
Are there psychologic predictors of treatment outcome in temporomandibular joint pain and dysfunction?

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This study explores the relationship between diverse psychologic factors and treatment outcome in temporomandibular joint pain and dysfunction (TMJPD). During assessment, 178 patients with TMJPD were given a pressure pain threshold and tolerance task and completed the Basic Personality Inventory, the Illness Behavior Questionnaire, the Multidimensional Health Locus of Control, the Perceived Stress Scale, and the Ways of Coping Checklist. Subjects also answered questions pertaining to TMJPD symptomatology, including chronicity and severity. After conservative treatment with simple jaw exercises and ultrasound, patients were contacted again at 5 months to complete a follow-up questionnaire package similar to the initial questionnaire battery. Percent reduction in average pain intensity and perceived TMJPD severity were used as outcome criteria. The data were analyzed with discriminant function analyses. One hundred patients responded to the follow-up questionnaire. Patients who reported more than a 50% reduction in average pain intensity tended to be less inclined to accept responsibility for their problems and were slightly better able to distance themselves from their problems than the less improved groups. Those who reported more than a 50% reduction in TMJPD severity indicated that the condition was not associated with an identifiable onset event and that the condition had become moderately worse between onset and first seeking help.

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Treatments for temporomandibular joint pain and dysfunction (TMJPD) are as varied as the theories to account for the syndrome. Many of these treatments are supported by sufficient scientific evidence for their efficacy, whereas others are not.^{1,2} Treatments for TMJPD tend to fall into two broad categories: non-conservative and conservative treatments. Nonconservative treatments, which are often irreversible, include surgical techniques such as meniscectomy, high

condylectomy, and disk plication procedures to repair the damaged meniscus³; occlusal adjustment; and mandibular repositioning.⁴ The more conservative and reversible treatments include occlusal bite plane splints, analgesics, antidepressants, muscle relaxants, injections of local anesthetics, physical therapy, vapocoolant sprays, and short-wave diathermy.³⁻⁸

With respect to the conservative treatments, employing physiotherapy, splints, and tranquilizers, Brooke et al.⁵ found that 81% of the patients were either free of symptoms or greatly improved 16 to 44 months after their first treatment. Similar results have been reported by Cohen⁹ with ethyl chloride spray (a vapocoolant), intramuscular injections of anesthetic, diazepam, and muscle exercises for the jaw. Relaxation therapies have also been shown to be effective,¹⁰⁻¹² as has counseling, although there may not be a change in clinical signs.¹³

Irrespective of the treatment, success rates appear

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to be fairly consistent and fall within the 60% to 80% range.¹⁴ The general efficacy of these treatments calls into question the role of placebo, demand characteristics, and personality factors in treatment outcome.¹⁵⁻¹⁷

Although researchers have had some success in psychometrically differentiating between responders and nonresponders in patients with low back pain and headache,¹⁸⁻²¹ few studies have examined the predictors of treatment outcome in TMJPD and, where they have, the results have tended to be unfavorable.

Schwartz et al.²² found that the overall Minnesota Multiphasic Personality Inventory (MMPI) profiles for 42 successfully treated women were similar to those of 42 unsuccessfully treated women; however, the overall degree of emotional stress in the unsuccessful group was higher, which was suggestive of depression, agitation, and anger. These elevations, however, were below a T-score of 70, which indicates that they were not clinically relevant. The conversion V configuration for both groups corresponds to that found among other chronic pain groups.¹⁸⁻²⁰

In a 1½-year follow-up of female TMJPD patients, Heloe and Heiberg²³ observed that those who had been successfully treated were better able to form a stable relationship before treatment than those unsuccessfully treated. Various demographic characteristics were also important. Moran et al.²⁴ found that response to occlusal correction was related to the site of pain, specific muscles tender to palpation, occlusion, and age but not to the duration of the symptoms or to sex. In a study by Lipton and Marbach,²⁵ patients with TMJPD who responded to treatment had had pain for less than 6 months, consulted fewer than three doctors, achieved some earlier relief from previous therapy, and reported fewer emotional or expressive responses to pain than did those unsuccessfully treated.

Funch and Gale¹⁰ found that predictors of success depended on the treatment received. Patients who responded to relaxation therapy tended to be younger, had TMJ pain a shorter period of time, and had additional psychophysiologic problems. Those who responded to biofeedback therapy tended to be older and married, had had TMJ pain for a longer period of time, and had not received prior treatment with equilibration. Small²⁶ found that all 40 patients classified as abnormal on psychologic tests responded to nonspecific forms of treatment such as heat, whereas only three of 10 normal subjects did.

Salter et al.²⁷ suggest that the relationship between personality and outcome may not be a simple linear one. They report that the treatment outcome for 59 patients at a 3-month follow-up was not related to the

sex or age of the patient, to the initial pain ratings, to the severity of the disorder, or to the laterality of the symptoms. The "shapes" of the psychologic profiles, which were based on the General Health Questionnaire and the Crowne-Crisp Experiential Index, did not differ between outcome groups, but there were differences in the elevations. The "same or worse" group scored highest on psychologic illness, the "improved a little" group scored the lowest, and the "completely better or improved a lot" group scored intermediately. With the use of psychologic test scores, a discriminant function analysis could correctly classify the 3-month outcome of 60% of the patients, although this was not deemed to be of clinical significance.

Treatment outcome studies have focused on reductions in pain intensity. Little attention has been paid to the other characteristic features of the dysfunction. Where these symptoms have been considered as outcome variables, they do not appear to have been quantified. In addition to pain reduction, the present study also considers the overall reduction in TMJPD symptomatology as an outcome measure.

Furthermore, most treatment outcome studies have tended to focus on only one dimension of personality. The MMPI and similar instruments have been used to tap this dimension. Such a restricted view, however, overlooks the importance of other dimensions of personality. These include coping styles, illness behavior, pain tolerance, and health locus of control. The present study examines the role these factors may play in predicting treatment outcome.

MATERIAL AND METHODS

Subjects

A total of 178 consecutive referrals to the Facial Pain Clinic at the University of Western Ontario were used in the study. Patients meeting the TMJPD criteria outlined by Eversole and Machado²⁸ were categorized as having either myogenic facial pain ($n = 39$), internal derangement type I ($n = 58$), internal derangement type II ($n = 75$), or internal derangement type III ($n = 6$). The mean age for the TMJPD group was 27.4 years ($SD = 9.7$), of which 86.5% of the subjects were female. The mean age and sex ratio are comparable to those reported elsewhere.^{5, 27, 29}

Pretreatment questionnaire

A 30-page questionnaire was developed for the study. In addition to items pertaining to the onset and chronicity of the presenting problems, and to the age and sex of the subject, the questionnaire contained the following major measures.

TMJPD index. The TMJPD index comprised 10 items formatted on a 6-point Likert scale, anchored by "never" and "always." These items, which dealt with such variables as pain, limited mobility, clicking, and grinding, were culled from the dental literature and are symptoms commonly reported by patients with TMJPD. The sum of these items, which can range from 0 to 50, was used to represent an overall subjective measure of the severity of the dysfunction.

Visual analogue scale. A numbered visual analogue scale (VAS) was used to rate average pain intensity. Values ranged from 0 to 6 with the endpoints anchored by "no pain at all" and "as intense as I can possibly imagine."

Basic Personality Inventory. The Basic Personality Inventory (BPI),³⁰ a 12-scale, 240-item, true-false questionnaire, measures components of psychopathology similar to those measured by the MMPI.³¹ The BPI was chosen over the MMPI because the latter has been considered inappropriate for use with pain patients.^{32,33} The BPI contains fewer pain-related items than the MMPI, and its scales are relatively independent, with no item overlap, allowing for greater discriminatory power. Each scale contains 20 separate items. The 12 scales include hypochondriasis, depression, denial, interpersonal problems, alienation, persecutory ideas, anxiety, thinking disorder, impulse expression, social introversion, self-depreciation, and deviation. Four of these scales (alienation, persecutory ideas, thinking disorder, and deviation) were excluded from the present study because the subjects were unlikely to exhibit marked signs of psychopathology.

Multidimensional Health Locus of Control. The Multidimensional Health Locus of Control³⁴ scale is a three-dimension, 18-item, Likert scale questionnaire designed to measure the extent to which a person believes his or her health is or is not controlled or determined by his or her own behavior.

Illness Behavior Questionnaire. The Illness Behavior Questionnaire³⁵ is a 7-scale, 62-item, yes-no format questionnaire that measures various aspects of a patient's attitudes and feelings toward his or her illness, perception of how others react to his or her illness, and view of his or her current psychosocial situation.³⁶

Perceived Stress Scale. The Perceived Stress Scale³⁷ is a 14-item, 5-point Likert scale questionnaire designed to measure the extent to which situations in the subject's life are perceived as stressful. A general measure of self-reported stress is obtained by summing across the 14 items.

Ways of Coping (Revised) Scale. The Ways of Coping (Revised) Scale^{38,39} is an 8-factor, 66-item,

4-point Likert scale questionnaire designed to sample a wide variety of thoughts and acts people use to deal with stressful situations. In the present study the subjects were told that people have many different ways of coping with stressful events. They were instructed to select those strategies listed in the questionnaire which they might use in dealing with stressful situations.

Threshold and tolerance measures

Pressure pain threshold and tolerance measures were obtained with a pressure algometer supplied by Eastern Scale Manufacturing Inc. (model 719-40, John Chatillon & Sons Inc., Kew Gardens, N.Y.). Pressure was applied through a rubber-tipped disk with a diameter of 1 cm to a point on the right upper forearm approximately 5 to 7 cm from the elbow. The pressure was increased by the experimenter at a rate of approximately 1 kg/sec. Subjects were instructed to indicate verbally when the pressure was first perceived as painful (threshold) and then to indicate when tolerance had been reached. The pressure was removed as soon as tolerance or the upper limit of 18 kg was attained.

Follow-up questionnaire

The follow-up questionnaire was similar to the pre-treatment questionnaire with the exception of additional questions pertaining to the treatment itself. Subjects were asked to rate treatment efficacy on a numbered, 7-point VAS anchored at 0 by "not at all effective" and at 6 by "100% effective. I no longer suffer from this problem." Subjects were also asked to indicate on a 5-point category scale the extent to which treatment was followed. Questions pertaining to average pain intensity and the perceived severity of the TMJ dysfunction, as measured by the TMJPD index, remained unchanged.

Procedure

The 178 patients were seen by R.I.B. and conditions were diagnosed according to the criteria outlined by Eversole and Machado.²⁸ A diagnosis of myogenic facial pain was made in patients whose main complaint was pain in the absence of any joint sounds on opening and closing the mouth. If limited opening was present, it could be attributed to myospasm and not to any structural limitation in the joint. A diagnosis of internal derangement type I was made in subjects who had an opening click with or without a closing or reciprocal click. The criterion for a diagnosis of internal derangement type II was met if subjects reported a history of transitory closed lock. The patient's jaw would occasionally lock while opening; however, this

Table 1. Pretreatment and posttreatment variable means for the two criteria used as measures of treatment outcome

Treatment outcome measure	Pretreatment mean (SD) for all subjects (n = 178)	Pretreatment mean (SD) for subset of subjects used in analyses (n = 100)	Posttreatment mean (SD) for subset of subjects used in analyses (n = 100)
TMJPD index score	24.3 (7.6)	24.9 (8.0)	20.8 (8.6)*
TMJPD index items			
Difficulty opening mouth	3.2 (1.6)	3.3 (1.6)	2.7 (1.6)*
Any pain in face	2.4 (1.6)	2.6 (1.6)	1.8 (1.4)*
Clicking, popping	3.7 (1.6)	3.7 (1.5)	3.0 (1.7)*
Grating sounds	1.7 (1.7)	1.9 (1.8)	1.8 (1.6) NS
Jaw muscles tired	3.0 (1.4)	3.1 (1.4)	2.7 (1.6)†
Pain chewing	3.5 (1.5)	3.5 (1.6)	2.5 (1.6)*
Unusual bite	2.4 (1.8)	2.6 (1.8)	1.9 (1.6)*
Grind teeth during day	0.5 (0.9)	0.5 (0.9)	0.7 (1.1)†
Clench teeth	1.8 (1.4)	1.8 (1.5)	1.9 (1.4) NS
Jaw locks/goes out	2.1 (1.7)	2.1 (1.7)	1.7 (1.4)†
Average pain intensity	2.9 (1.7)	2.8 (1.8)	1.4 (1.4)*

NS, Not significant.
* $p < 0.001$ Significant difference between pretreatment and posttreatment means.
† $p < 0.05$.

difficulty could be readily overcome if the patient put the mandible through lateral excursions or pushed manually on the joint. If the closed lock condition (<25 mm opening) could not be readily overcome and no clicking joint sounds were audible, a diagnosis of internal derangement type III was made. Joint sounds may or may not be present in this condition.²⁸

After assessment and diagnostic classification by R.I.B., all patients were asked to complete the questionnaires either in the clinic or at home. This task took approximately 45 minutes. All patients were initially prescribed simple jaw exercises to conduct at home and were referred for ultrasound at a physiotherapy clinic. All patients received the same therapy to standardize treatments and to avoid the confounding of additional variables. These conservative, non-invasive forms of treatment have been shown to be effective^{5, 6, 8, 40, 41} and are generally used before more radical treatment is attempted.

At a 5-month follow-up, the patients with TMJPD were contacted by mail and asked to evaluate their pain and symptoms and to complete and return a questionnaire battery similar to that originally completed. For those who did not return the questionnaire, a follow-up letter reminding them to complete the questionnaire and to return it, was sent. Of those contacted, 100 returned the questionnaires. No further attempt was made to increase compliance.

RESULTS

The percentage of patients who responded to the follow-up questionnaire was 56.2%. The response rate

does not appear to be a function of treatment success, because the percentage of replying patients who believed that treatment was successful (31.4%) was approximately equal to those who thought that it was not successful (34.8%). Although only 12.2% of the patients indicated more than a 50% reduction in the perceived severity of the overall TMJ dysfunction, 43% indicated more than a 50% reduction in pain intensity as measured by the VAS. The moderate response rate may have been due to the time of year (summer months) during which the patients were contacted and to the length of time (45 minutes) it took subjects to complete the questionnaire. Table I presents a breakdown of the pretreatment and post-treatment variable means for the outcome variables of pain intensity and TMJ dysfunction.

Pain intensity as a criterion for treatment outcome

During the initial assessment, only 40.4% of the patients reported a pain intensity score of less than 2 (range 0 to 6). The distribution was reasonably normal with a mean of 2.9 (SD = 1.7, mode = 4). At follow-up, however, 82% of the subjects reported a score less than 2. The distribution was positively skewed with a mean of 1.4 (SD = 1.4, mode = 1). There was a significant overall decrease in pain intensity from assessment to follow-up ($t[99] = 6.91, p < 0.001$). At least with respect to pain intensity, most of the subjects appear to report some improvement over time.

By the procedure of Blanchard and Andrasik,²⁰

Table II. Summary of discriminant function analyses with pain intensity as a measure of treatment outcome

Predictor variables	Variance accounted for	χ^2	Significance (p value)	Structure coefficient (>0.30)	Correctly classified (%)			
					Poor	Fair	Good	Overall
Analysis 1 Dysfunction-related items (7)		17.8	NS					
Analysis 2 PSS (1) BPI (8)		13.2	NS					
Analysis 3 IBQ (7) MHLC (3) Hopeful of cure (1) Followed treatment (1)		25.3	NS					
Analysis 4 Ways of Coping (8)	0.265	27.5	0.034	Distancing (0.38) Accept responsibility (0.49)	45.8	55.6	55.8	51.0
Analysis 5 Threshold (1) Tolerance (1)		3.1	NS					

IBQ, Illness Behavior Questionnaire; MHLC, Multidimensional Health Locus of Control; NS, not significant; PSS, Perceived Stress Scale.

patients were classified as improved if their pain intensity scores were reduced by at least 50%, as slightly improved if initial pain intensity scores were reduced by 26% to 49%, and as unimproved if scores were reduced by less than 25%. This resulted in 43 of 100 follow-ups being classified as improved with regard to pain, 9 as slightly improved, and 48 as unimproved.

Five separate discriminant function analyses were performed with different sets of predictors. These sets examined in turn the role of epidemiologic variables, stress and personality, illness behavior, coping styles, and responsiveness to experimentally induced pain. In the first analysis the predictors included seven symptom-related items: diagnostic classification, age, chronicity, whether the condition had changed in severity since onset and first seeking help, whether the onset of the condition was associated with an identifiable event, initial pain intensity, and the initial TMJPD index score. In the second analysis, the predictors were the Perceived Stress Scale and the BPI. In the third analysis, several items pertaining to illness behavior were entered. These included the Illness Behavior Questionnaire, the Multidimensional Health Locus of Control, a question asking subjects how hopeful they were of a cure, and a follow-up question that asked to what extent treatment was followed. The fourth analysis included the Ways of Coping Scale, and the fifth analysis examined the role of pain threshold and tolerance in predicting outcome. The results of these analyses are presented in Table II.

The only analysis to obtain significance was that for the Ways of Coping Scale ($\chi^2[16] = 27.5, p = 0.037$). The discriminant function was able to account for 26.5% of the variance and correctly classified 51.0% of the subjects. The probability of correctly classifying the subjects by chance is 33.3%. The structure coefficients indicate that the coping strategies of accepting responsibility (0.49) and distancing (0.38) contributed most to the prediction. Subjects who improved the most tended to be less inclined to accept responsibility for their problems and were slightly better able to distance themselves from their problems than the other two groups. Stated another way, patients who reported the largest reduction in pain intensity are less inclined to blame themselves for their problems and are more able to divert their attention away from problems that they find stressful. In this case the principal problem may be the pain. Patients in whom pain reduction was only slight tended to use distancing strategies less frequently, as did those who were unimproved. Both the slightly improved and unimproved groups tended to blame themselves more for their problems.

TMJPD symptomatology as a criterion for treatment outcome

With the previous criteria of Blanchard and Andra-sik,²⁰ the subjects were then classified as improved, slightly improved, or unimproved on the basis of their TMJPD index scores. This resulted in only 11 of the 90 patients who answered the index questions classi-

Table III. Summary of discriminant function analyses with perceived TMJPD index as a measure of treatment outcome

Predictor variables	Variance accounted for	χ^2	Significance (p value)	Structure coefficient (>0.30)	Correctly classified (%)			
					Poor	Fair	Good	Overall
Analysis 1 Dysfunction-related items (7)	0.296	30.2	0.007	Changed in severity (0.43) Associated onset event (0.53)	67.8	64.7	45.5	64.4
Analysis 2 PSS (1) BPI (8)		22.3	NS					
Analysis 3 IBQ (7) MHLC (3) Hopeful of cure (1) Followed treatment (1)		13.4	NS					
Analysis 4 Ways of Coping (8)		16.1	NS					
Analysis 5 Threshold (1) Tolerance (1)		6.0	NS					

IBQ, Illness Behavior Questionnaire; MHLC, Multidimensional Health Locus of Control; NS, not significant; PSS, Perceived Stress Scale.

fied as improved, 17 as slightly improved, and 62 as unimproved. (Of the 100 subjects, 10 were excluded from this analysis, because the TMJPD index is based on a composite score. These subjects had one or more missing data points for their composite score.) Although there was a significant decrease ($t[90] = 5.09$, $p < 0.001$) on the TMJPD index from assessment (mean 24.9, SD = 8.0) to follow-up (mean 20.8, SD = 8.6), the decrease was not large. This suggests that, at least with respect to the patient's perception of the overall severity of the dysfunction, the symptoms did not change much with treatment.

The data were then analyzed with the same five sets of predictors as in the first analysis. The results are presented in Table III.

The only analysis to attain significance was that for the symptom-related items ($\chi^2[14] = 30.2$; $p = 0.007$). The discriminant function accounted for 29.6% of the variance and correctly classified 64.4% of the subjects. The prior probability is 33.3%. Only two of the predictors had structure coefficients greater than 0.30. These were whether the condition had changed in severity since the onset and first seeking help (0.53) and whether the onset of the condition was associated with an identifiable event (0.43). The first variable ranged from 1 (improvement) to 5 (much worse) and the second was dichotomous with "yes" represented by 1, and "no" by 2. Subjects who tended to respond best to treatment indicated that the condition had become moderately worse since onset and first seeking help (mean 3.8) and that the onset was not associated with an event (mean 1.7). Those who

were slightly improved also indicated that the initial condition had become moderately worse (mean 3.6) but tended to note that the onset was associated with an event (mean 1.3). The unimproved group reported that the baseline condition had become only slightly worse since the onset and first seeking help (mean 2.9) and felt that the onset was not associated with a specific event (mean 1.8).

DISCUSSION

Of the five variable sets entered into the discriminant function analyses to predict changes in pain intensity, the only analysis to obtain significance was that for the Ways of Coping Scale. The discriminant function correctly classified 51.0% of the subjects, which is moderately higher than that expected by chance (33.3%). Subjects who improved the most tended to be less inclined to accept responsibility for their problems and were slightly better able to distance themselves from their problems than the other two groups. Stated more positively, these patients seem to be less inclined to blame themselves for their pain and are better able to divert their attention away from the pain.

When the TMJPD index was used as the criterion for treatment outcome, only the symptom set was able to predict treatment outcome. The symptom set was able to classify correctly 64.4% of the subjects, although this value is possibly inflated because of the differential sizes of the outcome groups and the low subject/variable ratio. As with any discriminant function analysis, replication of these results

will help confirm the importance of the significant variables.

Subjects who tended to respond best to treatment indicated that the condition had become moderately worse since onset and first seeking help and that the onset was not associated with an identifiable event. Subjects who were slightly improved also indicated that the condition had become moderately worse since the onset and first seeking help but that the onset was more likely to be associated with an event. Those who were unimproved reported that the condition had become only slightly worse since onset and that the onset was not associated with an event.

Patients whose condition had become moderately worse since onset might be expected to be more responsive to treatment for two reasons. First, if the condition had worsened, there may be more room for improvement. This may represent a regression toward the mean. Second, a change in the severity of the condition may indicate that the condition is still changing. A static condition may be less modifiable than a dynamic one.

With respect to an associated onset event, Brooke et al.^{5,42} note that patients who do not attribute the onset of the condition to an accident respond better to treatment (80%) than do those whose TMJPD may be the result of an accident (40%). In the present study both the improved and unimproved groups did not associate the onset of the dysfunction with an event whereas the slightly improved group did. This peculiar relationship is difficult to interpret. It may suggest a complex relationship between symptomatology and treatment outcome, or it may be a function of the subject to variable ratio or the analyses that were used.

The inability of the psychometric measures to strongly predict treatment outcome for TMJPD should be considered in light of the statistical limitations of the study. First, the response rate of 57% may reflect a biased sample on which analyses were based. This appears unlikely, because the percentage of responding patients who believed that treatment was successful (31.4%) was approximately equal to those who thought that it was not successful (34.8%). Second, although an attempt was made to increase the response rate by mailing a follow-up reminder, the response rate and consequently the total number of responding subjects ($n = 100$) remained lower than ideal considering the number of analyses performed and the subject/variable ratio. However, even this moderate response represents considerably more subjects than reported in other studies of treatment outcome ($n < 60$).^{10, 25-27, 43-45}

With these limitations in mind, these findings are similar to those reported elsewhere.^{10, 22, 25, 35, 46-48}

Lipton and Marbach²⁵ did not find any difference in psychologic measures of distress between responders and nonresponders. As in other studies, demographic or clinical factors were more important. Patients who did not respond to treatment consulted three or more doctors, never achieved relief from pain, and reported more emotional or expressive responses to pain. They did not differ, however, from the responders on measures of psychologic distress.

Similarly, in a well-designed study by Gerschman et al.,⁴⁶ the best predictor of treatment outcome was the extent to which the patient had previous contact with dental and medical practitioners. The more contact, the poorer the outcome. As they point out, this is not a surprising finding, because the best predictor of future behavior is past behavior. As the number of unsuccessful attempts at treatment increases, the probability of future failures also increases. This might suggest that the more severe problems were less responsive to treatment or that the practitioners did not employ treatments effective in controlling the problem. Gerschman et al. found only a modest but clinically meaningless relationship between psychologic and social variables and response to treatment.

Finally, Millstein-Prentky and Olson⁴⁸ failed in their attempt to develop a subscale of the MMPI that could identify potential nonresponders. As in the study by Schwartz et al.,²² they noted that unsuccessful patients had higher scores on hypochondriasis, depression, and hysteria, but the profiles of the two groups were similar. This pattern has been found in other conditions as well. Werder et al.¹⁹ found that unsuccessfully treated headache patients had higher deviations on the MMPI hypochondriasis and hysteria scales than successfully treated patients. Blanchard and Andrasik²⁰ present data that suggest that unsuccessfully treated headache patients tend to score higher on the "neurotic triad" of the MMPI, the Beck Depression Inventory, the Trait Anxiety Inventory, and the Psychosomatic Symptom Checklist than the more successfully treated patients. Similarly, Sternbach et al.¹⁸ found higher scores on hypochondriasis, depression, and hysteria among patients with chronic (unsuccessfully treated) low back pain than among those with more acute low back pain.

It appears that in only one of the studies we reviewed have psychologic factors been found to give more weight in predicting treatment outcome than have clinical predictors. Gale and Funch⁴³ found that high levels of patient motivation, low levels of depression, and high scores on internal locus of control were the best predictors of both short- and long-term outcome. However, once again, the longer the patients had the problem, the less likely were pain levels to change with treatment. This is also in contrast to a

similar study by Funch and Gale,¹⁰ in which personality factors, that is, locus of control, anxiety, and initial motivation, were not associated with outcome.

It is somewhat surprising that few studies have been able to identify strong psychologic predictors of treatment when such variables have been identified in other pain disorders.¹⁸⁻²¹ One possible explanation for this is that successful outcome in headache and back pain are more easily defined than in TMJPD. In the former, the treatment success is based on pain reduction. In TMJPD, on the other hand, pain is only one component of the disorder. Successful outcome may therefore be harder to define clearly and quantifiably. This explanation, however, is tempered by the finding that clinical factors, as diverse as they are, have been somewhat more successful in predicting outcome in TMJPD.

It is also surprising that few studies have been able to identify a strong relationship between psychologic factors and outcome when one considers that the percentage of patients who respond to treatment is often reported to be relatively high (60% to 80%) irrespective of the treatment received.¹⁴ This suggests that it is not the treatment itself that is responsible for the change but other intervening factors, presumably psychologic. These factors, however, do not appear to be readily identifiable.

The results of the present study suggest that most of the change in symptomatology occurs in pain levels. Whereas only 12.2% of the patients indicated more than a 50% reduction in the perceived overall severity of the dysfunction (e.g., joint sounds and locking), 43% of the patients indicated more than a 50% reduction in pain category. Success in pain reduction is also evidenced by the finding that 82% of the patients report little or no pain after treatment. This is considerably higher than the 40.4% who report little or no pain before treatment.

The data reported here and in the literature suggest that intervening factors are influential in changing pain levels. However, they do not seem to be easy to identify. As one of the main components of the more conservative approaches to treatment involves rest through the use of simple jaw exercises, relaxation therapy, ultrasound, or muscle relaxants, the patient's awareness of the dysfunction as a problem over which he or she has some degree of control may be one of the essential and common ingredients for successful outcome.

When the condition becomes aggravated enough for the patient to seek health care, he or she is made aware of exacerbating factors, such as yawning too widely, biting too hard, gum chewing, bruxing, and clenching. In consultation with a dentist or physician, the patient with TMJPD may be educated to realize

that the joint and affected musculature need time to heal. The awareness of factors that influence the status of the dysfunction, and the patient's concerted effort to control these, may be sufficient to effect a change in pain level.

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