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Evaluating a single dental anxiety question in Finnish adults

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Abstract

Objective. To evaluate the psychometric properties (criterion validity, construct validity, sensitivity, and specificity) of a single-item question screening for dental anxiety in a Finnish adult population. ***Material and methods.*** A total of 823 subjects, ranging in age from 18 to 87 years, answered a questionnaire comprising sections assessing the respondents' demographic profile and dental attendance patterns. A single dental anxiety question and the Modified Dental Anxiety Scale (MDAS) were included. The final response rate was 85%. ***Results.*** Eight percent of the sample was highly dentally anxious using the MDAS cut-off point of 19 or above. Twelve percent of the respondents rated themselves as "very scared" on the single-item question. The percentage agreement between the single-item question and the MDAS was 93; the Kappa coefficient was 0.63. Specificity of the single question was 0.95 while sensitivity was 0.80 using the MDAS dichotomous classification. The single-item question related to age ($p < 0.001$), gender ($p < 0.001$), and dental attendance ($p < 0.001$), as predicted. ***Conclusions.*** The single question has good validity, specificity, and sensitivity and may be used with confidence to assess dental fear in such situations as national health surveys or in routine dental practice where a multi-item dental anxiety questionnaire is not feasible.

Key Words: *Dental fear*, *questionnaire*, *sensitivity*, *specificity*, *validity*

Introduction

Dental health surveys of adults in Europe suggest that a small but sizable proportion of individuals experience anxiety when attending for dental treatment. In the United Kingdom, for example, 32% state that they are definitely anxious [1]; in Germany the prevalence is 23% [2] and in Finland 20% of adults state that they are fearful about going to the dentist for dental treatment [3]. Dental anxiety is associated with avoidance of dental care, which in turn may lead to deterioration of oral health [4,5].

Despite problems in comparing the results due to methodological differences, and in agreement with Sohn & Ismail [6], these epidemiological findings suggest that an assessment of dental anxiety in practice populations is needed if appropriate and holistic care is to be provided and emotional discomfort in their attending patients is to be reduced. Furthermore, an assessment of dental anxiety would contribute to evidence-based research into this psychological construct which has been shown to predict dental avoidance [4,5]. Despite the need for assessment, Dailey et al. [7] have shown that dentists are unlikely to use dental anxiety questionnaires in the practice setting. Reasons for non-use include the possibility that the process of answering a questionnaire might sensitize the patients and increase their level of anxiety. In addition to this potentially negative effect, some dentists believe that they can readily recognize the anxious patient.

Recent research [8,9] has shown that completion of a dental anxiety questionnaire by practice patients, on the contrary, has no effect on patient anxiety. The issue of time urgency, however, may be an additional and real concern for dental practitioners. To this end, researchers have devised a short-item version of the Fear of Dental Pain Scale,

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which has been found to correlate strongly with the original scale [10]. These findings suggest that a one-item question screening patients for dental anxiety may be appropriate, realistic, and achievable in the busy practice setting, and be more patient-centered than relying on the dentist's perceptions of patient behavior.

It is proposed that a single dental anxiety question could be used as a screening tool for assessing an individual's experience of dental fear when attending for dental treatment. If an individual scores high on the single question, then a more in-depth assessment of the attending patient's dental anxiety [11] can be made using such inventories as the Modified Dental Anxiety Scale (MDAS) [12,13] or the Dental Fear Survey Schedule [14]. Furthermore, a single item would be of value in prevalence studies or in general health surveys on a population basis where more extensive questioning about dental anxiety is not possible.

Nevertheless, an important issue remains. What would be the validity of a single question in screening for dental anxiety and hence its ability to differentiate between anxious and non-anxious patients? In order to assess validity, it would be necessary to use a "gold standard", such as the MDAS [12,13], to assess criterion validity and to collect demographics (age and gender) and details of dental attendance patterns from respondents in order to assess construct validity. The aim of this investigation was therefore to evaluate the psychometric properties (criterion validity, construct validity, sensitivity, and specificity) of a single-item question screening for dental anxiety in a Finnish adult population attending dental practice.

Material and methods

The sample

Pori, the 10th largest city in Finland, has a population of 76,144, with 85% in the age range 15 to 64 years. Thirty percent (22,851) of the Pori population attend the public dental services. A 1.0% consecutive sample of people (823) aged 18 years and over from all of the 14 public dental clinics in Pori was invited to take part from April to June. Written consent was obtained and ethical approval was given by the Oulu University Hospital Ethics Committee.

Of the 823 questionnaires administered to the sample, 713 were completed, giving a response rate of 87%. Of the 110 who refused to participate, only 59 provided reasons for their non-participation. These included not having time (36), not have their reading glasses with them (8), not being interested (10), not being afraid (3), and being in too much pain (2). Fifteen cases were removed from the final data set due to missing data on MDAS or single item, resulting in a final response rate of 85% (698).

The mean age of the sample was 42.0 (SD 16.7) years. Eighty-seven percent of the sample population were aged between 18 and 64 years, which was equivalent for the age profile of the general population residing in Pori. Thirty-eight percent of the sample was male and 77% stated that they attended the clinic on a yearly basis (Table I).

The procedure

Each individual approached was provided with written and verbal information explaining the aim of the survey and requesting their participation. They were informed that participation was voluntary and would not affect their present or future dental care. The receptionists and dental nurses were instructed on how to approach the potential participant and on how to provide assistance if reading difficulties were encountered. They were instructed not to prompt participants while they completed the questionnaires or to assist them when choosing a response. Age and gender were noted on the data collection form.

The questionnaire

The questionnaire was in three parts, the first inquiring about the participants' demographic profile, which included age (in years) and gender (male, female). The second part asked about dental attendance patterns (regularly for check-up, only when having pain or other problems, never). The final part assessed dental anxiety using, first, the single question, which was assessed on a 3-point scale. It asked: "Is a visit to the dentist (i) "not scary at all?" (scoring 1), (ii) "scary to some extent?" (scoring 2), (iii) "very scary?" (scoring 3).

The second assessment of dental anxiety used was the Finnish version of the MDAS [13]. The MDAS is a five-item questionnaire asking respondents to indicate their emotional reaction to a dental visit, when in the waiting room, in anticipation of drilling,

Table I. Distribution of the sample of adults visiting public dental clinics in Pori, Finland, according to gender, age, and dental visiting habits

	n	%
Gender		
Male	262	38
Female	436	62
Age (years)		
18–34	264	38
35–49	204	29
50–64	138	20
65+	92	13
Dental visiting in past 12 months*		
Yes	531	77
No	162	23

*Five missing.

scaling, and local anesthetic injection. The MDAS uses a simple rating scale with five possible responses to each question, ranging from "not anxious" (scoring 1) to "extremely anxious" (scoring 5). Reliability of the MDAS is high (internal consistency=0.89; test-retest=0.82) [12] and also for the Finnish adult population [13].

Statistical analysis

The data were subjected to Spearman's correlation analysis, Kruskal-Wallis one-way analysis of variance (ANOVA), Mann-Whitney tests, and sensitivity and specificity analysis (SPSS v. 12, SPSS, Chicago, Ill., USA).

Results

Criterion validity

Spearman correlation coefficients between the single question and all the items and total scale score of the MDAS are given in Table II. All coefficients were highly significant ($p<0.001$). The mean levels for the total scale and the five individual item scores across the three categories of the single dental anxiety question were in rank order of magnitude according to prediction (Table II). The Kruskal-Wallis test confirmed that the respondents' rating on the single question was successfully discriminated ($p<0.001$) by each of the single items and total scale scores on the MDAS. Respondents who rated their anxiety as "very scary" had a significantly higher mean sum score of MDAS compared to subjects who reported being "scared up to some extent" (19.11 vs. 9.02, Z=13.39; $p<0.001$). In addition, the sample was split between those who stated they were very scared about their visit to the dentist and those less scared. This dichotomy was compared with the profile of the sample divided according to the clinically validated MDAS cut-off score of 19 into high and low dentally anxious patients. Percentage agreement was 93 and the Kappa coefficient 0.63.

Assessing specificity and sensitivity

Eight percent of the sample was found to be highly dentally anxious on the MDAS scoring using the 19 cut-off score. Twelve percent of respondents rated themselves as very scared. Specificity of the single question when split into those who replied "very scary" compared with the rest of the sample was found to be 0.95; sensitivity was 0.80 using the MDAS dichotomous classification. Of those participants scoring less than 3, i.e. 611 respondents, only 29 (5%) rated their response to any of the 5 items on the MDAS as "extremely anxious".

Construct validity

Age. Older age groups (i.e. >50 years) had significantly lower mean scores for dental anxiety as assessed by the single-item measure compared with younger age groups (those aged between 18 and 49 years) (Table III).

Gender. Women (mean 1.81, SD 0.67) had significantly higher mean scores for dental anxiety as assessed by the single-item measure compared with men (mean 1.56, SD 0.63) (Z=4.88; $p<0.001$).

Dental attendance pattern. Subjects who attended the dentist on a regular basis had significantly lower mean dental anxiety scores than those who attended on a more irregular basis (1.60 vs. 1.87, Z=4.90; $p<0.001$).

Discussion

The sample population appeared to be representative of the Pori population, as 87% were aged

Table II. Mean (SD) for single items and total scores of MDAS and Spearman correlation coefficients (r_s) for each of the items and the single dental anxiety question

Is a visit* to the dentist?		Visiting dentist tomorrow	Sitting in waiting room	Having a filling	Having a scale and polish	Having a local anesthetic injection	MDAS scale total
Not scary	Mean	1.08	1.20	1.49	1.32	1.47	6.55
($n=279$)	SD	0.27	0.40	0.63	0.61	0.67	1.73
Scary to some extent	Mean	1.90	2.18	2.65	2.04	2.34	11.10
($n=332$)	SD	0.78	0.76	0.97	1.00	0.98	3.46
Very scary	Mean	3.57	3.91	4.39	3.45	3.78	19.11
($n=82$)	SD	1.05	1.00	0.83	1.23	1.28	4.14
r_s		0.73	0.76	0.72	0.55	0.59	0.77

Note: All correlations $p<0.001$.
*Five missing.

Table III. Comparison of single-item scores (means and standard deviations) by age group

Age group (years)	18–34 ($n=264$)	35–49 ($n=204$)	50–64 ($n=138$)	65+ ($n=92$)
Mean	1.87[a]	1.75[b]	1.58[b]	1.40
SD	0.70	0.64	0.56	0.59

Analysis of variance: $\chi^2_3=24.29$; $p<0.001$.
[a]This group differs significantly from all other groups at $p<0.02$.
[b]These groups differ significantly from each other at $p<0.02$.

between 18 and 64 years compared with 85% of the Pori population for the same age groups. We did not attempt to approach the non-respondents as the inclusion rate was almost 90%.

With regard to criterion validity, the single question behaved as predicted by demonstrating expected relationships with a criterion measure of dental anxiety – the MDAS. The single question, therefore, exhibited good criterion validity, since there were significant correlations between the single-item question and the MDAS, not just for individual items but also for total scores. There was 93% agreement between scores with regard to those participants who scored 19 and over on the MDAS and 3 on the single-item question; Kappa, which takes into account chance agreement, was "substantial" [15].

Furthermore, the results showed that within this Finnish patient population 12% of the sample experienced a visit to the dentist as "very scary". Therefore, respondents who indicated that they found a visit to the dentist "very scary" had an 80% chance of being highly dentally anxious as assessed by the MDAS. Those participants who rated themselves as not being scared or scared "to some extent" had a 95% chance of not being dentally anxious as assessed by the MDAS. A small percentage (less than 5) of these patients stated that they were "extremely anxious" on at least one of the five items of the MDAS. Hence, one of these patients may have stated that they were not "very scared", but still with difficulty receiving an aspect of dental treatment. Moreover, the sensitivity of the single question was 0.80, indicating that there is an 80% probability that the patient checking the "very scary" category was predicted correctly as being highly dentally anxious (i.e. scoring 19 or above on the MDAS). Overall, this suggests that the single-item question can be used with confidence to screen patients who might score 19 or over on the MDAS, which in turn complies well with the often used DAS measure [16]. Although, Corah's original DAS measure has been employed extensively, it has been recommended that the MDAS supersedes the original DAS tool [16]. Therefore, in recognition of the large fund of data collected by those reporting Corah's scale, there is now an efficient mechanism for converting to the MDAS metric. The issue of the MDAS being recognized as the gold standard is further supported in an independent work by Newton and Edward, who state that, "the MDAS is a highly consistent and reliable measure which has good discriminant and concurrent validity" [17]. This would indicate the need for a more in-depth assessment of their dental anxiety and the requirement of specialist services.

With regard to construct validity, the single question behaved as predicted by demonstrating expected relationships with age, gender, and visiting behavior. As noted elsewhere in the dental anxiety literature, the single-item question demonstrated that older age groups [12], men [18] and those who were yearly [18] and regular dental attenders, experienced less dental anxiety compared with younger age groups, women and irregular attenders.

Concerns have been raised by dental practitioners regarding the use of dental anxiety questionnaires in the practice setting [7], and issues surrounding the time taken to administer and analyze such inventories are felt to be important. However, the development and use of a single question as a screening tool could be appropriate, realistic, and achievable for use by dentists. This single-item question has been shown to have good validity, specificity, and sensitivity, and could be used with confidence to screen patients with high dental anxiety. Furthermore, a possible clinical assessment model may be proposed which would be to adopt the single-item screening question and follow up with a more extensive questionnaire, such as the MDAS or the Dental Fear Survey Schedule, to ascertain specific features of the patients' dental anxiety profile.

In conclusion, this investigation indicates that a single question can be used with confidence to assess dental fear in such situations as national general health surveys or routine clinical practice where a multi-item dental anxiety questionnaire is not realistic or feasible.

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References

[1] Nuttall N, Bradnock G, Morris J, Nunn J. Dental attendance in 1998 and implications for the future. Br Dent J 2001;190: 177–82.
[2] Enkling N, Marwinski G, Johren P. Dental anxiety in a representative sample of residents of a large German city. Clin Oral Investig 2006;10:84–91.
[3] Lahti S, Hausen H, Vehkalahti MM, Nordblad A. Dental anxiety among adult Finns by age and gender. Community Dent Health 2003;20:190–1.
[4] Berggren U, Carlson SG. Psychometric measures of dental fear. Community Dent Oral Epidemiol 1984;12:319–24.

[5] Berggren U, Carlson SG. The usefulness of two psychometric scales in patients with severe dental fear. Community Dent Oral Epidemiol 1985;13:70–4.
[6] Sohn W, Ismail AI. Regular dental visits and dental anxiety in an adult dentate population. J Am Dent Assoc 2005;136: 58–66.
[7] Dailey YM, Humphris GM, Lennon MA. The use of dental anxiety questionnaires: a survey of a group of UK dental practitioners. Br Dent J 2001;190:450–3.
[8] Humphris GM, Clarke HMM, Freeman R. Does completing a dental anxiety questionnaire increase anxiety? A randomised controlled trial in general dental practice. Br Dent J 2006;20:33–5.
[9] Humphris GM, Hull P. Do dental anxiety questionnaires raise anxiety in dentally anxious adult patients? A two wave panel study. Prim Dent Care 2007;14:7–11.
[10] van Wijk AJ, McNeil DW, Ho CJ, Buchanan H, Hoogstraten J. A short English version of the Fear of Dental Pain questionnaire. Eur J Oral Sci 2006;114:204–8.
[11] Erten H, Akarslan ZZ, Bodrumlu E. Dental fear and anxiety levels of patients attending a dental clinic. Quintessence Int 2006;37:304–10.
[12] Humphris GM, Morrison T, Lindsay SJ. The Modified Dental Anxiety Scale: validation and United Kingdom norms. Community Dent Health 1995;12:143–50.
[13] Humphris GM, Freeman R, Campbell J, Tuutti H, D'Souza V. Further evidence for the reliability and validity of the Modified Dental Anxiety Scale. Int Dent J 2000;50:367–70.
[14] Cuthbert MI, Melamed BG. A screening device: children at risk for dental fears and management problems. ASDC J Dent Child 1982;49:432–6.
[15] Landis JR, Koch GG. The measurement of observer agreement for categorical data. Biometrics 1977;33:159–74.
[16] Freeman R, Clarke HMM, Humphris GM. Conversion tables for the Corah and Modified Dental Anxiety Scales. Community Dent Health 2007;24:49–54.
[17] Newton JT, Edward JC. Psychometric properties of the modified dental anxiety scale: an independent replication. Community Dent Health 2005;1:40–2.
[18] Skaret E, Raadal M, Kvale G, Berg E. Gender-based differences in factors related to non-utilization of dental care in young Norwegians. A longitudinal study. Eur J Oral Sci 2003;111:377–82.