Pilot Study on the Psychologic Evaluation of Prosthesis Incompatibility Using the SCL-90-R Scale and the CES-D Scale

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Purpose: The aim of this pilot study was to evaluate and determine psychogenic aspects of prosthesis incompatibility by psychologic tests that define the (psychogenic) prosthesis incompatibility as a psychologic disorder. The patients' complaints with the restorations included taste disorders, odynophagia, pain sensations, and functional and esthetic dissatisfaction. ***Materials and Methods:*** The study cohort comprised 83 patients with complete dentures fabricated according to a standardized protocol. A dental history questionnaire was used to evaluate whether the patients had adapted to their dentures 6 months after incorporation. Twelve patients with suspected psychogenic prosthesis incompatibility and a group of 24 randomly selected control subjects were evaluated by application of the psychologic tests Symptom Checklist–90-R (SCL-90-R) and the Center of Epidemiological Studies Depression Scale (CES-D). ***Results:*** When compared with the control group, patients with suspected psychogenic dental prosthesis incompatibility showed statistically significant differences in the CES-D cumulative values ($P = .015$) and the SCL-90-R values Global Severity Index ($P = .024$) and Positive Symptom Distress Index ($P = .049$). ***Conclusion:*** This was the first documented study to use the SCL-90-R and CES-D scales on patients with suspected psychogenic dental prosthesis incompatibility with nonadaptation 6 months after incorporation. Adaptation problems were ruled out as a possible cause. Using the SCL-90-R and CES-D, it was possible to make a reliable initial diagnosis of the psychosomatic clinical situation regarding psychogenic prosthesis incompatibility. The results have direct implications on socioeconomic and forensic consequences for diagnosis and treatment by a dental clinician. *Int J Prosthodont 2006;19:482–490.*

Twenty years ago, Schepank[1] performed an epidemiologic, depth-psychology study on psychogenic disorders in the general public. The results revealed that 25% of 25- to 45-year-old subjects had a psychologic disorder, and 12.5% were in need of psychotherapeutic treatment. It is these patients who comprise the clientele of a general dental practice. In most cases, the dental clinician will not be aware that the patient has a psychologic disorder. Many patients either do not know about their condition or keep it a secret. Dental prosthetic treatment usually involves lengthy and elaborate procedures (eg, loss of teeth, incorporation of a removable dental prosthesis), and the entire stomatognathic system is affected by both functional and esthetic aspects. However, the success of prosthetic treatment is not merely assessable through objective parameters, since the subjective perception of each patient plays a considerable role in the outcome.[2] Patients with previous psychogenic conditions have an especially wide range of "weak spots," which can lead to the development of psychosomatic dental disorders that focus their thoughts predominantly on the oral region during and/or after prosthodontic treatment. The majority of complaints in odontology that may be related to a somatoform or psychologic disorder are temporomandibular dysfunctions/pains,[3,4] para-

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functions such as bruxism,[4,5] dental fear,[6,7] severe gagging,[3,8,9] burning tongue, and/or mouth sensation,[10–12] and (psychogenic) prosthesis incompatibility.[3,13]

Prosthesis incompatibility can be classified as a kind of "mental state" or a pathomorphologic-physiologic functional disease with an oral manifestation. Psychogenic prosthesis incompatibility was defined by Marxkors et al as a failure to adapt to a dental prosthesis at least 6 months after incorporation.[14] After this period, initial prosthesis adaptation problems, such as muscular synergy, habituation, trainability, and stereognostic perception,[15] are eliminated.

Whereas the 3-dimensional tactile intraoral differentiation capability known as stereognostic perception was investigated in a number of studies based on various parameters,[16–20] the influence of the psychologic status of a patient on the acceptance of removable dental prostheses has yet to be investigated.

To evaluate a possible impact of psychologic factors in (psychogenic) prosthesis incompatibility, Marxkors and Müller-Fahlbusch´s 5 diagnostic criteria for psychosomatic disorders can be used[21,22]:

1. Clear discrepancy between clinical findings and patient condition
2. Diagnosis ex non iuvantibus (ie, the therapy procedures that are useful for disorders with organic causes are unsuccessful)
3. Shifting of complaints
4. Inclusion of personality (teeth or a dental prosthesis play an extremely important role in the everyday life of the patient)
5. Concordance of complaints with situation and biography (eg, the outbreak of the disorder is associated with certain biographic events)

In order to make an initial diagnosis, there must be concordance in at least 3 of the 5 criteria.

It should be noted that demonstrated diagnostic abilities do not suffice to diagnose a psychogenic prosthesis incompatibility. This clinical pilot study on the evaluation of psychogenic or psychosomatic factors is the first study in dentistry in which psychologic test methods were used to validate psychogenic prosthesis incompatibility. It was hypothesized that patients suspected of having psychogenic prosthesis incompatibility show significantly different results in correspondent psychologic tests compared to controls. The aim of the study was to verify the existence of a psychogenic impact on dental prosthesis incompatibility and to define psychogenic prosthesis incompatibility as a psychologic disorder using psychologic tests. Therefore, the German version of the Center of Epidemiological Studies Depression Scale (CES-D),[23] ie, the ADS-L checklist by Hautzinger,[24] and the Symptom Checklist–90-R (SCL-90-R) by Derogatis et al[25–27] were applied. The CES-D scale can be used both in the general population and in psychosomatic medicine to determine depression characteristics. Regarding its suitability, there are no restrictions in terms of patient age. The CES-D scale was used successfully in sample tests involving patients up to the age of 97 years.[28] The SCL-90-R is a checklist based on scales used to determine the subjective impairment by physical or psychogenic symptom patterns. The scales refer to factors such as somatization, obsessive compulsive disorders, interpersonal sensitivity, depression, hostility, anxiety, phobic anxiety, paranoid ideation, and psychoticism.[26]

Materials and Methods

Subjects

Eighty-three edentulous patients of the Department of Prosthodontics at Friedrich-Alexander University of Erlangen-Nuremberg received a complete denture. Restorations were fabricated and incorporated according to a standardized protocol. After 1, 3, and 6 months, patient satisfaction with the denture was assessed by a self-developed dental history questionnaire, including a diagnostic profile for psychosomatic disorders (Fig 1).[21,22] After 6 months, 12 patients (mean age: 69.1 years; 11 women, 1 man) had not adapted to their dentures. They were considered the test group, with a suspected psychogenic prosthesis incompatibility. From the remaining 71 patients, 24 were randomly selected as controls (mean age: 68.2 years; 14 women, 10 men). The dental history questionnaire was completed by the controls and showed that they had adapted to their prostheses. The protocol was approved by the Ethics Committee of the Friedrich- Alexander University of Erlangen-Nuremberg and all patients gave written consent to participate in the study (no. 2572).

Procedures

Clinical examinations of all dentures revealed appropriate function and esthetics after 6 months. No intraoral pathologic findings were present. Health-related problems or medication, which could be a possible factor for dental prosthesis incompatibility, were ruled out. Patients of the test group complained about discomfort caused by burning of the oral mucosa, taste disorders, and pain, all of which indicated a nonadaptation to the complete denture. However, all subjects of the test group fulfilled at least 3 of the 5 criteria of a psychosomatic disorder. No subject of the control group fulfilled more than 2. Of particular interest were the questions regarding symptoms in the oral and fa-

Name: Gender:
Age: Profession:
Address: Phone:

Date/Time:

Diseases:
Medications:
Miscellaneous:

Current general complaints:
Duration: Time of appearance:

Current oral complaints:
Duration (wk):
Time of appearance (mornings, noon, evenings, nights, entire day):

Which part of the complete denture causes the most problems?

Current complete denture since (upper/lower jaw):
First complete denture since (upper/lower jaw):
Number of complete dentures to date (upper/lower jaw):
Number of dentists visited for the current complaints:

Subjective sufficiency of the complete dentures (upper/lower jaw):
Satisfaction (S)/Dissatisfaction (D) with:
Speaking (S/D)
Esthetics (S/D)
Chewing (S/D)
Swallowing (S/D)

Questions for the dentist:
Is there a discrepancy between the clinical findings and the patient's condition?
(eg, burning of the mucosa without any redness or perforation of the mucosa.)

Do useful therapeutic procedures in functional or organic disorders reveal any therapeutic effect?
(eg, complete denture abstention over days without any reduction of symptoms.)

Do the complaints shift in time, location, or intensity?
(eg, do the complaints appear irregularly?)

How often does the patient reflect on the prosthesis and how often is he/she displeased about it during the day or week?
(eg, is the patient's daily life highly influenced by the dental prosthesis? Is the patient able to work?)

Did major (negative) changes occur in the patient's recent past?
(eg, serious disease or death of a family member, loss of job.)

Fig 1 Dental History Questionnaire with a checklist of questions regarding the diagnostic criteria for psychosomatic disorders.

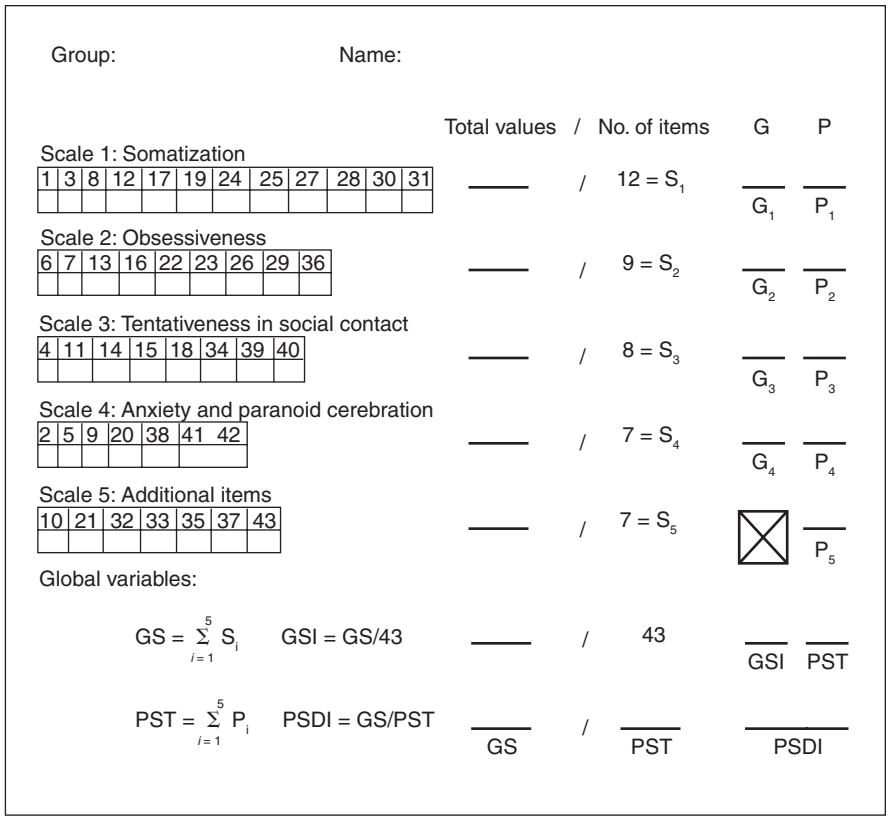
cial region caused "by the prosthetic treatment," the number of dentists visited previously, and the level of (dis)satisfaction with the dental prosthesis (speaking, esthetics, chewing, swallowing).

The patients then completed the CES-D and the SCL-90-R questionnaires. All examinations were performed at the Clinic of Odontology of the Friedrich-Alexander University of Erlangen-Nuremberg. The patients were examined in a separate examination room at the Department of Prosthodontics. The examinations were carried out both discretely and without any interruptions. Only the patient and the examining specialist were present in the room.

CES-D

The German version of this test discriminates between the long version (ADS-L, 20 questions) and the short version (ADS-K, 15 questions). The long version was applied in the present study, and is comparable to the American version of the CES-D scale. The questions refer to various depression symptoms, eg, exhaustion, self-debasement, loneliness, sadness, sleeping disorders, and concentration problems. All questions relate to symptoms experienced in the previous week. Answers were given using the 4-point scale of degree of severity of symptoms: "Rarely or none of the time"

Fig 2 The SCL-90-R checklist.



(value 0) means the symptom occurred less than 1 day during the previous week; "some or little of the time" (value 1) means the symptom occurred on 1 to 2 days; "occasionally or a moderate amount of the time" (value 2) means the symptom occurred 3 to 4 days; and "most or all of the time" (value 3) means the symptom occurred 5 to 7 days of the previous week.

Sixteen of 20 questions are positively linked. Item values from 1 to 3 indicate a depressive disorder. The remaining 4 questions are negatively linked, ie, the answer "rarely or none of the time" (value 0) indicates a depressive disorder. The lie criterion derived from the following formula: Σ positively linked items – 4x Σ negatively linked items. Questionnaires scoring less than –28 points for the lie criterion were removed from the evaluation. The CES-D cumulative value is calculated by the sum of the single item values and is used to validate the presence of depressive symptoms. Hautzinger[24] proposed a critical value of $>$ 23 points as the threshold for the presence of a depression symptom.

SCL-90-R

The aim of the SCL-90-R (Fig 2) is to determine 3 global indices that provide information on the psychogenic distress level: the Global Severity Index (GSI), the number of self-reported distress symptoms (Positive Symptom Total [PST]), and the intensity of the symptoms (Positive Symptom Distress Index [PSDI]).

For each question, the patient had 5 answer options, ranging from "not at all" (value 0) to "very severe" (value 4). For calculation of psychogenic distress (GSI), the global variable GS must be divided by the total number of items (questions): GSI = GS/Total number of items (= 43 questions). The global variable GS derives from the sum of all item values of all scales (scale 1 to 4 and additional items). In analogy to the GSI, a scale value $G_{(n)}$ can be calculated for each single scale: $G_{(n)}$ = Sum of the item values of a single scale/Number of items of the single scale ($S_{(n)}$).

To obtain the number of self-reported distress symptoms (PST), the distress tendency $P_{(n)}$ must be determined for each scale. The number of items for which the patients indicate distress (values $>$ 0) are added. The PST is calculated by adding all distress tendencies of all scales (P_1–P_5): PST = Σ P_1–P_5.

The final step is to compose the global index value PSDI by dividing the GS value by the PST value obtained: PSDI = GS / PST.

All questions of the SCL-90-R checklist refer to the week prior to the survey. If a question cannot be answered, the number of items, ie, questions, in the evaluation decreases accordingly.

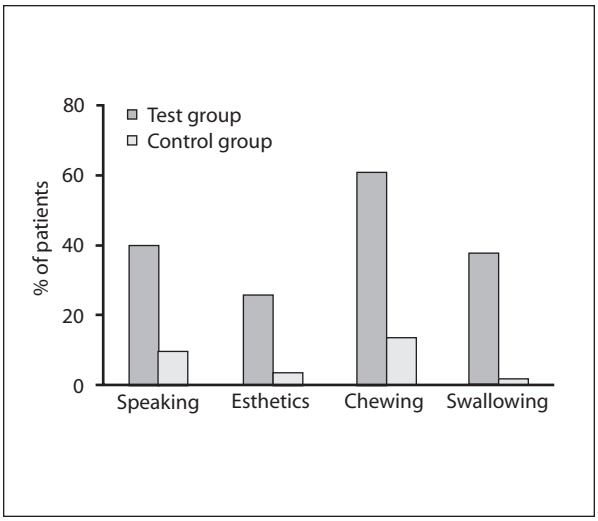


Fig 3 Patients' dissatisfaction with their dental prostheses.

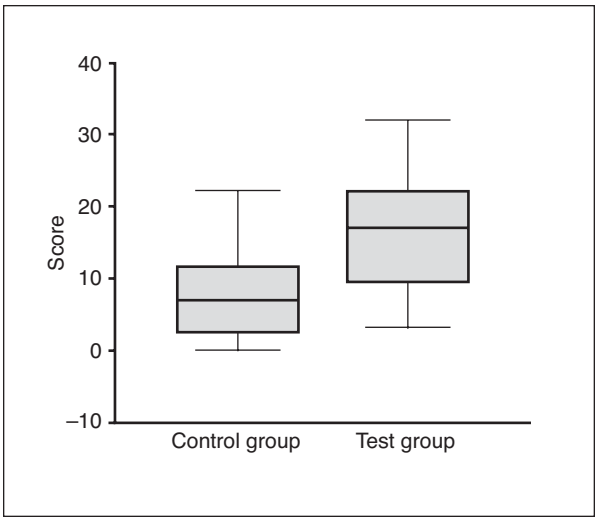


Fig 4 Boxplot of the CES-D scores (cumulative values).

Data Evaluation

Descriptive statistics, the Mann-Whitney *U* test for comparison of scores between groups, and the Spearman correlation coefficient were applied for data analysis. The level of significance was set at 5%. A low correlation coefficient was defined by values up to 0.5, a medium correlation coefficient by values up to 0.7, and a high correlation coefficient by values up to 0.9. Values above 0.9 were considered to have a very high correlation.

Results

Dental History

The results of the dental history questionnaire clearly showed that 86% of the control subjects were very satisfied with the function of their prostheses and 98% with the esthetics of their prostheses. The patients in the test group with suspected psychogenic dental prosthesis incompatibility expressed considerable dissatisfaction with their prostheses. They found their dental prostheses ill functioning, and were unsatisfied with their speaking (40%), chewing (61%), and swallowing ability (38%). Twenty-six percent of patients from the test group stated that their prosthesis was inadequate in terms of shape, color, and positioning (Fig 3).

CES-D

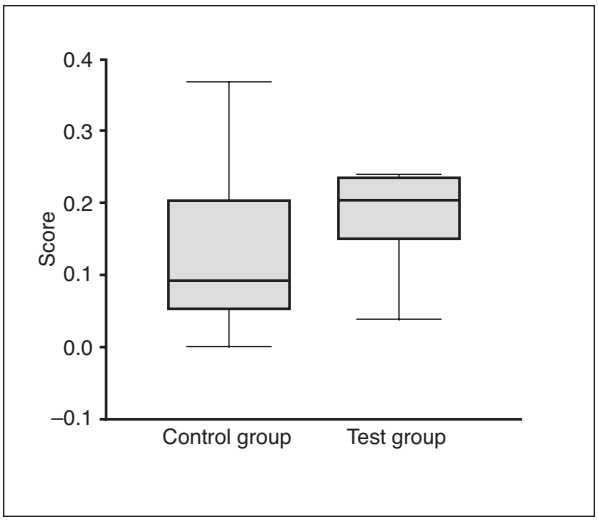
One questionnaire from the control group could not be used in the analysis because the critical value for the lie criterion of –28 points was reached. With regard to the answer patterns, a significant difference was found between the test and control groups. The depressive distress level found in the test group was significantly ($P = .015$) higher than that of the control group (Fig 4).

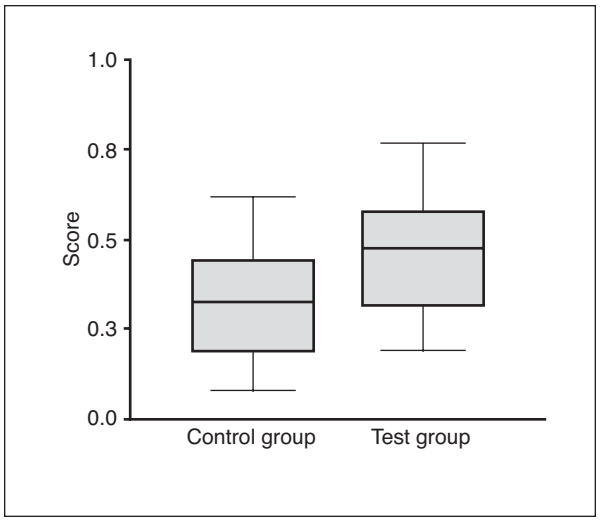
SCL-90-R

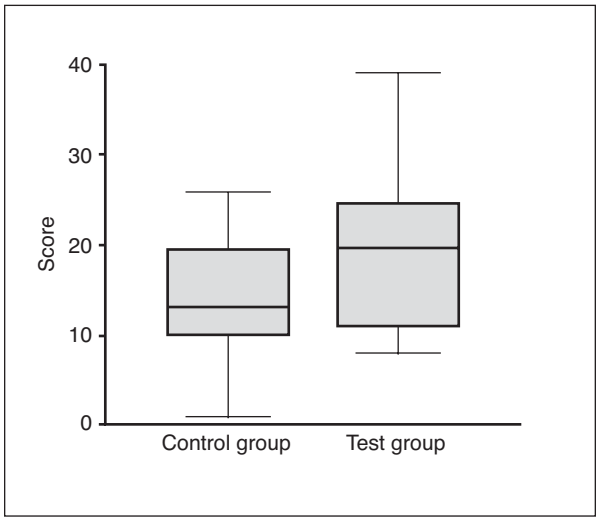
In the evaluation using the SCL-90-R checklist, all patients were included to determine the GSI, PST, and PSDI. A boxplot diagram was drawn for every value (Figs 5a to 5c). The Mann-Whitney *U* test showed statistically significant difference between the test and control groups for the GSI ($P = .024$) and PSDI ($P = .049$). The test group displayed greater distress levels than the control group, as well as greater intensity of symptoms. No significant difference was found for the PST ($P = .146$).

A correlation was found for the answers of the test group in the GSI and the CES-D ($r = 0.74$) and in the PSDI and the CES-D ($r = 0.66$).

A correlation was also found for the answers of the test group in the scale value G_1 (somatization) ($r = 0.71$) and scale value G_2 (obsessiveness) ($r = 0.60$) in relation to the clinical dissatisfaction with their chewing ability. A comparable correlation was demonstrated for the answers of the test group in the scale value G_1 (somatization) ($r = 0.64$) and scale value G_3 "tentativeness in social contact" ($r = 0.67$) in relation to the clinical dissatisfaction with speaking ability.







Figs 5a to 5c Boxplots of the SCL-90 scores for GSI *(above)*, PSDI *(above right)*, and PST *(right)*.

Discussion

Dentistry is affected by psychosomatic patient disorders as much as any other field of medicine. Dental clinicians should be able to identify possible psychosomatic causes of a dental problem as early as possible to prevent time-consuming and expensive repairs of new restorations. In the present study, patients with an assumed psychosomatic disorder who appeared to have psychogenic prosthesis incompatibility reported far greater dissatisfaction with their dentures than patients in the control group, even though all dentures were fabricated and incorporated according to a standardized protocol and displayed no defects or shortcomings. Similarly, a dental history questionnaire and a general medical diagnosis ensured that no systemic disorders were the cause of prosthesis incompatibility. In the dental history questionnaire, the control group rated their dental prostheses very highly in all 4 areas: speaking, esthetics, chewing, and swallowing (only 2% to 14% dissatisfaction). Patients in the test group, on the other hand, gave very poor marks (dissatisfaction = 60% for speaking, 74% for esthetics, 39% for chewing, and 62% for swallowing). These patients were not only dissatisfied with the function, but also the design, and they complained about the positioning, color, and shape of the teeth, as well as about the denture base. For these patients, the prosthesis became the focal point of their lives, and they "identified" with their prostheses. Winnberg and Forberger[29] also found that patients with psychogenic prosthesis incompatibility strongly focus on the appearance, shape, size, color, and position of the teeth. Focusing attention on a certain area of the body is known as *dysmorphophobia*, in which patients experience increased self-monitoring.[30] In the present study, this distorted perception applies to the orofacial region. The demonstrated correlations between the scale values of G_1

(somatization) and G_2 (obsessiveness) with chewing ability and G_1 (somatization) and G_3 (tentativeness in social contact) with speaking ability may be assessed to suggest increased self-monitoring. Additionally, the patients found themselves incapable of following their daily routine because of their prostheses, and they fulfilled at least 3 diagnostic criteria for a psychosomatic disorder.[21,22]

"Symptoms" like the described dissatisfaction regarding chewing or speaking ability initially will be seen by clinicians as functional defects rather than psychogenic disorders. Thus, corrective steps are often taken with little long-term therapeutic success, and it is not long before patients need further "improvements." Brodine and Hartshorn[2] describe these sorts of treatments as extremely time-consuming and resulting in treatment failure with forensic consequences. Therefore, dental treatment for subjects with possible psychosomatic disorders must be avoided or initiated in conjunction with psychotherapeutic support.

When evaluating the causes of prosthesis incompatibility, odontology has focused primarily on oral-medical conditions, eg, on oral stereognosis, as reflected by the majority of the literature. For example, in recent publications, Engelen et al investigated "the relationship between oral sensitivity and masticatory performance,"[31] as well as the influence of temperature on oral sensitivity[32]; Hirano et al examined "the role of sensorimotor function in masticatory ability"[33]; and Smith and McCord studied the "oral stereognostic ability in edentulous and dentate individuals."[34] To determine the quality of life of patients with dental prostheses, the Oral Health Impact Profile[35] has been used in various prosthetic treatment modalities.[36,37] However, a psychologic test that can evaluate the psychogenic components of the psychosomatic clinical situation of dental prosthesis incompatibility is still missing in dentistry. Instead, this diagnosis is based on a dental examination by exclusion with no clinical-morphologic correlation to account for the symptom pattern of dental prosthesis incompatibility. In psychology and psychiatry, where the knowledge and expertise to diagnose and treat psychogenic prosthesis incompatibility can be found, this disease pattern has been given no consideration. Psychology and psychiatry have focused primarily on dental anxiety[38,39] and pain.[40] Patients suffering from psychogenic prosthesis incompatibility and problems with their dental prostheses primarily turn to dental clinicians for help. But dental clinicians do not have the expertise to definitively diagnose and treat psychosomatic disorders. Further, psychologists and psychiatrists lack the expertise to rule out possible intraoral causes of oral manifestations of psychogenic disorders. In the present study, the presence of psychogenic prosthesis incompatibility was evaluated using psychologic tools 6 months after prostheses were delivered. Marxkors et al[14] defined the period of 6 months after dental prosthesis incorporation as the earliest point in time to diagnose a failure to adapt to a dental prosthesis. Thus, adaptation problems within 6 months were ruled out. General health problems and ill-functioning prostheses were also ruled out. In cooperation with the Department of Prosthodontics and the Department of Neurology and Psychiatry, the CES-D scale[23,24] and the SCL-90-R checklist[25–27] were selected as appropriate psychologic test methods. The test patients were mostly elderly. In the literature, the CES-D scale is often referred to as a yardstick for the depressive status of elderly patients.[28,41] The unequal proportion of male and female patients in the test group is confirmed by Lesse,[42] who also found far more women than men affected by (psychogenic) prosthesis incompatibility.

The CES-D has never been used to evaluate psychogenic prosthesis incompatibility. Thus, no values are available for comparison. The same is true for the SCL-90-R checklist, for which comparisons are only available with the Brief Symptom Inventory (BSI)[25,43] and the short version of the Oral Health Impact Profile (OHIP-S).[44] Thus, this study used the SCL-90-R and CES-D for the first time for patients suffering from assumed psychogenic prosthesis incompatibility. In comparison to the control group, who adapted to their dental prostheses, the test group showed significant differences in the psychologic parameters. The depressive distress levels found in the test group were far higher than those of the control group (CES-D). Similarly, the values obtained for the GSI (psychogenic distress) and the PSDI (intensity of the symptoms reported) were significantly higher for the test group than for the control group. The only item for which no significant difference was found was the number of self-reported distress symptoms (PST).

The present study shows that the SCL-90-R checklist and the CES-D scale can be used as adequate psychologic tools, which can be adopted by dental clinicians for an initial diagnosis of a possible psychogenic prosthesis incompatibility. Based on the correlation between the CES-D and the GSI and PSDI of the SCL-90-R, the CES-D is recommended for dental applications in further studies and daily routine. The CES-D is a short and concise questionnaire that is fast and easy to complete and analyze. On the other hand, the SCL-90-R is time consuming and some questions are inappropriate for dental applications. To avoid a false diagnosis between (dental) prosthesis incompatibility and psychogenic prosthesis incompatibility, the initial diagnosis by a dental clinician should be based on the following diagnostic triad:

1. Dental/oral causes of prosthesis incompatibility, such as mechanical, thermal, biological, or chemical irritation of the mucosa and allergic (local or systemic) reactions, should be excluded.
2. General health and medication causes of prosthesis incompatibility should be excluded.
3. Patients with assumed psychogenic prosthesis incompatibility should fulfill at least 3 diagnostic criteria of a psychosomatic disorder,[21,22] and the symptoms should be present at least 6 months after incorporation of the dental prosthesis.

The CES-D and SCL-90-R are helpful in confirming the diagnosis.

After the initial diagnosis, the patient should be provided with the expertise and assistance of a psychotherapist. Interdisciplinary diagnosis and therapy for psychogenic dental prosthesis incompatibility do not only have therapeutic results, but also socioeconomic and forensic consequences for both patients and dentists, such as avoidance of "corrective" dental treatment for patients with psychogenic prosthesis incompatibility.

Further investigations using a larger number of cases that analyze the relationship between the psychologic tools and clinical questions, such as stereognostic ability, are necessary for the validation of the use of the CES-D and SCL-90-R in diagnosing patients with psychogenic prosthesis incompatibility.

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Commentary on the Psychologic Evaluation of Prosthesis Incompatibility

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> I should rather have lost an arm, as long as it is not the one that wields my sword. For I must tell you, Sancho, that a mouth without molars is like a mill without a millstone, and dentation is to be valued much more than diamonds.
>
> Miguel de Cervantes, *Don Quixote*

Tooth loss may be a catastrophe to some people, while others will tolerate many missing teeth.[1] Dental clinicians become involved during the preparation of dental prostheses, and the fact that some patients do not adapt well has been known for many decades.[2] Several factors influence patient adaptation to dentures. The insightful therapist aims to identify these factors and address patient expectations before treatment. All too often, a reactionary diagnosis of a maladaptive response occurs only after the dentures are made, patient expectations are unmet, and the clinician feels defeated. This pilot study of dissatisfied denture patients 6 months after prosthetic insertion has taken a similar approach. When success is fleeting, then look for a reason. The authors advance the hypothesis that prosthetic incompatibility is a psychologic disorder. Several factors affect patient acceptance of dentures, and none have a high correlation.[3] If a pretreatment psychologic assessment can be verified in prospective pretreatment surveys with a high positive posttreatment correlation, it would serve as one predictive tool to help identify maladaptive individuals. This would benefit the psychologic health of the clinician and the patient. For these patients, dental implants would be the most cost effective and appropriate therapy for tooth replacement.[4,5]

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