TEMPOROMANDİBULAR DİSFONKSİYONLU BİREYLERDE AĞRIYI FELAKETLEŞTİRME VE AĞRI YOĞUNLUĞUNUN ISIRMA KUVVETİ VE ÇENE KAS KUVVETİ İLE İLİŞKİSİ

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ÖZ

Bu çalışma temporomandibular eklem disfonksiyonu (TMED) bulunan bireylerde ağrıyı felaketleştirme ve aktivite ağrısı ile ısırma kuvveti ve çene kas kuvveti arasındaki ilişkiyi göstermek amacıyla planlandı. Çalışmaya TMER tanılı 43 birey (ortalama yaş 29,79±8,34 yıl) dâhil edildi. Bireylerin ağrıyı felaketleştirme düzeyleri Ağrı Felaketleştirme Skalası (AFS), aktivite ağrısı Görsel Analog Skala (GAS), ısırma kuvvetleri pinç metre ve çene kas kuvvetleri Lafayette manuel kas testi cihazı ile ölçüldü. Değişkenler arası ilişki Pearson Korelasyon testi ile incelendi. AFS ile ısırma kuvvetleri (merkezi: -0,519; sağ: -0,518; sol: -0,515) ve çene kas kuvvetleri (açma: -0,688; kapatma: -0,635; sağ ekskürsiyon: -0,609, sol ekskürsiyon: -0,645; protrüzyon: -0,621) arasında; aktivite ağrısı ile ısırma kuvvetleri (merkezi: -0,429; sağ: -0,453; sol: -0,451) ve çene kas kuvvetleri (açma: -0,511; kapatma: -0,420; sağ ekskürsiyon: -0,343, sol ekskürsiyon: -0,463; protrüzyon: -0,471) arasında negatif yönde anlamlı ilişki bulundu ($p<0,05$). TMED'li bireylerde ağrı ve ağrı algısı ısırma ve çene kas kuvvetini azaltmaktadır. Bu bireylerin aktivite ağrısı şiddetine kıyasla ağrı algıları ısırma ve çene kas kuvvetleri ile daha yüksek derecede ilişkilidir. Bu sonuçlara dayanarak TMED'li bireylerde daha iyi ısırma ve çene kas kuvveti için biyodavranışsal model ile ağrıya yaklaşımın daha yararlı olabileceğini söyleyebiliriz.
Anahtar kelimeler: Temporomandibular disfonksiyon, biyodavranışsal model, ağrıyı felaketleştirme, ısırma kuvveti

THE RELATIONSHIP OF PAIN CATASTROPHIZING AND PAIN SEVERITY WITH BITE FORCE AND JAW MUSCLE STRENGTH IN INDIVIDUALS WITH TEMPOROMANDIBULAR DYSFUNCTION

ABSTRACT

This study was conducted to show the relationship between pain catastrophizing and activity pain severity with bite force and jaw muscle strength in individuals with temporomandibular dysfuncion (TMD). Forty-three individuals (mean age 29,79±8,34 years) with a diagnosis of TMD were included in the study. Pain catastrophizing levels of individuals with the Pain Catastrophizing Scale (PCS), activity pain with the Visual Analog Scale (VAS), bite force with a pinch meter, and jaw muscle strength with Lafayette manual muscle testing device were measured. The relationship between the variables was examined with the Pearson Correlation test. Statistically significant negative correlations were found PCS between bite forces (central: -0,519; right: -0,518; left: -0,515) and jaw muscle strengths (opening: -0,688; closing: -0,635; right excursion: -0,609, left excursion: -0,645; protrusion: -0,621); activity pain intensity between bite forces (central: -0,429; right: -0,453; left: -0,451) and jaw muscle strengths (opening: -0,511; closing: -0,420; right excursion: -0,343, left excursion: -0,463; protrusion: -0,471) ($p<0,05$). Pain and pain perception decrease bite and jaw muscle strength in individuals with TMD. Pain perceptions of these individuals are more highly correlated with bite and jaw muscle strength compared to activity pain severity. Based on these results, we can say that a biobehavioral model and an approach to pain may be more beneficial for better bite and jaw muscle strength in individuals with TMD.
Keywords: Temporomandibular dysfunction, biobehavioral model, pain catastrophizing, bite force

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INTRODUCTION

Temporomandibular disorder (TMD) is a broad term describing musculoskeletal conditions that cause pain and/or dysfunction in the masticatory muscles, temporomandibular joints, and related structures (1, 2). The most common symptoms are regional pain in the face and preauricular area, limitations in jaw movements, and noises from the temporomandibular joints during jaw movements (3). It has been reported that individuals with TMD-related pain show higher levels of stress, anxiety, depression, somatic awareness, pain catastrophizing, and kinesiophobia compared to healthy and asymptomatic individuals (4-9).

Pain catastrophizing is defined as a maladaptive cognitive-affective response that includes negative thoughts about the experience of pain (10). It is believed to be a complex construct consisting of magnification, helplessness, and rumination (11). Pain catastrophizing can determine disability and pain intensity (12). It is correlated with increased emotional distress (13), muscle and joint tenderness, and disability-related pain (14, 15). Such disorders, which occur with pain in the musculoskeletal system, cause changes in motor behavior according to the biobehavioral model (16). It has been stated that motor changes can be explained by peripheral and central mechanisms related to the central nervous system (17, 18). The peripheral mechanism may be explained by the fact that stimuli that cause the experience of physical pain contribute to the development of the threat of physical harm (19). Experimental studies have shown that muscle pain affects motor control systems through central mechanisms (20, 21). In addition, several studies have found functional and structural changes in the motor cortical areas of individuals with chronic pain (22, 23).

There are studies examining the relationship between pain catastrophizing and physical performance in individuals after total knee and hip arthroplasty (24), and the relationship between pain catastrophizing and muscle strength in individuals with knee osteoarthritis (25, 26). In this context, it was thought that pain catastrophizing might cause a decrease in strength by causing motor changes. As a result of the investigations, such research was not encountered. Therefore, this study was planned to examine the relationship between pain catastrophizing and pain intensity with bite force and jaw muscle strength in individuals with TMD.

METHOD

Between March and July 2021, 43 individuals over the age of 18 who applied to the Faculty of Dentistry, Ankara University and Faculty of Dentistry, Gazi University and were diagnosed with temporomandibular joint disorder by the dentist were included in the study. By examining a similar study (27), it was calculated that it would be sufficient to include 28 individuals in the study, with the parameters (power= 0.80; a=0.05; effect size=1) used and the G*Power program. The necessary permission and approval were obtained from the Ankara University, Faculty of Dentistry, Clinical Research Ethics Committee (14.10.2020- Decision no: 11/05) and the Ministry of Health, Turkish Medicines and Medical Devices Agency (22.10.2020- Decision no: 68869993-511.06-E.239934). The criteria for inclusion of individuals in the study were: individuals who were diagnosed with

TMD, classified by Research Diagnostic Criteria for TMD (RDC/TMD), with class I-II-III occlusion, volunteered to participate in the study, and filling in the informed consent form were included. The criteria for exclusion of individuals were: individuals who had acute trauma or operation from the temporomandibular joint region, have a neurological or psychiatric disorder, have a dental or orofacial infection, have an anomaly, infection, and tumor (in the lip, lip mucosa, cheek, buccal mucosa, oropharynx, tonsils, hard and soft palate, tongue, sublingual, the floor of the mouth, salivary glands, gingiva, and alveolar mucosa), have with multiple or complete tooth loss causing severe malocclusions such as oligodontia and anodontia, have any diagnosed disease in the shoulder and neck region, and presence of trigeminal or postherpetic neuralgia.

Demographic information of individuals such as age, gender, weight, height, body mass index, chewing and complaint sides, duration of complaints were recorded.

Pain Catastrophizing Scale (PCS): PCS consists of 13 questions about the effect of pain experience on emotions and thoughts. It evaluates the emotional perception of pain. Each question contains 5 points (ranging from 0 (not at all) to 4 (all the time)) Likert-type answers. The total score takes values between 0-52 (28). The Turkish version, validity, and reliability study of the PCS was performed by Süren et al. (29).

Activity Pain Severity: Horizontal Visual Analog Scale (VAS) was used to evaluate the pain severity of individuals related to TMD. The individual is asked to mark the perceived pain severity level (for a certain period) on the 100 mm line (30). The evaluator scored the scale by measuring the distance in millimeters from the "no pain" point to the mark that the individual defined as the pain level.

Bite Force: The bite force of individuals was evaluated with the Baseline® pinch meter (Mechanical Pinch Gauges, NexGen Ergonomics, Inc.Montreal, Canada). Individuals sat in a relaxed, neutral position in a chair with their backs supported. The soles of the feet were in full contact with the ground. To prevent the hard metal structure of the pinch meter from damaging the teeth, biting was performed with disc make-up removal cotton. For the central bite force between the anterior incisors and the lateral bite forces between the right and left lateral posterior arches, 3 repeated bites were made and the averages were evaluated.

Jaw Muscle Strength: Lafayette manual muscle test system (model 01165; Lafayette Instrument Company, Lafayette, IN, USA) was used for the evaluation of jaw muscle strength. Individuals sat in a relaxed and neutral position in a chair with their backs supported. The soles of the feet were in full contact with the ground. Muscle strengths in the opening, closing, protrusion, right and left excursion directions of the jaw were measured. While individuals were asked to perform these movements, muscle strength was recorded by applying force in the opposite direction. The mean of three measurements was taken

Statistical Analysis

All statistical analysis except confirmatory factor analysis was carried out using Statistical Package for the Social Sciences

(SPSS 22.0, SPSS Inc., Chicago, Illinois). Descriptive statistics were identified as mean ± standard deviation, median (minimum-maximum), and %. The Shapiro Wilk test was used to determine whether the numeric variables conform to the normal distribution. To determine whether there was a relationship between pain catastrophizing and activity pain with jaw muscle strength and bite force was applied Pearson correlation analysis. The correlation coefficients <0,30; 0,30-0,50; 0,50-0,70; ,070-0,90 and >0,90 were interpreted as negligible, low, moderate, high and excellent, respectively (31). Differences in p values <0,05 were considered to be statistically significant.

RESULTS

Of the fifty-four individuals planned to be included in the study, forty-three individuals (mean age 29,79 ± 8,34 years old) completed the measurements. Eleven individuals were excluded from the study because 2 individuals underwent botox and 1 individual had arthrocentesis, 1 individual did not speak Turkish, and 7 individuals did not want to participate in the evaluation. Demographic information of individuals was given in Table 1.

There were moderate negative correlations (r min: -0,515 – r max: -0,688) between the pain catastrophizing values with all bite forces and jaw muscle strengths. There were low negative correlations (r min: -0,343 – r max: -0,471) between the severity of activity VAS with the bite forces and jaw muscle strengths, except opening strength (r: -0,511) (Table 2). In addition, a statistically significant correlation was found between pain catastrophizing and activity pain severity (r= 0,617; p= 0,000).

Table 1. Demographic information of individuals

Gender	Female	27 (62,8%)
	Male	16 (37,2%)
BMI (kilogram/ centimeter^2)	Mean±SD	23,77±4,39
Employment	Employed	33 (76,74%)
	Unemployed	10 (23,26%)
Educational level	Primary school	3 (6,98%)
	Middle school	2 (4,65%)
	High school	14 (32,56%)
	Bachelor degree or above	24 (55,81%)
Pain duration (month)	6 months-1 year	15 (34,88%)
	More than 1 year	28 (65,12%)
Complaint side	Right	14 (32,6%)
	Left	11 (25,6%)
	Bilateral	18 (41,9%)

SD: Standard deviation; BMI: Body mass index

Table 2. The relationship between pain catastrophizing scale values and activity pain severity (VAS) with bite forces and jaw muscle strengths

	PCS	Activity pain severity (VAS)
Central bite force	-0,519**	-0,429**
Lateral bite force (right)	-0,518**	-0,453**
Lateral bite force (left)	-0,515**	-0,451**
Opening strength	-0,688**	-0,511**
Closing strength	-0,635**	-0,420**
Lateral excursion strength (right)	-0,609**	-0,343*
Lateral excursion strength (left)	-0,645**	-0,463**
Protrusion strength	-0,621**	-0,471**

*p<0,05 statistically significant correlation, ** p<0,01 statistically significant correlation, PCS: Pain Catastrophizing Scale, VAS: Visual Analog Scale

DISCUSSION

When the results were examined, it was seen that there was a relationship between pain catastrophizing and pain intensity with bite force and jaw muscle strength.

In a study evaluating the relationship between pain catastrophizing and physical performance after total knee and hip arthroplasty, changes were observed before and after surgery. A relationship was found between catastrophizing post-surgical pain and physical performance (24). In studies conducted to examine the relationship between pain catastrophizing and muscle strength in individuals with knee osteoarthritis, it has been stated that psychosocial factors may play an important role in dysfunctions such as muscle weakness (25) and pain intensity may be affected by pain catastrophizing through muscle weakness (26).

When the literature is examined, although there are studies examining pain catastrophizing in individuals with TMD (32), no study examining its relationship with muscle strength has been found. In 2020, a systematic review examining the prevalence of catastrophizing pain and its relationship with treatment outcomes in individuals with TMD, it was suggested that the relationship between pain catastrophizing and TMD may affect not only symptom severity but also treatment outcomes (32).

The outcomes of the present study stating that there is a negative correlation between pain and pain perception with strength indicate that treatment should not be limited to physiological and medical dimensions in individuals with TMD. As emphasized before, the biomedical model remains inadequate for diagnosis and treatment in patients with TMD. A biobehavioral model is recommended in the diagnosis and treatment of these individuals from a comprehensive perspective (33).

The biobehavioral model for individuals with TMD considers the interaction of psychological factors (ie pain history, current emotional and cognitive state, beliefs, learned behaviors, and coping skills) with physiological changes that affect the individual. From a therapeutic perspective, it provides an improvement in general functionality by enabling individuals to self-manage pain (34). The biobehavioral approach proposes four dimensions (affective–motivational, sensory–discriminative, cognitive–evaluative, and motor behavior) to address individuals in terms of diagnosis and intervention. This model has been named the biobehavioral model of pain perception and motor behavior and is designed to study any musculoskeletal disorder (33).

Pain avoidance behaviors may include motor activities such as avoidance of movement and a tendency to touch the affected area of the body (35). Emotional factors associated with fear of pain play an important role in the degree of protective behaviors triggered by pain (36). Recent research has shown that high levels of fear of pain are associated with limited range of motion (37, 38), physical disability (39), being less physically active (40, 41), and strategies for adopting alternative movements (42). Based on this information, pain perception and increased pain with decreased strength are compatible with the literature in this study. In addition, the positive and significant correlation between pain catastrophizing and activity pain severity supports the literature.

The present study drew attention to the relationship between pain perception and

physiological effects in individuals with TMD. It has been argued that the biobehavioral approach should be considered in these individuals. Independent of statistical analysis, when individuals are examined in the clinic, each should be evaluated by this model. Cognitive-behavioral therapy, education and self-management strategies, and relaxation techniques are applications that will help in this regard.

Limitations

The present study has limitations. Since there was no primary objective, the relationship between pain catastrophizing and activity pain severity with bite force and jaw muscle strength was not examined by dividing individuals into diagnostic classifications. This may be taken into account when planning future research. Another limitation was the use of a pinch meter and hand-held dynamometer when assessing bite force and jaw muscle strength. Although these tools provide objective data, they were used for the first time in the current study to measure these forces to the authors' knowledge. Further research should be conducted on the effectiveness of the pinch meter and hand-held dynamometer in measuring these forces.

CONCLUSION

According to the results of this study, a negative correlation was found between pain catastrophizing and activity pain severity and bite forces and jaw muscle strengths. Although the association levels range from statistically low to moderate, this association is too important to be ignored in the clinic. Therefore, as in other musculoskeletal disorders, individuals in TMD should be examined with a biobehavioral model.

Researchers' Contribution Rate Statement

H.A.: Planning the research, collecting the data, analyzing the data, and writing the manuscript, S.Ç.: Planning the research, analyzing the data, and writing the manuscript, C.Ü.: Diagnosing individuals, and writing the manuscript, C.Ö.Ü.: Diagnosing individuals, and writing the manuscript.

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Conflict of Interest

The authors report no conflicts of interest.

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