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THE PREVALENCE OF COMORBID SYMPTOMS OF CENTRAL SENSITIZATION SYNDROME AMONG THREE DIFFERENT GROUPS OF TEMPOROMANDIBULAR DISORDER PATIENTS

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Abstract

Aims—Symptoms of central sensitization syndrome (CSS) were evaluated among three different groups of temporomandibular disorder (TMD) patients. Additionally, TMD group differences in pain and pain-related disability were assessed, as well as emotional distress.

Methods—Participants were 250 patients with symptoms of acute TMD, recruited from dental clinics within a major metropolitan area. Sequential regressions and multivariate analyses of covariance were conducted in order to make group comparisons.

Results—Those with a TMD Muscle Disorder [i.e., myofascial TMD (m-TMD)] and those with more than one TMD diagnosis, had the most symptoms of CSS and higher reports of pain and pain-related disability. Moreover, emotional distress accounted for a substantial amount of the variance for physical symptoms and mediated all TMD comparisons.

Conclusions—Myofascial TMD is characterized by a high degree of comorbidity of symptoms of CSS and associated emotional distress.

Keywords

temporomandibular disorder; myofascial TMD; central sensitization syndrome; emotional distress

Recently, there has been a substantial amount of interest directed at investigating temporomandibular disorder (TMD)¹. The motivation to better understand this pain condition was stimulated by many studies demonstrating the apparent overlap of physical symptoms among TMD and other comorbid disorders, such as fibromyalgia (FM), chronic fatigue syndrome (CFS), and chronic headaches, etc ². Symptoms involving aches and pains in the muscles and joints, cognitive problems, gastrointestinal disturbances, and changes in the quantity or quality of sleep are commonly observed among those with TMD, FM, and CFS. Indeed, 75% of those with FM can also be diagnosed with TMD using the Research Diagnostic Criteria for TMD (RDC/TMD), whereas 35% to 70% of those with CFS meet the criteria for FM³. Yunus⁴ discusses the implications of the terms that have been used to classify these disorders. He explains that, traditionally, the polysymptomatic patient would

have been given a “wastebasket” diagnosis, such as “somatoform disorder,” or “multiple symptoms disorder.” Such terms potentially complicate patient-physician relationships as they imply, at some level, that the symptoms are purely psychological, and, therefore, “not real.” Moreover, as the etiology is poorly understood, such phenomenology possesses certain connotations that are not conducive to effective treatment strategies. With more research demonstrating the possibility that these disorders could result from similar underlying mechanisms involving *central sensitization* (CS), the term *central sensitization syndrome* (CSS) has been introduced in an attempt to provide more validity in searching for some underlying etiology than was previously offered by terms used in the past⁴.

Although there is yet no conclusive evidence that CS is a common etiological factor of TMD and comorbid CSS, several studies have made a convincing argument in favor of such an etiology⁵. In many cases, CS is the basis of chronic pain, “or pain that persists beyond a normal time of healing”⁶. It is characterized by hyperexcitability in the dorsal horn neurons in the spinal cord, which ascend through the spino-thalamic tract⁷. In addition, it is promoted and maintained by neural activity among key regions in the brain involved in pain processing. The general assumption is that the central nervous system is altered in ways that amplify pain processing. Consistent with the idea that CS may be involved in the pathogenesis of TMD, the Orofacial Pain: Prospective Evaluation of Risk-Assessment (OPPERA) study was funded to investigate the biopsychosocial factors of TMD⁸. The general hope among the collaborators was that important risk factors or mechanisms would be elucidated, which might provide some insight for other musculoskeletal pain conditions. Among the studies, Greenspan and colleagues⁹ identified increased pain sensitivity to different types of experimental pain at multiple body sites beyond the orofacial region. Genetic risk-factors were also identified among those with TMD, which have demonstrated to be important in pain transmission¹⁰. Specifically, they found that polymorphisms on the genes, that encode for dopamine and serotonin, were positively correlated with pain severity, suggesting a genetic basis for the hypersensitivity experienced among those with TMD. Moreover, the dysregulation among neuroendocrine and neurotransmitter systems observed within the TMD population is highly related to the dysregulation of the hypothalamic pituitary adrenal (HPA) axis¹⁰.

Dysfunction of the HPA axis has been consistently demonstrated to be involved in TMD and other comorbid pain conditions¹¹. The HPA axis serves as an important intermediary among neuroendocrine, neurotransmitter, and neuroimmune systems, all of which have been suggested to be imbalanced among those with TMD and CSS. In fact, Maixner and colleagues¹² identified altered function among those with TMD at rest, and in response to physical and psychosocial stressors. Specifically, they investigated indirect measures of HPA axis function, including heart rate, heart rate variability, baroreflex sensitivity, and blood pressure. Ohrbach and McCall¹³ also proposed that prolonged stress exposure plays a more direct role in TMD pathogenesis, causing sustained increases in stress hormones that promote tonic muscle contraction and consequential orofacial pain. However, many others have suggested that emotional distress is a consequence of pain, while the majority support a view involving dynamic interactions among these factors¹⁴⁻¹⁵.

The indirect influence of emotional distress can be observed in pain behaviors and cognitions common among these patients¹⁵⁻¹⁶. For example, it is typical for individuals to seek treatment when they experience pain. However, there is a sub-population of individuals who do not respond adaptively in this regard. The *somatic amplification hypothesis* suggests that some individuals become hypersensitive and hyperreactive to pain, benign somatic sensations, and stressful events¹⁶. Hyperreactivity often manifests itself in a highly catastrophic manner owing to the common tendency for these individuals to misinterpret their symptoms as indicators of serious illness when, in fact, there is none¹⁶. For this

reason, treatment-seeking is more common among those with CSSs, although these individuals are usually resistant to reassurance from physicians. A common concern among these individuals is that something important has been overlooked. In trying to convince physicians that there is “something wrong,” they reinforce their invalid beliefs that they have a serious medical disease that, in turn, engenders more emotional distress¹⁶.

The influence of daily stressors is reflected in increases in the prevalence of somatic complaints, as well as the severity of symptoms during times of greater psychosocial stress (e.g., work load, interpersonal problems)¹⁸⁻¹⁹. Subsequent increases in stress hormones and inflammatory factors in response to prolonged stress exposure has been linked to illness behavior, including changes in diet and exercise habits, activity level, and other maladaptive coping strategies that pose challenges for treatment²⁰. Also, studies have shown that having a muscle disorder and elevation on the Minnesota Multiphasic Personality Inventory (MMPI) Scale-2, which is considered a good indicator of psychosocial function, was predictive of poor treatment outcomes²⁰. More recent studies have demonstrated a pattern of elevation on the MMPI-2 (known as the “Disability Profile”) to be particularly problematic and resistant to treatment responsiveness²¹.

While the relationship between TMD and symptoms of CSS is becoming readily established, there still remains the need to identify what accounts for this relationship². The current study was therefore designed to investigate the prevalence of comorbid symptoms across the various groups of TMD disorders (i.e., Axis I RDC/TMD Group I Muscle Disorders, Group II Disc Displacements, and Group III Bone Deficiencies). The importance of investigating the influence of emotional distress with respect to these disorders stems from the clinical observation that TMD and CSS are related⁴. Moreover, emotional distress is thought to play both a direct and indirect role in these disorders through the physiological mechanisms previously discussed, and through its ability to exacerbate the condition and hinder pain rehabilitation and management. Thus, the current study examines the contribution of emotional distress on the prevalence of comorbid symptoms of CSS, as well as in self-report of pain and pain-related disability. On the basis of previous research demonstrating indices of CS among those with TMD Muscle Disorders, it was predicted that those with an RDC/TMD Group I Muscle Disorder, and those with more than one diagnosis, would have more comorbid symptoms of CSS, as well as higher reports of pain and pain-related disability²². Additionally, it was expected that emotional distress would account for a significant amount of variance of symptoms of CSS, pain, and pain-related disability. Furthermore, it was predicted that all group comparisons would be mediated by emotional distress²³.

METHODS

Participants and Procedure

All analyses were conducted using the initial assessment of an ongoing prospective intervention study by Gatchel and colleagues. The total sample included 250 acute TMD patients. Within the sample: 33 did not have an RDC/TMD diagnosis; 66 had a Group I Muscle Disorder; 12 had a Group II Disc Displacement; 17 had a Group III Bone Deficiency; and 122 had more than one diagnosis. Participants were predominately female (80.8%), approximately 44.06 ($SE = .98$) years of age, who were recruited from various community dental clinics within a major metropolitan area. Table 1 presents the demographic characteristics of this cohort. Upon obtaining consent, participants completed a physical assessment and chewing task as described by Gatchel, Stowell, and Buschang²⁴. The RDC/TMD was used to assess the three groups of TMD disorders, using well-validated techniques, including palpation at 20 specified muscle sites²⁵. Disc displacements and bone deficiencies were observed by measuring limitations in jaw opening, as well as for protrusions and extrusions. Self-report of symptoms pertaining to jaw impairment and

associated pain were also gathered during this assessment. All participants were treated according to the standards of the Institutional Review Board of The University of Texas Arlington and the Baylor College of Dentistry, Dallas.

Measures

Physical factors of TMD—The RDC/TMD provides a systematic evaluation of the physical and psychosocial aspects of TMD with high reliability^{25, 26}. Axis I was used to diagnose Group I Muscle Disorders, Group II Disc Displacements, and Group III Bone Deficiencies. In the current sample, if participants' qualified for an Axis I diagnosis, they were coded dichotomously for each of the three groups of disorders. Axis II of the RDC/TMD consists of the Characteristic Pain Inventory (CPI), which assesses the current pain, as well as the average pain and the most intense pain over the past six months (with a Cronbach's alpha of .85). Pain-related disability was assessed using the Graded Chronic Pain Scale [GCPS; (Cronbach's α = .87)], which examined pain with respect to how it interfered with daily activities, recreational (social) activities, and ability to work²⁵.

Physical symptoms—The Symptom Checklist was a 138 item non-diagnostic tool comprised of demographic, criteria-based symptoms, and well-recognized symptoms for disorders of CSS². This self-report measure was used to identify the presence of symptoms from 10 clinical conditions, including CFS, FM, chronic headaches, irritable bowel syndrome (IBS), TMD, post-concussion syndrome, chemical sensitivities, irritable bladder syndrome, and pelvic pain with reasonable reliability (Cronbach's α = .75).

Emotional distress—The Short Form Health Survey (SF-36) is a well-validated assessment of health-related quality of life (Cronbach's α = .91)²⁷. The Mental Health Component (MHC) subscale was used in the current study as an indicator of emotional well-being. The Beck Depression Inventory (BDI) was used, and it is also a reliable measure of depressive symptomatology (Cronbach's α = .93)²⁸.

Data Analysis

The focus of the present study was to identify the prevalence of comorbid symptoms of CSS, as well as the severity of self-reported pain and pain-related disability among individuals with three types of Axis I RDC/TMD disorders (i.e., Group I Muscle Disorders, Group II Disc Displacements, Group III Bone Deficiencies). Additionally, the influence of emotional distress on these relationships was investigated. In order to examine the prevalence of comorbid symptoms of CSS among various Axis I RDC/TMD disorders, as well as the influence of emotional distress on the subjective experience of TMD-related pain and pain-related disability, multivariate analyses of variance (MANOVA)s were conducted to assess whether emotional distress mediated the effects of Axis I on the prevalence symptoms of CSS. The same statistical analysis procedure was conducted in order to assess whether emotional distress mediated the effects of Axis I on the severity of self-reports of pain and pain-related disability. As a prerequisite to the group comparisons, separate sequential regressions for emotional distress (evaluated by the SF-36 MHC and the BDI) were conducted in order to get a more comprehensive representation of the influence of different types of emotional distress on the reporting or presence of various types of physical symptoms²⁹. In addition, separate sequential regressions were conducted in order to determine whether the necessary relationships among Axis I (independent variable), and the dependent variables of pain-related disability, and emotional distress, were present in our sample as an initial step prior to conducting mediational analyses for both group comparisons including; 1) mediation of Axis I on symptoms of CSS; and 2) mediation of Axis I on pain and pain-related by emotional distress.

RESULTS

Axis I, Emotional Distress, and Physical Symptoms

Prior to mediational analyses, an initial analysis was conducted to establish whether the necessary relationship between the covariate and independent variable, as well as the covariate and dependent variables, were observable in the current sample. As expected, analysis of variance revealed an effect for Axis I on emotional distress (SF-36 MHC), $F(1, 243) = 3.87$, $r^2 = .02$, $p = .05$. However, there was no effect for Axis I and symptoms of depression as assessed by the BDI. Sequential regressions were then conducted in order to identify a relationship between emotional distress and comorbid physical symptoms. The SF-36 MHC was entered in Step 1, and the BDI was entered in Step 2, of the model in order to get a more comprehensive view of the influence of different types of emotional distress on physical symptoms²⁹. Lower scores on the SF-36 MHC indicated negative mental well-being, or more emotional distress. Higher scores on the BDI indicated more depressive symptomatology. As expected, emotional distress shared a positive relationship with total physical symptoms, including symptoms of CFS, FM, chronic headaches, low back pain, TMD, chemical sensitivities, IBS, post-concussion syndrome, and pelvic pain, as indicated by separate regression analyses for each of the subscales on the Symptom Checklist. Thirty-percent of the variance for total physical symptoms was accounted for by emotional distress. The SF-36 MHC was significant at Step 1. The strength of the model improved by the addition of BDI at Step 2. The regression coefficients after each step of the model for all significant results are presented in Table 2.

Having established the expected relationships between emotional distress and Axis I, as well as emotional distress and physical symptoms, mediational analysis was then conducted in order to investigate whether emotional distress mediated the influence of Axis I on the prevalence of symptoms of CSS. As a first step, a MANOVA was conducted in order to determine whether there was a multivariate effect of Axis I on symptoms of CSS, prior to mediation by emotional distress. As hypothesized, there was a multivariate effect for the Axis I TMD disorders, $F(12, 237) = 3.63$, $p < .05$, $\eta^2 = .16$, prior to mediation by emotional distress. Univariate analyses revealed that Axis I TMD disorders influenced total physical symptoms, $F(4, 245) = 2.99$, $p < .05$, $\eta^2 = .05$, as well as: symptoms of TMD, $F(4, 245) = 5.38$, $p < .05$, $\eta^2 = .08$; CFS, $F(4, 245) = 3.09$, $p < .05$, $\eta^2 = .05$; FM, $F(4, 245) = 2.43$, $p < .05$, $\eta^2 = .04$; and female pelvic pain, $F(4, 245) = 3.62$, $p < .05$, $\eta^2 = .06$. Specifically, those who had more than one RDC/TMD Axis I diagnosis had more symptoms of CFS and FM, relative to those with no diagnosis or an Axis I Group II Disc Displacement. In addition, those who had more than one RDC/TMD Axis I diagnosis, and those with only an Axis I Group I Muscle Disorder, had more total physical symptoms and symptoms of TMD, relative to those with no diagnosis. With the exception of those with an Axis I Group III Bone Deficiency, all other groups had more total physical symptoms than those with no diagnosis (see Figure 1).

Mediational analysis also revealed the expected multivariate effect for Axis I, $F(12, 222) = 3.42$, $p < .05$, $\eta^2 = .16$, and SF-36 MHC, $F(12, 219) = 10.50$, $p < .05$, $\eta^2 = .37$. Emotional distress partially mediated the group differences for total physical symptoms, $F(4, 230) = 2.54$, $p < .04$, $\eta^2 = .04$, as well as symptoms of TMD, $F(4, 230) = 4.56$, $p < .05$, $\eta^2 = .07$, CFS, $F(4, 230) = 2.66$, $p < .05$, $\eta^2 = .04$, and female pelvic pain, $F(4, 245) = 3.75$, $p < .05$, $\eta^2 = .06$. Symptoms of FM were fully mediated. Specifically, those with more than one Axis I RDC/TMD diagnosis had more total physical symptoms, as well as symptoms of CFS and female pelvic pain. Those with more than one diagnosis, and those with an Axis I Group I Muscle Disorder, had more symptoms of TMD, relative to those with no diagnosis after mediation by emotional distress (see Figure 2).

Axis I, Emotional Distress, Pain and Pain-Related Disability

The same statistical procedure for the investigation of emotional distress and physical symptoms was used in the analysis of emotional distress, pain, and pain-related disability. Having established a relationship between Axis I and SF-36 MHC in the previous analysis, the expected negative relationship between emotional distress and self-reports of pain and pain-related disability was confirmed. Six percent of the variance for pain, and 21% of the variance for pain-related disability was accounted for by emotional distress. For both pain and pain –related disability, the strength of the models was improved by the addition of the BDI at Step 2.

Having established the expected relationships between emotional distress and Axis I, and among emotional distress, pain, and pain-related disability, mediational analysis was conducted in order to investigate whether emotional distress mediated the influence of Axis I on the severity of pain and pain-related disability. As a first step, a MANOVA was conducted in order to determine whether there was a multivariate effect of Axis I on pain and pain-related disability, prior to mediation by emotional distress. As hypothesized, there was a multivariate effect for Axis I TMD Disorders, $F(4, 270) = 7.73, p < .05, \eta^2 = .10$, prior to mediation by emotional distress. Univariate analyses revealed that Axis I influenced CPI-measured pain, $F(4, 270) = 6.56, p < .05, \eta^2 = .09$, as well as pain-related disability, GCPS, $F(4, 270) = 5.17, p < .05, \eta^2 = .07$. Specifically, those with more than one Axis I RDC/TMD diagnosis, and those with an Axis I Group I Muscle Disorder, had more pain and pain –related disability than those with no diagnosis prior to mediation (see Figure 3). Mediational analysis also revealed the expected multivariate effect for Axis I TMD disorders, $F(4, 238) = 6.76, p < .05, \eta^2 = .10$, and SF-36 MHC, $F(2, 237) = 15.27, p < .05, \eta^2 = .11$. Univariate analyses revealed that Axis I influenced the CPI, $F(4, 238) = 6.10, p < .05, \eta^2 = .09$, as well as pain-related disability, GCPS, $F(4, 238) = 3.74, p < .05, \eta^2 = .06$. Specifically, those with more than one Axis I RDC/TMD diagnosis had more pain and pain-related disability than those with no diagnosis (see Figure 4).

DISCUSSION

The purpose of the present study was to examine the prevalence of comorbid physical symptoms that are commonly observed among those with CSS disorders, such as FM, CFS, IBS, etc., in a sample of individuals with acute TMD. On the basis of existing literature demonstrating the generalized hypersensitivity (a hallmark symptom of CS⁵), it was hypothesized that the prevalence of symptoms of CSS would be more pronounced among those with an Axis I RDC/TMD Group I Muscle Disorder, as well as those who had more than one Axis I diagnosis²². This hypothesis was confirmed. Both of these diagnostic groups had comparatively more total physical symptoms and symptoms of TMD. In addition, those with more than one diagnosis had more symptoms of FM, CFS, and female pelvic pain. Moreover, both of these groups had significantly higher reports of pain and pain-related disability. Also, the influence of emotional distress on the relationship between an Axis I RDC/TMD diagnosis and the prevalence of symptoms of CSS was investigated in light of the large body of evidence demonstrating the importance of high psychosocial distress within this broader population^{14,23}. The prevalence of symptoms with respect to mental health (measured by the SF-36 MHC and the BDI) was examined in order to get a more comprehensive understanding of the psychosocial contributions involved. It was found that both measures shared a strong relationship with the symptoms of CSS: the SF-36 MHC mediated the group differences among these symptoms such that, after the mediational analysis, symptoms of FM were completely mediated and all other symptoms were partially mediated. Moreover, total physical symptoms were fully mediated by emotional distress among those with a Group I Muscle Disorder. Emotional distress also partially mediated self-reports of pain and pain-related disability among those with more than one diagnosis,

and fully mediated group differences of pain and pain-related disability observed among those with a Group I Muscle Disorder. The present results, therefore, confirm the expectation that the overlap of comorbid symptoms of CSS and elevated self-reports of pain and pain-related disability would be more specific to myofascial TMD, relative to the other groups of Axis I RDC/TMD disorders, and that this relationship would be partly explained by emotional distress.

The current results align with other studies demonstrating a strong degree of overlap among symptoms of TMD and other pain conditions^{4,11,14}. Previously, Aaron, Burke, and Butchwald² demonstrated that those with TMD, FM, and CFS shared symptoms of: muscle pain, aching, or discomfort; problems falling or staying asleep, or sleeping too much; waking up tired or unrested after sleep; difficulty concentrating or forgetfulness; abdominal pain relieved by bowel movement; and differences in bowel consistency. While there has been a growing awareness of the overlap of pain-inclusive symptomatology within the general pain population, there has been a concomitant growing interest and attempt to define what accounts for these “multi-symptom” disorders³⁰. Some proposed that one of the unifying factors might be the result of biological stressors that could be examined through traditional indices of pain-inducing factors measured in the periphery, such as cytokines. The thought was that these measures of pain would be positively correlated with the prevalence of somatic complaints and severity of symptoms. Moreover, musculoskeletal pain conditions were expected to have an organic origin (e.g., a lesion or tear in the muscle). However, these attempts have been elusive, prompting investigators to speculate that psychosocial factors were more likely to account for the greater proportion of variance among these disorders³⁰. Such assertions seem to be appropriate considering the high degree of comorbidity with psychiatric disorders³¹. Moreover, psychosocial features of pain conditions remain valid targets in pain management and rehabilitation programs because patients will often respond to such treatments when they are tailored to specific psychosocial needs³². Relevant hypotheses related to this have proposed that many of the complexities of treating pain conditions are due to the additional emotional distress these individuals experience, which manifest in: hypervigilance or attention to bodily sensations; the tendency to concentrate on relatively benign sensations; and the disposition to be highly reactive to bodily sensations, and to interpret them as being more serious than they actually are¹⁶. These characteristics were projected to be the mechanisms through which somatic amplification operated in order to bring about what was once labeled as a *functional somatic syndrome* to describe many of the aforementioned somatic and pain-inclusive symptoms commonly observed among those with what is now known as CSS⁴⁻⁵. Such theories did not neglect the importance of physiological concomitants of emotional distress in the pathogenesis of these disorders, but failed to recognize that these disorders are promoted by augmented pain and autonomic responding along the central nervous system³³.

As a second aim, the current study investigated the influence of emotional distress on the prevalence of comorbid physical symptoms, severity of self-reports of pain, and pain-related disability in our sample of acute TMD patients. It was revealed that there was a particularly strong relationship between emotional distress and total physical symptoms, as well as symptoms of CFS and FM. Moreover, the expectation was confirmed that emotional distress would mediate the influence of group membership of Axis I RDC/TMD disorders on comorbid symptoms, as well as self-reports of pain and pain-related disability. With the exception of symptoms of FM, all other symptoms, self-reports of pain, and pain-related disability were only partially mediated, suggesting that, where emotional distress is an important consideration, it does not explain as much of the variance as what was previously emphasized in the literature. The present findings add to the emerging evidence demonstrating altered function along the pain pathway and multiple systems dysregulation among polysymptomatic patients. As a result, the term CSS has been proposed as an

etiological cause⁴⁻⁵. The effectiveness of the biopsychosocial approach to pain rehabilitation and management approaches are achieved in part due to the educational framework that is provided to the patients³⁰. Such an approach validates the impact pain has on nearly every aspect of the patient's life, while explaining that his/her symptoms and pain do, in fact, have a "real" physiological basis. Our knowledge regarding the phenomenology of CS helps aid in explaining such symptomatology to patients⁴⁻⁵. Moreover, an explanation regarding how certain psychosocial factors (such as catastrophic thought patterns, pain behaviors, daily habits, and stress) can enhance the perception of pain and the prevalence of symptoms, through modulating important features along the central nervous system involved in pain-autonomic responding, is provided. Patients can then be encouraged to become more aware of their endorsement of these pain-facilitating behaviors, and to replace them with effective coping strategies, such as prepared appraisals, distraction from negative affect or sensations, and relaxation³⁰. In addition to cognitive behavioral therapy (CBT), biofeedback has been shown to provide comprehensive treatment responsiveness through demonstrating that one has the capacity to control his/her physiological responding and replace hyperreactive responses to pain or stress with pain-inhibiting responses²⁰. This treatment modality is often used in conjunction with CBT because it helps those who are not inclined to respond to medical explanations²⁰. The biopsychosocial approach encourages patients to take more of an active role in the management of their pain. As a result, proactive involvement on the part of the patient has demonstrated long-term clinical- and cost-effectiveness³⁴. Early intervention studies employing the biopsychosocial approach have also demonstrated that the treatment responsiveness for physical factors, such as pain, and pain-related disability, coincide with amelioration of emotional distress, both at post-intervention and at the one-year follow-up, thus supporting the mutual influence of pain and stress in the context of disorders such as TMD and CSS³⁵⁻³⁷. While the current study provides only preliminary evidence that the symptoms of CSS are more pronounced among those with an Axis I Group I Muscle disorder, relative to the other two types of TMD disorders, less is known about the pathophysiology involved in the development TMD and its comorbid symptoms. Therefore, continued efforts to elucidate the biopsychosocial factors involved in these disorders and associated symptoms are warranted in an effort to develop even more effective treatment programs.

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Figure 1.
Symptoms of CSS as a Function of Axis I Prior to Mediation by Emotional Distress

Figure 2.
Symptoms of CSS as a Function of Axis I After Mediation by Emotional Distress

Figure 3. Pain and Pain-Related Disability as a Function of Axis I Prior to Mediation by Emotional Distress

Figure 4.
Pain and Pain-Related Disability as a Function of Axis I After Mediation by Emotional Distress

Table 1

Demographics for the Selected Sample at the Initial Baseline Assessment

Demographic	<i>M (SE)</i>	Demographic	<i>n (%)</i>
Age	44.06 (.97)	Gender	
		Male	52 (19.2)
		Female	219 (80.8)
Highest Grade Completed	15.11 (.14)	Ethnicity	
		White	193 (71.2)
		Latino	25 (9.2)
		Black	33 (12.2)
Number of Children in Household	.71 (.07)	Asian	9 (3.3)
		Other	9 (3.3)
		Marital Status	
		Married Together	91 (34)
		Married Apart	133 (49.6)
		Widowed	35 (13.1)
		Divorced	4 (1.5)
		Separate	5 (1.9)
		Household Income	
		\$0- 14,999	33 (12.3)
		\$15,000- 24,999	20 (7.5)
		\$25,000- 34,999	25(9.3)
		\$35,000- 50,000	23 (8.6)
		\$50,000 <	167 (62.3)

Table 2
Regression Coefficients for Emotional Distress and Symptoms of CSS for Each Step of the Model

DVs	B	SE	R	R_{adj}^2	sr_i	R_{change}	Df	F_{inc}	p
Total Symptoms									
Step 1 SF-36	-.00	.00	.48	.22	-.17	.23	(1, 230)	66.92	.00
Step 2 BDI	.09	.02	.52	.26	.24	.04	(1, 229)	13.51	.00
TMD									
Step 1	-.00	.00	.17	.02	.02	.03	(1, 231)	6.73	.01
Step 2	.05	.07	.17	.02	.02	.00	(1, 230)	.46	.50
CFS									
Step 1	-.00	.00	.59	.35	-.29	.35	(1, 239)	129.17	.00
Step 2	.17	.04	.63	.39	.26	.04	(1, 238)	16.98	.00
FM									
Step 1	-.00	.00	.59	.35	-.26	.35	(1, 237)	126.39	.00
Step 2	.20	.04	.63	.40	.30	.40	(1, 236)	23.09	.00
Chronic Headache									
Step 1	-.00	.00	.35	.12	-.20	.12	(1, 240)	32.35	.00
Step 2	.05	.06	.35	.11	.05	.00	(1, 239)	.67	.41
Low Back									
Step 1	-.00	.00	.17	.03	-.08	.03	(1, 237)	7.08	.01
Step 2	.04	.06	.18	.02	.05	.00	(1, 236)	.53	.47
Chemical Sensitivities									
Step 1	-.00	.00	.25	.06	-.09	.06	(1, 241)	15.99	.00
Step 2	.05	.03	.27	.07	.11	.01	(1, 240)	2.73	.10
IBS									
Step 1	.00	.00	.29	.08	-.02	.08	(1, 240)	.08	.00
Step 2	.25	.07	.36	.13	.23	.05	(1, 239)	.05	.00
Irritable Bladder									
Step 1	.00	.00	.26	.06	.06	.07	(1, 242)	17.15	.00
Step 2	.08	.03	.30	.08	-.16	.02	(1, 241)	6.44	.01
Female Pelvic Pain									

DVs	B	SE	R	R_{adj}^2	sr_i	R_{change}	Df	F_{inc}	p
Step 1	.00	.00	.11	.01	.05	.01	(1, 238)	2.76	.10
Step 2	.10	.04	.19	.03	.15	.02	(1, 237)	5.71	.02