# General Well-Being as an Important Co-factor of Self-Assessment of Dental Appearance

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> **Purpose:** This study aimed to correlate the general well-being of patients and their judgment about their dental appearance. Materials and Methods: Based on internationally accepted guidelines regarding dental esthetics, a guestionnaire was developed to measure subjective assessments of dental appearance. Fourteen items defined an esthetic sum score (0 = satisfied; 56 = dissatisfied). Further, general wellbeing was evaluated with a long-established and highly reliable test. Eighty participants were included (47 women, 33 men). Participants were drawn from 4 different groups (n = 20): natural dentition (group N), fixed partial dentures (group F), removable partial dentures (group R), and patients who had an esthetic problem with their teeth (group P). *Results:* Seventy-five participants showed a normal well-being. Five participants showed a depressive state and formed a new group (group D). The medians of the sum scores (25th, 75th percentile) were: group N: 12 (10, 14); group F: 14 (8, 29); group R: 14 (9, 27); group P: 23 (18, 35); group D: 30 (26, 35). Significant differences were found between groups N and P, as well as between group D and groups N, F, and R. Conclusion: Because of the significant difference between groups N and P, basis validation of the sum score was achieved. Further, selfassessments of dental appearance appeared to be more negative for participants with a depressive state compared with the other groups. In clinical studies, selection bias can be prevented by using a test that measures well-being to verify if a study sample includes a normal number of depressive subjects and therefore represents the general population. Int J Prosthodont 2006; 19:449-454.

Koper's description of "difficult denture birds"<sup>1,2</sup> humorously characterizes different types of difficult patients and their behaviors in dental practice. Roker's

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intent was to sharpen clinicians' eyes to the identification of these hard-to-please patients. Obviously, it is advantageous for the outcome of therapy that the clinician is able to identify difficult patients before beginning prosthodontic treatment.

Further, Moulton<sup>3</sup> showed a correlation between patients' denture problems and emotional state. Different questionnaires have been used as a screening method to identify individuals with emotional problems, such as the Minnesota Multiphasic Personality Inventory (MMPI)<sup>4</sup> or the Cornell Medical Index (CMI).<sup>5</sup> Using the CMI, a definite correlation between an increase in total CMI score and a decrease in patient satisfaction concerning a new denture was established in a population of 402 complete-denture patients.<sup>6</sup>

Additionally, several authors have indicated a correlation between dental esthetics and quality of life. For example, Davis et al<sup>7</sup> showed that placement of a restoration, which improves dental esthetics, results in a positive effect on a patient's self-esteem and quality of life. Newton et al<sup>8</sup> reported that in the absence of other information, personal judgments about

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**Fig 1** The 4 study groups. Group N: participants with a complete and healthy dentition; group P: participants with esthetic problems at their maxillary anterior teeth; group F: participants with crowns or fixed partial dentures on at least 1 of their maxillary anterior teeth; group R: participants with removable prostheses replacing at least the maxillary anterior teeth.

strangers are significantly influenced by the stranger's dental appearance. Further, several studies showed a correlation between quality of life and general wellbeing.<sup>9-11</sup> This correlation is confirmed by the World Health Organization's definition of quality of life.<sup>12</sup>

When performing a clinical investigation, it is important for any study design to select homogenous groups and to control as many variables as possible, in order to minimize or reduce the standard deviation range of collected data. Further, the study sample should reflect the general population.

Therefore, the question arises whether there is a direct correlation between general well-being and the subjective assessment of dental appearance. If such a correlation could be shown, a test for general wellbeing (eg, Befindlichkeitsbogen, Beltz Test<sup>13,14</sup>) may be useful to standardize and homogenize the participants' data in scientific studies concerning the assessment of dental appearance or dental esthetics. Furthermore, such a test could detect whether the percentage of participants with an abnormal well-being in a study population corresponds to the general population, thus ensuring that the study is free of selection bias.

If a relationship between general well-being and the subjective assessment of dental appearance can be established, a corresponding psychologic test would be interesting to clinicians for whom the esthetic rehabilitation of patients is an important issue in his or her daily practice.<sup>15-17</sup> Such a test could be used, similar to the CMI, as a screening test to detect patients who have an imbalanced relationship with their dental appearance and therefore may be hard to satisfy.

The purpose of this study was to evaluate participants' satisfaction with their dental appearance and to correlate these results with their general well-being.

# **Materials and Methods**

#### **Participants**

Eighty participants (47 women, 33 men) were selected for the survey. The participants were unpaid volunteers and took part in the survey during a routine checkup. The study design and the questionnaires used were approved by the Ethical Committee of the Medical Faculty of Christian-Albrechts University. The participants gave verbal consent.

The inclusion criterion for all groups was age above 18 years for all participants, and the exclusion criteria were drug abuse and life-threatening diseases (ASA Classification<sup>18</sup>). None of the participants reported in their medical history that they were currently being treated for depression with either medication and/or counseling by a mental health care provider. Concerning their dental appearance, the participants were asked 2 standardized questions by the investigator:

- 1. Are you satisfied with the appearance of your teeth?
- 2. If not, are the esthetic problems your primary problem with your teeth?

Based on the participants' dental status and answers to these questions, they were assigned to 1 of 4 groups (n = 20) (Fig 1):

 Natural dentition (group N): Participants with a complete and healthy dentition, with no crowns, fixed or removable partial dentures, restorations, or periodontal problems in their maxillary anterior teeth. Participants in this group stated that they were content with the appearance of their teeth. Previously performed orthodontic treatment was not documented. All participants of this group were employees or dental students at the dental hospital (Christian-Albrechts University). Altogether, 30 participants were selected for this group, but 10 were excluded after the checkup, because they had restorations or were not satisfied with their dental appearance.

- 2. *Esthetic problems (group P):* Participants with esthetic problems in their maxillary anterior teeth, especially because of insufficient restorations, irregular tooth position, or periodontal problems, but with no prosthodontic restorations for their maxillary anterior teeth. All participants in this group were patients of the dental hospital who had consulted the clinic primarily because of their esthetic problems and concern for their dental appearance.
- 3. *Fixed partial dentures (group F):* Participants with crowns or fixed partial dentures on at least 1 of their maxillary anterior teeth. All were patients of the dental hospital.
- 4. *Removable partial dentures (group R):* Participants with removable partial dentures replacing at least the maxillary anterior teeth. All were patients of the dental hospital.

Patients of groups F and R had consulted the clinic primarily for a normal checkup or because of functional problems, pain, or insufficient restorations. Esthetic problems with their dental appearance were not articulated as the main problem by these patients. For groups P, F, and R, a total of 86 participants were selected. Twentysix were excluded after the checkup, because they did not fit the inclusion criteria for their respective group, or because they refused to fill out the questionnaires.

All participants were interviewed individually. Throughout the survey, the investigator's interest in a specific dental issue was not revealed. The survey was performed after the routine checkup in a classroom at the dental hospital. A mirror was provided to help the participants check their dental appearance.

## Well-Being

The well-being of the participants was evaluated using a long-established and highly reliable test containing 28 items (Befindlichkeitsbogen, Beltz Test).<sup>13,14</sup> Taking into account the age and gender of each participant, the results were transformed to standardized stanine values. These values ranged from 2 to 9. Stanine values from 3 to 7 defined a normal state of well-being, values lower than 3 defined a euphoric state, and values higher than 7 indicated a depressive state. All participants with a stanine value higher than 7 were assigned to an additional group (depressive state, group D).

The participants were generally not informed about the findings of the well-being test.

 
 Table 1
 Questionnaire on Participants' Satisfaction with their Dental Appearance\*

No.	Question
Q1	I am content with the length of my maxillary anterior teeth.
Q2	I am content with the length of the teeth exposed during laughing.
Q3	I am dissatisfied with the visibility of my gums during laughing.
Q4	I am content with the harmony of the widths of my maxillary anterior teeth.
Q5	I am dissatisfied with the black hole disease between my teeth.
Q6	I am content with the midline of my teeth.
Q7	I tend to hide my teeth.
Q8	I am content with the appearance of my teeth.
Q9	I am content with the position of my teeth.
Q10	I am content with the proportions of my teeth.
Q11	I am content with the color of my teeth.
Q12	The condition of my teeth is unpleasant to me.
Q13	I wish I had different teeth.
Q14	I feel old because of my teeth.

\*Translated from German.

# Participants' Satisfaction with their Dental Appearance

Based on Magne and Belser's<sup>19</sup> guidelines regarding anterior esthetics, a questionnaire was discussed and developed in a consensus meeting consisting of 4 dental clinicians, all of whom were experts in esthetic dentistry. In this context, an "expert" is a clinician involved in at least 2 scientific projects dealing with dental esthetics. The clinicians' vocational experience in this field ranged from 3 to 20 years. Two of the clinicians are specialists in prosthodontics (approved by the German Society for Prosthodontics and Dental Materials Science). The developed self-administered test instrument consisted of 14 items (Q1 to Q14). A Likert scale was used with 5 choices per item: "not at all," "slightly," "moderately," "quite," "very much." The values for these choices ranged from 0 for "not at all" to 4 for "very much." The questionnaire is shown in Table 1.

For the following analyses, the items comprising positive statements (Q1, Q2, Q4, Q6, Q8 to Q11) were transformed (value\_transform = value \* (-1) + 4). For the sum score of participants' satisfaction with their dental appearance, all items were added and ranged from 0 for "very satisfied" to 56 for "not satisfied."

During this primary evaluation, participants were not allowed to make any notes, and no information about the planned second survey was given. After approximately 1 year, the survey was repeated, using the same questionnaire, with 18 randomly chosen participants (20% of all participants, 10 men, 8 women). Only patients with no changes in dental status were included. These participants were part of groups N, F, and R.



**Fig 2** Distribution of stanine values regarding well-being for all participants.



**Fig 3** Box-and-whisker plot showing sum scores of participants' self-assessment of their dental appearance for each group (0 = "very satisfied"; 56 = "not satisfied"). Values connected by lines are significantly different (Wilcoxon rank sum test).

# Statistical Analysis

Since the data were not normally distributed (Shapiro-Wilks test), statistical analysis between groups was performed using the Kruskal-Wallis test followed by multiple pair-wise comparisons (Wilcoxon rank sum test), and adjusted for multiple testing with the Bonferroni-Holm correction. To determine the reliability of the sum score, the Pearson correlation coefficient between the primary evaluation and the second survey was calculated, and a paired *t* test of equivalence<sup>20</sup> with a 10% range of agreement was performed. For all tests, the level of significance was set to 5%.

#### Results

#### Well-Being

Figure 2 shows the distribution of well-being values among all 80 patients. These results were normally distributed. From the original 80 participants, 75 (94%) showed a normal well-being (mean age 47  $\pm$  17 years; range 19 to 79 years; 45 women, 30 men), distributed among the following professions: 19 pensioners, 3 housewives, 14 students, 30 employees, and 9 academics.

The remaining 5 participants (3 men, 2 women) had stanine values of 9 (depressive state), and were placed in group D. These participants were distributed among the original groups as such: 1 in group N, 1 in group P, and 3 in group F; and were distributed among the following professions: 1 pensioner, 1 student, and 3 employees. The mean age and age range of the individual groups were: group N (31  $\pm$  7 years, range 20 to 46 years); group P (42  $\pm$  10 years, range 19 to 62 years); group F (51  $\pm$  13 years, range 22 to 68 years); group R (64  $\pm$  13 years, range 35 to 79 years); group D (40  $\pm$  8 years, range 29 to 51 years). Significant differences ( $P \leq .05$ ) were found between group N and groups P, F, R, and D, and between group R and groups N, P, F, and D.

# Participants' Satisfaction with their Dental Appearance

The median of the sum score of each group is shown in Fig 3. The results show that participants from group N were more satisfied than those from group P. Furthermore, participants from groups N, F, and R were more satisfied than those from group D. These differences were statistically significant ( $P \le .05$ ).

No significant differences were found for the intergroup comparison of group N (depressive patients included versus depressive participants excluded). Similar results were found for the intergroup comparisons of groups P and F (P > .05).

For the following analysis, groups N, P, F, and R were pooled, stratified by gender, and compared with group D. The results of the 3 domains are shown in Fig 4. No gender-related difference was found regarding the self-assessment of dental appearance (P > .05). However, both men and women were more satisfied with their dental appearance than participants with a depressive state ( $P \le .05$ ).

## Reproducibility of the Sum Score

Concerning the 18 randomly chosen participants, the results of the primary evaluation and the second survey were statistically equivalent (P<.05, 10% range of agreement) with a Pearson correlation coefficient of 0.83 for the sum score. Therefore, it can be concluded that the sum score of participants' subjective assessment of their dental appearance is consistent in the judgment of the participants.

## Discussion

The classification of participants to the different groups was performed according to objective and subjective parameters. The objective parameter was dental status. The subjective parameter was participants' self-assessment of their dental appearance, which was classified by standardized questions concerning participants' satisfaction with their dental appearance. Dental appearance was not objectively examined by a clinician, because there may be discrepancies between a participant's subjective assessment and a clinician's objective assessment, as shown in a previous report.<sup>21</sup>

The test for well-being used in this study records variations between extreme manic and depressive moods.<sup>13</sup> However, the test was not designed to diagnose a mental health problem (eg, bipolar disorder); rather, it provides a profile of the current subjective well-being of an individual. Therefore, interpretation of the test results must be done with caution. Very low stanine values do not necessarily mean that the subject is abnormally euphoric; instead, it shows that the participant felt very comfortable at the time of testing. However, high stanine values do indicate a depressive state, and therefore usually suggest a pathologic mental health problem.13 Thus, only participants with stanine values higher than 7 were assigned to group D. Participants with low stanine values were not grouped separately, because of the uncertain diagnosis.

For the sum score of participants' satisfaction with their dental appearance, content validity<sup>22</sup> was achieved because the questionnaire was developed by a group of specialists using internationally accepted guidelines regarding anterior esthetics.<sup>19</sup> These items covered the main aspects of the theoretical construct "dental appearance," although it is impossible of course to ensure that the entire construct is covered by this sum score. Concurrent validity<sup>22</sup> can be assumed because of the significant differences between the participants of groups N and P (Fig 2).

Significant differences between group N and groups R and F were not expected, because dental appearance was not the main concern for participants from groups R and F. However, this does not mean that these par-



**Fig 4** Box-and-whisker plot showing sum scores of participants' self-assessment of their dental appearance based on gender. All groups were pooled. Men and women from group D were evaluated separately. Values connected by lines are significantly different (Wilcoxon rank sum test).

ticipants were fully satisfied with their dental appearance. Therefore, a wide variance in the answers of the participants of these groups was expected, and this led to insignificant differences compared with group N. Further, test-retest reliability was shown, as the sum score was reproducible in a second survey, thus demonstrating stability in the ratings of participants concerning the self-assessment of dental appearance.

Significant differences were found in the groups with regard to age. These differences may be explained by the fact that participants from group N were generally significantly younger than participants from the other groups. Further, participants from group R were significantly older than participants from the other groups. These significantly different age groups might have influenced the results and may be seen as a limitation of the study.

The 5 participants from group D were distributed among groups N, F, and P. This distribution seems to be independent from the grouping criteria in this study. Six percent of all participants were assigned to group D. This percentage is comparable to the results of a cross-national epidemiologic study, which showed an incidence of major depression of 4.5% for men and 13.5% for women.<sup>23</sup> However, interpretation of the results must be done with caution because of the small number of participants in group D.

Participants with a depressive state were highly significantly more dissatisfied with their dental appearance than participants with a normal well-being (groups N, F, and R). This is supported by the results of other studies, in which depressive illness was associated with low self-evaluation, low self-confidence, and low self-esteem.<sup>24,25</sup> Significant differences between groups P and D were not expected, even though the reasons for negative assessments of dental appearance (objective esthetic problems versus negative assessments of dental appearance based on low selfesteem differ between these groups.

The incidence of major depression in a general population was shown to vary from 4% to 14%.<sup>23</sup> In the present study, the incidence was 6%, and this did not lead to any significant differences for the intergroup comparisons for groups N, P, F, and R (depressive participants included versus excluded). Thus, a test for well-being is useful for clinical studies to verify whether a study sample includes a normal number of depressive subjects and therefore represents the general population, or whether the study sample covers an abnormal number of depressive subjects and therefore suggests selection bias.

For clinicians, this test may be useful to detect patients who have an imbalanced relationship with their dental appearance. This information could help the clinician find the optimum treatment strategy for this type of patient. For example, it may be preferable in some cases to test the outcome of restorations in the esthetic zone with a long-term provisional before starting with the production of the final prosthodontic restoration.<sup>26,27</sup> When discussing these results, it is important to remember that the test for well-being indicates only the current state of well-being. Therefore, the state of well-being may change, especially if the participant is getting over an acute problem, like pain or illness.<sup>13</sup>

## Conclusions

Within the limitations of the study, the following can be suggested:

- In clinical studies concerning dental appearance, an additional psychologic test for well-being is useful to verify that a study sample includes a normal number of depressive subjects and therefore represents the general population.
- This test may be useful for clinicians to detect patients who have an imbalanced relationship with their dental appearance.

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