Oral Health Impact in Patients Wearing Removable Prostheses: Relations to Somatization, Pain Sensitivity, and Body Consciousness

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Purpose: Previous studies investigating associations between patient personality traits and complaints related to wearing dental prostheses have been inconclusive. From the perspective of cognitive behavioral theory, the current study investigated whether pain sensitivity, body consciousness, and somatization affected the oral health of patients wearing removable dentures. ***Materials and Methods:*** Eighty-eight patients were supplied with removable partial and complete dentures. The Oral Health Impact Profile (OHIP), with six subscales measuring oral health impairment and disability during daily living, the Pain Sensitivity Index, the Private Body Consciousness scale, and the Somatization Scale of the SCL-90-R, were used. ***Results:*** The variables pain sensitivity, body consciousness, and somatization correlated significantly with all six OHIP subscales in removable denture wearers. In multiple hierarchic regression analyses, patient personality accounted for 38.0% of functional limitation and 41.5% of physical pain. ***Conclusion:*** Pain sensitivity and bodily preoccupation might be important factors in explaining the subjective oral health effects of removable denture wearing. *Int J Prosthodont 2005;18:106–111.*

Many patients do not readily adapt to wearing removable complete or partial dentures.[1] Muscular oral functions have to be reprogrammed, which can be difficult, especially for elderly people.[2] The sensation of a foreign body in the mouth may prove difficult to overcome, as the oral environment is extremely sensitive to stimulation.[3] Wearing a removable complete or partial denture is often accompanied by deteriorated oral function in mastication and speech.[2–6] Physical pain may be caused by soreness of denture-supporting tissues,[7,8] temporomandibular dysfunction,[9,10] or tooth movement or carious decay of abutment teeth in partially edentulous patients.[7] Physiologic adaptation is a process that is not satisfactorily completed by all patients.[11] When adaptation fails, denture wearers might complain about psychologic distress such as lowered self-esteem or depressive tendencies.[2,12] Even social relations might be affected by an avoidance of contact or uneasy feeling because of the denture or chewing problems.[12]

Some investigators have found that denture discomfort is not associated with prosthesis quality or anatomic features.[9,13] It has been suggested that denture complaints are based on an interaction of anatomic, biologic, constructional, and psychologic factors.[13] Various reviewers conclude that the patient's personality plays an important role in the subjective perception of oral health status in denture wearers.[2,9,11,14] Previous studies have focused on the investigation of general personality traits.[15–20] The results so far have been inconclusive, showing no agreement in reported associations between personality traits and denture dissatisfaction. The equivocal evidence may be explained by two reasons.

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First, measures of denture complaints or dissatisfaction are often based on ad hoc instruments not previously tested and restricted to a single aspect.[21] Second, patient measures based on personality theory or psychiatric nosology do not explain exaggerated perception of physical symptoms in denture wearers.[11] Thus, the finding of an association between neuroticism and denture dissatisfaction does not add to an understanding of the problem, and no conclusions for clinical practice are being made available.

A comprehensive instrument assessing effects of denture wearing and grounded in a theoretic basis, the Oral Health Impact Profile (OHIP), has been proposed.[22] According to World Health Organization definitions and their application to dentistry, consequences relating to subjective health status (impairment) and perceived adverse impact on daily living (disability) must be distinguished.[23,24] The impairment category includes functional limitations, physical pain, and psychologic discomfort. The disability category encompasses physical, psychologic, and social disability. OHIP, which shows a good test quality in terms of reliability, validity, and sensitivity for change,[25,26] was used in the present study for measuring denture complaints from the patient's perspective.

The concept of somatization,[27,28] thus far ignored in prosthodontics, is regarded to be specific for the explanation of exaggerated denture complaints. Somatization refers to reported physical symptoms that cannot be sufficiently explained by organic pathology. This phenomenon is often observered by general medical practitioners.[29] A population-based study found that 23% of respondents indicated at least subclinical signs of a somatization disorder.[30] Somatization has been suggested as an explanation for increased symptoms reported in dental practices.[31] In a clinical examination of patients with temporomandibular dysfunction, somatization was associated with pain dispersion and even reported pain at placebo sites.[32] It would therefore be of interest to study whether patients with removable partial or complete dentures, complaining of reduced subjective oral health or adverse consequences in their daily lives, also report multiple psychosomatic symptoms as measured by a scale assessing somatization tendencies.[33]

Cognitive behavioral theory suggests that two core processes are involved in the development of symptoms unrelated to a medical condition: symptom interpretation and body consciousness.[34] Symptom interpretation refers to a sensitivity for expecting harm as a result of the experience of normal physical sensations.[35] Patients might fear becoming ill, mentally incapable, or socially downgraded. In patients with musculoskeletal disorders, fear of physical pain symptoms is associated with nonspecific complaints, and this fear is more strongly related to disability in daily activity and exercise performance than to anatomic or clinical parameters.[36,37] These results suggest that the relationship between pain sensitivity and the perceived oral health effects of complete or partial denture wearing should be investigated. Cognitive behavioral theory predicts that body consciousness is also responsible for the development of somatization symptoms.[38] Persons with elevated body consciousness demonstrate amplified perceptions of physical and pain sensations in clinical and nonclinical conditions.[39–42] It would therefore be of interest to study the relationship between body consciousness and perceived oral health effects in subjects wearing removable prostheses.

The research question investigated in the present study was: To what degree do the predictors pain sensitivity, body consciousness, and somatization explain the variance of subjective impairment and disability reported by patients with removable dentures in hierarchic multiple regression analyses? The order of the regression model was established for theoretic reasons. Cognitive behavioral theory suggests that fear of pain is the central personality disposition causing bodily preoccupation, which, in turn, results in amplified symptom perception.[34] To control for sociodemographic influences (age, sex, education, living status) and time of denture wearing, these variables were included in the regression equation.

Materials and Methods

Subjects and Procedures

With informed consent, 88 patients from a dental clinic participated in the study. A dental student in the clinical stage of undergraduate training served as the examiner. Subjects were 45 years of age or older (mean 70.3 years, standard deviation 11.4). Thirty-five patients were supplied with removable partial dental prostheses, and 53 were supplied with removable complete prostheses; 38 were men, and 50 were women. Sixty-three were married or living with a partner; 25 were divorced or widowed and living alone. Forty-nine had received an 8-year elementary education, 29 had a 9-year education to junior high school level, and 10 had a 13-year education to senior high school level. The mean duration of wearing the present denture was 13.1 years.

Instruments

Oral Health Impact Profile (OHIP). Introduced by Slade and Spencer,[22] OHIP measures the effects on the oral condition in two categories, impairment and disability, each containing three domains. A seventh scale assessing severe work-related and socially related

handicaps was not included in the present study because of the rare prevalence of these handicaps.

Patients were requested to indicate their complaints during the 6 months preceding enrollment in the study. The response format was a five-point Likert scale ranging from 0 (never) to 4 (very often). In the impairment category, the "Functional Limitations" scale comprises nine questions referring predominantly to mastication, speech, and comfort. The reliability of the scale in this study was .89 according to Cronbach's alpha, a measure of the homogeneity of the scale. It is calculated on the basis of intercorrelations between item responses, and it is a necessary condition for adding individual answers to the sum score of a scale. A minimum of $\alpha = .70$ is regarded as a criterion for sufficient scale homogeneity, indicating that all items measure the same trait or symptom domain. The "Physical Pain" scale (nine items) pertains to sore jaw, sensitive teeth, or painful gingiva. Cronbach's alpha was .85. The "Psychological Discomfort" subtest refers to mild effects that oral health may have on well-being, such as worry, self-consciousness, or feeling uncomfortable or tense. A scale homogeneity of $\alpha = .90$ was found.

The disability category refers to interferences with the activities of daily living. The "Physical Disability" scale contains nine questions relating to problems with digestion, speech, and esthetics. The reliability of the scale was $\alpha = .88$. "Psychological Disability" (five items) refers to severe symptoms caused by denture wearing, such as depression, sleep disturbances, or concentration difficulties. Cronbach's alpha attained a value of .86. The "Social Disability" subtest addresses five problems caused by the dental prosthesis: avoiding going out, being less tolerant to one's spouse, being irritable with other persons, having difficulty getting along with other people, and having difficulty doing routine jobs. A reliability of $\alpha = .67$ was found. Further requirements of test quality were fulfilled by OHIP by demonstrating validity and sensitivity for change.[25,26]

Pain Sensitivity Index (PSI). The questionnaire developed by Gross[35] measures fear of pain as manifested by negative interpretations and catastrophic expectations when in pain. Sixteen items related to physical concerns, mental consequences, and social distress are assessed. A five-point response format is used to indicate the respective agreement with each statement. Cronbach's alpha in this study was .89.

Private Body Consciousness (PBC). The scale is part of the Body Consciousness Questionnaire measuring habitual focus of attention on physical sensations.[38] Agreement is indicated on a scale ranging from 0 to 4. Cronbach's alpha in the present study was .72.

Somatization Scale. The scale is part of the Symptom Check List (SCL)-90-R.[33] It measures the distress experienced by patients from 12 psychosomatic symptoms. The temporal frame of reference for indicating such occurrences was 6 months ($\alpha = .82$).

Statistical Analyses

The statistical package SPSS for Windows (version 11.5, SPSS) was used in all analyses. Hierarchic multiple regression analyses were conducted to assess the contribution of each predictor variable to the explanation of the variance of OHIP subtests in patients with removable dentures. Sociodemographic variables (age, sex, education, living status) and duration of denture wearing were included. The order of the predictors in each step was: pain sensitivity, body consciousness, and somatization. For inclusion in the regression equation by the "forward" procedures, a significance criterion of $P < .010$ had to be attained. Individual correlations of the predictors with the OHIP subtests were also calculated.

Results

Preliminary *t* tests to compare the mean OHIP scores of patients with removable partial and complete dentures revealed no significant differences. Thus, it seemed justifiable to include patients with both types of prostheses in one group for subsequent analyses. Hierarchic multiple regression analyses were performed to determine the amount of variance in denture-related impairment that could be explained by sociodemographic and psychologic predictors. Table 1 demonstrates the results related to the three domains of OHIP impairment as criterion variables. The percentages of variance were calculated by squaring the correlation increment for the inclusion of a new predictor and multiplying by 100 ($\Delta r^2 \times 100$).

Of the sociodemographic variables studied, age related to only one of the criterion variables: psychologic discomfort. The negative sign of the correlation coefficient indicated that less emotional distress was experienced through denture wearing with increasing age. The variables sex, education, living alone, and years of denture wearing were not related to any of the three OHIP impairment domains.

Individual correlations of psychologic variables with OHIP impairment scales ranging from $r = .35$ to .59 were all significant at the level of $P < .010$. Pain sensitivity accounted for 17.5% of functional limitation variance. Body consciousness predicted 9.9% of the functional limitation variation. Finally, after inclusion of both foregoing predictors, somatization accounted for 10.6% of the oral functional limitation caused by

Table 1 Multiple Hierarchic Regression Analyses Predicting OHIP Impairment Scale Values*

Predictor	Functional limitation			Physical pain			Psychologic discomfort		
	Individual correlation (r_i)	% of explained variance	t value†	Individual correlation (r_i)	% of explained variance	t value†	Individual correlation (r_i)	% of explained variance	t value†
Age	–.13	–	–	–.20	–	–	–.28[a]	8.1	–2.74[a]
Pain sensitivity	.42[b]	17.5	4.27[b]	.38[b]	14.7	3.85[b]	.41[b]	17.3	4.43[b]
Body consciousness	.48[b]	9.9	3.41[a]	.52[b]	14.3	4.13[b]	.45[b]	–	–
Somatization	.56[b]	10.6	3.78[b]	.59[b]	12.5	4.23[b]	.35[a]	–	–
Total	–	38.0	–	–	41.5	–	–	25.4	–

*Step 1 = sociodemographic variables; step 2 = pain sensitivity; step 3 = body consciousness; step 4 = somatization.
†Inclusion criterion $P < .010$.
a = $P < .010$; b = $P < .001$.

Table 2 Multiple Hierarchic Regression Analyses Predicting OHIP Disability in Daily Living Scale Values*

Predictor	Physical disability			Psychologic disability			Social disability		
	Individual correlation (r_i)	% of explained variance	t value†	Individual correlation (r_i)	% of explained variance	t value†	Individual correlation (r_i)	% of explained variance	t value†
Age	–.15	–	–	–.30[a]	9.0	2.91[a]	–.30[a]	9.0	–2.91[a]
Pain sensitivity	.33[a]	11.1	3.27[a]	.30[a]	9.7	3.18[a]	.36[b]	13.6	3.87[b]
Body consciousness	.40[b]	7.5	2.78[a]	.49[b]	10.7	3.56[a]	.52[b]	10.6	3.65[b]
Somatization	.42[b]	–	–	.37[b]	–	–	.41[a]	–	–
Total	–	18.6	–	–	29.4	–	–	33.2	–

*Step 1 = sociodemographic variables; step 2 = pain sensitivity; step 3 = body consciousness; step 4 = somatization.
†Inclusion criterion $P < .010$.
a = $P < .010$; b = $P < .001$.

denture wearing. Taken together, psychologic variables predicted 38.0% of the variation in functional limitation. Comparable results were found for physical pain as a criterion variable. Psychologic predictors completely explained 41.5% of physical pain variance. The only variable predicting psychologic discomfort, after age had been included, was pain sensitivity, accounting for 17.0%. Body consciousness and somatization did not account for psychologic symptoms at the impairment level.

The results of hierarchic multiple regression analyses predicting denture-related interferences in daily living (disability) are shown in Table 2. Age was the only sociodemographic predictor significantly related to psychologic and social disability. Individual correlations between personality predictors and OHIP disability scales ranged from $r = .33$ to .52. All were statistically significant at a level of $P < .010$ or better. The total oral health–related disability explained by personality predictors was lower than was evident in functional and physical pain impairments. These predictors accounted for 18.6% of physical, 20.4% of psychologic, and 24.2% of social disability. While pain sensitivity and body consciousness both explained approximately 10% of the variance in disability scores, somatization did not add to the prediction of oral health–related disability in any of the three OHIP scales.

Discussion

Research on the relationship between personality traits and complaints caused by denture wearing has not found any uncontroversial evidence to date.[15–20] The current study was conducted to meet two major criticisms of previous investigations: the global assessment of discomfort[21] and the use of personality instruments nonspecific for the problem investigated.[11] The first criticism was countered by using OHIP, a methodologically sound and comprehensive measure covering six domains of oral health effects.[22–26] The second objection was answered by taking into account the concept of somatization for explaining denture-induced complaints. Somatization refers to the personality disposition of experiencing physical symptoms without identifiable organic reasons.[27,28] According to cognitive behavioral theory, the process of misinterpreting physical or pain symptoms and focusing on bodily sensations is central for the development of amplified perception of somatic dysfunction.[34] The PSI and PBC scales are representations of these forms of information processing.[35,38]

A hierarchic model was postulated, with pain sensitivity considered first, as it is believed to be the core process in amplifying somatic perception. Second, body consciousness, which is determined by pain

sensitivity, was included in the regression equation. Both variables are thought to result in the experience of multiple somatic symptoms.[34] Therefore, the somatization scale was entered into the model in the third position. With respect to OHIP impairment category, functional limitation and physical pain variation were more affected by personality variables (common variances of 38.0% and 41.5%, respectively) than was psychologic discomfort (17.3%).

Pain sensitivity accounted for 17.5% of the functional limitation. Patients who misinterpret adverse physical stimuli tend to perceive their dentures as compromising their masticatory and/or speech function. Fear of pain has been shown to be predictive of bodily function and symptom report in patients with musculoskeletal disorders.[36,37] The current study provides confirmation and extends this to the medical condition of wearing a dental prosthesis.

Body consciousness accounted for 9.9% of the reported denture-induced functional limitation. Various clinical and nonclinical studies have shown that persons with heightened physical attention tend to amplify the perception of somatic dysfunction.[39–42] The assumption that this relation also applies in patients with removable dentures was supported by the current study.

Once pain sensitivity and body consciousness had been included in the regression equation, the somatization scale of the SCL-90-R added a further 10.6% to the reported functional limitation. Remarkably, after controlling for these variables, somatization had an additional effect on functional limitation. A third process may explain this special contribution. Psychophysiologic studies have found that persons with high somatization scores tend not to accommodate to repeated stressors, maintaining their arousal and tension during rest periods.[27] The pressure of a denture on oral structures during function serves as a stressor. In periods of nonfunctioning, somatizing denture wearers may remain tense in expectation of repeated aversive experience and prevent habituation to functional sensations. Testing this hypothesis in patients with denture intolerance would be a worthwhile enterprise for further studies.

The results of the regression model relating to physical pain are in agreement with previously discussed results. Pain sensitivity, body consciousness, and somatization independently predict physical pain experienced by patients with removable dentures. These results corroborate previous findings in the field of chronic pain conditions.[37]

Psychologic discomfort shares a high common variance with pain sensitivity in patients wearing removable dental prostheses. The strong relationship might be explained by the prior expectation of negative consequences when experiencing pain sensations. Regarding the OHIP disability category, pain sensitivity and bodily consciousness explained considerable variance of oral impact on daily living in the domains of physical, psychologic, and social disability. The report of somatization symptoms, however, did not further influence OHIP disability scales. An explanation may be that habituation processes play a minor role in perceived limitations in daily living. The associations between pain sensitivity and the three aspects of disability might be explained by the content of the PSI, which includes concerns about physical aspects of pain as well as mental and social implications.

The relationship of bodily preoccupation to physical disability was to be expected, whereas relationships with psychologic and social disability cannot be readily understood. According to the literature, focusing attention on physical sensations interferes with information processing in problem-solving tasks.[41] Consistent with these results, denture wearers with an elevated body consciousness may express a disability to process information presented in everyday life, thus becoming tense, irritable, less considerate with other persons, and less able to perform routine jobs. This hypothesis calls for further research.

There are relevant clinical applications as well. Knowledge of the processes of symptom interpretation and body consciousness might help clinicians understand patients who appear to be complaining about a technically ideal dental prosthesis. Clinicians may ask patients whether they worry about expected consequences of pain or adverse physical sensation to prepare themselves to assist in dealing with patient fears. Second, clinicians may interview patients about their attention to physical symptoms, inform them about the role of attention in symptom amplification, and discuss mechanisms of diverting attention. Third, practitioners could consider the importance of the processes of adaptation and habituation.

Somatizing patients tend to check the comfort of their denture, thus irritating the gingiva and amplifying the symptoms experienced. They also display a tendency toward avoidance behavior, not wearing their dentures and giving preference to soft food. Thus, periodontal tissues do not adapt to the stimulation induced by the denture, and habituation is impeded. Informing patients about these physiologic processes may help them overcome amplified perceptions of oral sensations.

Acknowledgment

The authors owe a debt of gratitude to the anonymous reviewers for their valuable suggestions for improving the presentation of this study.

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