Self-Efficacy Is Associated with Pain, Functioning, and Coping in Patients with Chronic Temporomandibular Disorder Pain

Heather Brister, BS
Graduate Student
Department of Psychology
University of Texas at Austin
Austin, Texas

Judith A. Turner, PhD
Professor
Department of Psychiatry and Behavioral Sciences
School of Medicine

Leslie A. Aaron, PhD, MPH
Research Scientist
Department of Oral Medicine
School of Dentistry

Lloyd Mancl, PhD
Research Associate Professor
Department of Dental Public Health Sciences
School of Dentistry

University of Washington
Seattle, Washington

Correspondence to:
Ms Heather Brister
University of Texas at Austin
University Station Stop A8000
Austin, TX 78712
Fax: +512 471 3413
E-mail: hbrister@mail.utexas.edu

Aims: *To examine the psychometric characteristics of a measure of self-efficacy for managing temporomandibular disorders (TMD) and to determine whether scores on this measure were related to pain, disability, and psychological distress in patients with chronic TMD pain.* ***Methods:*** *Patients seeking treatment for chronic TMD pain (n = 156, 87% female, mean age = 37 years) completed measures assessing pain, disability, mental health, pain-coping strategies, and self-efficacy for managing their pain.* ***Results:*** *The self-efficacy measure, which was adapted from arthritis research, demonstrated good psychometric characteristics (Cronbach's alpha = 0.91, minimal floor and ceiling effects, and validity). Greater self-efficacy was associated with significantly (*P *< .05) lower levels of pain, disability, and psychological distress. Self-efficacy remained significantly associated with disability and mental health measures even after controlling for demographic variables and pain intensity. In addition, patients with higher self-efficacy reported significantly (*P *< .05) greater use of an active, adaptive chronic pain-coping strategy (task persistence) and less use of a passive, maladaptive chronic pain-coping strategy (rest).* ***Conclusion:*** *Self-efficacy for managing pain appears to be important in the adjustment of patients with chronic TMD pain. Research is needed to determine whether treatments designed to increase self-efficacy improve TMD patient outcomes.*
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Key words: chronic pain, coping strategies, disability, self-efficacy, temporomandibular disorders

Temporomandibular disorders (TMD) are the most common type of facial pain problem,[1] affecting an estimated 10% to 12% of the population.[1–3] Typically, individuals with these disorders report pain in the temporomandibular joint (TMJ) and/or masticatory muscles and may exhibit a limited range of mandibular motion or sounds of the TMJ during jaw movements such as speaking or chewing.[1] Patients with chronic TMD pain show levels of pain intensity and depression similar to those observed among patients with other chronic pain problems, such as back and headache pain.[4] Currently, empirically-based treatment guidelines are lacking for TMD.

Although the etiologies of the most common forms of chronic TMD pain remain poorly understood,[5] considerable evidence supports the importance of psychosocial factors in relation to clinical symptoms and adjustment. For example, depression, anxiety, and somatization have been found to be associated significantly and positively with pain intensity among patients with TMD pain.[6,7] Evidence also points to a relationship between patient beliefs, such as perceived control over pain and belief that pain is a signal of damage, and patient physical and psychological functioning.[8] Furthermore, the efficacy of dental and behavioral treatments for TMD can be enhanced by interventions that target dysfunctional patient cognitions.[9–11] These studies highlight the need for further examination of cognitive variables that may play a role in pain and disability in TMD patients.

One cognitive variable that has received very little attention in the TMD literature is self-efficacy for managing pain. Self-efficacy refers to individuals' sense of personal efficacy to exert control over phenomena that affect their lives.[12] With respect to chronic pain, self-efficacy may be conceptualized as individuals' beliefs that they can exercise control over their pain or related problems; for example, belief that one can successfully use strategies to manage pain and pain-related disability and distress.

Based on Bandura's work,[12] Lorig and colleagues[13] developed a measure to assess self-efficacy to manage arthritis pain and related symptoms (the Arthritis Self-Efficacy Scale). They reported that higher scores predicted lower pain, disability, and depression after an arthritis self-management treatment program. Other studies have found self-efficacy for pain management to be related negatively to pain intensity, disability, and negative mood among patients with arthritis[14–18] as well as among patients with other chronic pain conditions. For example, higher self-efficacy was associated with less pain-related disability and depression in samples of patients with diverse chronic pain conditions,[19–21] fibromyalgia,[22] and chronic musculoskeletal pain.[23] Additionally, greater self-efficacy was associated with lower pain intensity among patients with cancer pain,[24] low-back pain,[24] and sickle cell disease[25] and with lower pain-related activity interference among patients with chronic low-back pain.[24] This body of research points to the potential fruitfulness of examining whether self-efficacy for managing pain is associated with pain, disability, and psychological distress among patients with TMD pain.

Bandura's social cognitive theory posits that self-efficacy is a major determinant of an individual's thoughts, feelings, and behaviors in stressful situations and influences the ability to cope successfully with challenges.[12] Thus, self-efficacy may also play an important role in how people cope with their pain. Specifically, Bandura proposed that individuals who believe they can alleviate their pain are likely to use pain-coping skills that they have learned and to persevere in their coping efforts.[12] Therefore, it can be hypothesized that people with higher self-efficacy to manage pain are more likely to engage and persist in adaptive pain coping strategies which, in turn, may relate to better adjustment to chronic pain.[26]

Much research has examined the relationship of chronic pain-coping strategy use to patient outcomes such as pain intensity, psychological distress, and disability. Many researchers have found it useful to distinguish between active and passive pain coping strategies. Active pain-coping strategies reflect efforts to manage pain through one's own resources.[27] Active pain-coping strategies such as task persistence, exercise, and attention diversion have been found to be associated with less pain, psychological distress, and physical disability[17,28–33] across different chronic pain conditions, and therefore are viewed as adaptive. Coping that reflects patient-perceived helplessness in controlling pain or reliance on others is labeled passive coping.[27,28,31] Passive chronic pain-coping strategies such as resting and guarding have been found to be associated with worse outcomes and thus are regarded as maladaptive.[17,28–38]

Consistent with the prediction that people with higher self-efficacy to manage pain are more likely to engage in adaptive coping, which in turn may relate to better adjustment, self-efficacy has been found to be related to both coping strategy use and adjustment among patients with chronic pain. For instance, French et al[39] reported that greater pain self-efficacy was associated positively with the use of active coping strategies to manage headaches. Similarly, several studies have found that rheumatoid arthritis patients with greater general self-efficacy were more likely to use active pain-coping strategies and that patients with lower self-efficacy were more likely to use passive strategies.[17,18,28] Furthermore, passive coping predicted poorer outcomes and active coping predicted better outcomes 6 months later, even after controlling for baseline outcome measure scores.[28]

In sum, research supports the association of self-efficacy with pain and functioning as well as with greater use of active, adaptive pain coping and less use of passive, maladaptive coping in a variety of chronic pain patient populations. However, the authors were unable to identify any studies of self-efficacy among patients with chronic TMD pain, although 1 review article called for a measure of TMD self-efficacy and for studies investigating the role of self-efficacy in TMD.[40] Therefore, the objective of this study was to examine the psychometric characteristics of a measure of self-efficacy for managing TMD and to determine whether scores on this measure were related to pain, disability, and psychological distress in patients with chronic TMD pain. The following hypotheses were tested:

1. Self-efficacy will be associated significantly and negatively with pain, disability, and psychological distress.
2. Even after approaches are incorporated to control for pain intensity, the associations of self-efficacy with disability and psychological distress will remain statistically significant.
3. Higher self-efficacy will be associated with greater use of task persistence, an active, adaptive chronic pain-coping strategy, and with less use of rest, a passive, maladaptive chronic pain-coping strategy.

Materials and Methods

Participants

Study participants were recruited from patients seeking treatment at the University of Washington TMD clinic and enrolled in a randomized clinical trial (RCT) comparing usual care in the clinic plus either a self-care manual or 4 cognitive-behavioral pain management training sessions. All data in this report were collected during the study baseline phase, before participants were randomized to study treatment condition. To be included in the study, patients had to *(1)* be at least 18 years old; *(2)* be diagnosed with a Research Diagnostic Criteria/Temporomandibular Disorders (RDC/TMD) Axis I TMD pain diagnosis[41] as determined by an oral medicine specialist based on a standardized RDC/TMD clinical examination; *(3)* live within a 2-hour drive of the TMD clinic (due to the RCT protocol requirement of multiple visits to the clinic); *(4)* have experienced TMD pain for at least 3 months; *(5)* have pain-related disability, as defined by a Chronic Pain Grade[42] of II high (high pain and low pain-related disability), III (moderate disability), or IV (severe disability); and *(6)* be able to communicate in English. Study exclusion criteria were: need for further diagnostic evaluation, pending litigation or disability compensation for pain, current or prior participation in cognitive-behavioral therapy for pain, and major medical or psychiatric conditions that would interfere with ability to participate (eg, psychosis, indications for surgical treatment, major medical illness, active suicidal ideation, current alcohol or other substance dependence or abuse). The study was approved by the University of Washington institutional review board, and all study participants provided written informed consent.

Among the 366 patients approached for the study and found to be eligible, 158 (43%) enrolled and 208 (57%) declined to participate. Time constraints were the most frequently cited reasons for nonparticipation. Two participants were subsequently withdrawn from the study for psychiatric reasons, leaving a sample of 156. The 156 study participants did not differ significantly from the 208 study refusers in gender, race (Caucasian versus other), RDC/TMD Axis I TMD pain diagnosis, education, facial pain intensity, or pain-related activity interference, as assessed by *t* tests and chi-square tests. However, study refusers were somewhat older than study participants on average (mean ± SD 39.6 ± 12.5 years versus 37.0 ± 11.4 years, respectively; $P = .04$).

Among the 156 study participants, the mean age was 37 years (SD = 11; range, 18 to 68 years) and 87% were female. This is consistent with the well-known predominance of women among patients with TMD pain.[43] Participants had experienced their current facial pain for a median of 60 months (range, 2 months to 46 years). Ethnic/racial group was reported to be Caucasian by 81%, Asian or Pacific Islander by 5%, Hispanic by 7%, American or Alaskan Native by 1%, African-American by 1%, and another category (mixed or other) by 5%. Highest level of education was reported to be some high school by 4%, high school completion by 17%, some college by 42%, college completion by 22%, and postgraduate by 15%. Forty-seven percent were married; 33% had never been married; and 20% were divorced, separated, or widowed.

Measures

Study participants completed a baseline questionnaire that included questions about sociodemographic variables (age, race, ethnicity, gender, marital status, education) and pain duration. Participants also completed a number of standardized measures at baseline.

Self-Efficacy. To assess TMD self-efficacy, the 8-item Arthritis Self-Efficacy Scale[44,45] was used. The scale was modified by replacing the word "arthritis" with the words "facial pain." This Arthritis Self-Efficacy Scale was found previously to have high internal consistency (Cronbach's alpha = 0.95), adequate test-retest reliability (0.69), and validity.[44] On this measure, patients are asked to answer on scales numbered from 0 (very uncertain) to 10 (very certain) the following questions, each with the stem, "How certain are you that you can...":

- Decrease your pain quite a bit
- Keep facial pain from interfering with your sleep
- Keep the physical discomfort of your facial pain from interfering with the things you want to do
- Regulate your activity so as to be active without aggravating your facial pain
- Keep the fatigue caused by your facial pain from interfering with the things you want to do
- Do something to help yourself feel better if you are feeling blue
- Manage facial pain during your daily activities, as compared with other people with facial pain like yours
- Deal with the frustration of facial pain

Scores for the scale are reported as the mean of the 8 ratings.

Facial Pain Intensity. Characteristic pain intensity was calculated by averaging 0-to-10 ratings of current pain and average and worst facial pain in the past month in response to questions from the Graded Chronic Pain Scale (GCPS), which has been validated and shown to have good psychometric properties.[42,46,47] Composite ratings created by averaging multiple pain intensity ratings tend to be more stable than single pain ratings.[48]

Pain-Related Disability. Three types of disability were assessed. The pain-related disability score of the GCPS[46] was used to assess facial pain-related interference with customary daily activities. This score is calculated by averaging 0-to-10 ratings of facial pain-related interference with daily activities, work/housework activities, and recreational/social activities in the past month. Higher scores indicate greater activity interference. The pain-related disability score has good internal consistency (Cronbach's alpha = 0.89), test-retest reliability (0.85 over a 1- to 2-week interval), and validity, as evidenced by associations with other measures of disability.[46,49]

In addition to this TMD-specific disability measure, 2 well-known generic disability measures were also administered. Study participants completed the Short Form-36 (SF-36);[50] for this study, the Physical Functioning (PF) and Role-Physical (RP) scales were used. The PF scale assesses health-related limitations in physical functioning (eg, walking, stair climbing) and the RP scale assesses limitations in customary role activities (eg, working) due to physical health problems. On both scales, lower scores indicate greater disability.

Mental Health. Two measures of psychological functioning were examined. The 21-item Beck Depression Inventory (BDI)[51] was used to assess depressive symptom severity. The BDI has been shown to have high internal consistency, adequate test-retest reliability, and validity,[52] and to be a valid screening instrument for depression among patients with chronic pain.[53–55] Higher scores indicate greater depressive symptom severity. The SF-36 Mental Health (MH) scale was also used. High scores on the scale indicate psychological well-being, and low scores indicate psychological distress.[50]

Coping Strategy Use and Coping Efficacy. To limit subject burden, only 4 subscales of the Chronic Pain Coping Inventory (CPCI)[30] were administered to patients to assess use of specific types of pain-coping strategies. Three of these subscales are thought to reflect active, adaptive coping (Task Persistence, Coping Self-Statements, and Relaxation) and 1 of these scales reflects passive, maladaptive coping (Rest). A review of the literature, however, led to the decision to focus on only 2 subscales, Task Persistence and Rest, for this report. These 2 subscales have been demonstrated in previous research to be associated with important pain-related outcomes.[29,30,33] In contrast, several studies have found no significant relationships between patient outcomes and the CPCI Coping Self-Statements[29,30,33,36,56] and Relaxation[29,30,32,33] scales. Items on each scale ask respondents to indicate the number of days in the past week they used the specific type of coping strategy. Scale scores are calculated by averaging the responses to items on each scale. The CPCI Task Persistence and Rest scales have demonstrated acceptable internal consistency, test-retest reliability, and concurrent validity.[30]

In order to assess the validity of the TMD Self-Efficacy Scale, several measures of perceived pain-coping efficacy were also administered. These included 2 questions from the Coping Strategies Questionnaire (CSQ)[57] that ask patients to rate on 0-to-6 scales their ability to control and to decrease their pain. In the present sample, these 2 items were moderately correlated (r = 0.55). Because the size of this coefficient indicates a substantial amount of unshared variance, these items were analyzed separately. The 10-item Survey of Pain Attitudes (SOPA)[58] Control scale was also administered to assess patient beliefs that they can control their pain (sample items: "I have learned to control my pain," "There are many times when I can influence the amount of pain I feel"). The scale has acceptable internal consistency.[58]

Table 1 Scores on Study Measures of 156 Patients with Chronic TMD Pain

Measure (possible range)	Mean	SD
Self-efficacy and related constructs		
TMD Self-Efficacy (0–10)	4.9	2.1
SOPA-Control (0–4)	1.8	0.7
CSQ-control pain (0–6)	2.3	1.1
CSQ-decrease pain (0–6)	2.2	1.1
Characteristic pain intensity (0–10)	6.8	1.7
Disability		
GCPS Pain-related Disability (0–10)	4.8	2.4
SF-36 PF (0–100)	72.8	24.4
SF-36 RP (0–100)	35.3	37.4
Mental health		
BDI (0–63)	14.6	8.5
SF-36 MH (0–100)	58.3	20.4
Coping strategies		
Task Persistence (0–7)	4.2	1.8
Rest (0–7)	3.2	1.7

Statistical Analysis

To describe the sample's scores on the study measures, the means and standard deviations (SDs) were calculated. To evaluate the TMD Self-Efficacy Scale's psychometric characteristics, the percentage of the sample who achieved the lowest and highest possible scores was calculated in order to assess possible floor or ceiling effects. Such effects are problematic because decreases and increases cannot be detected at future assessments. To assess internal consistency, Cronbach's alpha was calculated. Convergent validity[59] was assessed by calculating Pearson correlation coefficients between the TMD Self-Efficacy Scale and other measures related to the construct of self-efficacy for controlling pain (the SOPA Control scale and the CSQ coping efficacy ratings).

To test the hypothesis that self-efficacy was associated with pain, disability, and mental health, Pearson correlation coefficients were calculated between the TMD Self-Efficacy Scale and measures of these constructs. Separate linear regression models were then constructed to assess the association of self-efficacy with each outcome measure. Age, gender, and pain duration were controlled for, because each of these variables potentially may affect these outcomes. Pain duration was positively skewed; therefore, a square root transformation was used for this variable in all analyses. The partial R^2, or squared semi-partial correlation coefficient, was calculated for self-efficacy to determine its unique contribution to each outcome measure beyond that of the other independent variables in the model. To test the hypothesis that self-efficacy would be associated significantly with disability and mental health even after controlling for pain intensity, the linear regression analyses were repeated for the measures of disability and mental health and controlled for characteristic pain intensity in addition to age, gender, and pain duration.

To examine the relationships between self-efficacy and coping, Pearson correlation coefficients were first calculated to examine the bivariate associations. Linear regression models predicting each coping strategy from self-efficacy scores, similar to the models constructed for the disability and mental health measures, were then calculated. A P value of < .05 was considered to indicate statistical significance in all analyses.

Results

Patient Characteristics

For descriptive purposes, scores on the study measures are summarized in Table 1. In general, the patient sample was characterized by moderate to severe pain and moderate pain-related disability. The mean score on the SF-36 PF scale was slightly above the 25th percentile score (70) in the US general population normative sample.[50] Mean scores on the SF-36 RP and MH scales were below the

Table 2 Associations of Self-Efficacy with Pain Intensity, Disability, and Mental Health Measures (Linear Regression Results)

Independent variable	Outcome measure: Pain intensity	Pain-related disability	SF-36 PF	SF-36 RP	SF-36 MH	BDI
Age§	–0.01	–0.02	–0.49**	–0.50	0.14	–0.05
Gender†§	0.37	–0.03	–5.54	–8.66	1.43	1.56
Pain duration‡§	0.05	0.24	–3.83**	–0.10	–0.89	0.41
Self-efficacy§	–0.26***	–0.45***	2.54**	3.29*	2.94***	–1.26***
Self-efficacy partial R^2	0.10	0.15	0.05	0.03	0.09	0.09
Model R^2	0.10	0.17	0.17	0.06	0.10	0.10

†Reference = males.
‡ Pain duration was square root transformed to normalize distribution.
§ Unstandardized regression coefficient B.
* $P < .05$.
** $P < .01$.
*** $P < .001$.

25th percentile score (50 for RP and 64 for MH) in the US general population normative sample.[50] The mean score on the BDI corresponded to a moderate level of depressive symptom severity.[60] These findings indicate a moderate to high level of physical and psychosocial dysfunction on average in the study sample, consistent with the study inclusion criteria requiring high pain or pain-related disability.

Psychometric Characteristics of the TMD Self-Efficacy Scale

The TMD Self-Efficacy Scale scores showed a normal distribution with a mean score at approximately the midpoint of the scale. The scale had minimal floor effects (1.3%) and no ceiling effects (no participants achieved the highest possible score) in this sample. Internal consistency was excellent (Cronbach's alpha = 0.91). Support for convergent validity came from statistically significant associations with measures of similar constructs, which reflected good correspondence between self-efficacy and belief in one's ability to control and decrease pain (SOPA Control scale, r = 0.54, $P < .001$; CSQ ability to control pain, r = 0.58, $P < .001$; and CSQ ability to decrease pain, r = 0.48, $P < .001$).

Associations Between the TMD Self-Efficacy Scale and Pain, Disability, and Mental Health

The Self-Efficacy Scale was associated significantly with each of the pain, disability, and mental health measures in the hypothesized directions (characteristic pain intensity, r = –0.31; pain-related disability, r = –0.38; SF-36 RP, r = 0.17; SF-36 PF, r = 0.20; SF-36 MH, r = 0.30; BDI, r = –0.30; $P < .05$ for all). Table 2 shows the results of the regression models examining the associations of self-efficacy with measures of pain intensity, disability, and mental health. When adjustments were made for age, gender, and pain duration, higher self-efficacy scores were associated significantly with lower characteristic pain intensity and facial pain-related disability, and with better physical functioning, physical health-related role functioning, and mental health, as indicated by both SF-36 MH scores and BDI scores. Self-efficacy uniquely explained between 3% (SF-RP score) and 15% (pain-related disability score) of the variance in the outcome measures after controlling for age, gender, and pain duration.

Table 3 shows the results of the linear regression models examining the associations of self-efficacy with measures of disability and mental health, controlling for pain intensity as well as the demographic variables and pain duration. Self-efficacy continued to explain significant unique amounts of variance in the outcome measures (range, 3% of SF-36 RP scores to 10% of BDI scores).

Associations Between Self-Efficacy and Coping Strategies

Supporting the hypotheses, bivariate analyses showed higher levels of self-efficacy to be associated with significantly greater use of task persistence (r = 0.22, P = .007) and significantly less use of rest (r = –0.17, P = .03) as pain-coping strategies. Table 4 shows the results of the linear regression models examining the associations of self-efficacy with each coping strategy. Adjusting for gender, age, and pain duration, higher self-efficacy was related to significantly greater use of task per-

Table 3 Associations of Self-Efficacy with Disability and Mental Health Measures, Adjusting for Pain Intensity (Linear Regression Results)

Independent variable	Outcome measure				
	Pain-related disability	SF-36 PF	SF-36 RP	SF-36 MH	BDI
Age§	–0.02	–0.50**	–0.51	0.15	–0.05
Gender†§	–0.23	–5.41	–8.34	1.04	1.68
Pain duration‡§	0.21	–3.81**	–0.06	–0.94	0.42
Pain intensity§	0.55***	–0.35	–0.88	1.05	–0.34
Self-efficacy§	–0.31***	2.45**	3.07*	3.21***	–1.35***
Self-efficacy partial R^2	0.06	0.04	0.03	0.09	0.10
Model R^2	0.30	0.17	0.06	0.11	0.11

† Reference = males.
‡ Pain duration was square root transformed to normalize distribution.
§ Unstandardized regression coefficient B.
* $P < .05$.
** $P < .01$.
*** $P < .001$.

Table 4 Associations of Self-Efficacy with Active and Passive Coping Strategies (Linear Regression Results)

Independent variable	Coping measure	
	Task Persistence	Rest
Gender†§	–0.17	1.15**
Age§	–0.01	–0.03*
Pain duration‡fl§	0.01	0.02
Self-efficacy §	0.19**	–0.15*
Self-efficacy partial R^2	0.05	0.03
Model R^2	0.05	0.11

† Reference = males.
‡ Pain duration was square root transformed to normalize distribution.
§ Unstandardized regression coefficient B.
* $P < .05$.
** $P < .01$.

sistence and significantly less use of rest. After also controlling for pain intensity (results not shown in Table 4), self-efficacy was still significantly associated with task persistence (B = 0.15, $P = .04$), but it was no longer significantly associated with rest (B = –0.11, $P = .10$). Controlling for pain intensity decreased the amount of variance explained by self-efficacy from 5% to 3% in task persistence scores and from 3% to 2% in rest scores.

Discussion

We have recently reported that TMD patients use a variety of coping strategies to contend with their daily pain,[61] but this is the first study, to the authors' knowledge, to examine the association of self-efficacy with pain and physical and psychosocial functioning in patients with chronic TMD pain. The 8-item Arthritis Self-Efficacy Scale, modified for use with patients with TMD pain, showed excellent psychometric characteristics, including high internal consistency, minimal floor and ceiling effects, and acceptable validity. Scores on this scale were associated significantly, and in the hypothesized directions, with measures of perceived ability to control pain, pain intensity, TMD pain-related and general health-related disability, and mental health. Moreover, the results supported the hypotheses that self-efficacy would remain significantly related to patient physical and psychological functioning even after controlling for age, gender, pain duration, and pain intensity. This suggests that, among patients with comparable levels of pain severity and duration, those with greater self-efficacy for managing their TMD have better psychological adjustment and less disability. These findings also suggest that the self-efficacy measure and patient ratings of the intensity of their pain, although related, reflect distinct constructs.

The extent of the relationship with self-efficacy varied across the outcome measures examined. Self-efficacy uniquely explained a sizable amount of the variance in pain-related disability (15%), pain intensity (10%), and mental health (9%), but only modest amounts of variance in the generic measures of physical functioning and role limitations due to physical health. The smaller amount of variance accounted for by self-efficacy in these scales may reflect the fact that the activities assessed by the SF-36 RP and PF scales (eg, climbing stairs, walking) may be less affected by facial pain. Controlling for pain intensity did not change the size of the association of self-efficacy with the generic mental health, physical functioning, and role limitations measures, but it did reduce the amount of unique explained variance in pain-related disability. Nonetheless, the fact that self-efficacy explained an additional 6% of the variance in the measure of pain-related disability even after controlling for age, gender, pain duration, and pain intensity points to the potential value of further research examining the role of self-efficacy in patient adjustment to chronic TMD pain.

The findings also supported the hypothesis that patients with higher self-efficacy would report less use of rest and greater use of task persistence, suggesting that those with higher self-efficacy cope with their pain more adaptively. However, these associations were fairly modest in size, with self-efficacy explaining 3% to 5% of the variance in the coping strategies. Furthermore, the relationship between self-efficacy and rest was no longer statistically significant after pain intensity was controlled for, suggesting the importance of pain level in accounting for this association. Further research is needed to assess the association of self-efficacy for managing TMD with other pain-coping strategies, and to examine the extent to which coping may mediate the relationship between self-efficacy and patient outcomes.

Other studies of patients with chronic pain problems have shown that individuals' self-efficacy for managing their pain is not a static trait but one that can be increased through cognitive-behavioral and self-management treatments.[62–64] Increasing self-efficacy has also been shown to be associated with decreases in pain level and enhanced patient functioning.[13,16,64] Longitudinal studies are now needed to determine whether self-efficacy can be increased through cognitive-behavioral and self-management treatment programs for TMD pain, and if so, whether such increases are associated with short- and long-term improvement in pain and other important outcomes, as well as with changes in coping strategy use.

Study limitations include the correlational design and the possibility of sample self-selection bias. Only 43% of patients approached to participate in the larger RCT agreed to enroll, and study participants were somewhat younger than nonparticipants. However, age and other potentially important confounding variables were adjusted for in the study analyses, and study participants and nonparticipants did not differ in pain or pain-related disability. Further research is needed to examine the generalizability of the study findings to other populations of individuals with TMD pain as well as to populations of patients with other chronic pain problems.

Overall, these findings suggest that self-efficacy is an important construct associated with pain and quality of life outcomes among patients with chronic TMD pain, as has been found for patients with other chronic pain problems. Rapid assessment of self-efficacy is possible in the clinical setting with the brief (8-item) measure used in the present study. Patients in need of more confidence in their ability to manage their TMD pain may benefit from referral to cognitive-behavioral treatment programs. Patient participation in cognitive-behavioral treatment in conjunction with dental treatment may lead to enhanced compliance with dental self-care strategies as well as use of newly learned cognitive and behavioral pain-coping strategies, which may in turn lead to improved outcomes. Further research is needed to test these possibilities.

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