Original Article

Frequency and severity of temporomandibular disorders symptoms in Crossfit® practitioners: a cross-sectional study

Frequência e severidade de sintomas de disfunção temporomandibular em praticantes de Crossfit®: estudo transversal

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ABSTRACT | INTRODUCTION: Weight lifting has been associated with teeth clenching and, consequently, the predisposition to temporomandibular disorder (TMD). Even though CrossFit® is a modality that works with weight lifting, no papers were found that investigated TMD in its practitioners. **OBJECTIVE:** To estimate the frequency and severity of temporomandibular disorders symptoms in CrossFit® practitioners and to verify whether there is a relation between participation in competitions or this sport practice time. **MATERIALS AND METHODS:** Cross-sectional study, approved by the Research Ethics Committee from Faculdades Integradas de Jaú (CAAE 91712418.3.0000.5427), conducted in the three CrossFit® boxes that exists in the city. Male practitioners, between 20 and 40 years old, were assessed using Fonseca Anamnesic Index. The outcome variables were: symptom score and degree of TDM severity, as well participation in competitions and sport practice time. **RESULTS:** Regarding the 52 research participants, 40.4% have TMD symptoms. Out of these, 38.4% show mild and 2.0% moderate TMD. No statistical difference was found comparing practice time or competitors and non-competitors. **CONCLUSION:** The frequency of TMD symptoms in CrossFit® practitioners is 40.4%. The predominant degree of severity was mild. No relation was found between the increased incidence and the modality practice time, or the fact of being a competitor.

KEYWORDS: Temporomandibular joint disorders. Weightlifting. Bruxism.

RESUMO | INTRODUÇÃO: O levantamento de peso tem sido associado ao hábito do apertamento dentário e, consequentemente, à predisposição de disfunção temporomandibular (DTM). Mesmo o CrossFit® sendo uma modalidade que trabalha com levantamento de peso, não foram encontrados artigos que investigaram a DTM em seus praticantes. **OBJETIVO:** Estimar a frequência e severidade dos sintomas de disfunções temporomandibulares em praticantes de CrossFit® e verificar se há relação com a participação em competições ou o tempo de prática da modalidade. **MATERIAIS E MÉTODOS:** Estudo transversal realizado nos três boxes de CrossFit® existentes no município de Jaú/SP. Praticantes pertencentes ao sexo masculino, com idade entre 20 e 40 anos, foram avaliados utilizando-se o Índice Anamnésico de Fonseca. As variáveis de desfecho foram o escore de sintomas e grau de severidade da DTM, além da participação em competições e o tempo de prática da modalidade. Houve aprovação da pesquisa pelo Comitê de Ética das Faculdades Integradas de Jaú (CAAE 91712418.3.0000.5427). **RESULTADOS:** Dos 52 participantes da pesquisa, 40,4% possuem sintomas de DTM. Desses, 38,4% de grau leve e 2,0% de grau moderado. Não foi encontrada diferença estatística comparando-se o tempo de prática ou competidores e não competidores. **CONCLUSÃO:** A frequência de sintomas de DTM em praticantes de CrossFit é de 40,4%. O grau de severidade predominante foi o leve. Não foi encontrada relação entre o aumento da frequência e o tempo de prática da modalidade ou o fato de ser competidor.

PALAVRAS-CHAVE: Transtornos da articulação temporomandibular. Levantamento de peso. Bruxismo.

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Introduction

Functional changes concerning temporomandibular joint (TMJ) and masticatory structures are called Temporomandibular Disorders (TMD)[1,2]. They affect 3 to 15% of the population[3] and are described as being more prevalent among people aged 20 to 45 years old. It is important to consider that, up to 40 years old, its main cause is muscular and, after that age, it is joint degeneration.

TMD is multifactorial, having its origin associated with genetic, developmental, postural, structural, traumatic and emotional factors[2]. According to the literature, the main TMJ symptoms are pain, difficulty in opening and closing the mouth, crackles and headaches. There are also auditory findings, which include otalgia, hearing loss, pressure in the ears, tinnitus and dizziness[4,5]. Moreover, it is also described that, depending on the different symptoms intensity, TMD impairs sleep, food habits and, consequently, professional or school activities, negatively impacting the affected person's quality of life[2,6].

Studies indicate an increase in the number of athletes with TMD, mainly in modalities which involve contact, such as rugby, wrestling and football, with mostly facial and head traumas. In addition, it is possible to observe that high-intensity sport activities require a lot of effort, which generates unconscious tooth clenching[4,7]. However, dental clenching can also be performed consciously during physical activity, since it consists of one of the techniques for enhancement after activation, called Jendrassik Maneuver. This maneuver was created in the 1880s and results in muscle strength increase during resistance training[8,9], up to 15.8% for activities involving handgrip10 and 13.9% for knee extensor muscles, resulting in up to 19.5%[11] gain in strength development during jumps on the track.

It is important to highlight, however, that dental clenching is predominant among individuals with TMD, generating pain and overload in the masticatory muscle[12]. According to Amantéa et al.[13], dental clenching is one of the parafunctional habits that results in hyperactivity of the masticatory muscles, causing spasms, which corresponds to 80% of TMD etiology.

It is known that CrossFit® is among the sports which involve weightlifting and extensive training. It is characterized by performing high intensity functional exercise using squats, throws, starting, developing, aerobic activities, besides gymnastic movements[14]. Literature relates failures in the execution of several movements in this modality to injuries in shoulders, spine and knees[15], having already reached up to 73% of the practitioners. Seven percent of the injuries needed surgical interventions[16]. The aforementioned authors reinforce the need of supervision by a qualified instructor, among the suggestions for activities to prevent injuries.

It is emphasized that no papers were found relating TMD to this modality. Thus, the present research aims to verify the frequency and severity of temporomandibular disorder symptoms in CrossFit® practitioners, as well as to check if there is any relation with athletes' participation in competitions or with the sport practicing time.

Materials and Methods

This is a cross-sectional study, carried out in the municipality of Jaú / SP, and approved by the Research Ethics Committee of the Integrated Colleges of Jáu, opinion No. 2,785,510 (CAAE 91712418.3.0000.5427).

The sample was composed of CrossFit® practitioners, belonging to the three boxes in the municipality. It is noteworthy that there are only these three places offering this modality in the municipality.

For sample selection, initial contact was made with the boxes and, after the agreement of the responsible technician, visits to the places were scheduled. In order to carry out the collection, the researcher was present for one week in January and one week in July in each of the participating boxes, after 6 pm. The collection was performed in the last three weeks of each month described.

As an inclusion criterion, we selected male individuals, aged between 20 and 40 years old, who also practiced the sport at least 3 times a week.

Exclusion criteria included changes in postural order, which could generate bias, as they are an etiological factor for TMD17. These changes were identified through interviews with the participants. It is important to mention that, whenever these participants indicated that they had postural alteration, they were automatically excluded from the sample. However, all CrossFit® practitioners who met the inclusion criteria stated that they did not have postural alterations.

All individuals who were in the boxes on the visit days and periods, as well as the ones who met the inclusion and exclusion criteria, were invited to take part in the study. The objectives and procedures were explained to them and they were informed that their identities would be kept confidential. Having said that, 100% agreed to participate in the research by signing the Informed Consent Form.

As to the procedures, an interview was carried out, in order to provide personal information which included age, sport practicing time, how many times a week they practiced it and the fact of being or not a competitor. Then, Fonseca Questionnaire and Anamnesis Index, one of the few tools available in Portuguese to characterize TMD symptoms severity, was applied. The results found with the questionnaire showed a 95% correlation compared with the patients' clinical evaluation. Another important aspect is that it is a simple and easy material to be applied, which favors its use, even in population epidemiological studies[18].

This tool consists of 10 questions regarding TMD symptoms, and the participant had to answer whether it always, sometimes or never occurred.

To score the questionnaire previously answered by the participant, each time the individuals' answer to a symptom was "always", 10 points were assigned; when they said that the investigated situation occurred "sometimes", 5 points were given; and when they answered that the symptom had "never" been experienced, 0 points were assinged[18]. The scores were then added together.

Concerning the questionnaire final score, when it ranged from 0 to 15, there was no TMD; between 20 and 40, there was an indication of mild TMD. Moderate TMD corresponded to values between 45 and 65; and values from 70 to 100 suggested severe TMD[18].

It is important to mention that participants whose symptoms corresponded to TMD were referred to dental care at a health center near their houses.

To compare competitors with non-competitors, T-student test was used with a 5% significance level. In order to compare the training time, the sample was divided into 3: A) up to 1.5 years of practice; B) from 1.5 to 2.5 years of practice and C) from 2.5 years of practice. ANOVA statistical test was applied, also with a 5% significance level.

It is noteworthy saying that these two parametric tests, T-student test and ANOVA, were applied because the application of Shapiro - Wilks test showed that the research data followed a normal distribution.

Results

The sample included 52 volunteers with minimum age of 20 years old and maximum of 40 years old ($\bar{x}$ = 29.4 years ± 5.24). Participants' CrossFit® practicing time ranged from 4 months to 8 full years. Considering the participants in the research, 40.4% had symptoms which were equivalent to TMD. The frequency of CrossFit® practitioners with each TMD symptoms severity degree is shown in Table 1.

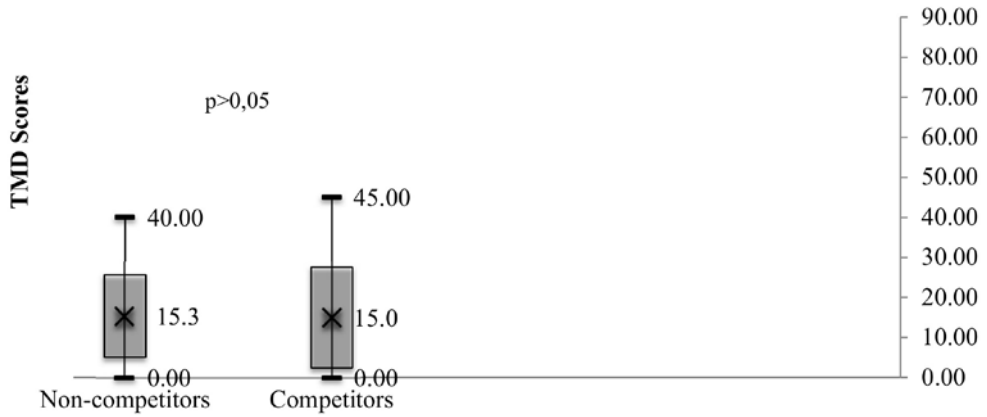
Table 1. TMD symptoms severity degree in CrossFit® practitioners

TMD degree	Frequency (%)
Normal (0 to 15 points)	31 (59.6%)
Mild TMD (20 to 40 points)	20 (38.4%)
Moderate TMD (45 to 65 points)	1 (2.0%)
Severe TMD (70 to 100 pontos)	0 (0.00%)
Total	52 (100%)

Regarding the frequency of TMD symptoms among competitors (14 individuals) and non-competitors (38 individuals), 5 individuals (36%) were found with TMD symptoms in the first group, 4 (29%) mild degree and 1 (7%) moderate degree. Among non-competitors, Fonseca Questionnaire and Anamnesis Index indicated that 16 (42%) had TMD symptoms, all of which were mild.

Comparing the scores of competitors and non-competitors with T-student test, it was found that there was no statistical difference (p> 0.05) between them. The distribution of the participants' scores divided into these categories, based on the values of minimum, maximum, average and standard deviation is shown in Figure 1.

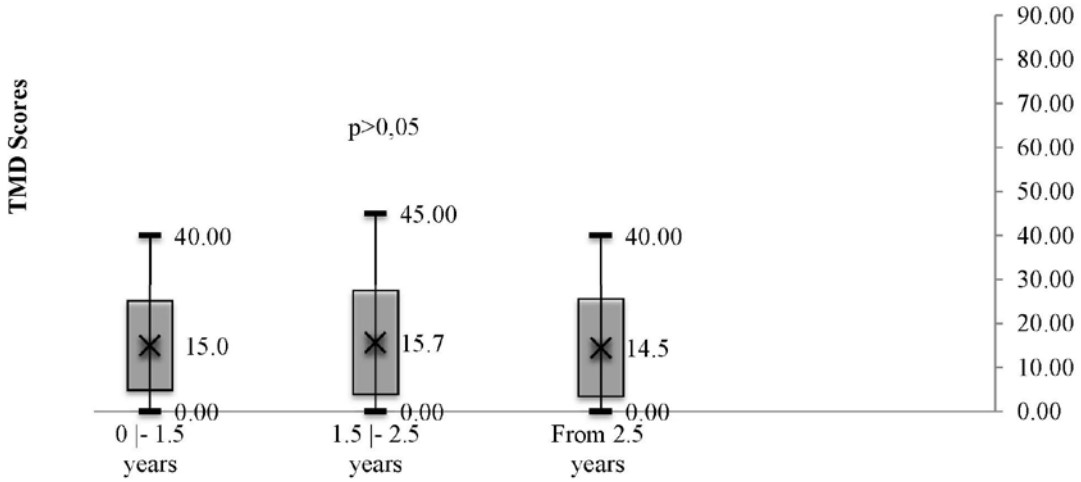
Figure 1. Distribution of TMD scores from competitors and non-competitors



As to TMD symptoms frequency within each CrossFit® practice time range, out of the 19 individuals who practiced from four months to one year and a half, 8 (42%) showed mild TMD symptoms. Among the 22 individuals in the group who practiced between 1.5 year and 2.5 years, 9 (41%) had TMD symptoms, 8 (36%) mild and 1 (5%) moderate. In the group with 11 individuals, who trained from 2.5 years to 8 complete years, 4 (36%) presented mild TMD symptoms.

The comparison between the scores of individuals belonging to each training time category was made with ANOVA statistical test, and revealed that there was no statistically significant difference (p> 0.05) among them. The participants score distribution, divided into these categories and based on the values of minimum, maximum, average and standard deviation is shown in Figure 2.

Figure 2. Distribution of TMD symptom scores according to CrossFit® practicing time



Discussion

This research aimed to estimate the frequency and severity of TMD symptoms in CrossFit® practitioners. The theme choice was due to the fact that weight lifting is related to dental clenching[7,8,9] and, thus, CrossFit® employs weight lifting[13].

TMD symptoms frequency identified in the present study among CrossFit® practitioners (40.4%) was higher than the incidence of TMD found in a population study conducted by Progiante et al. 19, when they investigated this dysfunction in 561 Brazilian men, with average age between 32.7 and 38.2 years, corresponding to 25%. These findings suggest that, among the male individuals in the present sample, there was a higher frequency of TMD symptoms in them than in their peers in the Brazilian population in general. Thus, professionals who work with this dysfunction need to be attentive and promote guidance actions that reach this public. Moreover, it is also important to facilitate their access to clinical examinations that favor their diagnosis and treatment possibilities.

It was also observed that the frequency of TMD symptoms in the present study (40.4%) was similar to the one found by Duplat and Nunes20, when they investigated this disorder using the same instrument in 51 boxing practitioners, with an average age of 20.7 years old. It should be noted, however, that the overload mechanism to which ATM joint is exposed is different for both modalities: while CrossFit® extensive training is likely to result in an increase in oral parafunctional habits, such as dental clenching, in boxing there are direct impacts on the practitioner's face. These findings reinforce the need for further research with objective instruments in the field of biomechanics, in order to analyze the genesis of the different mechanisms of TMJ injury in these and other sports. These investigations will favor the development of protection strategies for this public, and may include the replacement of Jendrassik Maneuver by any other which may also result in strength gain, without generating overload to the masticatory muscles. Besides, the use of protective equipment, such as the adoption of plates to protect the teeth during the sport practice, or even exercises or stretching in order to relax the orofacial muscles after training periods, should also be considered.

One of the specific objectives of the present study was to verify if there is any relation between participation in competitions and the increase in TMD frequency. This comparison was made between CrossFit® practitioners, since competing requires more training, which implies a greater burden on the body. However, there was no statistical difference when comparing these conditions. It is emphasized that no scientific publications that analyzed the intensity or frequency of this sport practitioners' training, dividing them into amateurs or competitors / professionals, who could be compared to the present findings, were found.

The other specific objective of the present study was to verify if there would be a greater frequency of TMD symptoms in individuals who trained CrossFit® for a longer time. However, no statistical difference was found comparing those who trained for up to 1.5 years, between 1.5 years and 2.5 years and for more than 2.5 years. It is reinforced that in the three investigated periods, TMD symptoms frequency was equivalent, varying from 36% to 42% and being above the 25% found by Progiante et al.[19] in a population study carried out in Brazilians who belonged to the same gender and the same age range.

It is important to highlight that in the present sample, individuals who practice the sport for the shortest time, have been doing it for at least 4 months. There are possibilities, therefore, that future research involving practitioners between 0 and 4 months may indicate the variation in TMD frequency between the 25% population up to 40% found in the studied public. It is a methodology used in CrossFit®, first to acquire the technique mastery and, from then on, to increase the load[15,16].

Regarding the choice of the sample, only men were evaluated because there is a difference in the incidence of TMD when comparing the gender, i.e., 2 to 6 women with TMD for each man who has the alteration. These differences are related to estrogen hormone, which acts on the physiological mechanisms of pain modulation, generating changes in the prevalence of TMD even within studies involving only women, depending on the phase of the menstrual cycle[21]. Studying only men aimed at avoiding this relevant bias.

Individuals aged 20 to 40 years old were selected for the sample, once literature indicates that the prevalence of TMD of muscular origin is higher in this age group. In addition, from 40 years old on, due to aging, the main etiological factor becomes joint degeneration[2]. It was interesting to investigate this age, as the focus of TMD related to dental clenching is precisely muscle overload[12]. Therefore, it was also preferred to avoid bias regarding age.

Facing the results found, the number of participants can be described as a limitation of this study, that is why care was taken in order to avoid generalizing the present data, describing them only as a result of a particular sample, and not as population data.

Another limitation is the absence of a control group. This occurred because, while sedentary groups are related to a greater predisposition to emotional changes, such as depression and anxiety[22], other relevant etiological factors for increasing the incidence of TMD[4], it was not possible to define which sport or level of physical activity would be the most appropriate for a comparison with CrossFit®, without setting a methodological bias.

There was also the absence of postural, emotional assessment and the use of objective instruments for TMD assessment, once the research focus was Fonseca Questionnaire and Anamnesis Index18. However, further studies comparing TMD frequency in this target population, with clinical evaluation and objective instruments, would be interesting.

Nevertheless, the research is relevant due to the fact that studies on TMD in CrossFit® practitioners have not been found in literature, thus shedding light on further investigations on the subject. Furthermore, as also explained by Duplat and Nunes20 in a study that used the same instrument, the methodology employed is easy and cheap to apply, which allows its reproduction by other research groups.

Conclusion

The frequency of TMD symptoms among CrossFit® practitioners was 40.04%, being 38.4% mild and 2.0% moderate. There was no symptoms frequency related to TMD severe degree.

There wasn't any relation found, neither considering the fact of being a competitor nor regarding CrossFit® practicing time, with TMD increased frequency.

Author contributions

Kaminiecki AKM and Davatz GC were responsible for all stages of the research, from conception to writing, as well as the final version approval.

Competing interests

No financial, legal or political competing interests with third parties (government, commercial, private foundation, etc.) were disclosed for any aspect of the submitted work (including but not limited to grants, data monitoring board, study design, manuscript preparation, statistical analysis, etc.).

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