KH Abrahamsson
J Stenman
K Öhrn
M Hakeberg

Attitudes to dental hygienists: evaluation of the Dental Hygienist Beliefs Survey in a Swedish population of patients and students

Authors' affiliations:
Kajsa H. Abrahamsson, *Jane Stenman*, Department of Periodontology, Institute of Odontology, The Sahlgrenska Academy at Göteborg University, Göteborg, Sweden
Kajsa H. Abrahamsson, Vårdal Institute, Göteborg University, Göteborg, Sweden
Kerstin Öhrn, Department of Health and Social Sciences, Dalarna University, Falun, Sweden
Magnus Hakeberg, School of Health Sciences, Jönköping University, Jönköping and Oral Behavioral Sciences, Institute of Odontology, The Sahlgrenska Akademy at Göteborg University, Göteborg, Sweden

Correspondence to:
Kajsa H. Abrahamsson
Department of Periodontology
Institute of Odontology
The Sahlgrenska Academy at Göteborg University
Box 450 405 30 Göteborg
Sweden
Tel.: +46 31 7733788
Fax: +46 31 77331791
E-mail: kajsa.henning.abrahamsson@odontologi.gu.se

Dates:
Accepted 8 January 2007

To cite this article:
Int J Dent Hygiene **5**, 2007; 95–102
Abrahamsson KH, Stenman J, Öhrn K, Hakeberg M. Attitudes to dental hygienists: evaluation of the Dental Hygienist Beliefs Survey in a Swedish population of patients and students.

Abstract: The aim was to evaluate and test the psychometric properties of the Dental Hygienist Beliefs Survey (DHBS) in a Swedish sample of different patient groups and students. It was hypothesized that negative dental hygienist beliefs would discriminate between fearful and non-fearful study groups. The DHBS was distributed together with the revised Dental Beliefs Survey (DBS-R) and the Dental Anxiety Scale (DAS). The study sample included 394 subjects (130 students, 144 general dental patients, 90 periodontal patients and 30 patients on a waiting list for dental fear treatment). The results verified that the DHBS discriminates well between dentally fearful and non-fearful study groups. The DHBS had high internal consistency (Cronbach's $\alpha = 0.96–0.98$) in all the groups. The correlation between the DHBS and the DBS-R was high ($\rho = 0.82$, $P < 0.001$). Furthermore, the DHBS correlated significantly with the DAS, as well as with a low but significant correlation to age (more negative attitudes in younger age groups) and gender (more negative attitudes amongst women). Regression analysis showed that gender and the DHBS items: 23, 16 and 28, i.e. items related to feeling helpless, worries/fears not being taken seriously and fear about 'bad news' possibly preventing treatment, were the most important predictors of dental fear. The results suggest that the DHBS may be a valid and reliable scale to use in order to assess patient's specific attitudes to dental hygienists. However, the psychometric properties including test–retest analysis and the underlying factor structure of the DHBS need to be further explored.

Key words: dental fear; dental hygienist beliefs survey; dental hygienist–patient relationship

Introduction

The interaction between the patient and the dental-care provider and its possible influence on treatment is an important part of dentistry. Previous studies about interpersonal relationships in dentistry have mainly focused on the dentist–patient relationship and most of the studies in this area have been performed amongst the specific group of dental fear patients [for a review see (1–3)]. The treatment alliance in dentistry is however not exclusively directed to the patient–dentist interaction, but also to the interaction between the patient and the dental hygienist. Remarkably little is known about patients' perceptions about dental hygienists and dental hygienist care. De Jongh and Stouthard (4) investigated anxiety reactions related to treatment carried out by dental hygienists and found that about 15% of the patients reported that a visit to the dental hygienist was more distressing than treatment performed by the dentist. Thus, feelings and sounds of instrument, patient's helplessness and perceived lack of control over what happens were identified as important contributors to anxiety for the dental hygienist treatment (4).

In Sweden, as well as in many other countries, dental hygienists are trained to carry out specific prevention and treatment measures (5). During recent years, the dental hygienists' professional role have been evolving and there has been an increase in education, scope of practice and professional autonomy (5). Further knowledge about how patients perceive dental hygienists' behaviour and delivery of care may thus be of high clinical relevance. To our knowledge, no study so far has focused on patients' specific attitudes to dental hygienists and how dental hygienist care is performed.

The Dental Beliefs Survey (DBS) is a well-known questionnaire directed towards the patient's subjective perceptions about dentist's behaviour and the process of how dental care is delivered (6, 7). The original DBS instrument (6) has been shown to correlate with dental fear (8–12), general psychological distress (13, 14), as well as with dental attendance (11, 15, 16) and satisfaction with dental care (17). More recently, the revised DBS (DBS-R) has been introduced (7). The DBS-R contains 28 items intended to cover three underlying dimensions related to; 'ethics', i.e. patients' concern about the ethical standards of the dentist, 'communication', i.e. patients' concern about how dentists communicate, 'control', i.e. patients' feeling of control/lack of control during treatment (7). In addition, a fourth DBS-R dimension of 'trust' has been suggested (18). The DBS-R has recently been evaluated in American samples of students and dental fear patients (19) and in a Swedish population of patients and students (20) and found to be a reliable and valid scale. As the content of the DBS-R items relates to patients confidence in the interaction with the dentist, and not to type of treatment, it could be assumed that the scale could be made suitable for the assessment of patients' confidence in the interaction with the dental hygienist. Hence, the DBS-R (7, 20) was adapted and revised to assess patients' specific attitudes about dental hygienists and dental hygienist care; it led to the development of the Dental Hygienist Beliefs Survey (DHBS). The aim of this study was to evaluate and test the psychometric properties of the DHBS in a Swedish sample of different patient groups and students. In specific, we wanted to (i) test the internal consistency of the DHBS in the study groups, (ii) compare the DHBS between the study groups and (iii) test the predictive value for dental fear of the DHBS items. It was hypothesized that negative dental hygienist beliefs would discriminate between dentally fearful and non-fearful study groups.

Materials and methods

Subjects and procedure

The questionnaires were consecutively distributed to 710 adults; 240 students (psychology, sociology, technology, health and caring sciences), 200 general dental care patients (five clinics), 170 patients referred for periodontal treatment (two clinics) living in the community of Göteborg and Falun, Sweden, and 100 patients on a waiting list for treatment at a specialized dental fear clinic in Göteborg (20). The study was approved by the regional ethical review board at Göteborg and Dalarna University.

The DHBS was distributed together with the Corah Dental Anxiety Scale (DAS) (21–23). The questionnaire package also included the DBS-R, which has been reported elsewhere (20). The students received the questionnaires in relation to a lecture, the general dental care patients received the questionnaires at a regular visit or check-up at the clinic, and the periodontal patients received the questionnaire package at their first visit at a specialist clinic for periodontal treatment. Most respondents answered and returned the questionnaires directly in a sealed envelope, whereas others returned the questionnaires by mail. Further, 100 patients on a waiting list for treatment at a specialized dental fear clinic received the questionnaires by mail and were asked to return their surveys in a stamped envelope. As the questionnaires were anonymous, no reminder was sent.

Assessments

Background information – besides group membership, data about gender and age were collected.

Dental Hygienist Beliefs were assessed using the DHBS exploring patients' confidence in the interaction with the dental hygienist. The DHBS was based on the Swedish version of the DBS-R (20) and consists of 28 items, scored from 1 (do not agree at all) to 5 (highly agree), giving a range of total scores between 28 (not negative) and 140 (highly negative). The DBS-R, which was also included in the questionnaire package (20), has originally been suggested to cover three dimensions related to *Professionalism or Ethics* (items 1–11), *Communication* (items 12–20) and *Control* (items 21–28) (7). However, factor analyses of DBS-R have indicated a somewhat different four factor solution; *Ethics* (items 1, 2, 5, 7–9, 12, 13), *Communication* (items 14–17, 19, 20), *Control* (items 6, 21–23) and *Trust* (items 4, 10, 24–27) (18). Amongst fearful dental patients DBS-R item mean scores of about 2.8–3.1 (18–20) and amongst college students (19, 20) and general dental patients (20) item mean scores of about 1.8 and 1.5, respectively, have been presented. The DHBS was tested on a smaller sub sample before data collection started and based on comments from the test subjects some minor corrections were made. Thus, item 3, which in DBS-R relates to a worry about if the dentist is technically competent, was changed to a worry about if the dental hygienist is competent, i.e. the word 'technically' was omitted. Further, item 15 and item 19, which in DBS-R relates to things that dental professionals/dental personnel say to make the patient feel guilty or will embarrass the patient over the condition of his/her teeth, was changed in the DHBS to a concern about things that dental hygienists say to make the patients feel guilty or will embarrass the patient, i.e. dental professional/dental personnel was replaced with dental hygienist. Otherwise, the DHBS items were identical to the DBS-R (20) except the fact that the dentist was replaced with dental hygienist throughout the questionnaire. Item 28 was identical in DBS-R and DHBS (see Table 3 for the content of the DHBS items).

Dental fear/anxiety was assessed by the DAS (21, 22). The DAS assesses dental anxiety level from 4 (no fear) to 20 (extreme fear). Average DAS scores of about 8–9 in ordinary patients and 13 or above amongst fearful dental patients have been reported (21–23).

Statistical analyses

The data were analyzed with descriptive statistics, chi-squared analyses, and one-way ANOVA followed by *post hoc* Tukey test for comparison between the study groups regarding gender, DAS and DHBS. Spearman rank-order correlation coefficients were calculated for the relationship between gender, age, DAS, DBS-R and DHBS. Cronbach's alpha reliability coefficients were calculated to test the internal consistency of the DHBS. Linear regression analysis was used in order to explore the predictive values for dental fear (DAS) of the separate items of the DHBS, as well as gender and age. Missing value analyses with regard to separate items in DHBS were performed, and estimated mean values for each individual were calculated to replace the missing values if two or less. Data were processed using the SPSS statistical package (24) and a *P*-value of 0.05 was considered the level of statistical significance.

Results

In total 550 (77%) respondents returned the questionnaires: 206 (86%) students, 177 (89%) general dental patients, 105 (62%) periodontal patients and 62 (62%) dental fear patients (20). However, 146 respondents (26%) stated that they had never visited a dental hygienist: 74 (36%) students, 27 (15%) general dental patients, 13 (12%) periodontal patients and 32 (52%) dental fear patients. Twenty-four individuals (10 students, six general dental care patients, seven periodontal patients and one dental fear patient) did not answer the DAS at all, which was the last instrument in the questionnaire package. The internal drop-out rate in each instrument was low. In the DHBS, 10 cases were excluded because of more than two missing values. The analysis of missing values in the DHBS showed no clear pattern with regard to separate items (maximum six missing values in any of the items). Therefore, the final sample comprised 394 subjects (260 women = 66%) with data on the DHBS (Table 1).

Reliability of the DHBS

Estimates of the α reliabilities amongst the DHBS scores were generally high, with a total Cronbach's α coefficient of 0.97 (students 0.96, general dental patients 0.96, periodontal patients 0.96, dental fear patients 0.98).

Correlations between gender, age, DAS, DBS-R and DHBS

Correlation analysis showed that the DHBS sum of scores was significantly correlated with DBS-R ($\rho = 0.82$, $P < 0.001$) and DAS ($\rho = 0.54$, $P < 0.001$), and also with a low but significant correlation to age ($\rho = -0.21$, $P < 0.001$) and to gender

Table 1. **Description of the study group of students, general dental patients, periodontal patients and dental fear patients with regard to gender, age and mean sum of scores (SD) of DHBS and DAS**

Subjects ($n = 394$)	Students ($n = 130$)	General patients ($n = 144$)	Periodontal patients ($n = 90$)	Fear patients ($n = 30$)	χ^2/F	*P*-value
Women ($n = 260$)	91	91	55	23	$\chi^2 = 3.9$	NS
Men ($n = 134$)	39	53	35	7		
Age, mean (SD)	29.8 (8.7)	53.2 (14.6)	56.8 (11.1)	41.5 (13.3)	$F = 120.1$	<0.001
Scale						
DHBS, mean sum score (SD)	41.6 (16.3)	37.3 (14.6)	41.2 (17.8)	84.3 (28.7)	$F = 62.7$	<0.001
DAS, mean sum score (SD)	8.4 (3.8)	8.1 (3.6)	8.8 (4.7)	17.8 (2.8)	$F = 53.7$	<0.001
DHBS, mean item score (SD)	1.5 (0.6)	1.3 (0.5)	1.5 (0.6)	3.0 (1.0)		

DHBS, Dental Hygienist Beliefs Survey; DAS, Dental Anxiety Scale.
The chi-squared and anova were used for significance testing (NS = not significant).

($\rho = -0.12$, $P < 0.05$) with higher DHBS sum of scores amongst women.

Description of the study groups with regard to gender, age, DAS and DHBS

A majority of the respondents in all the study groups were women and there were no statistically significant difference between the groups with regard to gender distribution. The mean age in the study group was 45.3 years, with the lowest mean age (29.8 years) amongst students and the highest mean age amongst periodontal patients (56.8 years). There was a statistically significant difference in mean age between the student, patient and dental fear groups ($P < 0.001$), but not between the groups of general and periodontal patients (Table 1). The average DHBS sum of scores varied; 37.3 amongst general dental patients, 41.2 for periodontal patients, 41.6 amongst students and 84.3 in the dental fear group. As shown in Table 1, the mean item sum of scores of the DHBS was 3.0 for dental fear patients compared with values between 1.3 and 1.5 for the other groups. There was a statistically significant difference regarding mean DHBS values, between the dental fear patients compared with all the other groups ($P < 0.001$). The mean DAS-scores varied from 8.1 in the group of general dental patients to 17.8 for the dental fear patients. There was a statistically significant difference in DAS-scores between dental fear patients compared with the other groups ($P < 0.001$) (Table 1).

DHBS subdimensions

Table 2 shows the item mean scores for the DHBS subdimensions, in accordance with the suggested underlying factors for DBS-R by Milgrom *et al.* (7) and Kvale *et al.* (18). The lowest item mean scores of the DHBS dimensions was found in the group of general dental patients, followed by periodontal patients and students with values between 1.3 and 1.7, while the dental fear group showed significantly higher scores (varying from 2.7 to 3.5) in all subdimensions compared with the other groups ($P < 0.001$). The highest mean item scores in all the groups were found in relation to the subdimensions of 'control'.

Table 2. **Item mean scores (SD) for subdimensions according to Milgrom *et al.* (7) and Kvale *et al.* (18) of DHBS in the study groups**

Subjects ($n = 394$)	Students ($n = 130$), mean (SD)	General patients ($n = 144$), mean (SD)	Periodontal patients ($n = 90$), mean (SD)	Fear patients ($n = 30$), mean (SD)	*F*-value	*P*-value
Milgrom *et al.:*						
DHBS						
Ethics	1.4 (0.6)	1.3 (0.5)	1.5 (0.7)	2.7 (1.0)	44.3	<0.001
Communication	1.5 (0.6)	1.3 (0.6)	1.4 (0.6)	3.1 (1.2)	61.9	<0.001
Control	1.6 (0.7)	1.4 (0.6)	1.5 (0.8)	3.3 (1.2)	58.3	<0.001
Kvale *et al.:*						
DHBS						
Ethics	1.4 (0.5)	1.3 (0.5)	1.4 (0.6)	2.7 (1.1)	44.7	<0.001
Communication	1.5 (0.7)	1.4 (0.6)	1.4 (0.7)	3.2 (1.3)	55.3	<0.001
Control	1.7 (0.8)	1.5 (0.7)	1.7 (0.9)	3.5 (1.2)	46.5	<0.001
Trust	1.4 (0.6)	1.3 (0.5)	1.4 (0.7)	2.8 (1.1)	47.8	<0.001

DHBS, Dental Hygienist Beliefs Survey.
The anova was used for significance testing.

DHBS, separate item mean scores and ranking orders

Table 3 shows separate item mean scores and ranking order of the DHBS in the dental fear, student and regular dental patient (general and periodontal patients) groups. In all groups the highest ranked item was item 23 in the subdimension of control 'Once I am in the chair I feel helpless (that things are out of my control). Amongst dental fear patients, item 23 was followed in ranking by item 16 in the subdimension of communication 'I am concerned that dental hygienists will not take my worries (fears) about dentistry seriously'. The lowest ranked item in the dental fear group was item 4 in the ethics or trust dimension 'I have had dental hygienists say one thing and do another'. In both the student and patient groups, item 23 was followed in ranking by item 8 'When a dental hygienist seems in a hurry I worry that I'm not getting good care' in the subdimension of ethics. The lowest ranked item in the student and patient groups was also found in the subfactor of ethics, i.e. item 2 'I believe dental hygienists say/do things to withhold information from me' and item 7 'I've had dental hygienists seem reluctant to correct work unsatisfactory to me' respectively. The most evident difference in ranking between dental fear patients versus the student and patient groups was found in relation to item 17 'I am concerned that dental hygienists will put me down (make light of my fears)', which was higher ranked amongst dental fear patients. Item 28 'Being overwhelmed by the amount of work needed (all the bad news) could be enough to keep me from beginning or completing treatment' was evidently higher ranked by dental fear patients, but also by students, compared with the patient group. There were statistically significant differences in all DHBS items between the dental fear versus the student and patient groups ($P < 0.001$). There were also a statistically significant difference between the student and patient group, with higher values amongst students on item 8 'When a dental hygienist seems in a hurry I worry that I'm not getting good care', and item 28 ($P < 0.05$).

Regression analysis

Finally, linear regression analyses were performed in order to predict dental fear (DAS) in the study sample. The predictor variables were the 28 items of the DHBS, gender and age. The last step of the forward stepwise procedure showed that gender (i.e. being a woman) ($t = -2.79$, $P < 0.01$) and the DHBS item 23 ($t = 7.69$, $P < 0.001$), item 16 ($t = 6.23$, $P < 0.001$), item 28 ($t = 5.04$, $P < 0.001$) and item 27 ($t = -1.37$, $P < 0.001$), significantly predicted dental fear. The level of explained variance (adjusted R^2) in the model was 0.52. However, due to high correlations between some of the DHBS items we found a collinearity interaction, which in this multivariate model was indicated with a shift from positive to negative correlation in item 27. Thus, in the next regression model, we removed item 27 resulting in the final model including the predictor variables: gender, and the DHBS items: 23, 16 and 28 (adjusted $R^2 = 0.49$) (Table 4). A separate regression analysis amongst the specific group of regular dental patients ($n = 234$; general and periodontal patients) revealed a comparable final model suggesting that female gender, as well as the DHBS items; 23, 16 and 28, were the best to predict dental fear (adjusted $R^{2.} = 0.42$).

Discussion

The present report was part of a study investigating the Swedish version of the DBS-R (20) and a partly new questionnaire, the DHBS, constructed to assess patients' specific attitudes to dental hygienists and dental hygienist care. The specific aim was to evaluate and to test the psychometric properties of the DHBS in a Swedish sample of different patient groups and students. It was hypothesized that negative dental hygienist beliefs would discriminate between fearful and non-fearful study groups. The results verified that the DHBS adequately discriminates between dental fear patients on a waiting list for dental fear treatment and regular dental patients, as well as between dental fear patients and a non-clinical sample of students. The DHBS had high internal consistency in all the study groups. The correlation between the DHBS and the DBS-R was high ($\rho = 0.82$). Moreover, the DHBS correlated significantly with the DAS, as well as with a low but significant correlation with gender and age. Linear regression analysis showed that the DHBS items: 23, 16 and 28, as well as gender (women), were the most significant predictors for dental fear (DAS).

Shortcomings of the present study may be the non-randomized selection of subjects (20) as well as the limited number of respondents in the severe dental fear group that had visited a dental hygienist. However, the strength in the study may be the different geographical and clinical location of the selected subjects as well as the distribution in the groups of regular dental patients and students suggesting that the results are representative of similar study populations.

Estimates of the α reliabilites amongst the DHBS scores were generally high, with a Cronbach's α coefficient varying from 0.96 to 0.98 in the study groups. The internal consistency of the overall DHBS corresponds well with that reported for

Table 3. **Item mean scores (SD) and ranking of DHBS in the dental fear, student and regular dental patient (general and periodontal patients) groups**

		Fear ($n = 30$)		Students ($n = 130$)		Patients ($n = 234$)	
Items	Main content	Mean (SD)	Rank	Mean (SD)	Rank	Mean (SD)	Rank
1	I am concerned that dental hygienists recommend work that is not really needed	2.4 (1.4)	25	1.4 (0.8)	16	1.4 (0.8)	13
2	I believe dental hygienists say/do things to withhold information from me	2.3 (1.3)	26	1.2 (0.5)	28	1.2 (0.5)	27
3	I worry if the dental hygienist is competent and is doing quality work	2.6 (1.4)	23	1.5 (0.9)	14	1.4 (0.9)	9
4	I have had dental hygienists say one thing and do another	2.1 (1.3)	28	1.2 (0.6)	27	1.2 (0.7)	24
5	I am concerned that dental hygienists provide all information I need to make good decisions	2.7 (1.3)	21	1.3 (0.8)	24	1.4 (0.8)	12
6	Dental hygienists do not seem to care that patients sometimes need a rest	3.2 (1.2)	10	1.5 (0.8)	9	1.4 (0.8)	10
7	I have had dental hygienists seem reluctant to correct work unsatisfactory to me	2.2 (1.5)	27	1.2 (0.7)	26	1.1 (0.5)	28
8	When a dental hygienist seems in a hurry I worry that I am not getting good care	3.3 (1.4)	8	1.9 (0.9)	2	1.6 (0.9)	2
9	I am concerned that the dental hygienist is not really looking out for my best interests	2.8 (1.4)	20	1.4 (0.8)	19	1.3 (0.8)	19
10	Dental hygienists focus too much on getting the job done and not enough on the patient's comfort	3.0 (1.3)	16	1.5 (0.8)	11	1.4 (0.8)	8
11	I am concerned that dental hygienists might not be skilled enough to deal with my fears or dental problems	3.6 (1.5)	4	1.5 (0.9)	10	1.5 (1.0)	7
12	I feel dental hygienists do not provide clear explanations	2.5 (1.0)	24	1.4 (0.7)	21	1.3 (0.7)	18
13	I am concerned that dental hygienists do not like to take the time to really talk to patients	3.1 (1.4)	11	1.4 (0.7)	20	1.3 (0.7)	21
14	I feel uncomfortable asking questions	2.6 (1.5)	22	1.3 (0.7)	22	1.2 (0.7)	23
15	Dental hygienists say things to make me feel guilty about the way I care for my teeth	3.1 (1.6)	13	1.8 (1.2)	3	1.6 (0.9)	4
16	I am concerned that dental hygienists will not take my worries (fears) about dentistry seriously	3.8 (1.5)	2	1.4 (0.8)	18	1.4 (0.8)	14
17	I am concerned that dental hygienists will put me down (make light of my fears)	3.5 (1.6)	5	1.3 (0.8)	25	1.2 (0.7)	26
18	I am concerned that dental hygienists do not like it when a patient makes request	3.0 (1.4)	14	1.4 (0.8)	13	1.3 (0.7)	22
19	I am concerned that dental hygienists will embarrass me over the condition of my teeth	3.3 (1.7)	9	1.7 (1.1)	5	1.5 (0.9)	6
20	I believe that dental hygienists do not have enough empathy for what it is really like to be a patient	3.1 (1.4)	12	1.5 (0.8)	12	1.4 (0.8)	11
21	When I am in the chair I do not feel like I can stop the appointment for a rest if I feel the need	3.5 (1.4)	6	1.8 (0.9)	4	1.6 (0.9)	3
22	Dental hygienists do not seem to notice that patients sometimes need a rest	3.4 (1.2)	7	1.6 (0.8)	6	1.6 (0.8)	5
23	Once I am in the dental hygienists chair I feel helpless (that things are out of my control)	3.8 (1.4)	1	2.0 (1.1)	1	1.8 (1.2)	1
24	If I were to indicate that it hurts, I think that the dental hygienist would be reluctant to stop and try to correct the problem	2.9 (1.4)	19	1.4 (0.8)	17	1.3 (0.8)	16
25	I have had dental hygienists not believe me when I said I felt pain	2.9 (1.4)	18	1.3 (0.8)	23	1.2 (0.7)	25
26	Dental hygienists often seem in a hurry, so I feel rushed	3.0 (1.4)	15	1.5 (0.9)	8	1.3 (0.7)	17
27	I am concerned that the dental hygienists will do what they want and not really listen to me while I am in the chair	2.9 (1.3)	17	1.4 (0.8)	15	1.3 (0.8)	15
28	Being overwhelmed by the amount of work needed (all the bad news) could be enough to keep me from beginning or completing treatment	3.6 (1.5)	3	1.6 (1.1)	7	1.3 (0.8)	20

DHBS, Dental Hygienist Beliefs Survey.

Table 4. **The final model of the linear regression analyses predicting dental fear (DAS). The predictor variables included were age, gender (women = 0) and the 28 items of the DHBS**

Variable	*B*	SE	*β*	*t*	*P*-value
Constant	4.12	0.36		11.47	<0.001
DHBS:					
Item 23; 'I feel helpless/that things are out of my control'	1.12	0.18	0.31	6.21	<0.001
Item 16; 'dental hygienists will not take my worries/fears seriously'	1.03	0.22	0.25	4.59	<0.001
Item 28; 'all bad news could be enough to keep me from treatment'	0.89	0.20	0.23	4.40	<0.001
Gender	−0.96	0.36	−0.09	−2.68	<0.01

DHBS, Dental Hygienist Beliefs Survey; DAS, Dental Anxiety Scale.
$n = 381$; $R^2 = 0.50$; adjusted $R^2 = 0.49$; $F_{4,376} = 94.3$.

the DBS-R in the same study groups (20), as well as with that previously reported for DBS-R amongst dental fear patients and students (18, 19). The correlation between the DBS-R and the DHBS was 0.82. Hence, the results suggest that patients' general perceptions about dentists and dental hygienists are highly connected, and that the DHBS may be a valid and reliable scale to use in order to assess patients' specific attitudes to dental hygienists.

The mean DAS scores in the study groups were in accordance with previously reported normative values for general dental patients and for dental fear patients (21–23). The correlation between DHBS and DAS was 0.54. Thus, the correlation between DHBS and DAS was somewhat lower than reported between DBS-R and DAS in the same study population (20). The results may partly be explained by the limited number of respondents in the dental fear group, regarding DHBS. Moreover, the relatively moderate correlation between DHBS and DAS may not only further confirm the suggestion that dental beliefs and dental fear are connected, but also that the two concepts differ (10, 12, 20, 25).

The average sum of scores of the DHBS was somewhat lower than that reported for the DBS-R in the same study groups (20) and in comparable study groups of fearful patients and students (19). Moreover, previously reported data on the DBS-R (20) revealed a significant difference not only between the dental fear group versus the other groups, but also between students and general dental patients. This difference between students and general dental patients was not found in relation to average sum of scores of the DHBS. The interpretation of the results may suggest that there are differences in patients' attitudes to dentists versus dental hygienists. However, the high correlation found between the DHBS and the DBS-R in the present study sample strengthens the interpretation of the results suggesting that individuals with experience from dental hygienist care to a larger extent are regular dental visitors, compared with patients without such experience. In this study 52% of the severe dental fear patients and 36% of the students stated that they had never visited a dental hygienist. Thus, the results may reflect a more positive attitude amongst the present respondents which may be related to dental attendance, as dental attendance has shown to be related to dental beliefs (11, 15, 16).

The highest item mean sum of scores of the DHBS was found in the subdimensions of 'control', in accordance with the suggested subfactors for the DBS-R (7, 18). In all the groups, the highest ranked item was item 23 'Once I am in the dental hygienists chair I feel helpless (that things are out of my control)'. This was in agreement with previously reported for the DBS-R (20), which further elucidate the importance to improve patient's feelings of control during dental treatments and in order to prevent fear and anxiety reactions (7, 26, 27). Worth to consider specifically is the student group that scored significantly higher than regular dental patients, on item 28 'being overwhelmed by the amount of work needed (all the bad news) could be enough to keep me from beginning or completing treatment', as this may indicate irregular dental care habits (10, 11) and indicate a risk of future dropout from dental care in young patient groups (15).

Regression analyses showed that gender, i.e. being a woman, as well as the DHBS items: 23, 16 and 28 were the most important predictors of dental fear. Thus, the items included in the final regression models relate to patients perceptions of communication (item 16) and lack of control (item 23) in relation to treatment performed by dental hygienists, but also to dental attendance as indicated by item 28. The results are in accordance with those previously reported where most studies have shown that women are more likely to report high dental fear (28–30). The results are also partly in agreement with the results previously reported for the DBS where item 16 (i.e. item 9 in the original DBS) and item 28 (i.e. item 15 in the original DBS) were found to be amongst the best items to differentiate between fearful and non-fearful patient groups (11). Moreover, the strong predictive value of item 23 further supports the suggestion by De Jongh and Stouthard (4), that

patients' helplessness and perceived lack of control are important contributors to anxiety for dental hygienist treatment.

In conclusion, the data revealed an acceptable reliability and validity of the DHBS in a Swedish sample of patients and students and an ability to discriminate between dentally fearful and non-fearful study groups. However, the psychometric properties including test–retest analysis and the factor structure of the DHBS need to be further explored. Moreover, a pair wise comparison of the separate items of the DHBS and the DBS-R may further explore if patients' specific attitudes to dental hygienists versus dentists differ.

Acknowledgements

This study received support from the Swedish Research Council (grant 13449 and 20132), and from the Research Foundation for Västra Götaland, Sweden.

References

1 Hamilton ME. A critical review of studies on the dentist–patient relationship. *Can J Community Dent* 1987; **2:** 34–49.
2 Ter Horst G, De Wit CA. Review of behavioural research in dentistry 1987–1992: dental anxiety, dentist–patient relationship, compliance and dental attendance. *Int Dent J* 1993; **43:** 265–278.
3 Abrahamsson KH. Dental fear and oral health behavior. Studies on psychological and psychosocial factors, Thesis. Faculty of Odontology, The Sahlgrenska Academy at Göteborg University, Göteborg, Sweden, 2003.
4 De Jongh A, Stouthard ME. Anxiety about dental hygienist treatment. *Community Dent Oral Epidemiol* 1993; **21:** 91–95.
5 Johnson PM. International profiles of dental hygiene 1987 to 2001: a 19-nation comparative study. *Int Dent J* 2003; **53:** 299–313.
6 Milgrom P, Weinstein P, Kleinknecht R, Getz T. *Treating Fearful Dental Patients: A Patient Management Handbook*. Reston, WA, Reston Publishing Co., 1985.
7 Milgrom P, Weinstein P, Getz T. *Treating Fearful Dental Patients: A Patient Management Handbook*, 2nd edn. Seattle, WA, Continuing Dental Education, University of Washington, 1995.
8 Smith T, Getz T, Milgrom P, Weinstein P. Evaluation of treatment at a dental fears research clinic. *Spec Care Dentist* 1987; **7:** 130–134.
9 Moore R, Berggren U, Carlsson SG. Reliability and clinical usefulness of psychometric measures in a self- referred population of odontophobics. *Community Dent Oral Epidemiol* 1991; **19:** 347–351.
10 Johansson P, Berggren U, Hakeberg M, Hirsch JM. Measures of dental beliefs and attitudes: their relationships with measures of fear. *Community Dent Health* 1992; **10:** 31–39.
11 Kvale G, Berg E, Nilsen CM et al. Validation of the Dental Fear Scale and the Dental Belief Survey in a Norwegian sample. *Community Dent Oral Epidemiol* 1997; **25:** 160–164.
12 Abrahamsson KH, Berggren U, Hakeberg M, Carlsson SG. The importance of dental beliefs for the outcome of dental-fear treatment. *Eur J Oral Sci* 2003; **111:** 99–105.
13 Moore R, Brodsgaard I, Birn H. Manifestations, acquisition and diagnostic categories of dental fear in a self-referred population. *Behav Res Ther* 1991; **29:** 51–60.
14 Berggren U, Carlsson SG, Hakeberg M, Hägglin C, Samsonowitz V. Assessment of patients with phobic dental anxiety. *Acta Odontol Scand* 1997; **55:** 217–222.
15 Skaret E, Raadal M, Kvale G, Berg E. Factors related to missed and cancelled dental appointments among adolescents in Norway. *Eur J Oral Sci* 2000; **108:** 175–183.
16 Moore R, Brodsgaard I, Abrahamsen R. A 3-year comparison of dental anxiety treatment outcomes: hypnosis, group therapy and individual desensitization vs. no specialist treatment. *Eur J Oral Sci* 2002; **110:** 287–295.
17 Skaret E, Berg E, Raadal M, Kvale G. Factors related to satisfaction with dental care among 23-year olds in Norway. *Community Dent Oral Epidemiol* 2005; **33:** 150–157.
18 Kvale G, Milgrom P, Getz T, Weinstein P, Johnsen TB. Beliefs about professional ethics, dentist-patient communication, control and trust among fearful dental patients: the factor structure of the revised Dental Beliefs Survey. *Acta Odontol Scand* 2004; **62:** 21–29.
19 Coolidge T, Heima M, Coldwell SE, Weinstein P, Milgrom P. Psychometric properties of the Revised Dental Beliefs Survey. *Community Dent Oral Epidemiol* 2005; **33:** 289–297.
20 Abrahamsson KH, Hakeberg M, Stenman J, Öhrn K. Dental beliefs: evaluation of the Swedish version of the revised Dental Beliefs Survey in different patient groups and in a non-clinical student sample. *Eur J Oral Sci* 2006; **114:** 209–215.
21 Corah N. Development of a dental anxiety scale. *J Dent Res* 1969; **48:** 596.
22 Corah N, Gale E, Illig S. Assessment of a dental anxiety scale. *J Am Dent Assoc* 1978; **97:** 816–819.
23 Berggren U, Carlsson SG. Usefulness of two psychometric scales in Swedish patients with severe dental fear. *Community Dent Oral Epidemiol* 1985; **13:** 70–74.
24 SPSS. *Advanced Statistics 11.0*. Chicago, IL, SPSS Inc., 2002.
25 Kvale G, Raadal M, Vika M et al. Treatment of dental anxiety disorders. Outcome related to DSM-IV diagnoses. *Eur J Oral Sci* 2002; **110:** 69–74.
26 Berggren U. Long-term management of the fearful adult patient using behavior modification and other modalities. *J Dent Educ* 2001; **65:** 1357–1368.
27 Abrahamsson KH, Berggren U, Hallberg L, Carlsson SG. Dental phobic patients view of dental anxiety and experiences in dental care: a qualitative study. *Scand J Caring Sci* 2002; **16:** 188–196.
28 Hakeberg M, Berggren U, Carlsson SG. Prevalence of dental anxiety in an adult population in a major urban area in Sweden. *Community Dent Oral Epidemiol* 1992; **20:** 97–101.
29 Moore R, Birn H, Kirkegaard E, Brodsgaard I, Scheutz F. Prevalence and characteristics of dental anxiety in Danish adults. *Community Dent Oral Epidemiol* 1993; **21:** 292–296.
30 Skaret E, Raadal M, Berg E, Kvale G. Dental anxiety among 18-yr-olds in Norway. Prevalence and related factors. *Eur J Oral Sci* 1998; **106:** 835–843.