Stress-Related Adaptive Versus Maladaptive Coping and Temporomandibular Disorder Pain

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Aims: *To test whether patients with temporomandibular disorder (TMD) pain differ from subjects from the general population with regard to their stress-related coping styles.* ***Methods:*** *Consecutive adult TMD patients (n = 70) and adult subjects of a regional general population sample (n = 868), examined according to the German version of the Research Diagnostic Criteria for TMD (RDC/TMD), were included in this study. The inclusion criterion for TMD patients was at least one pain-related diagnosis according to the RDC/TMD, while general-population subjects were excluded if they had any pain-related TMD diagnosis. Coping styles were assessed using a common and well-accepted German 114-item stress-coping questionnaire ("Stressverarbeitungsfragebogen" SVF 114). The coping style–TMD pain relationship was investigated using logistic regression analyses adjusted for possible confounders (age, sex, level of education), as well as the influence of psychosocial measures (RDC/TMD Axis II). Odds ratios (OR) with 95% confidence intervals (CI) were calculated.* ***Results:*** *Study participants who used fewer adaptive coping styles (OR = 0.47, CI: 0.26–0.83) and more maladaptive coping styles (OR = 1.55, CI: 1.05–2.29) were at greater risk for TMD pain. After adjustment for sociodemographic confounders, the coping style–TMD pain relationship changed only slightly in magnitude. In an analysis adjusted for sociodemographic confounders and psychosocial RDC/TMD Axis II measures, adaptive coping styles were even more profoundly related to TMD pain (OR: 0.27, 95 CI: 0.09–0.83), but maladaptive coping styles were less related to TMD pain (OR: 1.17, 95% CI: 0.51–2.72).* ***Conclusion:*** *Differences in the applied stress-related coping styles of TMD patients and subjects without TMD may have implications for clinical decision-making and choosing among treatment alternatives.* J OROFAC PAIN 2012;26:181–190

Key words: coping, stress, temporomandibular disorders

Increasing evidence indicates that coping with stress, disease, and pain is important for musculoskeletal conditions.[1,2] Coping can be defined as predictable cognitive and behavioral efforts to manage environmental and internal demands or conflicts, and can broadly be classified as either problem-focused or emotion-focused.[3] While problem-focused coping involves dealing directly with the stressor by adapting the stressor or oneself, emotion-focused coping involves managing the emotions evoked by the stressor. Others have drawn a distinction between approach- versus avoidance-oriented

coping[4] and between adaptive versus maladaptive coping.[5] However, all these delineations are based on similar psychological theories and, therefore, coping styles in these categories seem to be quite consistent. Hence, problem-focused and approach-oriented coping can be regarded as adaptive, whereas emotion-focused and avoidance-oriented coping can be regarded as maladaptive.[5]

Adaptive coping such as problem solving has been reported to be linked to positive psychological and physical health under stressful circumstances. In contrast, maladaptive coping appears to be a risk factor for negative psychological and physical health.[6] Recent theories have noted the impact of coping resources as antecedents of specific coping strategies. Personal coping resources such as optimism, personal control or mastery, and high self-esteem are linked to lesser distress and better health outcomes.[6] In contrast, catastrophizing is considered one of the most negative coping strategies.[7,8]

A number of studies have investigated coping in patients with temporomandibular disorders (TMD). Catastrophizing was found to have a highly negative impact on pain severity, especially in combination with depression.[9,10] In contrast, positive health beliefs (eg, self-efficacy) were found to have a positive impact on the course of the disease.[9,11–14] Primarily emotion-focused coping strategies such as "wishful thinking" and "expressed emotions" were found to be good predictors for increased psychological impairment and higher levels of pain-related reactions.[13,15] In TMD patients, psychological alterations seem to be primarily related to myogenic dysfunctions,[16] a result that suggests less adaptive coping in this group of patients. However, the results of studies addressing this issue are contradictory. It has been reported that TMD patients with pain primarily in the masticatory muscles indicate higher levels in the active coping scale of the Brief Cope Inventory[17] than patients with arthrogenic pain.[18]

However, the question of whether stress-related coping differs between TMD pain patients and subjects without TMD has rarely been investigated. In one study, TMD pain patients indicate less use of reinterpretation as an adaptive coping style than subjects without TMD.[19] Given the fact that cognitive-behavioral treatment is proven to be effective in altering coping behavior in TMD patients,[20] a broader insight into the profiles of the coping style in these pain patients compared to pain-free subjects is required for tailored treatment and better prevention of TMD pain.

The aim of this study was to test whether patients with TMD pain differ from general-population subjects with regard to their stress-related coping styles.

Materials and Methods

Subjects and Study Design

In this case-control study, subjects (cases) were recruited as a consecutive sample of 70 adult patients seeking treatment for masticatory muscle and temporomandibular joint problems at the Department of Prosthodontics and Materials Science, University of Leipzig, and who had at least one pain-related diagnosis according to the Research Diagnostic Criteria for TMD (RDC/TMD). Additionally, already existing data of 868 adult subjects without any pain-related TMD diagnosis (unmatched controls) were selected for comparison from a probability sample of the general population in the metropolitan area of Halle/Saale and surrounding areas in Germany. For details of the recruitment procedure, see Hirsch et al.[21] A sample size calculation was not performed because this study was a secondary data analysis.

This research was conducted in accordance with accepted ethical standards for research practice, undergoing review and approval by the Institutional Review Board at the University of Leipzig. Written informed consent was obtained from all participants prior to their enrollment.

TMD Diagnoses

Clinical examination and assignment of TMD diagnoses of all subjects, including the general population sample, were performed according to the recommendations of the working group on pain assessment of the German Chapter of the International Association for the Study of Pain, using the German version of the RDC/TMD.[22,23] The RDC/TMD is a well-established and internationally accepted diagnostic system that applies a dual-axis approach. Axis I involves physical assessment according to a standardized protocol, while Axis II assesses psychosocial aspects of TMD.

The German version of the RDC/TMD is essentially identical to the English original, and includes measures to assess dysfunctional chronic pain, jaw disability, depression, and nonspecific physical symptoms.[24] Dysfunctional chronic pain was assessed using the Graded Chronic Pain Scale (GCPS).[25] Jaw disability was measured with the Jaw Disability List.[26] Depression was assessed using the "Giessen-Test"[27] with six items, and nonspecific physical symptoms were evaluated by the "Beschwerdenliste" (Complaint List),[28] a well-validated, 24-item instrument widely used in Germany. Population-based normative data are available for measures

of depression and nonspecific physical symptoms, which allow the classification in "normal," "moderate," and "severe."

Participants with missing data for depression (patients: n = 3, 4.3%; subjects: n = 7, 0.8%), nonspecific physical symptoms (patients: n = 1, 1.4%; subjects: n = 4, 0.5%), or jaw disability (patients: n = 1, 1.4%; subjects: n = 5, 0.6%) were excluded from the analyses of these variables. GCPS data were available for 65 patients (92.9%). Only subjects who had TMD pain within the 6 months prior to the examination completed the GCPS (n = 76, 8.8%). Cronbach's alpha was 0.78 for graded chronic pain, 0.73 for jaw disability, 0.91 for nonspecific physical symptoms, and 0.89 for depression.

All clinical examiners had advanced training in diagnosing TMD. Furthermore, for standardization, all examiners were instructed by using the manual of the German RDC/TMD, which contains explicit explanations of each step of the clinical examination. Reliability of the RDC/TMD clinical examination has been investigated in previous reports and found to be sufficient.[29,30]

The inclusion criterion for TMD patients was at least one pain-related Axis I diagnosis according to the RDC/TMD. However, for the comparison group, only general-population subjects without any pain-related TMD diagnosis were recruited.

Assessment of Stress-Related Coping

All TMD patients and general population subjects completed a common and well-accepted German 114-item stress-coping questionnaire ("Stressverarbeitungsfragebogen," SVF 114),[31] for which respondents are expected to rate the probability of 114 statements on how they deal with hypothetical stressors (eg, "If I am disturbed, irritated, or upset by anything or anyone, I tend to escape"). Responses to each item are given on a scale from 0 (not at all) to 4 (very probable). Items are combined into 19 subscales, each consisting of 6 items and representing a special style of coping with stress. These subscales can be regarded as indicative of either adaptive ("positive," eg, situational control) or maladaptive ("negative," eg, resignation) stress-related coping styles. Scales 1 to 9 were combined to create a mean score for adaptive coping (AC) responses, whereas scales 12 to 17 were combined to create a mean score for maladaptive coping (MC) responses based on recommendations of the test developers.[31] Scales 10, 11, 18, and 19 were not assigned to the composite scores since these scales concern occasional coping strategies that have to be evaluated separately.

Cronbach's alpha as a measure of internal consistency was 0.94 for the complete set of 114 items, 0.81 for the subset of scales representing AC responses, and 0.88 for the subset representing MC responses.

Data Analyses

The analytic approach involved the investigation of the scientific questions whether SVF scores of the 19 scales and the composite AC and MC scores differed with respect to the presence of a pain-related TMD diagnosis. The relationship between stress-related coping and the presence of TMD pain was assessed using TMD patients with a pain-related Axis I diagnosis and general-population subjects without a pain-related TMD diagnosis.

Pearson correlation analyses were performed to estimate the strength of the correlation between the AC and MC composite scores with the 19 scales of the SVF, to test whether the scales correlate with the appropriate composite score among all study participants. Furthermore, correlation analyses were conducted using the AC and MC composite score and the RDC Axis II measures. Except for GCPS, Pearson's product-moment correlation coefficients were calculated using the raw scores of depression, nonspecific physical symptoms, and jaw disability measures. Spearman rank correlation coefficients were computed for the correlation between AC and MC composite scores and the categorized measures of the GCPS.

Group differences in stress-related coping were tested in several ways. First, a multivariate analysis of variance (MANOVA) was conducted, using all of the 19 scales in this analysis, to estimate whether groups differed in their profile of applied coping strategies. Second, mean SVF scores of the 19 subscales and the mean composite scores of AC responses and MC responses, including 95% confidence intervals for investigated groups, were presented. Group differences in SVF scale scores and composite scores were computed and tested for statistical significance by using two-tailed Student *t* test. Analyses were performed without adjustment for multiple comparisons. Effect sizes were computed for each group comparison. According to Cohen,[32] an effect size above 0.2 indicates a small effect, above 0.5 a medium effect, and above 0.8 a large effect. Third, the relationship between coping and the presence of TMD pain was computed using logistic regression analyses adjusted for possible confounders (sociodemographic variables) and for the influence of psychosocial measures. Case-control status was considered the criterion variable, whereas coping-scale scores were treated as predictive variables and

Table 1 Characteristics of TMD Patients and General-Population Subjects

	TMD patients (n = 70)	General-population subjects (n = 868)
Sociodemographic characteristics		
Demography		
Sex [% woman]***	81.4	56.8
Age [mean (SD)]NS	41.9 (±15.6)	40.4 (±11.8)
Level of education [n (%)]†*		
6 y of school	–	3 (0.3)
8 y of school	18 (25.7)	107 (12.3)
10 y of school	23 (32.9)	299 (34.5)
12 y of school	5 (7.1)	81 (9.3)
College	14 (20.0)	199 (22.9)
University	9 (12.9)	173 (19.9)
TMD Axis I diagnoses [n (%)]NA		
Myofascial pain without limited opening	24 (34.3)	–
Myofascial pain with limited opening	21 (30.0)	–
Disc displacement with reduction	20 (28.6)	121 (13.9)
Disc displacement without reduction with limited opening	5 (7.1)	–
Disc displacement without reduction without limited opening	3 (4.3)	4 (0.5)
Arthralgia	48 (68.6)	–
Osteoarthritis	4 (5.7)	–
Osteoarthrosis	3 (4.3)	19 (2.2)
TMD Axis II measures		
Depression [n (%)]‡***		
Low	24 (35.8)	524 (60.9)
Moderate	18 (26.9)	147 (17.1)
Severe	25 (37.3)	190 (22.1)
Nonspecific physical symptoms [n (%)]§***		
Low	26 (37.7)	525 (60.8)
Moderate	21 (30.4)	233 (27.0)
Severe	22 (31.9)	106 (12.3)
Jaw disability [n (%)]‖***		
0–3	20 (29.0)	827 (95.8)
4–7	30 (43.5)	25 (2.9)
8–12	19 (27.5)	11 (1.3)
Graded chronic pain [n (%)]¶***		
Grade 1	24 (34.3)	55 (6.3)
Grade 2	30 (42.9)	13 (1.5)
Grade 3	7 (10.0)	4 (0.5)
Grade 4	4 (5.7)	4 (0.5)

†n = 1 patient and n = 6 subjects with missing values for level of education.
‡n = 3 patients and n= 7 subjects with missing values for depression.
§n = 1 patient and n = 4 subjects with missing values for nonspecific physical symptoms.
‖n = 1 patient and n = 5 subjects with missing values for jaw disability.
¶n = 65 patients and n = 76 subjects with values for graded chronic pain.

* = $P < .05$; *** = $P < .001$; NS = $P > .05$; NA = statistical testing not applicable (TMD diagnoses were inclusion and exclusion criteria, respectively).

Table 2 Internal Consistency of Scales and Correlation Between Scales and Mean Scores of AC Responses and MC Responses

Scale		Internal consistency (Cronbach's alpha)	AC responses (Correlation coefficient)	MC responses (Correlation coefficient)
1	Disparagement	0.74	**0.67*** **	0.08*
2	Self-revalidation	0.84	**0.52*** **	–0.39***
3	Defense from guilt	0.78	**0.58*** **	0.18***
4	Diversion from situation	0.75	**0.66*** **	0.19***
5	Substitute gratification	0.83	**0.58*** **	0.19***
6	Self-affirmation	0.82	**0.72*** **	0.13***
7	Situational control	0.80	**0.56*** **	0.07*
8	Reactional control	0.73	**0.65*** **	0.13***
9	Positive self-instruction	0.84	**0.74*** **	–0.14***
10	Need social support	0.88	0.25***	0.20***
11	Avoidance	0.84	0.34***	0.52***
12	Escape	0.73	0.19***	**0.82*** **
13	Social withdrawal	0.85	0.00	**0.74*** **
14	Intrusive thoughts	0.92	0.04	**0.78*** **
15	Resignation	0.82	–0.07*	**0.86*** **
16	Self-pity	0.84	0.16***	**0.82*** **
17	Self-blame	0.78	0.07*	**0.74*** **
18	Aggression	0.85	0.05	0.45***
19	Drug use	0.64	0.03	0.32***

Scales in **bold** are components of the composite score of AC responses and MC responses, respectively.
*$P < .05$; ***$P < .001$.

sociodemographic (age, sex, level of education) as well as psychosocial measures (RDC/TMD Axis II measures: depression, nonspecific physical symptoms, jaw disability, graded chronic pain) as covariates. Several analyses were performed by using different models. The first model included only the AC and the MC composite score. The second model additionally included the variables age, sex, and level of education as possible confounders for the relationship between stress-related coping and the case-control status. In the third model, all RDC/TMD Axis II measures were included to adjust for the influence of psychosocial measures.

All analyses were performed using the statistical software package STATA (Stata Statistical Software: Release 12, StataCorp LP), with the probability of a type I error set at the.05 level. A P value of < .05 was considered statistically significant.

Results

Characteristics of TMD Patients and General-Population Subjects

TMD patients were significantly more often female (chi-square test: $P < .001$) and had a lower level of education (rank-sum test: $P < .05$) than the general-population subjects, whereas there was no statistically significant difference in mean age between both groups (t test: $P > .05$; Table 1). Psychosocial measures (RDC/TMD Axis II) were rated as substantially more severe by the TMD patients than the general-population subjects (rank-sum test: all $P < .001$).

Stress-Related Coping Scales, Composite scores, and RDC Axis II Measures

Correlation coefficients between the AC composite scores and scales that have been classified as AC strategies were substantially higher than correlation coefficients between AC composite scores and scales that have been classified as maladaptive or scales without any allocation (Table 2). Furthermore, MC composite scores had a substantially stronger correlation to scales representing MC strategies than with scales including AC strategies or with scales without an allocation (Table 2). This indicates that the scales considered as AC and the scales considered as MC, were relatively independent of each other. All scales correlated substantially with the appropriate AC and MC composite scores, indicating a correct allocation of the scales to the response category.

Table 3 Correlations Between AC Responses, MC Responses, and RDC/TMD Axis II Measures

	Depression	Nonspecific physical symptoms	Jaw disability	Graded chronic pain
AC responses	–0.17***	0.01	–0.03	–0.15
MC responses	0.52***	0.40***	0.08*	–0.01

*$P < .05$; ***$P < .001$.

Table 4 Scores of SVF Scales, AC Responses, and MC Responses of TMD Patients and General-Population Subjects, and Effect Size of Differences

Scale	TMD patients (n = 70) Mean (95% CI)	General-population subjects (n = 868) Mean (95% CI)	Significance (*P* value)	Effect size (Cohen's d)
1 Disparagement	1.9 (1.7–2.0)	2.0 (2.0–2.1)	.055	–0.24
2 Self-revalidation	**1.6 (1.4–1.7)**	**1.7 (1.7–1.8)**	**.037**	**–0.25**
3 Defense from guilt	1.8 (1.6–2.0)	1.8 (1.7–1.8)	.865	0.02
4 Diversion from situation	2.2 (2.0–2.4)	2.2 (2.2–2.3)	.927	–0.01
5 Substitute gratification	1.5 (1.3–1.7)	1.6 (1.6–1.7)	.261	–0.14
6 Self-affirmation	**1.8 (1.7–2.0)**	**2.1 (2.0–2.1)**	**.012**	**–0.31**
7 Situational control	**2.7 (2.5–2.8)**	**2.8 (2.8–2.9)**	**.021**	**–0.28**
8 Reactional control	2.6 (2.4–2.7)	2.7 (2.6–2.7)	.200	–0.16
9 Positive self-instruction	**2.6 (2.5–2.8)**	**2.8 (2.8–2.9)**	**.007**	**–0.33**
10 Need social support	2.3 (2.1–2.5)	2.4 (2.3–2.4)	.530	–0.08
11 Avoidance	2.3 (2.1–2.5)	2.1 (2.1–2.2)	.113	0.18
12 Escape	1.8 (1.7–2.0)	1.7 (1.7–1.7)	.093	0.20
13 Social withdrawal	**1.4 (1.2–1.6)**	**1.2 (1.2–1.3)**	**.049**	**0.23**
14 Intrusive thoughts	2.5 (2.2–2.7)	2.4 (2.4–2.5)	.629	0.06
15 Resignation	**1.6 (1.4–1.8)**	**1.3 (1.2–1.3)**	**< .001**	**0.41**
16 Self-pity	**1.8 (1.6–2.0)**	**1.6 (1.6–1.7)**	**.035**	**0.25**
17 Self-blame	1.9 (1.7–2.1)	1.9 (1.9–2.0)	.996	0.00
18 Aggression	**1.6 (1.4–1.8)**	**1.3 (1.3–1.4)**	**.006**	**0.31**
19 Drug use	**0.6 (0.4–0.8)**	**0.5 (0.4–0.5)**	**.027**	**0.25**
AC responses	**2.1 (2.0–2.2)**	**2.2 (2.2–2.2)**	**.014**	**–0.30**
MC responses	**1.9 (1.7–2.0)**	**1.7 (1.7–1.7)**	**.040**	**0.23**

Scales in **bold** differed statistically significantly between subgroups.

Correlation between AC and MC composite scores and RDC/TMD Axis II measures are presented in Table 3. The composite score of AC responses was slightly correlated to the depression score only ($r = –0.17$; $P < .001$), whereas the MC composite score was substantially associated with the depression score ($r = 0.52$; $P < .001$) and the nonspecific physical symptoms score ($r = 0.40$; $P < .001$).

Stress-Related Coping and Presence of TMD Pain

Multivariate analysis of variance revealed a statistically significant difference in the mean scores of the 19 SVF scales between patients with pain-related TMD diagnoses and general-population subjects without such a diagnosis (MANOVA: $P < .01$), indicating different profiles of applied coping strategies.

Comparisons of the individual scores of the 19 scales revealed significant differences in nine scales ($P < .05$; Table 4). Effect sizes ranged from d = 0.25 to 0.41, indicating small effects. TMD patients indicated lower levels of AC styles (eg, "situational control," "positive self-instruction") and more maladaptive stress-related coping styles (eg, "resignation," "self-pity") than general-population subjects. These results were supported by the differences in the AC and MC composite scores ($P < .05$; Table 4).

As indicated in Table 5, both AC responses and MC responses were significantly related to case-control status (model 1). For AC, an odds ratio (OR) of 0.47 was observed. For MC, an OR of

Table 5 Logistic Regression Analysis Models Characterizing the Relationship Between Case-Control Status and Coping Strategies in Unadjusted and Adjusted (Sociodemographic, Psychosocial Variables) Analyses

Model	Variable	OR	95% CI	*P* value
# 1				
	AC responses	0.47	0.26–0.83	.010
	MC responses	1.55	1.05–2.29	.026
# 2				
	AC responses	0.43	0.24–0.77	.005
	MC responses	1.43	0.96–2.15	.080
	Age	1.01	0.99–1.04	.169
	Sex	3.43	1.83–6.43	< .001
	Level of education	0.77	0.64–0.93	.006
# 3				
	AC responses	0.27	0.09–0.83	.023
	MC responses	1.17	0.51–2.72	.709
	Age	1.01	0.98–1.05	.428
	Sex	0.77	0.27–2.26	.640
	Level of education	0.74	0.54–1.03	.071
	Depression	0.99	0.97–1.01	.220
	Nonspecific physical symptoms	0.98	0.92–1.04	.491
	Jaw disability	1.73	1.41–2.12	< .001
	Graded chronic pain	1.60	0.85–3.00	.144

1.55 was observed. After adjustment for possible sociodemographic confounders (model 2), the AC influence on TMD pain slightly decreased and the MC effect slightly decreased in magnitude. Because the precision of the estimates, ie, the standard errors, basically stayed the same, the AC effect became even more statistically significant with $P = .01$ and the MC effect became less statistically significant with $P = .08$. Further adjustment for psychosocial measures (model 3) changed the AC/MC-TMD pain relationship even more in the previously observed direction. The OR for the AC composite score decreased to 0.27. The odds ratio for the MC composite score decreased to 1.17. The AC relationship stayed statistically significant, whereas the MC relationship became clearly statistically nonsignificant.

Discussion

The results of this study have shown that TMD patients cope differently with stress than subjects from the general population. TMD patients use fewer AC and more MC strategies than general-population subjects. When the socioeconomic characteristics are taken into account in the analysis of the coping style–TMD relationship, the magnitude of the relationship does not change substantially. When, in addition to the socioeconomic characteristics, RDC/TMD Axis II values are taken into account, the relationship of AC styles to TMD pain becomes stronger and that of MC styles becomes weaker. Because coping style is a multifaceted construct with many subscales characterizing the different aspects of the coping styles, each style's relationship to TMD pain is relevant on its own. However, more important is the pattern that arises when adaptive and maladaptive styles are taken together as coping strategies. This pattern suggests that both coping-style strategies have a relationship to TMD pain that is of substantial magnitude.

These findings are in line with the results of previous studies demonstrating that TMD patients show more MC and fewer AC strategies than control subjects. Callahan reported significantly more "escape-avoidance," less "problem-solving," and less "optimism" in TMD patients.[33] Ferrando et al found that TMD patients use less "positive reinterpretation."[19] However, one study (Schüz et al[14]) using the SVF did not find differences in coping styles between subjects with TMD and subjects without TMD. This result can best be explained by the study

design. Schüz et al[14] examined only dental students between 18 and 35 years of age. Although they used the RDC/TMD for assigning subjects to the two study groups (subjects either having TMD or not having TMD), it is unclear if any of the dental students really were TMD patients with treatment need. It is likely that an impaired coping ability can only be found in TMD patients with a certain disease severity.

It can be stated that TMD patients apply fewer AC strategies than control subjects. Due to the lack of prospective studies, it remains unclear if AC is a risk factor for TMD or if pain impairs coping resources. The only prospective studies to date investigated patients who already suffered from TMD at baseline. In one study, it was demonstrated that a dysfunctional/distressed coping profile leads to a worse outcome in TMD.[34] Another study, which investigated TMD patients suffering from chronic pain, stated that cognitive-behavioral treatment helps TMD patients change their coping style and thus ease their pain.[20] On one hand, it could be argued that coping strategies are at least in part trait variables, characteristics for each individual patient predicted to a substantial degree by personality, and, therefore, they seem to be quite constant over time.[35–38] Thus, based on the present findings, coping might play a role in the etiology of TMD. On the other hand, it has been proposed that chronic pain might lead to a generalization of the experience of helplessness in coping with pain.[39]

If stress-related coping is causally related to the presence of TMD pain, a reasonable biological hypothesis should explain how stress affects TMD pain. An increased activity of the masticatory muscles has been discussed as a compensatory reaction to stress.[40] For patients with TMD, this increased activity could directly and indirectly result in an overload of the temporomandibular joints and the masticatory muscles,[41] thereby causing TMD pain.

The impaired coping demonstrated by TMD patients in this study appears to be partly related to depression and nonspecific physical symptoms. A correlation of depressed mood and catastrophizing has previously been reported.[9,13] The present results confirm the association of depression and MC strategies by showing that not only catastrophizing, but MC in general is increased in depressed TMD patients. To the authors' knowledge, the correlation of nonspecific physical symptoms and coping in TMD patients had not been investigated prior to this study.

A major strength of the present study was the use of a standardized and internationally recognized instrument, the RDC/TMD. However, due to limited sample size, the authors were unable to investigate whether differences exist in coping between TMD subgroups with myogenic and arthrogenic pain. Galdón et al found that TMD patients with myogenic pain cope more actively, although they experienced higher levels of distress, anxiety, and somatization.[18] In contrast, Ferrando et al[19] reported minor use of positive reinterpretation and humor as coping strategies in TMD patients with myogenic pain, who were found to suffer from higher levels of distress, anxiety, and somatization than TMD patients with arthrogenic pain. Thus, it remains an open question as to whether myogenic or arthrogenic TMD patients cope better. Substantial differences between these two subgroups likely do not exist. The hypothesis that neither myogenic nor arthrogenic TMD patients cope significantly better is in line with only small or negligible differences in broad measures of psychosocial impact, such as the Multidimensional Pain Inventory[42] or oral health-related quality of life,[43] observed among TMD subgroups defined by RDC/TMD.

The SVF is a measure for stress-related coping that is only available in German. However, as a validated coping style measure of major concepts of coping (adaptive and maladaptive),[4,5] results should nevertheless be standard to other cultures and populations, assuming that coping styles share similarities across cultures.[44]

Differences between patients and subjects in the individual scales of the SVF and in the AC and MC responses were not of a large magnitude. Under the assumption that stress-related coping is a causal factor, this was expected because stress-related coping is not considered the only major etiologic factor for TMD pain. TMD is of multifactorial origin[45] and, therefore, the present findings of small but statistically significant effects are in line with the multifactorial etiology model of TMD.

In this case-control study, patients (cases) differed substantially from subjects (unmatched controls) in sex and level of education. This is anticipated because controls came from the general population and TMD patients are known to deviate from this population regarding socioeconomic characteristics. Population-based subjects were selected as controls because this is the most relevant comparison population—conceptually, the TMD cases have arisen from this population. When analyses were controlled for socioeconomic factors, the relationship between MC styles and pain-related TMD was no longer statistically significant at the $P = .05$ level. The authors do not think this situation changes the interpretation of the results substantially, because the magnitude of the estimates did not change notably and the P value (.08) was close to statistical significance. What

seems clear from the analysis is that MC styles are not associated with TMD pain above and beyond RDC/TMD Axis II measures. That is, in patients and controls with the same level of psychosocial impairment (measured by RDC/TMD), MC styles are not associated with TMD pain. However, AC styles are substantially associated with TMD pain, holding psychosocial status constant.

Due to the multifaceted nature of coping styles, with many scales representing the many aspects of this construct, many statistical tests were performed. The test results should be interpreted in their entirety, ie, more as a pattern of multiple findings pointing in the same direction. This pattern emphasizes that coping strategies, combining the different AC and MC styles, were differently used by TMD pain patients compared to the general population even if study limitations are taken into account.

Because a causal role of coping styles in the etiology of TMD cannot be confirmed from the cross-sectional design of this study, the hypothesis that coping might contribute to the etiology of TMD should be investigated in future prospective studies. To identify whether coping styles are a causal factor for the development of TMD would be important for an improved understanding of TMD. From a clinical point of view, the nontrivial effect sizes between patients and controls observed in this study may be relevant for clinical decision-making.

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