Impact of chronic orofacial pain of temporomandibular disorder and anxiety on the academic performance of dental students

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ABSTRACT

Introduction: The presence of chronic pain and mood disorders can be related to the performance of intellectual and technical tasks. **Objective:** This study evaluated the correlation between anxiety level, chronic orofacial pain of temporomandibular disorders (TMD), and academic performance in dental students. **Methods:** One hundred ninety-five students (74 men and 121 women) answered the Spielberger's trait–state anxiety inventory to evaluate the level of anxiety; the Research Diagnostic Criteria for TMD (RDC/TMD) was used to analyze chronic orofacial pain of TMD, and the academic performance was evaluated through the average grade of all college subjects concluded by the students. Correlations between the presence of chronic orofacial pain of TMD, trait, and state anxiety levels, chronic pain grade (CPG), chronic pain intensity (CPI), and academic performance were tested using Pearson's correlation test. **Results:** The mean age of the students was 21.8 years (SD=2.3). Chronic TMD was observed in 37.5% of the students. The majority of students had moderate trait and state anxiety. A significant correlation was observed between trait-anxiety level and CPG ($r=0.148$, $p=0.044$), and CPI ($r=0.187$, $p=0.009$). No significant correlation was found between academic grade and presence of chronic pain of TMD ($r=0.041$, $p=0.571$), trait ($r=0.079$, $p=0.273$) and state-anxiety ($r=0.107$, $p=0.136$). **Conclusion:** The CPG and CPI increase in participants with higher trait-anxiety levels, however, no significant correlation was found between academic performance and trait/state anxiety or chronic orofacial pain of TMD.

Keywords: students, dental; academic performance; facial pain; temporomandibular joint disorders; anxiety.

INTRODUCTION

Temporomandibular disorder (TMD) is a broad term for a complex group of orofacial painful conditions involving masticatory muscles, temporomandibular joints and associated structures, and other conditions such as changes in jaw movements and joint noises during the function[1,2]. Acute TMD is a state of nociception that warns of an identifiable injury, and the painful symptom usually lasts for a short time and is self-limiting. In chronic TMD the pain has a duration or recurrent episodes for more than 3 months[3].

It has been stated that chronic TMD has been reported with high prevalence worldwide, responsible for considerable impact on the quality of life and pain disability[4-6].

According to representative epidemiologic surveys, chronic TMD can affect anyone at any phase of life, however, it is more common in women aged 20-45 years old[7]. Its symptoms reach about 40% of the general population, although among university students this rate has shown to be higher, affecting about 70% of the students[8-10]. Many studies have stated that TMD has multifactorial etiology related to psychosocial, psychological, and physiological factors[11-14]. Psychological factors have attracted the attention of researchers in recent years since many investigations have shown a positive correlation between pain-related-chronic TMD and psychological disorders.

It is very common for patients diagnosed with pain-related-chronic TMD to show high levels of stress, depression, irritability, and anxiety[13-15]. Anxiety has been described as a relatively permanent state of irrational fear and nervousness with physical symptoms that may lead to compulsive behavior or panic attacks. As a highly disabling mental health condition, anxiety can interfere with the academic achievement, family life, and leisure activities of individuals[16-18]. In this sense, several types of research have shown that chronic TMD occurrence can increase significantly with higher levels of anxiety and, anxious individuals have reported higher intensity of chronic pain of TMD in clinical evaluations compared to non-anxious individuals[3,14,19]. Chronic pain of TMD and its significant association with anxiety have also been observed among students from different parts of the world, such as Portuguese college students (42.4%)[7] and Brazilian university students (32.7%)[19]. Furthermore, high levels of anxiety have been associated with disability and poor academic achievement among the students[12].

Although the literature has shown that psychological factors may be associated with the onset, progression, and severity of chronic TMD, there is a lack of information regarding the presence of TMD among dental students, anxiety symptom, and their academic performance. Thus, the purpose of this study was to investigate a possible correlation between anxiety level, chronic orofacial pain of TMD, and academic performance in dental students.

METHODS

Volunteers

The study was initiated only after approval by the local Ethics Committee in Research of Araçatuba Dental School (Process number 02101313.7.0000.5420).

This controlled observational cross-sectional study was carried out between September 2017 and March 2018, following the rules of the STROBE statement. The participants were recruited by the convenience sample method. A total of 195 volunteers (121 women and 74 men) participated in this research, with ages ranging from 19–27 years old. The sample included undergraduate students in different years of the São Paulo State University (UNESP), School of Dentistry, Araçatuba, São Paulo, Brazil. The university students were clarified about the aim of this study previously to their participation and all of them signed a formal consent of participation approved by the Research Ethics Committee.

As exclusion criteria were considered the presence of the previous diagnosis of psychosis, other pain causes, and lack of skill to answer questions for any reason when the questionnaire was applied since these conditions could make it impossible for students to answer the questionnaire properly. Any student was excluded from this research. All students from the dentistry course at the São Paulo State University (UNESP), School of Dentistry, Araçatuba invited to participate voluntarily in the research accepted the invitation and no student met the exclusion criteria of the study.

The sample power calculation was performed using the software Open Epi, considering the presence of TMD as a primary outcome variable, and academic performance as the secondary outcome variable. Calculation of sample size n = 195 showed a 100 % study power, with a 5% of the significance level.

Questionnaire

The presence and intensity of chronic orofacial pain, TMD, and anxiety data collection were performed using three different questionnaires. Volunteers were also asked to provide personal data such as age and gender.

Research Diagnostic Criteria for Temporomandibular Disorders (RDC/TMD) that was described by Dworkin and LeResche[1] has dual-axis diagnostic and was used to analyze the chronic orofacial pain of TMD, present at least for 4 weeks. Axis I refer to clinical TMD conditions and axis II refers to pain-related disability and psychological status. By the answers of Axis II of RDC/TMD, the presence of chronic orofacial pain was based on the answer to question 3, chronic pain intensity (CPI) is the mean results of questions 7, 8, and 9; and chronic pain grade (CPG) was determined according to the answers of questions 10, 11, 12 and 13; classified in four different degrees: 0, 1, 2 and 3.

To access the anxiety, the students were undergoing self-report symptoms through a questionnaire self-evaluative. The state and trait anxiety of the students were analyzed by using the Inventory of anxiety Trait–State of the Spielberger[20] which consists of two parts: Trait-anxiety and State-anxiety. The trait anxiety assessed how they generally feel and the state anxiety assessed how the students feel at a particular moment at the time. For that, trait and anxiety were analyzed separately totaling a maximum of 80 points for each one. To determine the anxiety levels of the students, it was used the following scores: low anxiety (20 to 34 points); moderate anxiety (35 to 49 points); high or serious anxiety (50 to 64 points), and Panic (65 to 80 points).

Academic performance

The student's academic performance consisted of the average grade in all college subjects concluded by the students. It was obtained from the academic section of São Paulo State University (UNESP), School of Dentistry, Araçatuba. These students have been evaluated through theoretical tests, practical laboratory, and clinical assessments with grades from 0 to 10. The average of the assessments corresponds to the final score in each course subject. The minimum grade required for approval is 5.0.

Data Analysis

After data collection, the data were submitted to the Kolmogorov-Smirnov test to analyze the normality and homogeneity, as some variables analyzed did not have a normal distribution, Pearson's correlation test (nonparametric) was chosen for this analysis. The participants were classified according to the presence of chronic orofacial pain (COP) of TMD (COP or no COP), also trait, and state level of anxiety. The data were evaluated by SPSS 20.0 version software (SPSS, Chicago, IL, USA) with a significant level of 5%. Chi-square test and Pearson's correlation were used for analyzing categorical variables and the correlation between TMD, gender, chronic orofacial pain, anxiety, and academic performance, respectively.

RESULTS

A total of 195 dental students participated in this research. Chronic orofacial pain of TMD was observed in 73 subjects (37.5%) (Table 1) and the population aged between 19 and 27 years old with a mean age of 21.8 years (SD 2.3). Proportionally, chronic orofacial pain of TMD was more prevalent in women (26.2%) than in men (11.3%), however, with no statically significant difference (Table 1).

Table 2 shows the mean and standard deviation (SD) values for the academic grade of the dental students concerning anxiety levels. The majority of the students had moderated traits and state anxiety and showed an academic grade average of 6.93 and 6.98, respectively. Surprisingly, there was no significant correlation between academic grade and the presence of chronic orofacial pain of TMD, CPI, CPG, trait anxiety, and state anxiety (Table 2).

Of the students who presented chronic orofacial pain of TMD, 72.6% had chronic pain degree 1, 20.55% degree 2, and 6.85% degree 3 (Table 3). In general, it was found that about 30% of men had some degree of pain, and among the women, 46.6% presented degree 1 of chronic pain, 17.8% and 5.5% degrees 2 and 3, respectively. Chronic pain grade exhibited a significant correlation with the female gender (Pearson's correlation 0.158, p=0.027), furthermore, the female gender also showed a significant correlation with trait anxiety (Pearson's correlation 0.141, p=0.049), but not with state-anxiety (Pearson's correlation 0.059, p=0.416).

From data acquired from Spielberger's trait-anxiety inventory, it was possible to observe that 26.2% of the students had low anxiety, 60% moderate, 12.8% high or serious anxiety, and only 1% state of panic. The results regarding state anxiety showed that most students showed moderate anxiety 51.7% followed by low anxiety 22.6%, high anxiety 20%, and panic 5.6%. It is interesting to note that among the students who presented low and moderate levels of anxiety, most of them were in the trait-anxiety axis (86.2%); on the other hand, among the students with high anxiety or panic, the highest prevalence rate occurred in the state-anxiety axis (25.6%) (Figure 1).

Trait-anxiety levels showed a low, however, significant correlation with CPG (Table 3). On the other hand, state-anxiety levels and CPG did not show a significant correlation (Table 4). Also, there was a low, but significant correlation between the increase of CPI and trait anxiety, but not with state anxiety (Table 5).

Table 1: Demographic characteristics of dental students who presented chronic orofacial pain (COP) of TMD.

Gender	Chronic orofacial pain of TMD		p value
	Presence n (%)	Absence n (%)	
Female	51 (26.2)	70 (35.9)	
Male	22 (11.3)	52 (26.7)	
Total	73 (37.5)	122 (62.6)	0.082

p-value for comparison between the two groups (Chi-square test)

Table 2: Distribution of the dental students according to academic grade, trait, and state-anxiety level (n=195).

Anxiety Level	Academic grade					
	Trait-anxiety level			State-anxiety level		
	n	Academic grade average	(SD)	n	Academic grade average	(SD)
Low	51	6.94	(0.6)	44	6.85	(0.5)
Moderate	117	6.93	(0.6)	101	6.98	(0.6)
High	25	7.16	(0.7)	39	7.0	(0.8)
Panic	2	6.95	(1.1)	11	7.1	(0.5)
Total	195	6.97	(0.6)	195	6.97	(0.6)
r/p ratio	0.008/0.914			0.027/0.708		

Values are expressed as n, mean (SD). Pearson's correlation coefficient (r).
p values for comparisons between the trait state anxiety and academic grade (Chi-square test)

DISCUSSION

The present study showed that there was no correlation between anxiety levels, the presence of chronic orofacial pain of TMD, and academic performance. Herein chronic TMD was considered a physical condition related to pain and functional disturbances, and anxiety was a psychological factor capable of triggering or contributing to TMD progression. Both physical and psychological factors have been associated with the poor performance of undergraduate dental students[21] probably because the pain and anxiety may threaten the learning process limiting the attention and concentration of the students during academic activities[22] however, it was not found in this research.

The literature has shown that TMD reaches 30.4% to 70.6% of students in different undergraduate courses[9,12,23,24]. In the present work, it was found that 37.5% of dental students had chronic TMD with some degree of chronic orofacial pain. This difference

in the prevalence of TMD found among different works in the literature could be explained by the fact of the populations studied
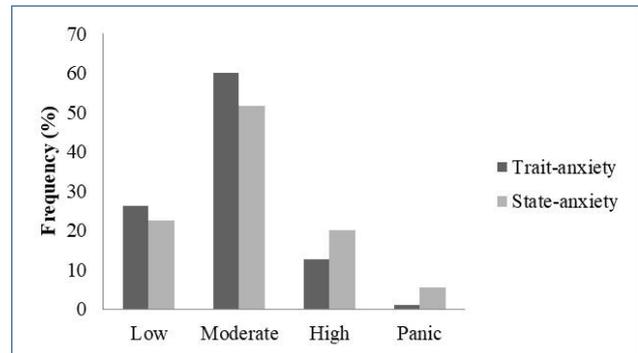
Figure 1: Frequency of the university students according to the anxiety levels obtained through Spielberger's Trait–State Anxiety Inventory (*n*=195).

Table 3: Absolute distribution and percentage of the dental students according to CPG of TMD and trait-anxiety level (*n*=195).

Anxiety Level	Chronic pain grade			
	Absence of COP of TMD		Presence of COP of TMD	
	Degree 0 n (%)	Degree 1 n (%)	Degree 2 n (%)	Degree 3 n (%)
Low	34 (17.5)	12 (6.2)	3 (1.5)	2 (1)
Moderate	78 (40)	30 (15.4)	8 (4.1)	1 (0.5)
High	8 (4.1)	11 (5.6)	4 (2.1)	2 (1)
Panic	2 (1)	0 (0)	0 (0)	0 (0)
Total	122 (62.6)	53 (27.2)	15 (7.7)	5 (2.5)
r/p ratio	0.148/0.044			

p-value for comparison between the CPG and trait anxiety (Chi-square test)
Values are expressed as *n* (%). Pearson's correlation coefficient (r).

Table 4: Absolute distribution and percentage of the dental students according to CPG of TMD and state-anxiety level (*n*=195).

Anxiety Level	Chronic pain grade			
	Absence of COP in TM		Presence of COP of TMD	
	Degree 0	Degree 1	Degree 2	Degree 3
Low	32 (16.4)	6 (3.1)	4 (2.1)	2 (1)
Moderate	62 (31.8)	33 (16.9)	3 (1.5)	3 (1.5)
High	22 (11.3)	10 (5.1)	7 (3.6)	0 (0)
Panic	6 (3.1)	4 (2.1)	1 (0.5)	0 (0)
Total	122 (62.6)	53 (27.2)	15 (7.7)	5 (2.5)
r/p ratio	0.064/0.375			

p-value for comparison between CPG and state anxiety (Chi-square test)
Values are expressed as *n* (%). Pearson's correlation coefficient (r).

Table 5: Distribution of the dental students according to CPI, trait, and state-anxiety level (*n*=195).

Anxiety Level	Chronic pain intensity					
	Trait-anxiety			State-anxiety		
	n	Mean	(SD)	n	Mean	(SD)
Low	51	10.2	(17.5)	44	10	(18.6)
Moderate	117	11.4	(19.5)	101	12.3	(19.2)
High	25	28.7	(26.0)	39	19.3	(26.5)
Panic	2	0	(0.0)	11	12.7	(16.3)
Total	195	13.2	(20.7)	195	13.2	(20.7)
r/p ratio	0.187/0.009			0.113/0.115		

Values are expressed as n, mean (SD). Pearson's correlation coefficient (r).
p values for comparisons between the CPI and trait or state anxiety (Chi-square test)

were different in some characteristics that may interfere with disease development and progression, such as nationality, socioeconomic conditions, and cultural aspects. Moreover, the prevalence of a condition such as TMD is dependent on the criteria used for analysis, and its time of evaluation[25].

Despite the known physiological differences between men and women that make the female gender more prone to TMD, and although most studies have shown a significantly higher prevalence of TMD among women[16,26], interestingly, in this work we have observed that there was no statistically significant difference in the presence of TMD between men and women. A possible explanation for this data would be that in the general population, women seek more care for TMD and pain, in the case of dental students because both genders know more deeply about risk factors, signs, and symptoms, this difference in the prevalence of TMD between genders was not observed.

Herein, it was expected that the prevalence of chronic TMD would be lower among dental students compared to students from other undergraduate courses or the general population, since that dental students were well trained and educated during the course to recognize and control parafunctional habits related to TMD, besides to diagnose the dysfunction early. However, the knowledge regarding TMD and its main etiological factors did not favor a marked decrease in the prevalence of the dysfunction in the studied population when compared to the general population, probably because although dental students have specific knowledge about TMD, they are exposed to higher levels of stress and anxiety than that of their peers and corresponding populations. Many factors have been cited for this high level of anxiety, including the large amount of new knowledge that has to be learned, the comparison between students that generates competition between them, fear of not overcoming challenges, the need to reach a minimum passing grade, clinical responsibility for patient care and large academic workload, which leaves little time for a personal life[27-30].

In this work, it was observed a significant correlation between trait anxiety and chronic orofacial pain grade and intensity. Similar findings were obtained by Marbach and Lund who also used the Spielberger State-Trait Anxiety Inventory to analyze 476 patients with the diagnosis of pain[31]. The association between chronic pain of TMD and psychological factors has been explained by two lines of thought, the first one describes that individuals with psychological deviations are more prone to TMD, and, the second states that psychological factors are manifestations of the pre-existing chronic pain conditions[31,32]. It has been stated that muscular tension and dysfunctional oral habits are increased in the presence of psychological distress, triggering the pain and other clinical symptoms of TMD[30]. According to Heer et al.[33] pain may cause anxiety which in turn the individual more sensitive to pain and, as consequence occurs pain persistence. Bonjardim et al.[34] reported

that pain perception has been cited as strongly influenced by anxiety, anxious people tend to pay more attention to pain amplifying their perceived intensity.

As regards data of the anxiety, chronic orofacial pain, and gender obtained, a significant correlation was observed between the female gender and trait anxiety, as well as between the female gender and chronic pain grade. These data are in agreement with previous studies that found that women are more sensitive to overall anxiety than men[35]. Anxiety is a complex experience and its effects are not uniform in sensory and emotional aspects among women and men, women are more sensitive to psychological, and behavioral factors[19].

The significant correlation observed between the female gender and CPG could be, at least in part, explained by the inherent physiological or constitutional difference in sex, women are more susceptible to hormonal variations, have different characteristics of the muscular structure, and connective tissue[10]. Moreover, women have more general hypermobility, and the temporomandibular joints with more mobility are more prone to disc displacement, which could also lead to situations of more pain[36].

The current literature has shown that students with chronic pain of TMD and high levels of anxiety, in general, have lower academic performance and distrust in their own technical and intellectual ability[21]. However, interestingly, in the present study, any correlation was observed between academic performance and chronic orofacial pain of TMD or anxiety. The different stages of the undergraduate course in which the students were analyzed including students at the beginning and end of the graduation course could be a possible reason for these results since each year has specific and relevant characteristics. In this framework, the level of anxiety could be different among the years, being higher in the early years and the phases most advanced of the course. In the early years, probably, because it involves an adaptation phase due to changes in academic life, and at the end of the course in function of the college finalization process involving uncertainties regarding the professional accomplishment and insertion in the work market, each time more concurred and demanding. Furthermore, recently, was reported that dental students showed good opinions about life and satisfactory academic performance, although the level of anxiety is high[30]. In this line, another study also indicated that stress and anxiety are not necessarily related to academic performance[37]. Taken together, these data suggest that chronic TMD is related to trait anxiety and chronic orofacial pain among dental students, however, this correlation did not significantly interfere with academic performance.

It is important to clarify that the current literature has shown that although the psychological factors and TMD are related, there are serious deficiencies concerning the difficulty of getting an accurate diagnostic in TMD and the absence of psychological instruments with a guarantee for psychometric measurement

differentiating distress and personality[32,38]. In the present study, a questionnaire self-responsive was used to determine the presence of TMD and trait-state anxiety, which could seem like a strong point of this study since RDC/TMD is accepted by international literature as a questionnaire that can efficiently assess psychological characteristics, including anxiety in axis II[8,39]. Furthermore, the questionnaires were applied by a blind examiner with experience with this type of data collection instrument which ensures that the data had a high degree of reliability.

Nevertheless, this study had some limitations as the evaluation of students from a single educational institution, in a single region of the country, also did not evaluate socio-economic, cultural, and lifestyle aspects. Thus, research related to psychological aspects, personality characteristics, variables such as lifestyle, gender, socio-economic aspects, and chronic pain of TMD are strongly indicated in larger samples and multi-centric studies.

It is important to emphasize that as there is not yet a definition between the cause and consequence of psychological factors and TMD, these factors cannot be disregarded during the TMD treatment. It is recommended that during dentistry students be accompanied by professionals capable of providing psychological support, as well as, evaluating and treating TMD cases.

Conclusion

This study concluded that CGP and CPI increased in participants with higher trait-anxiety levels, however, there was no correlation between academic performance and trait/state-anxiety levels or chronic orofacial pain of TMD.

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