

# The Relationships Between Psychosocial Factors and Short-Term Treatment Outcomes of Massage Therapy in Patients with Myogenic Temporomandibular Disorders: A Single-Arm Preliminary Study

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**Background:** Massage therapy is included as part of a comprehensive treatment plan for patients with temporomandibular disorders (TMDs). However, it displayed varying degrees of success. Pre-existing psychosocial impairments may be one of the possible factors affecting the treatment response. This preliminary study aimed to investigate the relationships between psychological factors and treatment outcomes of massage therapy in myogenous TMD patients.

**Methods:** Twenty-two myogenous TMD patients were enrolled in this single-arm preliminary study. Baseline psychosocial assessment was done using self-report measures associated with chronic pain severity, depression, anxiety, and non-specific physical symptoms. Massage therapy including the intraoral and extraoral massage of the face and neck muscles was performed twice a week for 4 weeks. Pain intensity and quality of life related to oral health were evaluated as treatment outcomes before and immediately after eight sessions of massage therapy.

**Results:** Regression analyses showed a significant effect of depression on changes in the quality of life after massage ( $\beta = 0.35$ ,  $p$ -value = 0.026). In addition, results showed a significant effect of chronic pain severity on changes in the pain intensity following massage ( $\beta = 1.50$ ,  $p$ -value = 0.027).

**Conclusion:** Our findings suggested that psychosocial characteristics of myogenous TMD patients should be considered as important factors that may adversely affect pain intensity reduction and quality-of-life improvement after short-term massage therapy.

**KEYWORDS:** Massage therapy; temporomandibular disorders; psychosocial factors

## INTRODUCTION

Temporomandibular disorders (TMDs) are described as a set of musculoskeletal conditions involving the masticatory muscles, temporomandibular joints (TMJ), and associated structures.<sup>(1)</sup> TMDs are the most frequent cause of chronic orofacial pain condition of non-dental origin,<sup>(2)</sup> and are among the three most common chronic pain conditions, together with headache and backache.<sup>(3)</sup> The main characteristics of TMDs are pain and limitations of jaw opening<sup>(4)</sup> that may affect daily activities, resulting in lower quality of life.<sup>(5)</sup>

The multifactorial etiology of TMDs has been well accepted.<sup>(1)</sup> Therefore, the Research Diagnostic Criteria for TMD (RDC/TMD), the most widely employed diagnostic protocol for TMD, developed a dual-axis system.<sup>(6)</sup> Axis I assigns the

clinical TMD diagnosis based on physical signs and symptoms into three broad groups including: masticatory muscle disorders; joint disorders related to temporomandibular disc derangements; and joint disorders related to TMJ arthralgia, arthritis, and arthrosis. Axis II assesses psychosocial status and pain-related disability.

Manfredini et al. stated that TMDs of muscular origin are the most frequently diagnosed conditions, accounting for up to more than half the patient cases attending TMD clinics throughout the world.<sup>(7)</sup> This group of patients is often compromised from a psychological, as well as a social viewpoint, showing high rates of chronic pain-related disability, depression, and non-specific physical (somatic) symptoms.<sup>(8)</sup> Researchers believed that the presence of psychosocial impairments in myogenous TMD patients is a challenging condition, since it affects treatment outcomes.<sup>(9,10)</sup> Notably, myogenous TMD patients experienced less pain reduction compared to patients presenting with joint problems and other TMD symptoms.<sup>(11,12)</sup> Moreover, several studies reported that pre-existing psychosocial deficits, such as somatic awareness and depression, represent risk factors for long-term persistence of TMD pain.<sup>(13-15)</sup> Additionally, depression and anxiety have been stated as important factors affecting the perception of pain.<sup>(16)</sup>

The aforementioned evidences clearly indicate that some factors (e.g., psychosocial) other than treatment modality may influence the treatment outcomes. Ignoring the affecting factors may be a reason why some patients with TMD do not respond to treatment interventions<sup>(16)</sup> and they have to receive different treatment modalities.<sup>(17)</sup> Furthermore, a lack of attention to affecting factors on treatment outcomes in TMD patients may result in diversity in therapeutic options.<sup>(18)</sup> So a few studies strongly recommended any specific treatment strategy in TMD patients.<sup>(19)</sup> Therefore, investigating the factors affecting the treatment outcomes should at least be considered important as treatment modalities. To the best of our knowledge, the number of studies concerning the effects of psychosocial factors on the TMD treatment outcomes is scarce.<sup>(20)</sup>

Among various treatment modalities, massage therapy has been suggested as part of a comprehensive treatment plan for TMDs, particularly for those of myogenous origin.<sup>(21)</sup> This treatment could be

implemented by all clinicians (e.g., dentists, massage therapists, physical therapists, etc.) who are specifically trained.<sup>(22)</sup> Massaging the muscles of mastication has been stated as a useful method, given its positive effects on pain reduction, increase in joint mobility, elimination of adhesions among muscle fibers, increase in local circulation and overall relaxation, increase in the mandible range of motion, and reduction in the electromyography activity of the muscles.<sup>(23)</sup> Therefore, massage therapy, as a conservative treatment, is considered the first-choice treatment modality for TMDs due to its low risk of side effects and high benefit-to-risk ratio.<sup>(24,25)</sup> However, research that address the effectiveness of massage therapy on TMDs have stated varying degrees of success.<sup>(22,26-28)</sup> It seems that investigating factors influencing the treatment response after massage therapy may be helpful in TMD patients.

Therefore, the aim of this preliminary study was to investigate the relationships between psychological factors and treatment outcomes of massage therapy in myogenous TMD patients. We hypothesized that a severe grade of disability related to pain, depression, anxiety, and non-specific physical symptoms would be associated with lower clinical outcomes of massage therapy in TMD patients. Knowledge of psychosocial factors associated with treatment outcomes of a specific intervention such as massage therapy could support a more personalized management approach and facilitate clinical decision-making.

## MATERIALS AND METHODS

This was a single-arm preliminary study. Subjects were selected by convenience sampling. The sample size was estimated based on previous related study (outcome measure: pain) with the power of 80% ( $\beta = 0.2$ ) and  $\alpha = 0.05$ .<sup>(12)</sup> Twenty-two subjects, who were clinically diagnosed with bilateral myogenic pain, were needed to recruit in this study (see Figure 1 for a consolidated standards of reporting trials (CONSORT) diagram of patients' enrollment). Subjects were voluntarily recruited through social media announcements and the university clinics of dentistry. One expert dentist with more than 10 years of experience in the management of patients with TMD confirmed myogenic TMD diagnosis according to the DC/TMD Axis I

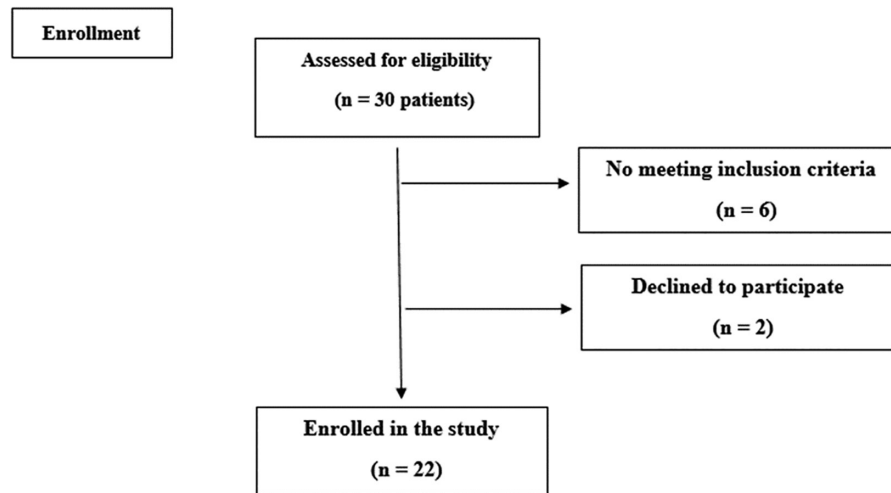


FIGURE 1. Consolidated standards of reporting trials (CONSORT) diagram of patients' enrollment.

using the Persian version of the protocol.<sup>(29)</sup> Myogenous TMD patients were enrolled based on the eligibility criteria such as age 18 through 65 years, Persian language fluency, and reporting untreated orofacial pain in the last 3 months. The exclusion criteria were history of TMJ surgery or injection, history of obstructive sleep apnea, pain due to systemic diseases (e.g., rheumatoid arthritis), pain due to whiplash-associated disorders, pregnancy, fibromyalgia, local skin infection over the myofascial region muscles, symptoms related to disease in the other parts of the stomatognathic system (e.g., toothache, neuralgia), and receiving another intervention for TMD (pharmacology, oral appliance, and others) throughout the duration of the study.

This study was performed according to the ethical recommendations approved by the university's institutional review board (IR.AJUMS.REC.1399.185). All patients were informed about the study and gave their written consent to participate.

### Psychosocial Assessment

Prior to treatment, baseline evaluation of some psychosocial criteria recommended by DC/TMD Axis II was performed for detecting the participants' psychosocial status and then determining the relationships between psychosocial status and change in values of treatment outcome measures.<sup>(30)</sup> Assessment was done using self-report measures associated with chronic pain severity, depression, anxiety, and non-specific physical symptoms. Patients filled in the Persian versions of the Graded Chronic Pain Scale (GCPS),

Beck Depression Inventory-II (BDI-II), Beck Anxiety Inventory (BAI), and Patient Health Questionnaire-15 (PHQ-15).

The GCPS is a short, reliable, and valid instrument that provides a quantitative index integrating perceived pain intensity and the extent to which pain is psychosocially disabling.<sup>(31)</sup> The GCPS categorizes patients into five levels as follows: grade 0, no pain or disability; grade I, low-intensity pain and no or low disability; grade II, high-intensity pain and no or low disability; grade III, high-intensity pain and moderately limiting disability; and grade IV, high-intensity pain and severely limiting disability.<sup>(32)</sup> Sufficient psychometric properties have been found for the Persian version of the GCPS instrument.<sup>(33)</sup>

The BDI-II consists of 21 self-reported items evaluated on a 4-point Likert scale (0–3) to measure the severity of depressive symptoms. The total BDI score is considered key to determine the depression severity. Therefore, higher total BDI scores indicate more severe depressive symptoms. The standard cut-off scores for each level were: 0–9, normal; 10–18, mild depression; 19–29, moderate depression; 30–63, severe depression.<sup>(34)</sup> The validity and reliability of the Persian version of the BDI-II have been confirmed.<sup>(35)</sup>

The BAI consists of 21 self-reported items evaluated on a 4-point Likert scale (0–3) to assess the intensity of anxiety symptoms during the past week (score range, 0–63). The standard cut-off scores for each level were: normal, 0–7; mild, 8–15; moderate, 16–25; and severe, 26–63. Higher total BAI scores and levels indicate more severe anxiety symptoms.<sup>(34)</sup> The validity and

reliability of Persian version of the BAI have been verified.<sup>(36)</sup>

The PHQ-15 is a widely used and validated screening instrument for assessing non-specific physical symptoms (presence of somatization).<sup>(37)</sup> It parallels the somatization scale of Axis II in the DC/TMD with respect to construct and clinical utility.<sup>(6)</sup> It consists of 15 items. Each question is scored on a 3-point response scale ranging from 0 (not bothered at all) to 2 (bothered a lot). Total sum scores of 5, 10, and 15 serve as cut-points for mild, moderate, and high somatic symptoms, correspondingly.<sup>(38)</sup> The PHQ-15 questionnaire has been translated and validated into Persian language and presented adequate metric properties.<sup>(39)</sup>

### Treatment Procedures

Massage therapy was performed by a trained researcher with more than 5 years of experience in this field. Treatment was performed twice a week for 4 weeks with at least a 48-h break between sessions. In order to minimize or eliminate the myofascial pain of the stomatognathic system, a total number of eight massage therapy sessions was recommended in previous studies.<sup>(40-42)</sup> Therefore, in this study each patient received eight massage therapy sessions. The duration of each session was approximately 45 min. Treatment included intraoral and extraoral massage of the face and neck muscles. The massaging method used in this study was based on the “therapeutic protocol” of the study conducted by Miernik et al.<sup>(40)</sup> During each session, several techniques of massage such as effleurage, kneading, trigger points release, and stretching were applied on the masticatory muscles. Treatment began with effleurage aiming to warm up the muscles and to relax them before the intraoral massage. Effleurage was soothing, stroking movements along the fibers of the masseter and temporalis muscles. It was used at the beginning and the end of each session. The next phase was kneading on the masseter and temporalis muscles. So, the skin and its underlying tissues were moved in a circular, rotating motion. The next step was trigger points release. Release is defined as pressing trigger points on the course of the muscle with a fingertip, and gradually increasing the pressure until the patient feels no pain. After trigger points release, stretching of the masseter muscles was performed by pulling the muscle along the

pass of its fibers. In addition, the intraoral massage of the masseter was done while the therapist placed her gloved fingers into the patient's open mouth between the cheek and the molars and applied pressure and created a pincer-like compression.<sup>(43)</sup>

Massage was then performed on the neck muscles for approximately 15 min, including muscle release and stretching of the upper trapezius, scalenes, sternocleidomastoid (SCM), cervical erector spinae, and the pectoralis major muscles and surrounding fascia. Additionally, picking up and twisting techniques were used on the SCM and upper trapezius muscles for releasing the trigger points.<sup>(44)</sup>

### Treatment Outcome Measures

In this study, pain intensity and quality of life related to oral health were selected as treatment outcomes that were measured before and immediately after 4 weeks of massage therapy. The pain intensity was calculated using the numeric rating scale (NRS), which consists of a grading scale from 0 to 10, where 0 means no pain at the moment and 10 is the worst pain imaginable.<sup>(45)</sup> The Oral Health Impact Profile-14 (OHIP-14) was another instrument that was completed by participants for assessing the quality of life related to oral health. Responses to OHIP-14 are scored with a 5-point Likert-type scale. In OHIP-14, the total score varies from 0 as the minimum to 56 as the maximum. It is interpreted that, as the total score of OHIP-14 increases, quality of life related to oral health decreases, and the severity of the problem increases.<sup>(46)</sup> The Persian version of the OHIP-14 questionnaire has been reported to be a valid and reliable measurement tool.<sup>(47)</sup>

### Statistical Analyses

Statistical analyses were completed with SPSS (version 22.0). The Kolmogorov-Smirnov test was performed to verify the data distribution. This confirmed the normal data distribution. Paired *t*-test was used to compare values of NRS and OHIP-14 before and after 4 weeks of massage therapy. A linear regression model was used to assess the relationships between depression, anxiety, and non-specific physical symptoms and mean difference (i.e., value of after 4 weeks of massaging minus before value) of NRS and OHIP-14. A *p*-value <0.05 was considered statistically significant.

**RESULTS**

Twenty-two subjects (7 males, 15 females) participated in this study. Demographic and psychosocial characteristics of subjects are displayed in Table 1. Distribution frequencies of GCPS were as follows: 10 patients with GCPS grade I and 12 patients with GCPS grade II. According to the correlation analysis, depression score was significantly associated with the mean difference value

TABLE 1. Demographic and Psychosocial Characteristics of Participants (n = 22)

Study Variables	Mean ± SD
Age (years)	30.12 ± 59.43
Height (cm)	165.06 ± 8.72
Weight (kg)	72.46 ± 8.06
BDI-II	15.77 ± 10.41
Normal (n = 9, 40.9%)	
Mild (n = 5, 22.72%)	
Moderate (n = 3, 13.63%)	
Sever (n = 5, 22.72%)	
BAI	16.40 ± 13.36
Normal (n = 8, 36.36%)	
Mild (n = 5, 22.72%)	
Moderate (n = 2, 9.09%)	
Sever (n = 7, 31.81%)	
PHQ-15	8.77 ± 5.95
Mild (n = 7, 31.81%)	
Moderate (n = 10, 45.45%)	
Severe (n = 5, 22.72%)	
Mean difference <sup>a</sup> of NRS	
Grade I GCPS (n = 10, 45.45%)	3.50 ± 1.51
Grade II GCPS (n = 12, 54.54%)	4.88 ± 1.25
Mean difference of OHIP-14	
Grade I GCPS (n = 10, 45.45%)	4.63 ± 1.74
Grade II GCPS (n = 12, 54.54%)	8.14 ± 2.91

BAI = Beck Anxiety Inventory; BDI-II = Beck Depression Inventory-II; GCPS = Graded Chronic Pain Scale; NRS = numeric rating scale; OHIP-14 = Oral Health Impact Profile-14; PHQ-15 = Patient Health Questionnaire-15; SD = standard deviation.

<sup>a</sup>Value of after 4 weeks of massaging minus before value.

TABLE 2. Correlation Analysis and Simple Regression Results for Psychosocial Scores and Mean Difference (Value of After 4 Weeks of Massaging Minus Before Value) of OHIP-14

Psychosocial Variables	Correlation Analysis		Regression Analysis		
	R	p-value	β	T	p-value
BDI-II	0.55	0.017*	0.35	2.51	0.026*
BAI	0.04	0.82	0.17	1.04	0.31
PHQ-15	0.24	0.32	0.12	0.30	0.76
GCPS	—	—	2.21	0.92	0.37

BAI = Beck Anxiety Inventory; BDI-II = Beck Depression Inventory-II; GCPS = Graded Chronic Pain Scale; OHIP-14 = Oral Health Impact Profile-14; PHQ-15 = Patient Health Questionnaire-15.

\*Significant p-values.

TABLE 3. Correlation Analysis and Simple Regression Results for Psychosocial Scores and Mean Difference (Value of After 4 Weeks of Massaging Minus Before Value) of NRS

Psychosocial Variables	Correlation Analysis		Regression Analysis		
	R	p-value	β	T	p-value
BDI-II	-0.01	0.96	0.006	0.16	0.87
BAI	-0.15	0.54	0.04	1.10	0.29
PHQ-15	-0.08	0.75	0.007	0.06	0.94
GCPS	—	—	1.50	2.47	0.027*

BAI = Beck Anxiety Inventory; BDI-II = Beck Depression Inventory-II; GCPS = Graded Chronic Pain Scale; NRS = numeric rating scale; PHQ-15 = Patient Health Questionnaire-15.

\*Significant p-values.

of OHIP-14 ( $R = 0.55$ ,  $p\text{-value} = 0.017$ ) (Table 2). No significant association was found between the other psychosocial factors and treatment outcomes. Regression analysis showed a significant effect of depression on the changes in the quality of life after massage ( $\beta = 0.35$ ,  $p\text{-value} = 0.026$ ) (Table 3) and a significant effect of chronic pain severity on the changes in pain intensity following massage ( $\beta = 1.50$ ,  $p\text{-value} = 0.027$ ) (Table 4). Additionally, the study results showed that there were significant differences between the mean scores and standard deviations (SDs) of NRS and OHIP-14 before and after 4 weeks of massage therapy ( $p\text{-value} < 0.001$ ) (Table 4).

TABLE 4. Results of Paired *t*-test Analysis of Treatment Outcomes

Treatment Outcomes	Before Treatment	After 4 Weeks of Treatment	<i>p</i> -value
NRS	6.04 ± 1.83	1.83 ± 1.65	<0.001*
OHIP-14	16.09 ± 9.85	9.94 ± 7.74	<0.001*

NRS = numeric rating scale; OHIP-14 = Oral Health Impact Profile-14.

\*Significant *p*-values in paired *t*-test.

## DISCUSSION

The present study is the first to investigate the relationships between psychological factors and treatment outcomes of massage therapy in myogenous TMD patients. Our findings confirmed the associations between psychosocial characteristics of TMD patients and treatment outcomes of massage therapy. The psychosocial profiles of patients negatively affected pain intensity reduction and quality-of-life improvement after eight sessions of massage therapy.

As a main finding, results highlighted that depressive symptoms in myogenous TMD patients were associated with changes in quality of life after eight sessions of massage therapy. So, more depressive symptoms in TMD patients reduced improvement in quality of life after massage therapy. Additionally, the study results showed that higher levels of chronic pain severity adversely affected changes in pain intensity after massage therapy sessions. However, our study could not find any significant association between other psychosocial factors including anxiety and non-specific physical symptoms and massage therapy treatment outcomes.

TMDs often become chronic and interfere with patients' daily habits, including chewing and eating. TMDs diminish patients' capacity to work and/or ability to interact with their social environment.<sup>(48)</sup> In fact, TMJ pain negatively affects patients' quality of life.<sup>(49)</sup> Previous research reported that quality of life in TMD patients is reduced compared to that in individuals without TMD.<sup>(48)</sup> Among the other psychosocial factors, depressive symptoms are known to have a considerable effect on patients' quality of life.<sup>(50)</sup> Depressive symptoms might affect how the person perceives pain and its associated disability.<sup>(50)</sup> Additionally, depressive symptoms

are associated with negative cognitive patterns.<sup>(51)</sup> Therefore, co-occurrence of depressive symptoms and TMD may even further decrease quality of life and affect treatment outcomes.

The role of psychosocial factors in treatment response has been investigated in a few number of TMD-related studies.<sup>(20)</sup> However, the DC/TMD Axis II indicated that identification of patients' psychosocial status was important in order to address them from the beginning of any intervention in an attempt to increase treatment success.<sup>(30)</sup> In other words, appropriate management of TMD requires an understanding of the underlying psychosocial characteristics of patients associated with the treatment modality. However, Steed et al. mentioned that measures of stress and psychosocial distress predicted initial perceived symptom levels but not treatment outcomes in patients with TMD.<sup>(52,53)</sup> Additionally, Nilsson et al. reported that depression and non-specific physical symptoms did not seem to influence the short-term efficacy of intraoral appliances.<sup>(54)</sup>

It is important to note that all of the study participants had no or low disability related to pain (GCPS grade I = 45.45% and grade II = 54.54%) based on GCPS severity classification. Moreover, participants revealed normal to moderate depression score in 77.28%, and normal to moderate anxiety score in 68.19% and normal to moderate somatic score in 77.28%. Hietaharju et al. stated that biopsychosocial symptoms such as depression, anxiety, and non-specific physical symptoms are more prevalent among TMD patients in GCPS grade III than among those in GCPS grade I and II.<sup>(32)</sup> Therefore, we speculate that in TMD patients with higher GCPS grade, strong associations may be found between psychosocial factors and massage therapy treatment outcomes. This hypothesis should be addressed in future research.

As an interesting finding, our results displayed that there was potential for massage therapy to have positive effects on the pain intensity and quality of life in myogenous TMD patients. Notably, changes in pain intensity observed in this study were greater than the amount of clinically meaningful changes considered for evaluating treatment effects on pain reduction in similar studies.<sup>(55-57)</sup> However, due to the study design and the absence of a control group, this finding should be cautiously interpreted. Regardless, these

findings are similar to those reported in other massage therapy-related research on TMD and other populations.<sup>(22,46)</sup> Although the exact mechanism for massage therapy positive responses is understudied in the literature, there are several prevalent theories. Tension in a tight muscle can directly cause pain by activating mechanosensitive pain receptors in the muscles as well as restricting blood flow, causing acute and local ischemia. The strokes and frictions applied during the massage are thought to promote muscle and connective tissue fiber relaxation. This would allow the fibers to release their tight association with neighboring fibers and to be realigned properly. In turn, the pain receptors would no longer be activated and blood flow would be promoted.<sup>(47)</sup> The pressure of therapeutic touch also provides a short-lived analgesic effect through the activation of subcutaneous mechanoreceptors. Once activated, these receptors block the signals from the pain receptors that arrive at the same spinal segment.<sup>(48,49)</sup> Another theory explains that the light touch of massage transiently reinforces an individual's existing discomfort and thus triggers a greater release of natural opiates such as  $\beta$ -endorphins. This in turn would mediate a more profound pain suppression which would promote greater ease of movement.<sup>(50)</sup> Regardless of the exact mechanism, improvement in pain and quality of life experienced by myogenous TMD patients after eight sessions of massage therapy is of great importance. These positive benefits offered through massage greatly assist TMD patients in their symptom management.

We acknowledge the following limitations that should be considered in future studies. Firstly, this study was performed in a few number of myogenous TMD patients. Further studies are needed to clarify the relationships between psychosocial factors and treatment outcomes of massage therapy in a large population of TMD patients. Secondly, only four psychosocial factors were assessed as basic characteristics of patients. It could be helpful to consider other aspects of psychosocial profiles of TMD patients. Thirdly, short-term treatment outcomes of massage therapy were investigated in myogenous TMD patients. Future studies need to investigate the associations between psychosocial factors and long-term treatment outcomes of this modality.

It is worth mentioning that although massage has been widely used in clinical practice, the associations between basic psychosocial factors of TMD patients and treatment outcomes were not completely clarified, yet. Therefore, despite study limitations, findings of this preliminary study could be helpful for providing insight to clinicians that clinical improvement does not only depend on treatment modality. Indeed, psychosocial factors may play a significant role in success of massage therapy in patients with TMD of myogenic origin. Such knowledge will lead to improved clinical and cost-effectiveness of rehabilitation.

### KEY FINDINGS

- The psychosocial profiles of patients negatively affect pain intensity reduction and quality-of-life improvement after short-term massage therapy.
- More depressive symptoms in TMD patients reduce improvement in quality of life after massage therapy.
- Higher levels of chronic pain severity adversely affect changes in pain intensity after massage therapy.

### CONCLUSION

Findings of the present study indicated that the psychosocial characteristics of myogenous TMD patients should be considered as important factors that adversely affect clinical improvement after short-term massage therapy. Therefore, psychosocial impairments, if present, should be identified early in the management of TMD patients, as failure to do so may result in unsuccessful treatment.

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### CONFLICT OF INTEREST NOTIFICATION

The authors declare there are no conflicts of interest.

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