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# Evaluation of the Dental Hygienist Beliefs Survey; test–retest assessment in a group of general dental patients

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**Abstract:** *Objective*: To evaluate the Dental Hygienist Beliefs Survey (DHBS) and the test–retest reliability of DHBS in a group of general dental patients. *Material and methods:* The DHBS, which is a questionnaire constructed to assess patients' specific attitudes towards dental hygienists (DHs), was distributed together with the Dental Anxiety Scale adapted to specifically assess fear of DH treatment (DHAS). It was hypothesized that DHBS would correlate with DHAS and gender. The questionnaires were consecutively distributed to 80 patients at their first visit and after a clinical examination performed by a DH student. Retest assessments of DHBS were conducted approximately two weeks later in conjunction with the next visit at the DH student and before treatment (scaling session). The final study sample included 77 adult general dental patients in treatment at an education clinic for DH students. *Results:* The results verified a statistically significant correlation between DHBS and DHAS. The DHBS sum of scores showed high internal consistency with Cronbach's *a* coefficient of 0.88 and 0.91 at the first and second assessments, respectively, and the test–retest reliability of the DHBS was acceptable with intraclass correlation coefficient of 0.76. No statistically significant association was found between DHBS and gender. *Conclusion:* The results suggest that the DHBS is a reliable and stable scale to use to assess patients' specific attitudes towards DHs. Moreover, DH beliefs are associated with fear of DH treatment.

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

## Introduction

The interaction between the patient and the dental hygienist (DH) and its possible influence on treatment is poorly studied. Knowledge and understanding about how patients view the communication and interaction with the DH is important for the development of care and treatment strategies. Previous studies have shown that patients may consider treatment performed by DH as painful and distressing (1–3). In a study by the Jongh and Stouthard (1), patients' helplessness and perceived lack of control over what happens were found to be important contributors to anxiety and distress in relation to DH treatment. Moreover, about 15% of patients stated that a visit to the DH was even more distressing than a visit to the dentist. Hakeberg and Cunha (2) found in a Swedish adult patient sample that about 7% had high levels of anxiety for DH treatment, but also that there were differences between gender and different patient populations in this respect. Thus, women were more anxious for

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DH treatment than men and periodontal patients more anxious compared to general dental patients. Stenman *et al.* (3) investigated patients' views on causal periodontal treatment. The results of the qualitative interviews elucidated the patients' vulnerability and the importance of communication in periodontal treatment. Thus, a trustful treatment alliance with the DH was seen as utmost important to decrease anxiety and increase feelings of control over the situation and to adhere to treatment and treatment regiments.

The Dental Hygienist Beliefs Survey (DHBS) is a questionnaire constructed to assess patients' specific attitudes towards DHs and the treatment performed by DHs (4). The DHBS is based on the revised version of the Dental Beliefs Survey (DBS-R) (5), which is a well-known questionnaire directed towards the patients' subjective perceptions about dentists and the process of how dental care is delivered (5, 6). The questionnaires contain a total of 28 items and are suggested to cover aspects of ethics, communication and control in relation to treatment performed by dentist and DHs, respectively. Previous studies have shown that patients attitudes towards dentists (6, 7) and DHs (4) are related to fear and anxiety, with more negative attitudes among anxious patients. It has also been shown that patients' attitudes towards dentists' communicative skills are important in treatment for dental fear (8). More recently, Öhrn *et al.* (9) investigated whether patients' attitudes towards dentist and DHs differed with regard to separate items in DBS-R and DHBS. It was shown that participants generally had somewhat less negative attitudes towards DH compared to dentists, with the exception of situations that may give rise to feelings of shame and guilt regarding oral hygiene and oral health conditions. Such attitudes and aspects of communication and interaction in DH treatment need attention, and further studies in this area are warranted.

Previous results suggest that the DHBS may be a valid and reliable scale to use to assess patients' specific attitudes towards DHs (4). Even so, the scale needs to be further evaluated and explored with regard to psychometric properties, including test–retest analysis. Hence, the aim of the present study was to further evaluate the DHBS and the test–retest reliability of DHBS in a sample of adult general dental patients. In specific, we wanted to investigate (i) the DHBS in relation to oral health-related attitudes and behaviour, fear of DH treatment and gender and (ii) the reliability of the DHBS with regard to internal consistency and test–retest reliability. It was hypothesized that DHBS would correlate with fear of DH treatment and gender (2, 4).

## Materials and methods

### Subjects and procedure

The questionnaires were consecutively distributed to 80 adult general dental patients in treatment at the DH programme in Gothenburg (40 patients) and Kristianstad (40 patients), Sweden. In conjunction with the first visit at a DH student and after dental examination, patients were informed about the study and asked about participation. The subjects were informed about their right to decline participation of the study at any time and without any further explanation. The inclusion criteria were that the patients should have previous experience of DH treatment and also that patient was scheduled for a following treatment visit, i.e. scaling, at the DH programme within 2–4 weeks after the examination. Patients that agreed to participate in the study were asked to answer a questionnaire, immediately after the examination, in the waiting room at the clinic and return the questionnaire in a sealed envelope. If the patient were in a hurry, they were asked to fill in the questionnaire at home during the same day and return it by post. Almost all patients filled in the questionnaire at the clinic. The first questionnaire included background information, questions regarding oral health-related attitudes and behaviour, the Dental Hygienist Anxiety Scale (DHAS) and the DHBS. The time to fill in the first questionnaire was about 20 min.

The second questionnaire, containing the DHAS (to be reported elsewhere) and the DHBS, was distributed at the next visit 2–4 weeks later. Patients were asked to fill in the questionnaire in the waiting room and before the treatment. If the scheduled appointment was cancelled for some reason and thus not in the interval of 2–4 weeks, patients were contacted by phone, and the questionnaire was sent home to be answered and returned. Almost all patients filled in the second questionnaire at the clinic when they arrived for treatment. The time to fill in the second questionnaire was about 15 min. Information of the study and distribution of questionnaires were performed by two of the authors (LK and PA) working as teachers at the DH programme in Gothenburg and Kristianstad, respectively. The two teachers calibrated the procedure of information and data sampling and did not take part in treatment of the study subjects.

To monitor the participants during the process of data sampling, patients were given a code number and a key list with codes, and patient information (name and phone number) was conducted. This key list was strictly confidential and destroyed immediately after data sampling was finished. Hence, in the further data and analysis process, individual patients were not possible to identify. The study was performed in accordance with Swedish law on ethical rules and principles for human research and in accordance with the Declaration of Helsinki (10).

### Assessments

For background information, data about gender, age and education were collected. Further, five questions, with fixed answer alternatives, focused on self-perceived oral health (very poor, quite poor, quite good and very good), toothbrushing habits (less than daily, once a day, twice a day or more), time since last DH treatment (during the last year, 1–2 years, >2–5 years and >5 years) and perceived pain during last DH treatment (no pain, some pain and highly painful). The questionnaire also contained the two following psychometric instruments:

*Dental hygienist anxiety*. This was assessed using the DHAS (2). The DHAS is based on the Corah Dental Anxiety Scale (DAS) (11–13). The two scales are identical except that the word dentist is replaced with DH. The scales assess fear and anxiety in relation to dentistry, from 4 (no anxiety) to 20 (extreme fear). The DAS has been widely used with average scores of about eight in ordinary patients, while scores of 13 or above are suggested to indicate high levels of dental anxiety (12–14). Regarding DHAS, average mean sum scores of about 6.5 have been reported in Swedish adult patients, with higher scores for women than men, seven and 5.7, respectively (2).

*Dental hygienist beliefs*. These were assessed using the DHBS, exploring patients' confidence in the interaction with the DH on a five-point Likert scale with sum of scores between 28 (highly positive) and 140 (highly negative) (Table 1). The DHBS was based on the Swedish version of the DBS-R (6). The two scales are almost identical except that the word dentist is replaced with DH throughout the questionnaire (4). The original DBS-R (5) has been suggested to cover three theoretical dimensions of ethics (item 1–11), communication (item 12–20) and control (item 21–28). However, factor analyses on DBS-R in a sample of Swedish general dental patients revealed a factor solution with one strong general factor of 'dental beliefs' and four-second-order factors of ethics (items 1–5, 7–9), belittlement (items 14, 15, 19), communication & empathy (items 6, 10, 12, 13, 18, 20–22, 24, 27) and control & anxiety (items 11, 16, 17, 23, 25, 26, 28) (15). The DBS-R has shown item mean scores of about 2.8–3.1 in fearful dental patients (6, 7, 16) and 1.5–1.7 in general and periodontal patients (6). The corresponding figures presented for DHBS were item sum scores of 3.0 in fearful patients and values between 1.3 and 1.5 among general and periodontal patients, respectively (4).

### Statistical analyses

The data were analysed with descriptive statistics. Spearman rank–order correlation coefficients were calculated for the relationship between DHBS, age, gender, oral health-related attitudes and behaviour and DHAS. $\chi^2$-analysis and Student's *t*-test were used for comparison between gender regarding non-parametric and continuous variables, respectively. Cronbach's alpha reliability coefficients were calculated to test the internal consistency of the DHBS and subdimensions of DHBS in accordance with factor analyses for the DBS-R among general dental patients as suggested by Abrahamsson

Table 1. **The Dental Hygienist Beliefs Survey (DHBS)**

| Items | Main content |
|---|---|
| 1 | I am concerned that DHs recommend work that is not really needed |
| 2 | I believe DHs say/do things to withhold information from me |
| 3 | I worry if the DH is competent and is doing quality work |
| 4 | I have had DHs say one thing and do another |
| 5 | I am concerned that DHs provide all the information I need to make good decisions |
| 6 | Dental hygienists don't seem to care that patients sometimes need a rest |
| 7 | I've had DHs seem reluctant to correct work unsatisfactory to me |
| 8 | When a DH seems in a hurry I worry that I'm not getting good care |
| 9 | I am concerned that the DH is not really looking out for my best interests |
| 10 | Dental hygienists focus too much on getting the job done and not enough on the patient's comfort |
| 11 | I'm concerned that DHs might not be skilled enough to deal with my fears or dental problems |
| 12 | I feel DHs do not provide clear explanations |
| 13 | I am concerned that DHs do not like to take the time to really talk to patients |
| 14 | I feel uncomfortable asking questions |
| 15 | Dental hygienists say things to make me feel guilty about the way I care for my teeth |
| 16 | I am concerned that DHs will not take my worries (fears) about dentistry seriously |
| 17 | I am concerned that DHs will put me down (make light of my fears) |
| 18 | I am concerned that DHs do not like it when a patient makes request |
| 19 | I am concerned that DHs will embarrass me over the condition of my teeth |
| 20 | I believe that DHs don't have enough empathy for what it is really like to be a patient |
| 21 | When I am in the chair I don't feel like I can stop the appointment for a rest if I feel the need |
| 22 | Dental hygienists don't seem to notice that patients sometimes need a rest |
| 23 | Once I am in the chair I feel helpless (that things are out of my control) |
| 24 | If I were to indicate that it hurts, I think that the DH would be reluctant to stop and try to correct the problem |
| 25 | I have had DHs not believe me when I said I felt pain |
| 26 | Dental hygienists often seem in a hurry, so I feel rushed |
| 27 | I am concerned that the DHs will do what they want and not really listen to me while I'm in the chair |
| 28 | Being overwhelmed by the amount of work needed (all the bad news) could be enough to keep me from beginning or completing treatment |

DH, dental hygienist.

*et al.* (15). Finally, intraclass correlation coefficients (ICC) were calculated for the test–retest reliability of DHBS total sum of scores and the subdimensions. Intraclass correlation coefficients values greater than 0.7 have been suggested to represent acceptable to good reliability (17, 18).

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. All of the 80 recruited patients returned the questionnaires. The internal dropout rate in each questionnaire was very low. In the DHBS, three patients were excluded because of more than two missing values. The missing values analysis with regard to separate items of the DHBS showed a maximum of two missing values in any of the items.

Data were processed by the SPSS statistical package (version 17.0), and a *P*-value of 0.05 was considered the level of statistical significance.

## Results

The final sample comprised 77 subjects (43 women = 56%). The mean age among the participants was 53 year (SD = 15.7, range from 21 to 87 year) with lower mean age among women compared to men, 49 and 57 year ($P < 0.05$), respectively (Table 2). Twenty-one patients (27%) had a 9-year compulsory school or less, 19 (25%) upper secondary school and 37 (48%) had higher education. There was no statistical difference between genders with regard to education level.

### Oral health-related attitudes and behaviour

Seventy-nine per cent of the patients considered their oral health as good or very good and 86% reported that they brushed their teeth at least two times a day. The majority (82%) reported that they have visited a DH in the last two years, while 17% reported that it was >2 years since their last visit at a DH. Fifty-three per cent of the patients considered their last DH visit as painful. A somewhat higher proportion of the women rated their last visit as painful compared to the men, but there were no statistically significant difference between genders regarding perceived pain or with regard to the other questions on oral health-related attitudes and behaviour.

### DHAS and DHBS

Table 2 shows the average sum of scores (standard deviation = SD) of the DHAS and DHBS, as well as item mean scores of DHBS and subdimensions of DHBS, among women and men. The average DHAS sum of scores among the subjects was 5.7 (range: 4–13) with significantly higher values among women compared to men, 6.2 and 5.0, respectively ($P < 0.05$). At the first assessment, the average sum of scores of the DHBS was 31.9 (range: 28–54), and the retest assessments of the DHBS showed average sum of scores of 32.5 (range: 28–58). There were no statistically significant differences between gender regarding DHBS.

Table 2. **Description of the study group of general dental fear of patients with regard to gender, age and mean sum of scores (standard deviation = SD) of Dental Hygienist Anxiety Scale (DHAS) and Dental Hygienist Beliefs Survey (DHBS), as well as mean item scores (SD) of DHBS and subdimensions of DHBS in accordance with Abrahamsson *et al.* (15)**

| Subjects: | Women<br>*n* = 43 (56%)<br>Mean (SD) | Men<br>*n* = 34 (44%)<br>Mean (SD) | *P*-value | Total<br>*n* = 77<br>Mean (SD) |
|---|---|---|---|---|
| Age | 49.2 (14.4) | 57.5 (16.3) | <0.05 | 52.8 (15.7) |
| Scale: | Mean sum score (SD) | Mean sum score (SD) | | Mean sum score (SD) |
| DHAS | 6.2 (2.8) | 5.0 (1.4) | <0.05 | 5.7 (2.4) |
| DHBS* | 31.6 (5.3) | 32.4 (6.1) | | 31.9 (5.6) |
| DHBS† | 32.7 (6.9) | 32.4 (6.1) | | 32.5 (6.5) |
| | Mean item score (SD) | Mean item score (SD) | | Mean item score (SD) |
| DHBS* | 1.1 (0.2) | 1.1 (0.2) | | 1.1 (0.2) |
| DHBS† | 1.2 (0.2) | 1.2 (0.2) | | 1.2 (0.2) |
| DHBS dimensions; | | | | |
| Ethics* | 1.1 (0.2) | 1.2 (0.3) | | 1.2 (0.3) |
| Belittlement* | 1.2 (0.3) | 1.2 (0.2) | | 1.2 (0.3) |
| Communication & empathy* | 1.1 (0.3) | 1.2 (0.3) | | 1.1 (0.3) |
| Control & anxiety* | 1.1 (0.2) | 1.1 (0.2) | | 1.1 (0.2) |
| Ethics† | 1.2 (0.2) | 1.1 (0.2) | | 1.1 (0.2) |
| Belittlement† | 1.2 (0.4) | 1.2 (0.4) | | 1.2 (0.4) |
| Communication & empathy† | 1.2 (0.3) | 1.2 (0.3) | | 1.2 (0.3) |
| Control & anxiety† | 1.1 (0.3) | 1.1 (0.2) | | 1.1 (0.2) |

*First assessment (test).
†Second assessment (retest).
The Student's *t*-test was used for significance testing.

### Correlations between DHBS and gender, age, education, oral health-related attitudes and behaviour and DHAS

Correlation analysis (Spearman's $\rho$) showed that the DHBS sum of scores (first assessment) was significantly correlated with the DHAS ($\rho$ 0.44, $P < 0.001$). Moreover, the subdimensions of DHBS were significantly correlated with DHAS with the lowest correlation coefficient in relation to the dimension of 'belittlement' ($\rho$ 0.28, $P < 0.05$) and the strongest in relation to the dimension of 'control & anxiety' ($\rho$ 0.48, $P < 0.001$). The correlation coefficient of the DHBS test and retest assessments was $\rho$ 0.70 ($P < 0.001$). No statistically significant association was found between DHBS and age or between DHBS and variables reflecting oral health-related attitudes and behaviour, *i.e.* self-perceived oral health, toothbrushing habits, time since last DH treatment and perceived pain during last DH treatment.

### Internal consistency and test–retest reliability of the DHBS

Estimates of the internal *a*-reliabilities among the DHBS sum of scores were high with Cronbach's *a* coefficient of 0.88 and 0.91 at the first and second assessments, respectively (Table 3). The subdimensions of DHBS showed a Cronbach's *a* coefficient, at the first and second assessments, respectively, of: 0.65 and 0.61 for 'ethics' (items: 1–5 and 7–9); 0.36 and 0.72 for 'belittlement' (items: 14, 15 and 19); 0.84 and 0.84 for 'communication & empathy' (items: 6, 10, 12, 13, 18, 20–22, 24 and 27) and 0.75 and 0.72 for 'control & anxiety' (items: 11, 16, 17, 23, 25 and 26).

Finally, ICC were calculated for the test–retest reliability of DHBS and the subdimensions of DHBS (Table 3). The ICC of the DHBS sum scores was 0.76, with a 95% confidence interval (CI) between 0.63 and 0.85. As shown in Table 3, the test–retest reliability for the subdimensions of DHBS varied between 0.57 (dimension of belittlement) and 0.79 (dimension of ethics).

Table 3. **Internal consistency (Cronbach's *a* coefficient) of the Dental Hygienist Beliefs Survey (DHBS) at first and second assessments, respectively, and test–retest reliability (ICC – intraclass correlation coefficient and CI – confidence interval) of DHBS sum of scores and DHBS dimensions**

| Scale: | Cronbach's *a* coefficient |
|---|---|
| DHBS* | 0.88 |
| DHBS† | 0.91 |
| | ICC (CI) |
| DHBS | 0.76 (0.63–0.85) |
| DHBS dimensions; | |
| Ethics | 0.79 (0.66–0.86) |
| Belittlement | 0.57 (0.33–0.73) |
| Communication & empathy | 0.71 (0.55–0.82) |
| Control & anxiety | 0.72 (0.55–0.82) |

*First assessment (test).
†Second assessment (retest).
$n = 77$.

## Discussion

The objective was to evaluate the DHBS and the test–retest reliability of DHBS in a sample of general dental patients. It was hypothesized that DHBS would correlate with fear of DH treatment and gender. The results verified a significant correlation between DHBS and DHAS, which may add support for the validity evidence of DHBS in relation to fear of DH treatment (4). The DHBS sum of scores showed high internal consistency with Cronbach's *a* coefficient of 0.88 and 0.91 at the first and second assessments, respectively, and the test–retest reliability of the DHBS was acceptable with an ICC of 0.76. No statistically significant association was found between DHBS and gender. The results suggest that the DHBS is a reliable and stable scale to use to assess patients' specific attitudes towards DHs.

Shortcomings of the present study may be the limited study sample and the non-randomized selection of participants. Moreover, the study population consisted of adult general dental patients in treatment by a DH student at an education clinic. The study participants may thus constitute a specific group of patients, which may have implications on the results. However, the focus of the study was the testing of the reliability of DHBS, and thus, the sample may be of less importance. Moreover, a strength of the study is that the test–retest assessments was conducted in a parallel and strict procedure at two comparable student clinics and by two calibrated researchers that did not take part in treatment of the study patients.

The results revealed somewhat lower values on DHAS and DHBS than previously reported for Swedish general dental patients (2, 4) indicating less negative attitudes and fear in relation to DH treatment in the present study group of patients in treatment at a DH school. Hence, Hakeberg and Cunha (2) reported DHAS mean sum scores of 6.5 in a group of general dental patients, compared to 5.7 in the present study group, and Abrahamsson *et al.* (4) reported DHBS mean sum scores of around 37 among general patients, compared to values of about 32 among present subjects. In accordance with previously reported (2), a statistically significant difference in DH fear was found between genders, with higher values among women. However, in contrast to our hypothesis (4), no significant difference between genders was found with regard to DHBS in the present study sample. The correlation between DHAS and DHBS sum of scores was 0.44, with the strongest correlation coefficient in relation to the DHBS-subdimension of 'control & anxiety' and the lowest in relation to the dimension of 'belittlement'. The results confirm a moderate but statistically significant relationship between DHAS and DHBS, even though the correlation between instruments was somewhat lower than previously reported for general dental patients (4). Still, the results are in line with previous studies suggesting that dental fear and dental beliefs certainly are connected but also that the two concepts differ (4, 6, 8, 19, 20) and that a change in dental fear may not necessarily be followed by a parallel change in dental beliefs (20).

The study sample consisted of general patients with regular dental care habits. A majority of the patients considered their oral health as good and reported that they brushed their teeth at

least two times a day and 86% of the subjects have visited a DH during the last two years. Even so, 53% of the patients considered their last DH treatment as somewhat or, in some cases, even very painful. This relatively high figure of pain experience was somewhat surprising, in specific because the study sample consisted of a patient group with a low level of dental fear according to DHAS but also with respect to that Swedish DHs are educated to apply local anaesthesia. Previous reports confirm that DH treatment for many patients, and in specific dental fear patients, is perceived as painful and unpleasant (1, 2, 21) and that a visit to a DH for some patients is even more distressing than a visit to the dentist (1). Moreover, patients' perceptions about pain and distress during DH treatment include aspects related to feelings of control and a trustful treatment alliance with the DH (1, 3). Such aspect needs further attention, and DHs may also consider the importance of sufficient pain control and that proper anaesthesia is given to their patients (22). No significant association, however, was found between perceived pain experience and DH beliefs in the present study sample. Still, there was a significant correlation between pain and DHAS (data not shown).

Estimates of the internal *a*-reliabilities among the DHBS sum of scores were high with Cronbach's *a* coefficient of 0.88 and 0.91 at the first and second assessments, respectively. The internal consistency of the overall DHBS corresponds well with that previously reported for the DHBS among general dental patients (4). The test–retest reliability of DHBS was acceptable with an ICC of 0.76. Hence, the results suggest that DHBS is a reliable and stable scale to use to assess patients' attitudes towards DHs. Moreover, the Cronbach's *a* and ICC coefficients among DHBS dimensions were moderately acceptable, with the exception of the dimension of 'belittlement' that showed low to moderate values. The dimension of 'belittlement' covers three items only (items: 14, 15, 19) which may partly explain the results because number of items has an effect on the coefficients (23). In the present study, we used a dimensional structure based on factor analyses on the DBS-R among general dental patients (15). Even so, the findings of that study throw doubt on the validity of using the scale as a multidimensional measure across groups and populations, and further studies are warranted.

In conclusion, the results revealed satisfactory internal consistency and test–retest reliability of the 28-item DHBS among general dental patients, suggesting that DHBS is a reliable and stable scale. However, the DHBS needs to be further explored with factor analytical studies regarding psychometric properties of internal and dimensional structure.

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