

Screening for Psychological Problems in Temporomandibular Disorder Patients

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Research efforts have been directed to determine whether temporomandibular disorder (TMD) patients have psychological problems and whether these factors influence treatment outcome. Because there is no consensus about the best way to quickly assess psychological problems in TMD patients, this study was designed to evaluate a simple method for identifying psychological factors that may need to be addressed as part of a comprehensive treatment program. This method involved having TMD patients systematically rate themselves, using a brief screening questionnaire, for the presence or absence of psychological problems. These ratings were then compared to results from extensive psychological testing. Sensitivity, specificity, and ordinal rank-based association model analyses showed moderate to strong associations between patients' ratings and the corresponding psychometric measures. These results provide evidence that the brief self-ratings of psychological factors utilized in this study may be a useful first step to screening for psychological difficulties in TMD patients.

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There are several important reasons to identify psychological problems in temporomandibular disorder (TMD) patients. For example, if certain psychological factors (ie, high stress levels) identify patients who would likely respond poorly to treatment, such patients could be offered additional treatments, such as stress management. Furthermore, the identification and treatment of psychological problems might improve the quality of life for TMD patients as well as ensure their compliance to medical and dental treatments. In this regard, it has been shown that early identification and treatment of psychological problems in persons with other health problems can reduce the need and cost of medical services.^{1,2}

Olson,³ in a paper given at the 1983 President's Council on the Examination, Diagnosis, and Management of Temporomandibular Disorders, emphasized the need to identify psychological factors that characterize the nonresponding patient. However, even if psychological factors are shown to predict treatment outcome, identifying these patients is often cumbersome and costly, requiring extensive, time-consuming, formal psychological tests. Given that only 25% to 50% of the TMD population present with elevated anxiety or depression according to psychometric testing,⁴ it would also be impractical to implement a large battery of psychological tests to every TMD patient.

Rugh⁵ has recommended that assessment of chronic TMD patients should include a behavioral and psychological evaluation. More recently, a checklist of psychological and behavioral factors that should be included in dental screening exams has been pro-

1. Do you characterize yourself as depressed? Yes or No If yes, rate severity:	1	2	3	4	5				
	mild		moderate		severe				
2. Do you characterize yourself as being anxious or tense? Yes or No If yes, rate severity:	1	2	3	4	5				
	mild		moderate		severe				
3. Do you think you have experienced a lot of stressful situations over the past year? Yes or No If yes, rate severity:	1	2	3	4	5				
	mild		moderate		severe				
4. How many people do you have in your life that you can talk with to help you feel better when things are not going well? Circle one:	1	2	3	4	5	6	7	8	9
5. Also, please circle one of the following which best describes your level of satisfaction with your social support (eg, people you can talk with when things are not going well).									
Circle one:	6—very satisfied		5—fairly satisfied		4—a little satisfied				
	3—a little dissatisfied		2—fairly dissatisfied		1—very dissatisfied				

Fig 1 Self-evaluation form completed by patients to rate anxiety, depression, recent life stress, and social support.

posed. Such information could indicate the necessity for further evaluation by a mental health professional.⁶ The first factor cited on this checklist is evidence of clinically significant anxiety or depression. However, there is evidence that dentists have difficulty recognizing these characteristics in an initial exam setting. In a previous study,² it was found that dentists are not very accurate in their estimates of anxiety or depression relative to psychological test scores. Analyses involving the estimation of sensitivity, specificity, and κ demonstrated high rates of misclassification and poor agreement between dentists' ratings and psychological test scores indicating depression and anxiety. It should be noted that dentists in that study did not directly interview patients about their psychological status and that specific training in this procedure might improve these results. It also remains possible that patients may be able to rate themselves with a higher degree of accuracy.

While the best method for assessing psychological factors in TMD has not yet been established, one possible approach to screening a large population would be to utilize a stepped approach as follows: (1) Patients rate themselves for specific psychological problems; (2) if problems are reported, then patients could be given self-administered, standardized psychological tests to clarify problem areas; (3) if the results of these self-administered tests are abnormal, then an interview could be conducted by a qualified professional to determine psychological status.

With regard to the latter two steps, it has been shown that for depression, psychometric measures have demonstrated good sensitivity and specificity relative to clinician ratings as the set standard.⁷ However, with regard to steps 1 and 2, there are no previous studies that have directly compared patient self-ratings to psychometric scores in a chronic pain population.

The purpose of this study was to explore the validity of a brief screening questionnaire by examining the relationship between patient ratings and psychometric scores for anxiety (state and trait), depression, and recent life stress. Specifically, patients' global self-ratings of psychological factors are regarded as a screening procedure to identify psychological problems in a TMD population. The sensitivity and specificity for patients' ratings of the aforementioned psychological problems are determined. Criteria based on standardized psychological tests serve as the standard in this study.

Materials and Methods

Subjects

This study group comprised 116 consecutive new TMD patients (85% women, 15% men; mean age 37.42 years) from the UCLA Temporomandibular and Facial Pain Clinic who reported pain and dysfunction of the temporomandibular region as the primary problem.

Procedure

Prior to treatment, all patients were given a battery of psychological tests, which included the Beck Depression Inventory (BDI),⁸ the Schedule of Recent Experience (SRE),⁹ and the State-Trait Anxiety Inventory (STAI).¹⁰ As a part of this battery, patients also completed a self-evaluation form that required them to rate anxiety, depression, recent life stress, and social support on a Likert Scale (Fig 1). Patients did not rate their current (state) anxiety and their general (trait) anxiety separately. Patients' responses to the single question on anxiety were therefore compared to both the state and trait versions of the STAI.

Two considerations in evaluating the performance of any screening procedure are sensitivity and specificity.¹¹ Sensitivity is the ability of a screening test to detect a particular disorder (yield a positive finding) when the person truly has the disorder. Specificity is the ability to accurately yield a negative finding when the person truly does not have the disorder.

Sensitivity and specificity values are affected by the cutoff criterion values of the screening procedure as well as the "gold standards." In this study two different sets of criterion values were compared in the screening procedure. The sensitivity and specificity estimates of the patient's Likert

scale ratings were computed as follows: Positive findings were determined by cutoff scores on the self-evaluation form in two ways: First, a patient response of "no" was regarded as a negative finding, and a score of 1 or greater was regarded as a positive finding. Second, cutoff scores were chosen such that the proportion of patients regarded as positive was comparable to the proportion determined positive by the gold standard. Scores were deemed positive if they were greater than 1 for depression, 2 for anxiety, and 3 for recent life stress. Patients' ratings equal to or less than these respective cutoffs were regarded as negative findings. These results were then compared to the findings of the psychological tests.

Sensitivity with patients' Likert Scale ratings was computed by expressing the number of people declared positive by both patient self-evaluation and psychological testing as a percentage of the total number of persons declared positive according to psychological test scores that served as the gold standard. Specificity was the number of people declared negative by both patient ratings and by psychological testing, expressed as a percentage of the total number of people declared negative by psychological testing.

Gold standard criteria were based on cutoff scores that corresponded with commonly accepted clinical thresholds of distress for the pertinent psychological variable. For example, scores on the Beck Depression Inventory greater than 9 are generally considered to indicate mild depression.^{12,13} A summary score greater than 300 on the Schedule of Recent Experience places an individual at a higher risk for medical illness in the near future.^{14,15}

The exception to the definition of gold standard criterion variables as commonly accepted clinical thresholds was state and trait anxiety, for which the gold standard was defined as scores greater than the 83rd percentile. Since there are no established clinical cutoffs for this test, a statistical criteria (83rd percentile) that corresponds to a score one standard deviation above the mean was chosen.

Computing sensitivity and specificity involves dichotomizing the patients' ratings in terms of the presence or absence of the various psychological factors. Patients' ratings can also be regarded in a more continuous fashion and compared to the psychometric gold standard by fitting a linear-by-linear association model.¹⁶ This utilizes the uniform local association model for ordered categorical data to obtain a quantification of association between the self-evaluation and the standard psychological test instruments. The uniform model

assumes that any two adjacent categories have the same odds ratio as any other two adjacent categories. Strong positive association is shown by ratios that are much higher than the "no association" reference value of 1.0. This model gives a unifying perspective on relationships between the distribution of values on the pair of measurement scales without using artificially determined cutoff criteria to force the scales into binary form, which would be necessary in other approaches to measurement of association such as a receiver operating curve.

Results

The gold standard criteria and corresponding base rates for each of the psychological variables in this TMD sample were as follows: depression (BDI > 9) = 40%; state anxiety (STAI > 83rd percentile) = 30%; trait anxiety (STAI > 83rd percentile) = 40%; recent life stress (SRE > 300) = 56%. The means, standard deviations, and ranges for psychometric scores observed in this TMD sample are presented in Table 1. The base rates of patients' self-evaluations of these same variables, utilizing various cutoffs on the self-evaluation scale are presented in Table 2. Using a cutoff of 1, almost 40% of the patients rated themselves as having no depression, while only 19% and 15% of the patients rated themselves as without anxiety and life stress, respectively.

Sensitivity and specificity were computed for each of the patient-rated psychological variables using two separate sets of criterion values for the screening form. The results of the analyses using scores greater than 0 as the criterion threshold for a positive finding are presented in Table 3. As can be seen, sensitivity ranged from 89% for life stress to 72% for depression; specificity ranged from a low of 31% for recent life stress to a high of 83% for depression. Specificity appeared to be quite low for patients' self-evaluations of life stress as well as for both state and trait anxiety. Table 4 shows the results of the analyses using criterion scores on the screening form that produced comparable base rates with the gold standard. As can be seen, the effect of raising the threshold criterion scores of the screening procedure decreases sensitivity while increasing specificity.

The sensitivity and specificity values presented in Tables 3 and 4 can also be used to determine how many patients who, based on self-evaluations, would have been referred but have not been determined positive by testing (false positives) as well as the number of patients who would not have been

Table 1 Base Rates of Psychological Factors From the Self-Rating Form Scales Using Different Criterion Cutoff Scores

Scale	% scoring x or higher					
	x = 1	2	3	4	5	6
Depression	61	39	23	12	3	1
Anxiety	81	66	43	18	5	1
Life stress	85	80	68	50	17	5

Table 2 Means, Standard Deviations, and Ranges for Psychometric Scores

Variable	n	Mean (SD)	Range
Age	70	37.42 (15.61)	17-72
Beck Depression Inventory	74	11.0 (11.9)	0-91
STAI-State Anxiety	74	60.55 (32.45)	3-100
STAI-Trait Anxiety	74	70.0 (29.39)	3-100
SRE-Life Stress Rating	74	540.9 (469.09)	44-1846

Table 3 Sensitivity and Specificity Estimates for Patients' Ratings of Psychological Variables*

Variable	Sensitivity n (%)	Specificity n (%)
Patient anxiety rating (trait)	46 (83)	70 (47)
Patient anxiety rating (state)	34 (82)	80 (41)
Patient life stress rating	64 (89)	51 (31)
Patient depression rating	46 (72)	70 (83)

*Standard = psychologic test scores; screening criterion cutoffs > 0.

Table 4 Sensitivity and Specificity Estimates for Patients' Ratings of Psychological Variables*

Variable†	Sensitivity n (%)	Specificity n (%)
Patient anxiety rating (trait)	46 (63)	70 (71)
Patient anxiety rating (state)	34 (65)	80 (66)
Patient life stress rating	64 (70)	51 (76)
Patient depression rating	46 (72)	70 (83)

*Standard = psychologic test scores.

†Screening criterion cutoffs: depression > 1, anxiety > 2, life stress > 3.

Table 5 Linear-by-Linear Association Model With Estimated Odds Ratio as a Quantification of the Degree of Agreement Between Self-Rated and Psychometric Scores

Psychometric scores	Self-ratings	Estimated local odds ratio	95% confidence interval for local odds ratio	n
STAI-state anxiety	State anxiety	1.918	(1.215, 3.026)	114
STAI-trait anxiety	Trait anxiety	2.029	(1.291, 3.188)	116
Beck Depression Inventory	Depression	3.337	(2.096, 5.311)	116
Schedule of Recent Experience	Recent life stress	1.841	(1.386, 2.445)	115

referred but who would have subsequently tested positive (false negatives). For example, Table 3 shows that if referral decisions were based on patients' self-evaluations of depression, 28% (1 - sensitivity) would not have been referred for testing who would have subsequently tested as at least mildly depressed. These self-ratings of depression also would have led to 17% (1 - specificity) of patients being referred for testing who subsequently would have tested as normal.

Computing sensitivity and specificity involves dichotomizing the patients' self-evaluations in terms of the presence or absence of the various psychological factors. The ratings can also be regarded in a more continuous fashion and compared to the psychometric gold standard by fitting a linear-by-linear association model.¹⁶ The extent of agreement is indicated by estimated local odds ratios that are presented in Table 5. These ratios are compared to a value of 1.00, which corresponds to a lack of trend (ie, independence) between the two sets of values.

Table 5 can be interpreted in accordance with the following example. A person scoring 2 or more on the self-evaluation form is approximately 3.33 times more likely to have a score of 9 or more on the Beck Depression Inventory than a person scoring less than 2 on the self-evaluation form. Overall, the associations between patient ratings and psychometric scores were moderate to strong. As can be seen in Table 5, the strongest associations occurred in depression and trait anxiety.

Discussion

A comparison of brief patient self-evaluations of psychological distress variables to standardized test results produced remarkably similar base rates

in this TMD population. A sizable proportion of this population was characterized by both assessment procedures as mildly depressed, while a higher percentage of these patients acknowledged at least some anxiety and recent life stress. The moderate to strong associations between patients' self-ratings and psychometric scores provide encouraging evidence that brief self-ratings may be a useful first step in screening TMD populations for psychological problems. However, the specificity values suggest that relatively large numbers of patients would be referred for testing that would show these individuals to be normal in terms of psychological testing criteria.

Sensitivity and specificity values (as well as false-positive and false-negative rates) are affected by the cutoffs chosen in both the gold standard as well as the screening procedure. Raising the cutoff threshold score of the gold standard has the effect of increasing sensitivity while decreasing specificity. Conversely, raising the cutoff threshold value of the screening procedure consistently has the opposite effect of decreasing sensitivity while increasing specificity. For example, if the cutoff for anxiety from the screening procedure is raised from greater than 0 to greater than 2, the sensitivity decreases from 83% to 65% while the specificity increases from 41% to 66%. Whatever cutoff values are chosen, the corresponding base rates of the gold standard factors also affect sensitivity and specificity. To minimize false negatives that result in failure to detect and treat significant problems, the cutoffs on the self-evaluation form were set at a level that maximized sensitivity for this data set. Patients who were above the cutoffs used in this study rated themselves as having at least some distress. Accordingly, we reasoned that it may be reassuring for those who were false positives to find out that the problems they reported had not

reached clinical significance according to standardized test criteria. Furthermore, rather than be confronted with the need to deal with psychological problems, these patients could still be offered options that improve their current quality of life.

Many clinicians do not include psychometric testing in their initial evaluation of all patients because of time constraints (up to 30 minutes are necessary for some patients to complete the BDI and STAI). Furthermore, asking all patients the types of questions included in these inventories (eg, Do you have thoughts of killing yourself?) may produce misunderstanding in those patients who do not view themselves as depressed but rather see their problems as physical in nature. However, if the patient admits to problems indicated on the screening form, then there is a rationale for following up with standardized psychometric testing.

This screening form could be part of a structured interview or as a paper-pencil test. The rationale for these questions would be that it is important to identify as a maintaining or exacerbating variable any emotional/behavioral factors that interact with the patient's physical condition. This will reduce the likelihood of misunderstanding between doctor and patient. The brief patient self-evaluation exam may be a valuable first step in screening for psychological problems. However, because this method was shown to be somewhat less sensitive and specific than psychological testing, it should not replace psychometric testing.

This stepped approach to screening for psychological problems may also be a valuable tool in research efforts attempting to identify psychological predictors of treatment outcome. This would be particularly true where batteries of standardized tests are impractical to implement. In this regard it would be preferable to determine ways to improve the accuracy of patients' self-ratings. For example, it may be that psychological factors that have both high sensitivity and specificity values on patients' self-evaluations (eg, depression) are those of which patients have the clearest understanding; conversely, self-ratings that have weaker associations with the respective psychological test may have been due to a less clear conceptualization. Thus, in the present study, the poor association between respective values for life stress may have been a result of the patients not fully understanding the term life stress as intended by the SRE: the layperson's notion of life stress may focus more predominantly on negative life events. It remains possible that giving patients well-specified operational definitions of the factors they are asked to rate may improve sensitivity and specificity. Additionally, it

would be interesting to determine how self-ratings predict treatment outcome relative to standardized psychological tests.

Finally, the results of this study should be replicated with a separate population to ensure that the sensitivity and specificity values generalize to other populations. It remains possible that the sensitivity/specificity values obtained in this study are inflated due to the fact that the cutoffs are based on the same population for whom sensitivity/specificity values are determined. We are currently investigating this critical question.

Acknowledgments

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Resumen

El examen masivo para el reconocimiento de los problemas psicológicos en pacientes con desórdenes temporomandibulares

Los esfuerzos investigativos han sido dirigidos hacia el propósito de determinar si los pacientes con desórdenes temporomandibulares (DTM), sufren de problemas psicológicos y si estos factores pueden influenciar el resultado del tratamiento. Debido a que no hay un consenso en cuanto a la mejor manera de evaluar rápidamente problemas psicológicos en pacientes con DTM, este estudio fue diseñado para evaluar un método simple para la identificación de factores psicológicos que se pudieran atender como parte de un programa de tratamiento comprensivo. Este método requiere la autoevaluación sistemática de los pacientes con DTM, utilizando un cuestionario breve, para reconocer la presencia o ausencia de problemas psicológicos. Estas evaluaciones fueron comparadas a los resultados obtenidos de pruebas psicológicas extensas. Las pruebas de sensibilidad, especificidad y los modelos de asociación basados en la posición ordinal indicaron que existían asociaciones que variaban entre moderadas y fuertes, relacionadas a las evaluaciones de los pacientes y las medidas psicométricas correspondientes. Estos resultados suministran la evidencia de que las autoevaluaciones breves de los factores psicológicos que se usaron en este estudio, pueden utilizarse como el primer paso para realizar los exámenes masivos de reconocimiento de los problemas psicológicos de los pacientes afectados por DTM.

Zusammenfassung

Psychologische Abklärung von Patienten mit Myoarthropathien des Kausystems

Verschiedene Studien sind der Fragestellung nachgegangen, ob Patienten mit Myoarthropathien des Kausystems (MAP) unter psychologischen Problemen leiden und ob diese den Behandlungserfolg massgeblich beeinflussen. In Ermangelung einer effizienten Methode zur psychologischen Abklärung von MAP-Patienten war es Ziel unserer Studie, mit einer einfachen Methode die psychologischen Faktoren zu identifizieren, die bei einer umfassenden Behandlung mitberücksichtigt werden müssten. Die MAP-Patienten mussten anhand eines kurzen Fragebogens angeben, ob sie unter psychologischen Problemen litten oder nicht. Diese Ergebnisse wurden dann mit Resultaten von ausgedehnten psychologischen Tests verglichen. Sensitivität, Spezifität und "ordinal rank-based association model" Analysen zeigten mässige bis starke Übereinstimmungen zwischen der Selbsteinschätzung des Patienten und den psychometrischen Ergebnissen. Diese Resultate lassen eine kurze psychologische Selbsteinschätzung in Form eines Fragebogens als ein nützliches Instrument zur Erhebung von psychologischen Schwierigkeiten bei MAP-Patienten erscheinen.