gets the needle ready for the anesthetic, I shut my eyes tight" is notably lower than the other loadings. In addition, in Table 1 scalability coefficients according to Mokken Scale Analysis are shown. The weighted H_g s per item are satisfactory for all but one item (5). The overall H for the S-DAI is 0.47 with item 5 included and 0.56 with that item excluded.

Mean DAS score was 17.5 (SD=2.8) for all patients. Mean score on the 10-point scale was 8.9 (SD=1.7). Finally, the S-DAI correlated significantly with the DAS and the 10-point scale (0.73, $p<0.001$ and 0.69, $p<0.001$ respectively). In terms of effect sizes these two correlations can be considered large, i.e., higher than 0.50 (Cohen, 1977). The S-DAI, the DAS and the 10-point scale did not correlate significantly with the SCL-90 or any of its subscales (all $p > 0.01$).

Table 1 Summary statistics for S-DAI

item	description	Mean	SD	Rank	Corrected item-total correlation	Factor loading	H
2	When I know the dentist is going to extract a tooth, I am already afraid in the waiting room.	4.72	0.72	1	0.61	0.65	0.45
7	On my way to the dentist, I get anxious at the thought that she/he will have to drill.	4.54	0.90	2	0.50	0.81	0.55
9	On my way to the dentist, the idea of being in the chair already makes me nervous.	4.49	0.91	3	0.64	0.80	0.53
8	When I am sitting in the dentist's chair not knowing what is going on in my mouth, I break into a cold sweat.	4.47	0.96	4	0.58	0.71	0.47
3	When I think of the sound of the drilling machine on my way to the dentist, I would rather go back.	4.44	1.04	5	0.32	0.77	0.51
6	In the waiting room, I sweat or freeze when I think of sitting down in the dentist's chair.	4.38	1.00	6	0.79	0.86	0.58
5	As soon as the dentist gets his/her needle ready for the anaesthetic, I shut my eyes tight.	4.33	1.15	7	0.62	0.35	0.22
1	I become nervous when the dentist invites me to sit down in the chair.	4.28	0.96	8	0.61	0.76	0.51
4	I want to walk out of the waiting room the moment I think the dentist will not explain what she/he is going to do in my mouth.	4.27	1.11	9	0.65	0.69	0.46

Discussion

The present study provides the first data on the psychometric properties of the S-DAI in a population of highly anxious dental patients. The results showed that women scored slightly higher than men. This is in line with findings in other studies where women tended to show more dental anxiety as indicated by self-report measures in the general Dutch population (Milgrom et al., 1988; Stouthard & Hoogstraten, 1990) and in highly anxious dental patients (Berggren, 1992; Hakeberg, Berggren, & Carlsson, 1992). Furthermore, highly anxious dental patients in this study were most anxious about tooth extraction. Tooth extraction is also considered the most frightening aspect in the general population (Stouthard et al., 1994). Ranking in the two populations on the other items do not correspond very well. In the general population, the item on anesthetic injection has the second highest mean score, whereas this item ranked seventh in the present group. But, as we will discuss later, this item seems less reliable and does not fit very well in the total scale.

Reliability in terms of internal consistency of the S-DAI was lower in this study than in the general population, where Cronbach's α was 0.93. This is in line with the observation that group homogeneity alters the reliability estimate (Crocker & Algina, 1986). When sample variance decreases, as it does in this study compared with the general population, the reliability estimate also decreases. Using the proposed formula for the prediction of the reliability estimate in the new sample we expected Cronbach's α to be 0.84. The value actually found in the present sample was higher.

Factor analysis of the S-DAI indicates that all items represent one construct. In Stouthard et al. (1993) it was stated that the new instrument should cover the whole range of dental anxiety, from no anxiety at all to extreme anxiety. The results from the Mokken Scale Analysis indicate that the S-DAI indeed covers the whole range of dental anxiety. This information points to a sufficient construct validity, although item 5, "As soon as the dentist gets the needle ready for the anesthetic, I shut my eyes tight", seems to be somewhat deficient. The item makes the scale less reliable, although overall reliability still is sufficient. This should be taken into account in future studies. It may, in some cases, even be better to exclude this item from analyses and to reduce the questionnaire to eight items.

However, one latent variable seems to underlie the nine items measuring dental anxiety.

In addition, correlations between the S-DAI on the one hand and the DAS and 10-point scale on the other indicate a good convergent validity of the scale. In Stouthard (1989) correlations with self-report measures of dental anxiety were higher, but the lower values found in our study are due to the restricted range in the present group. This group homogeneity may also explain that the lack of relation between S-DAI, the DAS and the 10-point scale on the one hand and the SCL anxiety scale or any of the other psychological dimensions on the other. This might also indicate that dental anxiety represents a separate construct and does not necessarily coincide with more general psychopathology, as measured by the SCL-90. In the general population such relations were assessed with the DAI (Stouthard et al., 1995). The mean score of the S-DAI found in the present study was higher than the mean scores for the general Dutch population, psychology students, and patients of a general dental practice. The S-DAI thus seems also capable of discriminating between groups. Usefulness to discriminate between, for example, treatment groups has to be assessed in future studies. Overall, the S-DAI seems to have satisfactory construct validity.

In general, the data suggest that the S-DAI is a good alternative to the DAI. As mentioned in the introduction, both in general practice and in dental fear clinics where patients often fill out many questionnaires, the short form is easier to administer. Furthermore, the present study suggests that the psychometric properties of the short version are sufficient. This study contributes to the field of diagnostic instruments suitable for use with highly anxious dental patients. It is important that questionnaires satisfy official norms for test construction (American Psychological Association, 1985). The S-DAI does so with regard to the description of anxiety or fear given by the constructors, the reliability, and validity. The normative data and cut-off scores of the S-DAI apply to highly anxious dental patients, and in a modified way to the general Dutch population. We therefore conclude that the S-DAI is a well-constructed, psychometrically sound questionnaire suitable for assessing dental anxiety in both regular and highly anxious dental patients.

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