Community Dent Oral Epidemiol 2004; 32: 25–30

Community Dentistry and Oral Epidemiology

Reliability and validity of the Dental Satisfaction Questionnaire in a population of 23-year-olds in Norway

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Skaret E, Berg E, Raadal M, Kvale G. Reliability and validity of the Dental Satisfaction Questionnaire in a population of 23-year-olds in Norway. Community Dent Oral Epidemiol 2004; 32: 25–30. © Blackwell Munksgaard, 2004

Abstract – *Objective:* The aim of this study was to explore the internal structure, reliability, and construct validity of the Dental Satisfaction Questionnaire (DSQ) in a population of young adults in Norway. *Methods:* The DSQ scale was mailed to a representative sample of 968 subjects aged 23 years in two Norwegian counties. The reliability assessment of the instrument was based on internal consistency analysis (Cronbach's alpha). A factor analysis (principal component) was used to confirm the internal structure of the scale. The construct validity of the DSQ was indicated by: (i) its correlation with the patients' beliefs regarding the way dentists deliver care, indexed by the Dental Beliefs Survey (DBS); and (ii) differences in DSQ scores between subjects who had dropped out from dental care at the age of 23 years and regular attenders. *Results:* The response rate was 69%. The alpha (Cronbach's) coefficient for the overall construct of DSQ was 0.81 ($n = 655$), and 0.65 or more for the subscales pain management, quality, and access. The correlation coefficient between the sum-scores of DSQ and DBS for the entire sample was $r = -0.69$. Subjects in the dropout group had significantly lower satisfaction with dental care than the rest of the group ($P < 0.001$). *Conclusions:* This study generally confirms the structure of the DSQ instrument and indicates that it is a reliable and valid instrument in cultures other than the one for which it was previously tested.

Key words: Dental Satisfaction Questionnaire; reliability; validity

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Submitted 7 January 2003;
accepted 10 June 2003

Variables related to satisfaction with health care have been shown to influence health beliefs, compliance, and utilization of care (1, 2). Understanding these factors may have an effect on the delivery of care and on interventions aimed at increasing utilization of care. Empirical studies (3) support the idea that the concept of satisfaction with dental care is multidimensional, and that this concept has to be measured with multi-item instruments. One of the few instruments of this kind is The Dental Satisfaction Questionnaire (DSQ), which was developed and tested for reliability and validity in a large scale, multisite national study in USA by Davies & Ware (4). This instrument has also been tested in a low-income population in the same country (5).

It is generally accepted that both the reliability and validity of psychometric scales may be influenced by cultural differences in attitudes, beliefs, and priorities, and the scales should therefore be retested before being used in a different cultural context. In their original work, Davies & Ware (4) suggested that the same principle should be applied to the DSQ scale as well as to the different dimensions of dental satisfaction, particularly satisfaction with pain management. However, to our knowledge, no such population-based studies have so far been published.

In Scandinavia, the utilization rate tends to drop during the transition period (age 18–21 years) when the adolescents leave the free public dental care system, which until then has been available to them (6, 7).

At this time, they have to establish a new relationship with a private or public dental clinic. Avoidance behavior during this age period is probably influenced by whether or not these subjects are satisfied with the previous care given to them. Studies have indicated that previous experiences of pain during childhood is one of the major factors related to avoidance of care in this population (8). Measurement of dental satisfaction with a reliable multidimensional instrument, which also includes a pain management subscale, may therefore reveal important aspects with regard to the reasons for dropout within this group.

The aim of the study was to explore the internal structure, reliability, and construct validity of the DSQ in a population of 23-year-olds in Norway.

Materials and methods

Subjects

The respondents from a random sample of adolescents who had been surveyed at the age of 18 years (original sample) were surveyed again at the age of 23 years ($n = 968$). The original sample had been randomly selected from two Norwegian counties. For further details, see (9). All subjects had been given free and regular dental care in the Norwegian Public Dental Service from birth and up to the age of 18 years, at which time they would have to take over the responsibility for their own dental care.

Survey methods

The data collection was based on questionnaires mailed to the 23-year-old subjects. Reminders were sent according to a modified version of the Total Design Method (10).

Measures

In addition to demographic variables (gender, social status), the following instruments were included in the survey: the DSQ (4) and the Dental Beliefs Survey (DBS) (11). The DSQ was designed to measure opinions and attitudes about dentistry, including five subscales assessing the constructs *access*, *availability*, *cost*, *pain management*, and *quality of care*. The instrument includes 19 five-point Likert-type items (from 1 = strongly agree to 5 = strongly disagree). The item-scores are aggregated to form an overall dental satisfaction score with a range from 19 to 95 (4). The DBS contains 15 Likert-type items (from 1 = strongly agree to 5 = strongly disagree) and records the dentist's behavior and how the care is delivered as perceived by the patients. The DBS sum-score has a range from 15 to 75 (11). The DSQ questionnaire was translated into Norwegian by the authors and then retranslated back into English by an independent person.

Reliability and validity

The reliability assessment of the DSQ was based on internal consistency analyses. Factor analyses were used to confirm the internal structure found in previous studies (4, 5). No 'gold standard' is defined for the construct of satisfaction with dental care. However, studies have indicated that the concept is associated with factors like the dentist–patient relationship and visiting habits (4, 12, 13). Accordingly, the construct validity of the DSQ and the different subconstructs were evaluated by analyzing: (i) their relationships to the patients' perception of the care delivered by the dentist, as indexed by the DBS; and (ii) differences in DSQ scores for subjects who had dropped out from regular dental care at the age of 23 years ($n = 45$) as compared to the rest of the group. This subgroup of the sample had already been identified in a previous study (14). The DBS instrument had already been tested for reliability and validity in Norway (15).

Statistical analyses

The data were analyzed using SPSS (version 10.0). Some of the items of the DSQ are scored in a negative direction, and these items were reversed before the analyses to make a high total DSQ score mean high satisfaction with care (4). Missing values on single items were 'plugged' using the mean of the scores of the other items. More than 20% missing items would qualify for exclusion from computing a sum-score (but none satisfied this criterion). Factor analyses (principal component) with orthogonal rotation was used. Reliability of the scale was assessed by Cronbach's alpha. The validity of the scale was analyzed by Pearson's correlation (DSQ and DBS), and comparisons between groups were analyzed with one-way analyses of variance (ANOVAs).

Results

A total of 666 subjects (55% females) completed and returned the questionnaire, corresponding to a response rate of 69% (666/968). The mean DSQ sum-score was 60.6 (SD = 8.5). Males scored higher than females (61.4 vs. 59.9; $F(1, 653) = 4.6$, $P < 0.05$;

Table 1. Satisfaction with dental care (mean and SD) according to gender for 23-year-olds in Norway

	Pain management	Quality	Access	Overall satisfaction
Males	10.58 (2.64)	23.61 (3.68)	21.28 (3.76)	61.37 (8.34)
Females	9.87 (2.80)	22.93 (4.00)	20.73 (3.64)	59.93 (8.63)
	$F(1, 661) = 10.95$, $P = 0.001$	$F(1, 661) = 5.09$, $P = 0.024$	$F(1, 661) = 3.63$, $P = 0.057$	$F(1, 653) = 4.63$, $P = 0.032$

(Table 1). No differences in dental satisfaction were found between social status groups.

Reliability and validity

The factor analysis produced a factor matrix of five factors with an eigen value of 1 or more, explaining a total of 51.6% of the scale variance (Table 2). The following factors were identified in the model: *pain management* (main items #4, 8, and 19); *quality* (main items #2, 6, 11, 14, and 18); *costs* (main items #1, 3, 10, 16, and 17); *availability/convenience* (main items # 7, 9, and 13); and *access* (main items # 5, 12, and 15). According to the authors of the original scale (4), the general satisfaction item (#1) and the continuity item (#12) should not be included in the subscales. Also, the factors costs, availability/convenience, and access were summarized to create a total access subscale (4). When added up in the same way as suggested by the authors, to be able to compare between populations, our analyses ended up with the same subscales as in the previous studies (4, 5): *pain management*, *quality*, *access* (total), and *DSQ-overall score* (sum-score of all the items). Factor analysis with items 1 and 12 excluded gave slightly different loadings, but not sufficient to give major changes in the factors. The access factor (items 5, 12, and 15) now disappeared, and the items 5 and 15 (12 was excluded) were included in the availability/convenience factor. Thereby, when the factors *costs*, *availability*, and *access* were summarized to a total access factor, the factors ended up in the same way as when items 1 and 12 were not excluded.

As shown in Table 3, the alpha (Cronbach's) coefficient for the overall construct of DSQ was 0.81 ($n = 655$). All the subscales had coefficients of 0.65 or more.

The correlation coefficient between the DSQ sum-scores and DBS sum-scores for the entire sample was $r = -0.69$. When analyzed for males and females separately, the coefficients were -0.67 and -0.72, respectively. Subjects in the dropout group had significantly lower satisfaction with dental care as

Table 2. Factor analyses of the DSQ in a sample of 23-year-olds

Item	Content	Matrix I	II	III	IV	V
1	There are things about the dental care I receive that could be better	0.22	0.29	**0.53**		0.22
2	Dentists are very careful to check everything when examining their patients		**0.58**	0.25		
3	The fees dentists charge are too high			**0.71**		
4	Sometimes I avoid going to the dentist because it is so painful	**0.78**				0.22
5	People are usually kept waiting a long time when they are at the dentist's office	0.28		0.21		**0.47**
6	Dentists always treat their patients with respect	0.26	**0.63**	0.25		
7	There are enough dentists around here				**0.83**	
8	Dentists should do more to reduce pain	**0.67**		0.25		
9	Places where you can get dental care are very conveniently located		0.27		**0.79**	
10	Dentists always avoid unnecessary patient expenses	0.26		**0.48**		0.23
11	Dentists aren't as thorough as they should be	**0.47**	**0.39**	**0.38**		0.21
12	I see the same dentist just about every time I go for dental care					**0.74**
13	It's hard to get a dental appointment for dental care right away			0.32	**0.57**	0.28
14	Dentists are able to relieve or cure most dental problems that people have		0.65			
15	Hours when you can get dental care are good for most people		0.23	0.23		**0.54**
16	Dentists usually explain what they are going to do and how much it will cost before they begin treatment		0.38	**0.47**		0.28
17	Dentists should do more to keep people from having problems with their teeth	0.31		**0.34**	0.21	
18	Dentists' offices are very modern and up to date		**0.63**			
19	I am not concerned about feeling pain when I go for dental care	**0.80**				
	Eigen value	4.86	1.60	1.38	1.25	1.00
	Variance explained (%)	24.1	8.4	7.2	6.6	5.3

Factors loadings > 0.20 (highest loadings in bold).

Table 3. Reliability (Cronbach's alpha) of the subscales based on the original DSQ

Subscale	Item #	Content (shortened form)	Cronbach's alpha
Pain management			0.70
	4	Sometimes I avoid the dentist because it is too painful	
	8	Dentists should do more to stop pain	
	19	I am not concerned about pain when I go to the dentist	
Quality			0.70
	2	Dentists check everything when examining their patients	
	6	Dentists always treat their patients with respect	
	11	Dentists are not as thorough as they should be	
	14	Dentists are able to fix or cure most dental problems	
	16	Dentists usually explain what they do and the costs	
	17	Dentists should do more to keep people away from teeth problems	
	18	Dental offices are modern and up to date	
Access			0.65
	3	Dentists charge too much money	
	5	People have to wait long time at dentist's office	
	7	There are enough dentists around here	
	9	Places where you can get dental care are easy to get to	
	10	Dentists always avoid unnecessary patient costs	
	13	It is hard to get a dental appointment right away	
	15	Hours when you can get dental care are good for most people	
Items not in subscales			
	1	There are things about dental care that could be better	
	12	I see the same dentist just about every time I go for dental care	
DSQ (overall)			0.81

Table 4. Overall satisfaction and sum-scores for subscales for the dropout group compared to the rest of the group of 23-year-olds in Norway

	Pain management	Quality	Access	Overall satisfaction
Dropout group	8.42 (3.41)	21.94 (3.62)	19.67 (3.18)	54.92 (8.41)
Rest of the group	10.32 (2.38)	23.33 (3.38)	21.09 (3.70)	60.98 (8.44)
	$F(1, 638) = 20.04$, $P = 0.000$	$F(1, 638) = 5.36$, $P = 0.021$	$F(1, 638) = 6.39$, $P = 0.012$	$F(1, 631) = 21.58$, $P = 0.000$

Table 5. Mean (SD) for DSQ and subscales, compared to other studies

Scale	23-year-olds in Norway			Original study sample			Low-income sample		
	# of items	Mean	SD	# of items	Mean	SD	# of items	Mean	SD
Pain management	3	10.19	2.75	3	9.21	2.56	3	7.91	2.91
Quality	7	23.24	3.87	7	24.78	3.45	7	24.77	3.63
Access	7	20.98	3.70	7	21.90	3.75	7	21.82	3.85
DSQ (overall)	19	60.59	8.52	19	63.11	8.54	19	60.64	9.05

compared to the rest of the group – 54.9 versus 61.0 ($F(1, 630) = 21.6$, $P < 0.001$) – including lower scores on all the subconstructs: *pain management*: 8.4 versus 10.3 ($F(1, 637) = 20.0$, $P < 0.001$); *quality*: 21.9 versus 23.3 ($F(1, 637) = 5.4$, $P < 0.05$); and *access*: 19.7 versus 21.1 ($F(1, 637) = 6.3$, $P < 0.05$) (Table 4).

Comparison between populations

The mean DSQ sum-scores and different subscale scores in the present study, the original population study (4), and the low-income population study in the US (5) are shown in Table 5. The Norwegian adolescents were more satisfied with pain management as compared to the low-income population in the US.

Discussion

The present study performed in a Norwegian setting generally confirmed the internal structure, reliability, and validity of the original DSQ instrument (4).

With regard to the internal structure, the same factors were found. The analyses indicated that the different items were both relevant and meaningful for the young adults in Norway. The only problem identified was item #11 where the word 'thorough' was translated to a word with a meaning more like 'careful'. This gave the item more 'pain-loading', and may explain the multiloadings identified for this specific item in the factor analyses. The item gave good reliability in both factor I and factor II, but as the question is originally a specific quality question and the multiloadings were probably caused by the translation error, the item was included in the quality factor. The high alpha-coefficients for the overall construct (>0.8) and the acceptable ones for the subscales (>0.6) (Table 3) testify to the reliability of the construct in this new setting.

Two different criteria were used for the validation of the DSQ instrument: its correlation with the DBS scale and whether or not the instrument was able to discriminate between the dropout group and the rest of the sample. The DBS scale measures cognitions, while dropout is defined on the basis of the subjects' behavior. The purpose of the DBS is to identify the patients' subjective perceptions as regards the dentists' behavior, which is an important aspect of satisfaction (12). A strong correlation between a high DBS score (a negative interpersonal relationship, including distrust and lack of control) and a low DSQ score support the validity of DSQ.

It seems reasonable to suppose that dropouts are less satisfied with dental care than regular attenders and, consequently, should be expected to have lower DSQ scores. However, dropout behavior, specifically in this age period, is very complex and multifactorial, and may be associated with variables not related to dissatisfaction with dental care. Therefore, only to some extent should the DSQ be expected to discriminate between dropouts and the rest of the group, and the possible effect be weak. Nevertheless, the results of the present study are in accordance with the above theory (Table 4). Based on the results of the factor analysis, the strong alpha (Cronbach's) coefficient, the relationship found between the total DSQ and the selected criteria for validation, and the fact that the explained variance of the 'Norwegian' DSQ is almost the same as the original one (4), we found it reasonable to conclude that DSQ is a valid instrument for use in the present population.

With regard to the subscales, some differences between the present results and US-collected ones could be observed. In the Norwegian material, the most important factor of dental care was pain management. This factor explained 24% of the variance (Table 2) as opposed to less than 6% in a US study of low-income mothers (5). For the latter group, the most important factor was availability/convenience that explained 20% of the variance. The latter finding makes sense in view of the fact that only 50% of the US subjects expressed that they had a regular source of care (16). Unlike the Norwegian sample who, until the age of 18, had free and regular treatment offered to them, the low-income families and racial minorities in the US are more likely to visit the dentist only symptomatically and are less likely to receive preventive care (17). They might, therefore, have perceived pain during dental treatment as reasonable.

The present study has confirmed the multidimensional concept of satisfaction with dental care, and that the concept should be measured by a multi-item instrument. The results have demonstrated that analyses of the subdimensions of the concept may diagnose clinically meaningful differences between populations, even if no differences in total satisfaction sum-scores exist.

DSQ may represent a valuable instrument in the evaluation of the delivery of dental services and for interventions aimed at increasing utilization of care among young adults in Norway.

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