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Prevalence and risk factors for bruxism among climbers

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Conflict of interest

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Abstract

Background: Bruxism is defined as the parafunction of masticatory system, which consists in clamping or gnashing teeth, often combined with the feeling of stiffness of the jaw. Risk factors for bruxism include psychosocial factors e.g. stress and anxiety. Climbing, as a extreme sports, may be associated with an increased level of mental tension due to the relatively high stress load.

Aim: This study aims to determine the prevalence and risk factors for bruxism among climbers.

Material and methods: 104 people came for the study. Finally 88 people were qualified for the statistical analysis, including 41 women and 47 men with an average age of 28 years (± 7 years). The study consisted of an author's questionnaire containing questions about bruxism and its risk factors. The questions used to assess bruxism were constructed in accordance with the guidelines of Pintado et al., Lavigne et al. and Thorpy.

Results: 51.1% of the respondents suffered from awakening bruxism (51.2% women, 51.1% men),

while 22.7% suffered from sleep bruxism (34.1% women, 12.8% men). 73.3% of the respondents with awakening bruxism and 80% of the respondents with sleep bruxism had higher education.

Conclusions:

- The prevalence of sleep bruxism among climbers is 22.7%, while awake bruxism is 51.1%.
- The higher prevalence of bruxism in climbers relative to the general population can be explained by the specificity of the mobility abilities necessary for climbing training and the climber's mental burden.
- Both sleep and awake bruxism seems to be associated with higher education.
- Sleep bruxism is more common in climbing women than in climbing men.
- We recommend further research into the prevalence and risk factors for bruxism among climbers and other athletes.

Key words: climbing, bruxism, sport medicine

Background

Climbing

Climbing is a physical activity in which athletes move on a steep terrain or wall using their legs and arms. Very often they use specialized equipment, e.g. in the form of a harness or rope, which is used to belay climbers [11]. Motor skills, which are particularly shaped during climbing, include strength and endurance, as well as flexibility, coordination and balance [19, 22]. There are many varieties of climbing, but the most popular are: bouldering, climbing with a rope or mountain climbing (mountaineering) [11, 19]. Currently, artificial climbing walls are very popular, allowing training to be carried out regardless of the weather or season [11, 22].

The name "bouldering" comes from the English word "boulder" meaning "erratic boulder", on which one should climb the marked path. These stones usually reach several meters in height. Bouldering is also practiced on artificial walls. Climbing is unsecured in the form of a rope, and the only form of belaying is the mattress [11, 22]. Paths cover from a few to a dozen or so moves and require from the climber particularly developed strength [19].

Climbing with the rope usually takes place on walls of several meters or slopes, where additional safety equipment is used in the form of a rope, harness and belay points located on the wall. The presence of a second person - the belayer is also necessary [11, 22]. When practicing this type of climbing, the athlete should be characterized by such motor abilities as general endurance and strength endurance [22]. They are necessary to complete paths consisting of several / dozens of movements.

Mountain climbing includes Tatra mountaineering, Alpine mountaineering and Himalayan mountaineering. Such climbing usually requires the use of specialized equipment, including rope, harness or hooks. It is a form of climbing practiced only in the natural environment, consisting in conquering mountain peaks located, for example, in the Tatra Mountains, the Alps and the Himalayas [4, 7]. Highly developed physical abilities, technical climbing skills and mental resilience are the basic features attributed to high mountain climbers [19].

Bruxism

Bruxism is defined as the parafunction of the movement of masticatory system, which consists in clamping or gnashing teeth, often combined with the feeling of stiffness of the jaw [14]. This parafunction has been divided into two types: sleep bruxism (unconscious) occurring at night and awakening bruxism (conscious) occurring during wakefulness [14, 18, 26]. Risk factors for bruxism include stress and anxiety, consumption of stimulants (caffeine, tobacco, alcohol, drugs), taking certain medications, and mental and neurological diseases [3, 7, 8]. Disturbances in the number of neurotransmitters or respiratory diseases (especially sleep apnea) may also contribute to the development of this parafunction [18].

Climbing and bruxism

Teeth clenching (which is the essence of bruxism) during sports training leads to an increase in the possibility of creating maximum strength, and also improves postural stability and motor control of the entire movement organ of the person exercising [15]. This applies especially to sports with strength-related effort, which includes climbing [11, 19, 20, 22]. Climbing, which belongs to extreme sports, may be associated with an increased level of mental tension due to the relatively high stress load [19, 22]. Participation in competitions or the prospect of accidental injury while climbing can intensify this condition and lead to the development of bruxism, which is one of the risk factors of psychological factors [19]. On the other hand, it is suggested that climbing reduces depression and anxiety, and improves emotional stability in those training it [25].

This study aims to determine the prevalence and risk factors for bruxism among climbers.

Material and methods

The study was conducted according to the recommendations of the Helsinki Declaration and with the consent of the Bioethics Committee of the Medical University of Lublin (KE-0254/191/2019). The subjects were informed about the objectives of the study, they were aware of the possibility of resigning from them at any time. Written consent to participate in the study has been obtained from all participants.

104 people came for the study. The following exclusion criteria were used: pregnancy, neurological disorders or syndromes, rheumatological diseases, autoimmune diseases, systemic diseases, no written consent for study. Finally 88 people were qualified for the statistical analysis, including 41 women and 47 men with an average age of 28 years (± 7 years).

The study consisted of an author's questionnaire containing questions about bruxism and its risk factors. The questions used to assess bruxism were constructed in accordance with the guidelines of Pintado et al. [16], Lavigne et al. [13] and Thorpy [24]. Conscious bruxism was assessed by the following question: "Have you ever been aware of clenching or grinding your teeth during wakefulness in the past 6 months?" The answer "yes" qualified the subjects to the group suffering from awakening bruxism [13, 16]. The following questions were used to assess sleep bruxism: 1. "Are you aware, or has anyone heard you, grinding your teeth frequently during sleep?" 2. "Are you aware that your dentition is worn down more than it should be?" And 3. "Are you aware of any of the following symptoms upon awakening?: (a) Sensation of fatigue, tightness or soreness of your jaw upon awakening?; (b) Feeling that your teeth are clenched or that your mouth is sore upon awakening?; (c) Aching of your temples upon awakening?; (d) Difficulty in opening your mouth wide upon awakening?; (e) Feeling of tension in your jaw joint upon awakening and feeling as if you have to move your lower jaw to release it?; (f) Hearing or feeling a "click" in your jaw joint upon awakening that disappears afterwards?" The subjects were assessed as suffering from night bruxism, if they answered "yes" to questions 1 and / or 2 and reported at least one symptom from question 3 [24]. Additionally, anthropometric data of the respondents (age, gender, education) and information about the length of climbing experience and its preferred form (bouldering, climbing with a rope, mountain climbing) were collected.

Results

51.1% of the respondents suffered from awakening bruxism (51.2% women, 51.1% men), while 22.7% suffered from sleep bruxism (34.1% women, 12.8% men). The most common symptom of sleep bruxism among the respondents was a "sensation of fatigue, tightness or soreness of jaw upon awakening" (46.7%), while the rarest was "difficulty in opening mouth wide upon awakening" (20%). "Feeling that teeth are clenched or that mouth is sore upon awakening" occurred in 37.8% of respondents, while "aching of temples upon awakening", "feeling of tension in jaw joint upon awakening and feeling as if you have to move your lower jaw to release it" and "hearing or feeling a "click" in jaw joint upon awakening that disappears afterwards" was reported by 31.1% of respondents.

Among people diagnosed with the daily form of bruxism, 73.3% of the respondents had

higher education, 22.2% high school education and 4.4% secondary school education, while among those suffering from night bruxism 80% reported to have higher education, 15% high school education and 5% secondary school education.

Discussion

Population studies regarding the prevalence of bruxism indicate that awakening bruxism is more common than sleep bruxism. This relationship is described by Emodi et al. who surveyed the inhabitants of Israel ($n = 1000$) and determined the incidence of sleep bruxism at 9.2% and waking bruxism at 19.2% [6]. Studies by Serra-Negra et al. conducted among 183 Brazilian dentistry students also showed a greater prevalence of awakening bruxism (36.5%) compared to sleep bruxism (21.5%) [21]. Therefore, the above works confirm author's study.

In this study, it has been shown that the incidence of sleep bruxism among climbers is 22.7%, while awakening bruxism is 51.1%. These results far outweigh the prevalence of bruxism in the earlier studies of Emodi et al. [6] and Serra-Negra et al. [21]. The reasons can be found in the teeth clamping function during sport training and in the mental aspect of climbing. According to the research of Marczak et al. [15], teeth clenching during sports activities can affect motor control in the entire musculoskeletal system, improve postural stability, and develop the ability to generate greater maximum force. The results of Churea's work suggest, however, that clenching teeth has an impact on the maximum grip strength and on the speed of its generation [3]. In addition, according to the work of Ebben et al., clenching of teeth leads to an increase in the quality of nerve conduction transfer to muscles located on the periphery of the body [5]. As climbing abilities are influenced by physical skills such as strength and power of the upper limb or technique [12], teeth clenching can be an attempt to increase these parameters.

As mentioned above, the increased prevalence of bruxism among climbers may also be affected by the psychological burden associated with this sport. According to the work of Steimer and Weissert, the level of psychological stress increases during climbing [22]. Saul et al. in research on the determinants of success in climbing suggest that tension and anxiety are associated with climbing regardless of the climber's skill level and may lead to reduced climbing efficiency [19]. What's more, research by Tahara et al. suggests that chewing gum and clenching teeth can affect the level of cortisol found in saliva, supporting relaxation and reducing perceived stress and anxiety [23]. Thus, the results of studies by Steimer and Weissert [22], Saul et al. [19] Tahara et al. [23] explain the higher prevalence of bruxism among climbers. Opposition to the above-mentioned works stands the research of Hrušová and Chaloupská, which indicate the positive psychological effects of sport climbing, such as improving well-being and increasing the willingness to engage in activity, and reduce impulsiveness, discomfort and anxiety, as well as sadness and anxiety [9]. Therefore, further and more detailed research on the psychological aspect of sport climbing is recommended.

The author's study showed that sleep bruxism is more likely to affect climbing women than men. This result is consistent with the observation made by Wetselaar et al. investigating the Danish population ($n = 1209$), the authors concluded that both sleep and awakening bruxism is more common among women [25]. This is also confirmed by the research of Cavallo et al. conducted on 278 students of an Italian university [1]. The lack of differences between the prevalence of awakening bruxism among men and women in the author's study can be explained by a small group of respondents.

An analysis of the results of this study indicates that 73.3% of respondents with a recognized form of bruxism had a higher education, 22.2% high school education and 4.4% secondary school education, and among those suffering from night bruxism 80% reported to have higher education, 15% high school education and 5% secondary school education. The presented data suggest the dependence of bruxism on the level of education. Confirmation of this assumption is the study of Cavallo et al. conducted on prisoners ($n = 280$) from southern Italy [2] and the study of Pontes and Prietsch [17] on the sleep bruxism of the inhabitants of Rio Grande ($n = 1280$), which indicate a correlation of bruxism with possession higher level of education. The authors of both studies

explain this connection with a higher level of stress experienced by people with higher education compared to people who completed lower education [2, 17].

According to current knowledge, the prevalence of bruxism among athletes of other disciplines is unknown. A review of the literature on the subject only indicates the research of Gay-Escoda et al. conducted on footballers from Football Club Barcelona, which indicate that bruxism concerns 30% of players playing football (n = 30) [8]. The summary of the results of the author's work and research by Gay-Escoda et al. suggests that the problem of bruxism may also apply to people undertaking different sports activities, while its prevalence may depend on the type of sport. However, due to the small amount of scientific work in this area, we suggest expanding research on bruxism to include its prevalence among athletes.

Conclusions

- The prevalence of sleep bruxism among climbers is 22.7%, while awake bruxism is 51.1%.
- The higher prevalence of bruxism in climbers relative to the general population can be explained by the specificity of the mobility abilities necessary for climbing training and the climber's mental burden.
- Both sleep and awake bruxism seems to be associated with higher education.
- Sleep bruxism is more common in climbing women than in climbing men.
- We recommend further research into the prevalence and risk factors for bruxism among climbers and other athletes.

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