

Temporomandibular Disorders: Part II. A Comparison of Psychologic Profiles in Australian and Finnish Patients

Tuija I. Suvinen, Lic Odont, LDS, PhD
Coordinator of the Temporomandibular
Pain and Dysfunction Research
Group
Lecturer in General Dentistry
School of Dental Science

Peter C. Reade, AM, MDS, PhD,
MDSc, FDSRCS, FRCPath
Professor Emeritus
School of Dental Science

University of Melbourne
Melbourne, Victoria
Australia

Birgitta Sundén, Lic Odont, MDS, PhD
Lecturer in Restorative Dentistry
University of Helsinki
School of Dental Science
Helsinki, Finland

Jack A. Gerschman, BDS, LDS, PhD
Coordinator of the Orofacial Pain Clinic
School of Dental Science

Eric Koukounas, BSc, MAPsS, PhD
Research Officer
National Health and Medical Research
Council
School of Dental Science

University of Melbourne
Melbourne, Victoria
Australia

Correspondence to:
Dr Tuija I. Suvinen
University of Melbourne
School of Dental Science
Faculty of Medicine, Dentistry
and Health Sciences
711 Elizabeth Street
Melbourne, Victoria 3000
Australia

Recent recommendations regard musculoskeletal disorders of the masticatory system as dual-axis disorders, but little comparative data of psychologic factors across different pain populations are available. In this study, presenting psychologic profiles were assessed in 40 Australian and 42 Finnish patients diagnosed with temporomandibular disorders. Findings were compared with those of a group of Australian patients reporting acute dental pain and with reference to response to conservative management. The psychologic testing instrument incorporated cognitive, motivational/affective, and illness behavior variables, and it was based on validated general pain questionnaires (Coping Strategies Questionnaire and Illness Behavior Questionnaire). This instrument was found internally reliable in the majority of its subscales in the group studies and provided comparable data to other pain populations. Significant differences in the presenting psychologic profiles were found according to nationality, type of pain suffered, and treatment outcome. Affective disturbance, hypochondriasis, lack of cognitive control, and feeling ill with symptoms were identified in discriminant function analysis as potential predictors of treatment outcome, and they correctly classified 79% of the Australian and 87% of the Finnish patients with temporomandibular disorders. It was concluded that psychologic profiles differed in the two nationalities and were related to treatment outcome. The concept of multiaxial assessment was supported.

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Temporomandibular disorders (TMD), also known as *cranio-mandibular disorders* and *temporomandibular pain-dys-function disorders* (TMPD), is defined as "musculoskeletal pain and dysfunction in the masticatory system usually aggravated by chewing or jaw function, but independent of local disease involving the teeth, mouth or other tissues."¹ Several etiologic concepts and diagnostic names have been presented in the literature, reflecting the complexities of the presentation of this disorder(s), which is the major cause of orofacial pain, often of considerable chronicity.²⁻⁸ However, the pathogenesis, natural cause of the disorder(s), and factors influencing treatment seeking and response are not clearly understood.

Epidemiologic studies have shown that as much as 88% of the general population may have signs of TMD.⁹⁻¹¹ A range of 5% to 26% in population samples, the majority being females, are reported to be in need of or to have sought treatment.^{10,12} Pain and severe limitation of function are the common symptoms that

cause patients to seek treatment, but other factors, including psychologic factors and those relating to health-care-seeking behavior, have been described also.^{13,14}

It is generally agreed that the distinguishing elements of TMD consist of pain and dysfunction in the craniocervical region generally aggravated by functional demands. Similarly, recent recommendations regard TMD as a dual-axis disorder,¹⁵ with both physical and psychologic dimensions, but the exact role of psychologic factors in diagnostic assessment and resolution of TMD remains unclear.¹⁵⁻¹⁹

Several assessment instruments have been developed to assess the dysfunctional or physical aspects of TMD, such as dysfunctional indexes and electromyographic, pantomographic, kinesiographic, and sonographic measures. Several conceptualizations of TMD have been developed from morphopathologic and functional theories, which have varied according to principal sites of the masticatory system believed to cause the multiple symptoms and signs reported in the literature.²⁻⁷ Similarly, several psychologic conceptualizations of TMD exist.^{18,19} The subjective and individual nature of a multidimensional pain experience as emphasized in the "gate control" theory of pain and its variants has recently gained more emphasis in studies of TMD.^{15,20,21} Past studies concerning psychologic parameters in patients suffering from TMD have produced diverse, conflicting data, partly as a result of differences in sample selection, methodology, and analysis of data, and partly because of interindividual differences related not only to sensory (threshold, tolerance), but also to cognitive (beliefs, meanings, attributes), affective (emotions), and behavioral (environment) dimensions. The general lack of psychometric testing and comparable data in the application of psychologic assessment of TMD has been noted.¹⁹ It has been concluded that there is no specific personality type involved in the etiology of TMD, but the results of research on the emotional components of TMD have supported increased anxiety and depression in these patients.^{15,18,19,22-28} There is some evidence that psychologic tests in these patients correlate with subgroups of patients,^{18,19,29,30} and that subsets of patients can be identified according to psychobehavioral factors.^{16,30,31} In studies where patients with TMD have been compared with asymptomatic control subjects, diverse results have been found.³²⁻³⁷ Based on the present evidence in the literature, it is not clear what role presenting psychologic profiles play in treatment seeking, diagnostic assessment, or resolution of TMD.^{18,19}

Notwithstanding the complexity of the condition, the majority of patients respond well to relatively simple conservative methods, the most common of these being counseling and physical and interocclusal appliance therapy.^{38,39} A minority remain resistant to treatment. A number of psychologic variables found to be predictive of non-resolution generally relate to the "psychologic makeup" of the individual patient including factors such as emotional distress prior to treatment,⁴⁰ the ability to form stable interpersonal relationships, and various psychosocial characteristics.^{1,41} Lipton and Marbach⁴² reported potential risk factors to include sociocultural background, sociomedical orientation, symptom and treatment history, and behavior and attitudes toward pain. Other investigators³⁵ have reported "abnormal illness behavior" in patients with nonresolution. More recently, investigators^{13,15,43} have alluded to the importance of assessing both physical and psychologic factors in patients with pain disorders. The use of psychologic screens in general practice^{15,43,44} and the importance of interdisciplinary approaches in cases with nonresolution have been mentioned.

Given that in a previous study,⁴⁵ the outcome of conservative therapy could not be determined on the basis of presenting symptom profiles and the need for comparative assessment, the present study assessed the role of presenting psychologic profiles with a TMD questionnaire that was based on general pain constructs. The primary objective of the present study was to compare presenting psychologic profiles, mainly coping strategies and illness behavior, in Australian and Finnish patients suffering from TMD. An additional objective was to contrast these parameters in patients with TMD and with those suffering from acute dental pain, and to examine the impact of coping and illness behavior on response to conservative therapy in patients with TMD. Findings of the present study are compared with other studies in which similar parameters were assessed for patients suffering from other musculoskeletal disorders such as back pain and general joint pain, including discussion on the interrelationship between coping, affect, and illness behavior.

Materials and Methods

Subjects

A total of 82 patients (40 Australian and 42 Finnish) diagnosed as suffering from TMD were

consecutively selected from those presenting at the Department of Oral Medicine in the University of Melbourne and the Department of Stomatognathic Physiology in the University of Helsinki, respectively. The Australian group consisted of 6 males and 34 females (mean age 40.4 years, standard deviation [SD] 18.5); the Finnish group was composed of 7 males and 35 females (mean age 36.4 years, SD 12.1). The ratio of males to females reflected the observed trend in distribution of TMD found in the clinic population.¹¹ A group of 40 Australian patients (31 females and 9 males, mean age 33.4 years, SD 16.0) suffering from acute dental pain (ie, toothache), but not TMD, were recruited from the Casualty Department of The Royal Dental Hospital of Melbourne.

Subjects were diagnosed with TMD after a detailed history (anamnesic examination, and extraoral and intraoral assessment) revealed presenting symptoms of pain and/or discomfort and dysfunction of the masticatory system. Using the guidelines for the Research Diagnostic Criteria for Temporomandibular Disorders,¹⁵ the majority of patients in the present study had combined muscle and temporomandibular joint (TMJ) symptoms. Patients were excluded from the study if they were younger than age 15 years or older than age 70 years, if they were unable to comprehend English in the Australian group or Finnish in the Finnish group, or if they had a severe psychiatric disturbance other than anxiety or depression. All participants signed an informed consent form according to the ethical requirements in each treatment center.

In the Australian TMD group, the majority of the 40 subjects were of Anglo-Saxon origin and fluent in the English language (90%). Every subject in the Finnish group was a Finnish citizen who spoke the national language as their native tongue. A higher proportion of the unemployed and pensioners were represented in the Australian group (40%); the majority of Finns were employed (67%). When the occupational status was viewed in the context of occupational satisfaction, no significant differences between the groups were observed. More than 80% in both groups expressed occupational satisfaction. Similarly, there were no significant differences between the groups in terms of marital satisfaction. The majority of patients in the Australian (65%) and Finnish groups (74%) reported "good" general health, even though the distribution of heart disorders was higher in the Australian TMD group (11 of 40) than in the Finnish group (1 of 42).

Questionnaires

For comparative reasons, all subjects were assessed with the Coping Strategies Questionnaire (CSQ)⁴⁶ and the Illness Behavior Questionnaire (IBQ).⁴⁷ The CSQ is a 48-item inventory that indexes the specific cognitive coping strategies and behavioral strategies used by patients to manage pain. There are six cognitive coping strategy subscales, which include diverting attention, reinterpreting pain sensations, coping self-statements, ignoring pain sensations, praying and hoping, and catastrophizing. Two behavioral coping strategies, increasing activity level or increasing pain behavior, can also be assessed by this inventory.

Patients who complete the CSQ are asked to rate how often they use a particular coping technique. Strategy effectiveness is indexed by asking patients to rate the amount of control they feel over their pain and how much they are able to decrease their pain. These responses are rated on a 7-point scale, where 0 = "no control/can't decrease it at all," 3 = "some control/can decrease it somewhat," and 6 = "complete control/can decrease it completely." The validity of the CSQ has been established by studying various patient groups with pain.^{46,48-50}

The other inventory administered to subjects in this study was the IBQ, a 62-item measure of the effect of illness on patients' lives, social correlates, and the patients' psychosocial situations. Seven subscales of this measure are those indexing general hypochondriasis, disease conviction, psychologic versus somatic perception of illness, affective inhibition, affective disturbance, denial, and irritability. The IBQ has been used extensively in the study of chronic and other pain conditions and has previously been administered to Australian and Finnish populations.^{35,51-53}

Procedure

At the first consultation, each patient completed the CSQ and the IBQ as part of their initial assessment prior to undergoing conservative therapy for TMD. Response to treatment was assessed by subjective reporting. After 6 months, the patients were grouped according to whether their responses were "rapid" or "slow." The rapid responders represented those patients who reported total resolution or major improvement of their TMD following treatment, while the slow responders comprised subjects who reported minor or no improvement of their TMD symptoms. In addition, the pain scores, as recorded by visual pain analog scales,

Table 1 Cronbach's Coefficient α Values for the Different Patient Groups According to the CSQ

	Australian TMD (n = 40)	Finnish TMD (n = 42)	Acute dental pain (n = 40)
Cognitive coping strategies			
1. Diverting attention	.77	.75	.81
2. Reinterpreting pain sensations	.74	.57	.73
3. Coping self-statements	.74	.76	.81
4. Ignoring pain sensations	.75	.81	.75
5. Praying and hoping	.82	.71	.82
6. Catastrophizing	.80	.85	.61
Behavioral coping strategies			
1. Increasing activity level	.75	.65	.74
2. Increasing pain behaviour	.50	.34	.66

Table 2 Cronbach's Coefficient α Values for the Different Patient Groups According to the IBQ

	Australian TMD (n = 40)	Finnish TMD (n = 42)	Acute dental pain (n = 40)
IBQ factors			
1. General hypochondriasis	.80	.65	.73
2. Disease conviction	.45	.66	.55
3. Psychologic versus somatic perception	-.22	-.65	.70
4. Affective inhibition	.59	.41	.65
5. Affective disturbance	.73	.72	.73
6. Denial	.77	.72	.69
7. Irritability	.61	.53	.78
Whiteley index of hypochondriasis	.81	.64	.77

had to be less than 20 (of 100) for the rapid responders.⁵⁴

During follow-up period, treatment of patients with TMD was based on conservative methods in each treatment center, such as patient education and conservative physical therapy, mainly in the form of interocclusal appliances, according to guidelines by McNeill et al.¹ Patients who did not respond favorably to conservative management were treated by appropriate adjunct therapies, such as physiotherapy and multidisciplinary management.

Results

Internal Reliability

Coping Strategies Questionnaire. Cronbach's coefficient α values⁵⁵ were computed to assess the internal reliability of the CSQ subscales in the pre-

sent samples (Table 1). The α values ranged from .57 to .85, indicating modest to good internal interitem consistency for the majority of the CSQ subscales for each of the groups examined. The subscale "increasing pain behaviors" had a poor internal interitem consistency and was excluded from further analyses.

Illness Behavior Questionnaire. As with the analysis of CSQ, Cronbach's coefficient α values⁵⁵ were computed to assess the internal reliability of the IBQ factors (Table 2). The α values for the IBQ ranged from .59 to .80 for four of the eight IBQ factors and Whiteley index of hypochondriasis, indicating modest to good internal inter-item consistency. Poor internal interitem consistencies were computed for IBQ factors "psychologic versus somatic perception of illness" ($r = -.22$) and "disease conviction" ($r = .45$) in the Australian TMD groups and for "affective inhibition" ($r = .41$) and "irritability" ($r = .53$) in the Finnish TMD group and were excluded from further analyses.

Comparison of Psychologic Profiles

A principal components analysis (with oblique rotation) was computed to identify the configuration of coping factors in the TMD groups and the acute pain group similar to that in previous studies in the use of the CSQ.^{46,48-50} Each factor accepted had to have an eigenvalue of 1 or greater, and factor loadings of more than 0.50 on the scale(s) concerned, similar to previous studies. As a result, distinct relationships among strategies were identified for each nationality and pain group. Two CSQ factors were identified in the Australian TMD group, three in the Finnish TMD group, and three in the group of patients with acute dental pain. Factor loadings and percentage variance explained by each factor extracted are reported in Table 3 for the Australian TMD, Finnish TMD, and acute dental groups. In the Australian TMD group, "coping attempts" (factor 1) and "pain control and rational thinking" (factor 2), accounted for 62.6% of the total variance. Patients exhibiting the first factor endorsed almost all of the coping subscales, appearing to make an active attempt to deal with their pain; those scoring high in the second factor felt some control and ability to decrease their pain. No statistically significant correlation existed between these two factors ($r = +.02, P > .05$).

In the Finnish TMD group, "cognitive coping and suppression" (factor 1), "helplessness" (factor 2), and "increasing activity and praying and hoping" (factor 3), accounted for 67.4% of the total variance. Individuals loading high on factor 1 and factor 3 reported making an attempt to overcome their pain, either by cognitive effort or by behavioral effort. Patients scoring high on factor 2, "helplessness," reported a poor ability to deal with their pain. Factors 1 and 2 were not significantly correlated with each other ($r = -.11, P > .05$), and neither were factors 1 and 3 ($r = +.18, P > .05$) and factors 2 and 3 ($r = +.02, P > .05$).

Three CSQ factors were isolated in the acute dental pain group, namely, "coping attempts" (factor 1), "helplessness" (factor 2), and "locus of control" (factor 3), which accounted for 70.8% of the total variance. Individuals either rated high in their coping attempts, using both cognitive and behavioral strategies to overcome their pain, or they felt helpless with a poor ability to deal with their pain, or loss of control by endorsing their catastrophizing, praying, and hoping. There were no statistically significant correlations between factors 1 and 2 ($r = -.23, P > .05$), factors 1 and 3 ($r = -.03, P > .05$), and factors 2 and 3 ($r = +.16, P > .05$).

Table 3 Factor Loadings and Variance for the Australian TMD, Finnish TMD, and Acute Dental Pain Groups

	Variance	Factor loadings
Australian TMD group (n = 40)		
Factor 1:		
Coping attempts	40.6%	
1. Reinterpreting pain sensations		0.69
2. Coping self-statements		0.69
3. Ignoring pain sensations		0.71
4. Increasing activity level		0.87
5. Diverting attention		0.82
6. Praying and hoping		0.68
Factor 2:		
Pain control and rational thinking	22.0%	
1. Catastrophizing		-0.66
2. Control over pain		0.72
3. Ability to decrease pain		0.75
Finnish TMD group (n = 42)		
Factor 1:		
Cognitive coping and suppression	32.9%	
1. Reinterpreting pain sensations		0.69
2. Coping self-statements		0.82
3. Ignoring pain sensations		0.76
4. Diverting attention		0.64
Factor 2:		
Helplessness	21.1%	
1. Catastrophizing		0.84
2. Control over pain		-0.85
3. Ability to decrease pain		-0.86
Factor 3:		
Increasing activity and praying and hoping	13.4%	
1. Increasing activity level		0.66
2. Praying and hoping		0.43
Acute dental pain group (n = 40)		
Factor 1:		
Coping attempts	40.9%	
1. Reinterpreting pain sensations		0.76
2. Coping self-statements		0.71
3. Ignoring pain sensations		0.47
4. Increasing activity level		0.86
5. Diverting attention		0.87
Factor 2:		
Helplessness	16.2%	
1. Control over pain		-0.86
2. Ability to decrease pain		-0.88
Factor 3:		
Locus of control	13.7%	
1. Catastrophizing		0.88
2. Praying and hoping		0.79

Table 4 Mean Frequencies of the Different Coping Strategy Subscales for Each Nationality, Pain, and Treatment Response Group*

CSQ subscales	AUST TMD (n = 30)	FIN TMD (n = 32)	AUST AC (n = 40)	AUST CHR (n = 10)	FIN CHR (n = 10)
Cognitive coping strategies					
1. Diverting attention	2.22	2.29	2.25	2.13	2.32
2. Reinterpreting pain sensations	1.25	0.97	1.27	1.10	0.57
3. Coping self-statements	3.67	3.02	3.01	3.15	2.71
4. Ignoring pain sensations	2.50	2.43	2.33	2.43	1.76
5. Praying and hoping	3.03	2.29	2.45	2.80	2.14
6. Catastrophizing [†]	1.98	1.37	1.87	2.48	2.65
Behavioral coping strategies					
1. Increasing activity level	2.76	2.78	2.68	3.06	2.73
2. Increasing pain behavior	2.45	2.58	2.48	2.78	2.91
Effectiveness ratings					
1. Control over pain [†]	3.42	3.90	3.15	2.67	3.50
2. Ability to decrease pain [‡]	2.57	3.48	2.30	1.88	2.63

*Groups: AUST TMD = Australian rapid responders; FIN TMD = Finnish rapid responders; AUST AC = Australian acute dental pain; AUST CHR = Australian slow responders; FIN CHR = Finnish slow responders.

[†]Statistically significant difference between the Australian and Finnish TMD groups and acute dental pain group: one-way analysis of variance; $P < .05$.

[‡]Statistically significant difference between the rapid responders versus slow responders in the Australian and Finnish TMD groups: two-by-two analysis; $P < .05$.

Table 5 Mean Frequencies of the IBQ Factors for Each Nationality, Pain, and Treatment Response Group*

IBQ factor	AUST TMD (n = 30)	FIN TMD (n = 32)	AUST AC (n = 40)	AUST CHR (n = 10)	FIN CHR (n = 10)
General hypochondriasis	1.78	1.57	2.05	2.50	2.78
Disease conviction	2.48	2.07	2.00	3.00	2.86
Psychologic versus somatic perception	1.92	2.00	2.10	2.22	1.44
Affective inhibition	2.43	1.86	2.48	3.30	2.00
Affective disturbance ^{†‡}	2.38	1.06	1.93	4.00	2.67
Denial	2.59	3.36	2.77	2.67	3.00
Irritability	1.21	0.65	1.63	1.40	1.78

*Groups: AUST TMD = Australian rapid responders; FIN TMD = Finnish rapid responders; AUST AC = Australian acute dental pain; AUST CHR = Australian slow responders; FIN CHR = Finnish slow responders.

[†]Statistically significant difference between the Australian and Finnish TMD groups and acute dental pain group: one-way analysis of variance; $P < .05$.

[‡]Statistically significant difference between the rapid responders versus slow responders in the Australian and Finnish TMD groups: two-by-two analysis; $P < .05$.

The mean frequencies and standard deviations of the different CSQ subscales and IBQ factors are summarized in Tables 4 and 5 for each TMD, acute dental pain, and treatment response group. Differences in the presenting psychologic profiles between the Australian and Finnish TMD groups and the acute dental pain group were examined for statistical significance using a one-way analysis of variance⁵⁶ with post hoc analysis by the Student-Neuman-Keul's multiple comparisons test set at an α level of .05. Differences according to the response to conservative management were analyzed by a Kruskal-Wallis two-by-two analysis.⁵⁶

Statistically significant differences were found in the overall effectiveness of the coping strategies used by Australian and Finnish TMD groups (Table 4; $P < .05$). The Finnish patients with TMD felt more in control of their disorders than did the Australian patients ($P = .04$), and had a greater ability to decrease pain ($P = .01$). Furthermore, the acute dental patients reported less control of their situation than those with TMD ($P = .002$). In both TMD groups, maladaptive coping strategies, such as catastrophizing, were used more often in the slow-responding patients with TMD than in the rapid responders ($P = .03$). The slow responders

also felt less in control of their pain than did the rapid responders ($P = .004$).

Statistically significant differences were found also in the level of affective disturbance between the Finnish and the Australian TMD groups (Table 5, $P = .001$). The IBQ scores of patients with acute dental pain closely resembled those of the TMD groups, with lower levels of affective disturbance ($P = .001$). Patients with a slow response to therapy showed significantly higher scores of affective disturbance for both TMD groups when compared to the rapid responders ($P = .0001$). Elevated scores for these groups were also observed in the areas of general hypochondriasis, disease conviction, affective inhibition, and irritability.

To evaluate potential predictors of treatment outcome and to assess whether the data obtained by the TMD questionnaires were able to correctly classify patients according to the subjective outcome of therapy, a discriminant function analysis (DFA) was computed. To minimize the instability that may have resulted from a possible imbalance between the number of predictors and subjects,⁵⁷ two sets of potential hypothetical discriminating variables were identified from the data set: (1) variables that were recorded on an interval scale and thus qualified for the analysis and (2) variables from the symptom and psychologic profile analyses. Thirty-six variables were found in the first set, and nine were found in the second. All the coping strategies subscales and illness behavior scales qualified, and the following were included: affective disturbance; cognitive control; catastrophizing; and somatization. Of the symptom profile data, the following were included: face pain, muscle fatigue, limitations of mandibular opening, jaw sounds, and nausea (ie, feeling ill with the symptoms).

In the explorative stepwise analyses using all of the 36 potential variables, the following were included in the analysis of pooled group: affective disturbance, coping strategies, general health status, cardinal symptoms, nausea, urgency for need of treatment, and severity of symptoms (Wilks' lambda = .44; $P < .03$); they correctly classified 86% of cases. In the Australian group (Wilks' lambda = .38; $P < .03$), 10 variables were identified (affective disturbance, coping strategies, general health status, age, muscle fatigue, nausea, and severity of symptoms) and correctly classified 89% of cases. In the Finnish group (Wilks' lambda = .32; $P < .03$), eight variables were identified (affective disturbance, coping strategies, general health status, face pain, limitations of

Table 6 Classification Results

	No. of patients	Predicted group membership	
		Slow responders	Rapid responders
Pooled TMD group (n = 79)			
Slow responders	19	15 (78.9%)	4 (21.1%)
Rapid responders	60	15 (25.0%)	45 (75.0%)
Percent of grouped patients correctly classified: 75.9%			
Australian TMD group (n = 34)			
Slow responders	9	8 (88.9%)	1 (11.1%)
Rapid responders	25	6 (24.0%)	19 (76.0%)
Percent of grouped patients correctly classified: 79.4%			
Finnish TMD group (n = 32)			
Slow responders	9	8 (88.9%)	1 (11.1%)
Rapid responders	30	4 (13.3%)	26 (86.7%)
Percent of grouped patients correctly classified: 87.2%			

mandibular mobility, urgency for need of treatment, and severity of symptoms) and correctly classified 97% of cases.

Because of the possibility that too many parameters versus subjects were included in this analysis, a restricted parameter stepwise analysis was conducted using the nine selected variables, one for the pooled group and one for the two nationality groups. A combination of three selected variables significantly discriminated the slow and rapid responders in the pooled group, (Wilks' lambda = .70; $P < .05$, ie, affective disturbance, nausea, and jaw sounds). Three variables in the Australian group (affective disturbance, cognitive control, and nausea) and four variables in the Finnish group (hypochondriasis, affective disturbance, jaw sounds, and nausea) significantly discriminated slow and rapid responders (Wilks' lambda = .58; $P < .05$ and Wilks' lambda = .66; $P < .05$, respectively). In the pooled group, 76% of the cases were correctly classified; in the separate analyses, 79% of the Australian cases and 87% of the Finnish cases were correctly classified by DFA (Table 6).

Discussion

Differences in the presenting psychologic profiles (especially ways of coping and illness behavior), as assessed by the CSQ and the IBQ, were found in the present study for Australian and Finnish patients seeking treatment for TMD. Differences in

these measures were found also according to the response to conservative treatment. Acute dental pain patients were found to differ in their adjustment to pain when compared with patients suffering from TMD.

Recent reviews^{18,19} regarding the role of psychologic factors in TMD have discussed the importance of proper psychometric evaluation of selected questionnaires. One method of doing this is reliability testing. It was shown in the present study that the majority of scales used to assess coping and illness behavior were internally reliable. Similar to the study by Rosenstiel and Keefe,⁴⁶ one scale of the CSQ, increasing pain behaviors, was found to have a poor internal reliability as measured by coefficient α values and was therefore not used in further analyses. Similarly, four of eight IBQ factors, including psychologic versus somatic perception, had poor internal reliability and were also omitted.

In addition, an exploratory factor analysis was conducted using the subscales of CSQ to compare data from the present study to previous studies in other pain populations.^{46,48-50,58,59} The assessment of CSQ factors in the Australian TMD group closely resembled that in patients suffering from chronic osteoarthritis in the study by Keefe et al.⁵⁰ These authors found that patients who reported that they were able to control their pain and who did not endorse catastrophizing responses had lower pain levels, better health status, and lower levels of psychologic distress. The Finnish CSQ factor structure closely resembled those by Rosenstiel and Keefe⁴⁶ and Turner and Clancy⁴⁹ in patients with chronic back pain. Patients with TMD, instead of diverting attention from pain, preferred adaptive coping, such as increasing activity levels. The previous studies^{46,49} have supported significant association between the use of certain types of coping strategies and measures of physical and psychosocial impairment or adjustment to chronic pain. No attempt in the present study was made to verify the original factor structure of the IBQ because the questionnaire has previously been validated and tested for reliability and comparative data available from both Australian and Finnish pain populations.^{35,60} It is noted, however, that some of the previous studies^{61,62} have challenged the validity of the original factor structure of IBQ as proposed for the populations in the study by Pilowsky and Spence.⁶³ These studies support the need for further psychometric validation in the analyses of commercially available pain questionnaires, especially when applied cross-culturally.

The findings of the present study indicated differences in the presenting psychologic profiles

between the Australian and Finnish TMD groups in the levels of control and affective disturbance. This finding supported a relationship between lack of control over pain and the level of affective disturbance, in light of the theoretical conceptualization concerning the interrelationships between affective, pain, and other psychologic dimensions.¹⁹ It was found also that patients with TMD and those suffering from other chronic musculoskeletal pain disorders had similarities in ways of coping and in illness behavior, but further research in this field is needed.

Previous psychologic surveys in patients with TMD have indicated that various psychologic variables, such as affective disturbance, somatization, and cognitive control, can be elevated in patients with TMD compared to control subjects.^{18,19} The present study found that patients with TMD differed from those reporting acute dental pain in the level of control, the type of coping strategies used, and the level of affective disturbance.

Many studies have reported the presence of psychologic factors in nonresolving TMD.^{18,19,64} The findings of discriminant function analysis in the present study supported the importance of psychologic variables as predictors of treatment outcome, mainly affective disturbance, lack of cognitive control, catastrophizing, and hypochondriasis. The slow responders in the present study had significantly lower scores of cognitive control and significantly higher scores of maladaptive coping such as catastrophizing and affective disturbance in both nationalities of TMD groups, compared to rapid responders. In contrast, those patients responding rapidly to therapy used a variety of coping strategies and reported effectiveness of these strategies in both TMD groups. Earlier studies with CSQ in other musculoskeletal disorders of the body have indicated a relationship between chronic intractable pain, lack of control, and catastrophizing.^{49,50} Previous studies with the IBQ have shown that patients with intractable pain were more convinced of the presence of disease and more somatically preoccupied.^{35,51,52,62-68}

The findings of the present study support the dual-axis concept of TMD and the multidimensional pain models, especially in identifying nonresolving TMD. The clinical implications of the present study relate to the delineation and role of coping strategies and illness behavior in TMD. In the present study, those with a slow response to therapy used more maladaptive coping, such as catastrophizing and feeling less in control of their disorders, and reported higher levels of affective disturbance. Cognitive/behavioral treatment, such

as operant conditioning and pain coping skills training, are methods of teaching patients more adaptive strategies to deal with their pain and have been shown to be of value in other pain populations.^{69,70} Cognitive/behavioral therapies, including biofeedback and relaxation training, have been proposed and used in the management of TMD.^{71,72} However, few controlled studies exist about the efficacy of these treatments in patients with TMD. Multidisciplinary pain management programs have been supported in the management of intractable pain.¹⁹ These management programs generally incorporate expertise from various clinical fields, including dentistry, medicine, psychology, and psychiatry. Approaches such as pharmacotherapy and supportive psychotherapy have been used to aid management of nonresolving TMD, which is resistant to physical therapy methods. The findings of the present study support the validity of initial psychologic assessment, especially in nonresolving TMD. Similar support has been expressed by others.^{15,44,64} This type of assessment may have applications in guided multidisciplinary treatment programs.

The findings of the present study need to be examined within the confines of the research design, given the relatively small sample sizes. Future research is needed to reverify the presented potential predictors of treatment outcome and to extend the concept of cognitive-behavioral mediation of responses to TMD therapy by delineating and experimentally manipulating specific psychologic factors. Similarly, caution needs to be given to the interpretation of the role of psychologic profiles as causes of nonresolution or as consequences of lack of successful treatment and prolonged suffering. The findings support the view that the multidimensional elements of the pain experience in patients suffering from musculoskeletal disorders of the craniocervical region need to be appreciated, and further examined in a clinical and therapeutic concept.

Conclusion

The present study found that patients suffering from TMD, similar to patients with other musculoskeletal pain disorders, used a variety of coping strategies to deal with their pain. Differences in presenting psychologic profiles between Australian and Finnish groups were related to differences in nationality, type of pain suffered, and treatment outcome. The precise role of various factors as predictors of outcome need to be viewed in the context

of intraethnic and interethnic heterogeneity.¹⁹ Future comparative research is needed to more precisely examine the role of symptom variables and cognitive and behavioral factors in the diagnosis, classification, and resolution of TMD.

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References

- McNeill C, Mohl ND, Rugh JD, Tanaka TT. Temporomandibular disorders: Diagnosis, management, education, and research. *J Am Dent Assoc* 1990;120:253-263.
- DeBoever JA. Functional disturbances of the temporomandibular joints. *Oral Sci Rev* 1973;2:100-117.
- Farrar WB. Craniomandibular practice: The state of the art; Definition and diagnosis. *J Craniomand Pract* 1983;1:4-12.
- Reade PC. An approach to the management of temporomandibular joint pain-dysfunction syndrome. *J Prosthet Dent* 1984;51:91-96.
- Stegenga B, deBont LGM, Boering G. Osteoarthritis as the cause of craniomandibular pain and dysfunction. A unifying concept. *J Oral Maxillofac Surg* 1989;47:249-256.
- Bell WE. Temporomandibular Disorders. Classification, Diagnosis, Management, ed 3. Chicago: Year Book, 1990.
- Parker MW. A dynamic model of etiology in temporomandibular disorders. *J Am Dent Assoc* 1990;120:283-290.
- Melzack R, Wall PD. Pain mechanisms: A new theory. *Science* 1965;150:971-979.
- Rugh JD, Solberg WK. Oral health status in the United States: Temporomandibular disorders. *J Dent Educ* 1985;49:398-405.
- Carlsson GE. Epidemiological studies of signs and symptoms of temporomandibular joint-pain-dysfunction. A literature review. *Aust Prosthodont Soc Bull* 1984;14:7-12.
- Dworkin SF, Huggins KH, LeResche L, Von-Korff M, Howard J, Truelove E, Sommers E. Epidemiology of signs and symptoms in temporomandibular disorders: Clinical signs in cases and controls. *J Am Dent Assoc* 1990;120:273-281.
- De Kanter RJ, Truin GJ, Burgersdijk RC, Van't Hof MA, Battistuzzi PG, Kalsbeek H, Kayser AF. Prevalence in the Dutch adult population and a meta-analysis of signs and symptoms of temporomandibular disorder. *J Dent Res* 1993;72:1509-1518.
- Speculand B, Hughes AO, Goss AN. Role of recent stressful life events experience in the onset of TMJ dysfunction pain. *Community Dent Oral Epidemiol* 1984;12:197-202.
- Marcus AC, Siegel JM. Sex differences in the use of physician services. A preliminary test of the fixed role hypothesis. *J Health Soc Behav* 1982;23:186-197.

15. Dworkin SF, LeResche L (eds). Research Diagnostic Criteria For Temporomandibular Disorders: Review, Criteria, Examinations and Specifications, Critique. *J Craniomandib Disord Facial Oral Pain* 1992;6:301-355.
16. Rudy TE, Turk DC, Zaki HS, Curtin HD. An empirical taxometric alternative to traditional classification of temporomandibular disorders. *Pain* 1989;36:311-320.
17. De Leeuw JR, Steenks MH, Ros WJ, Lobbezoo-Scholte AM, Bosman F, Winnubst JA. Multidimensional evaluation of craniomandibular dysfunction. I: Symptoms and correlates. *J Oral Rehabil* 1994;21:501-514.
18. Dahlstrom L. Psychometrics in temporomandibular disorders. An overview. *Acta Odontol Scand* 1993;51:339-352.
19. Suvinen TI, Reade PC. Temporomandibular disorders: A critical review of the nature of pain and its assessment. *J Orofacial Pain* 1995;9:317-339.
20. Friction JR, Nelson A, Monsein M. IMPATH: Micro-computer assessment of behavioral and psychosocial factors in craniomandibular disorders. *J Craniomand Pract* 1987;5:372-381.
21. Levitt SR, McKinney MW, Lundeen TF. The TMJ scale: Cross-validation and reliability studies. *J Craniomand Pract* 1988;6:17-25.
22. McCall JCM, Szymd L, Ritter RM. Personality characteristics in patients with temporomandibular joint symptoms. *J Am Dent Assoc* 1961;62:694-698.
23. Schumann NP, Zwienen U, Nebrich A. Personality and quantified neuromuscular activity of the masticatory system in patients with temporomandibular joint dysfunction. *J Oral Rehabil* 1988;15:35-47.
24. Moss RA, Adams HE. The assessment of personality, anxiety and depression in mandibular pain dysfunction subjects. *J Oral Rehabil* 1984;11:233-235.
25. Feinmann C, Harris M. Psychogenic facial pain. Part I: The clinical presentation. *Br Dent J* 1984;156:165-168.
26. Feinmann C, Harris M. Psychogenic facial pain: Presentation and treatment. *Br Med J* 1984;288:436-438.
27. Gerschman JA, Burrows GD, Reade PC. Chronic orofacial pain. In: Bonica JJ (ed). *Advances in Pain Research and Therapy*, vol 3. New York: Raven Press, 1979:317-323.
28. Tversky J, Reade PC, Gerschman JA, Holwill BJ, Wright J. Role of depressive illness in the outcome of treatment of temporomandibular joint pain-dysfunction syndrome. *Oral Surg Oral Med Oral Pathol* 1991;71:696-699.
29. Eversole LR, Stone CE, Matheson D, Kaplan H. Psychometric profiles and facial pain. *Oral Surg Oral Med Oral Pathol* 1985;60:269-274.
30. Butterworth JC, Deardorff WW. Psychometric profiles of craniomandibular pain patients: Identifying specific subgroups. *J Craniomand Pract* 1987;5:225-232.
31. Kleinknecht R, Mahoney E, Alexander L. Psychosocial and demographic correlates of temporomandibular disorders and related symptoms. *Pain* 1987;29:313-324.
32. Marbach JJ, Lipton JA. Aspects of illness behaviour in patients with facial pain. *J Am Dent Assoc* 1978;96:630-638.
33. Marbach JJ, Lund P. Depression, anhedonia and anxiety in temporomandibular joint and other facial pain syndromes. *Pain* 1981;11:73-84.
34. Schnurr RF, Rollman GB, Brooke RI. Are there psychologic predictors of treatment outcome in temporomandibular joint pain and dysfunction? *Oral Surg Oral Med Oral Pathol* 1991;72:550-558.
35. Speculand B, Goss AN, Hughes A, Spence ND, Pilowsky I. Temporomandibular joint dysfunction: Pain and illness behaviour. *Pain* 1983;17:139-150.
36. Keefe FJ, Dolan E. Pain behaviour and pain coping strategies in low back pain and myofascial pain dysfunction syndrome patients. *Pain* 1986;24:49-56.
37. Stockstill JW, Callahan CD. Personality hardiness, anxiety, and depression as constructs of interest in the study of temporomandibular disorders. *J Craniomandib Disord Facial Oral Pain* 1991;5:129-134.
38. Greene CS, Laskin DM. Long-term evaluation of treatment for myofascial pain-dysfunction syndrome: A comparative analysis. *J Am Dent Assoc* 1983;107:235-238.
39. Egermark-Eriksson I, Carlsson GE, Magnusson T. A long-term epidemiologic study of the relationship between occlusal factors and mandibular dysfunction in children and adolescents. *J Dent Res* 1987;66:67-71.
40. Melzack R, Casey KL. Sensory, motivational, and central control determinants of pain: A new conceptual model. In: Kenshalo DR (ed). *The Skin Senses*. Springfield, IL: Thomas, 1968.
41. Rugh JD. Psychological components of pain. *Dent Clin North Am* 1987;31:579-594.
42. Lipton JA, Marbach JJ. Predictors of treatment outcome in patients with myofascial pain-dysfunction syndrome and organic temporomandibular joint disorders. *J Prosthet Dent* 1984;51:387-393.
43. De Leeuw JR, Ros WJ, Steenks MH, Lobbezoo-Scholte AM, Bosman F, Winnubst JA. Multidimensional evaluation of craniomandibular dysfunction. II: Pain assessment. *J Oral Rehabil* 1994;21:515-532.
44. Oakley ME, McCreary CP, Flack VF, Clark GT. Screening for psychological problems in temporomandibular disorder patients. *J Orofacial Pain* 1993;7:143-149.
45. Suvinen TI, Reade PC, Sundén B, Gerschman J, Koukounas E. Temporomandibular pain and dysfunction: Part I. A comparison of symptom profiles in Australian and Finnish patients. *J Orofacial Pain* 1996;11:58-66.
46. Rosenstiel AK, Keefe FJ. The use of coping strategies in chronic low back pain patients: Relationship to patient characteristics and current adjustment. *Pain* 1983;17:33-44.
47. Pilowsky I, Spence ND. *Manual for the Illness Behaviour Questionnaire (IBQ)*, ed 2. Adelaide, Australia: University of Adelaide, 1983.
48. Gross AR. The effect of coping strategies on the relief of pain following surgical intervention for lower back pain. *Psychosom Med* 1986;48:229-241.
49. Turner JA, Clancy S. Strategies for coping with chronic low back pain: Relationship to pain and disability. *Pain* 1986;24:355-364.
50. Keefe FJ, Caldwell DS, Queen KT, Gil KM, Martinez S, Crisson JE, et al. Pain coping strategies in osteoarthritis patients. *J Consult Clin Psychol* 1987;55:208-212.
51. Pilowsky I, Spence ND. Patterns of illness behaviour in patients with intractable pain. *J Psychosom Res* 1975;19:279-287.
52. Speculand B, Goss AN, Spence ND, Pilowsky I. Intractable facial pain and illness behaviour. *Pain* 1981;11:213-219.
53. Waddell G, Pilowsky I, Bond MR. Clinical assessment and interpretation of abnormal illness behaviour in low back pain. *Pain* 1989;39:41-53.
54. Scott J, Huskisson EC. Graphic representation of pain. *Pain* 1976;2:175-184.

55. Cronbach LJ. *Essentials of Psychological Testing*, ed 3. New York: Harper and Row, 1970.
56. Nie N, Hull J, Jenkins J. SPSS—Statistical Package for the Social Sciences, ed 2. New York: McGraw-Hill, 1983.
57. Tabachnik BG, Fidell LS. *Using Multivariate Statistics*, ed 2. New York: Harper and Row, 1989.
58. Lawson K, Reesor KA, Keefe FJ, Turner JA. Dimensions of pain-related cognitive coping: Cross-validation of the factor structure of the Coping Strategy Questionnaire. *Pain* 1990;43:195-204.
59. Jensen IB, Linton SJ. Coping Strategies Questionnaire (CSQ): Reliability of the Swedish version of the CSQ. *Scand J Behav Ther* 1993;22:139-145.
60. Talo S. *Psychological Assessment of Functioning in Chronic Low Back Pain Patients*. Finland: Social Insurance Institution, 1992.
61. Main CJ, Waddell G. Psychometric construction and validity of the Pilowsky Illness Behaviour Questionnaire in British patients with chronic low back pain. *Pain* 1987; 28:13-25.
62. Wichmann E, Nilges P, Gerbershagen HU, Gamber J, Scheiffing I. The illness behaviour questionnaire, psychometric properties and validity of a German version [abstract 644]. *Pain* 1990;5(special issue):336.
63. Pilowsky I, Spence ND. Pain and illness behaviour: A comparative study. *J Psychosom Res* 1976;20:131-134.
64. McCreary CP, Clark GT, Oakley ME, Flack V. Predicting response to treatment for temporomandibular disorders. *J Craniomandib Disord Facial Oral Pain* 1992;6:161-169.
65. Pilowsky I, Chapman CR, Bonica JJ. Pain, depression, and illness behavior in a pain clinic population. *Pain* 1977; 4:183-192.
66. Skevting SM. Activities as indices of illness behaviour in chronic pain. *Pain* 1983;15:295-307.
67. Chapman CR, Sola AE, Bonica JJ. Illness behaviour and depression compared in pain center and private practice patients. *Pain* 1979;6:1-7.
68. Pilowsky I. Abnormal illness behaviour: A 25th anniversary review. *Aust NZ J Psychiatry* 1994;28:566-573.
69. Tan SY. Cognitive and cognitive-behavioral methods for pain control: A selective review. *Pain* 1982;12:201-228.
70. Turner JA. Comparison of group progressive-relaxation training and cognitive-behavioral group therapy for chronic low back pain. *J Consult Clin Psych* 1982;50: 757-765.
71. Dworkin SF, Turner JA, Wilson L, Massoth D, Whitney C, Huggins KH, et al. Brief group cognitive-behavioral intervention for temporomandibular disorders. *Pain* 1994;59:175-187.
72. Oakley ME, McCreary CP, Clark GT, Holston S, Glover D, Kashima K. A cognitive-behavioral approach to temporomandibular dysfunction treatment failures: A controlled comparison. *J Orofacial Pain* 1994;8:397-401.

Resumen

Desórdenes temporomandibulares: Parte II. A. Comparación de los perfiles psicológicos en pacientes australianos y finlandeses

Los estudios recientes estiman que los desórdenes musculoesqueléticos del sistema masticatorio son desórdenes de doble-eje, pero la información comparativa de los factores psicológicos de las diferentes poblaciones con dolor es escasa. En este estudio, se evaluaron los perfiles psicológicos de 40 pacientes australianos y 42 pacientes finlandeses que sufrían de problemas temporomandibulares. Estos hallazgos fueron comparados con los de un grupo de pacientes australianos que se quejaban de dolor dental agudo y también con respecto a la respuesta al tratamiento conservador. El examen psicológico incluyó variables de comportamiento cognoscitivo, motivador/afectivo y el relacionado a la enfermedad. Este examen estaba basado en cuestionarios validados relacionados al dolor general (cuestionario sobre las estrategias para manejar el problema y cuestionario sobre el comportamiento de la enfermedad). Se encontró que este instrumento era confiable internamente en la mayoría de sus subescalas en los estudios de grupo, y suministró información comparable a la de otras poblaciones con dolor. Se encontraron diferencias significativas en los perfiles psicológicos presentados de acuerdo a la nacionalidad, tipo de dolor, y resultados del tratamiento. Por medio de un análisis de función discriminante, se identificaron síntomas potenciales para predecir el resultado del tratamiento. Estos síntomas fueron los disturbios afectivos, hipocondriasis, la falta de control cognoscitivo, y "el sentirse enfermo"; tales síntomas clasificaron correctamente al 79% de los pacientes australianos y al 87% de los pacientes finlandeses que tenían desórdenes temporomandibulares. Se concluyó que los perfiles psicológicos se diferenciaron en las dos nacionalidades y se relacionaron al resultado del tratamiento. Se apoyó el concepto de la evaluación multiaxial.

Zusammenfassung

Temporomandibuläre Erkrankungen: Teil II. Ein Vergleich von psychologischen Profilen bei australischen und finnischen Patienten

Jüngsten Vorschlägen nach sind muskuloskeletale Erkrankungen des Kausystems als zweiseitige Krankheiten zu betrachten, aber nur wenige vergleichbare Daten von psychologischen Faktoren bei verschiedenen Schmerzpopulationen sind verfügbar. In dieser Studie werden die untersuchten psychologischen Profile bei 40 australischen und 42 finnischen Patienten mit diagnostizierten temporomandibulären Erkrankungen beurteilt. Die Befunde wurden mit denjenigen einer Gruppe australischer Patienten verglichen, welche über akuten Zahnschmerz berichteten und hinsichtlich des Ansprechens auf konservative Behandlung. Das psychologische Testinstrument beinhaltet kognitive, Motivations-/affektive und Krankheitshintergrund-Variablen, und es basiert auf für gültig erklärten Fragebögen für allgemeinen Schmerz (Coping Strategies- und Illness Behavior-Fragebogen). Dieses Instrument wurde intern für zuverlässig befunden in der Mehrheit seiner Unterteilungen in den Gruppenstudien und lieferte vergleichbare Daten zu anderen Schmerzpopulationen. Signifikante Unterschiede in den Schmerzprofilen wurden bezüglich der Nationalität, erlittenem Schmerztyp und Behandlungsergebnis gefunden. Eine affektive Störung, Hypochondriasis, ein Fehlen der kognitiven Kontrolle und Krankheitsgefühl mit Symptomen wurden in der Diskriminantenfunktionsanalyse als mögliche Vorhersagen des Behandlungsergebnisses identifiziert, und sie klassifizierten 79% der australischen und 87% der finnischen Patienten mit temporomandibulären Erkrankungen richtig. Es wurde der Schluss gezogen, dass sich die psychologischen Profile in den zwei Nationalitäten unterscheiden und dass sie mit dem Behandlungsergebnis verbunden sind. Das Konzept der mehrgleisigen Behandlung wurde unterstützt.

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