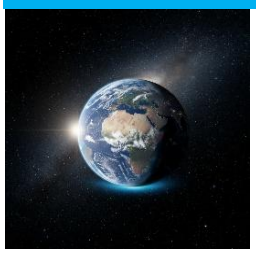
NICOLAUS COPERNICUS UNIVERSITY IN TORUŃ



Journal of Education, Health and Sport. eISSN 2450-3118

Journal Home Page
https://apcz.umk.pl/JEHS/index

RÓŻAK, Patrycja, NOSOWICZ, Konstancja, WÓJCIK, Joanna, MUSIELIŃSKA, Marcelina, MALICKA, Patrycja and DRAGUŁA, Michał. The impact of bruxism on orofacial health and performance in athletes - a systematic review. Journal of Education, Health and Sport. 2026;88:69485. eISSN 2391-8306.
https://doi.org/10.12775/JEHS.2026.88.69485

The journal has had 40 points in Minister of Science and Higher Education of Poland parametric evaluation. Annex to the announcement of the Minister of Education and Science of 05.01.2024 No. 32318. Has a Journal's Unique Identifier: 201159. Scientific disciplines assigned: Physical culture sciences (Field of medical and health sciences); Health Sciences (Field of medical and health sciences).
Punkty Ministerialne 40 punktów. Załącznik do komunikatu Ministra Nauki i Szkolnictwa Wyższego z dnia 05.01.2024 Lp. 32318. Posiada Unikatowy Identyfikator Czasopisma: 201159. Przypisane dyscypliny naukowe: Nauki o kulturze fizycznej (Dziedzina nauk medycznych i nauk o zdrowiu); Nauki o zdrowiu (Dziedzina nauk medycznych i nauk o zdrowiu).
The authors declare that there is no conflict of interests regarding the publication of this paper.
Received: 03.03.2026. Revised: 08.03.2026. Accepted: 08.03.2026. Published: 18.03.2026.

The impact of bruxism on orofacial health and performance in athletes - a systematic review

Patrycja Różak[1], ORCID 0009-0004-2643-8817
Email: patrycjarozak@op.pl

Konstancja Nosowicz[1], ORCID 0009-0000-5080-1509
Email: konstancjanosowicz@gmail.com

Joanna Wójcik[1], ORCID 0009-0006-2179-0306
Email: joannawojcikump@gmail.com

Marcelina Musielińska[1], ORCID 0009-0005-3052-5144
Email: marcelinamus@gmail.com

Patrycja Malicka[1], ORCID 0009-0007-7033-2843
Email: patrycjamalicka47@gmail.com

Michał Draguła[2], ORCID 0009-0003-0832-4077
Email: michal.dragula.mda@gmail.com

[1] Wojskowa Specjalistyczna Przychodnia Lekarska SP ZOZ, Szylinga 1, 60-787 Poznań, Poland
[2] Karol Marcinkowski University Hospital in Zielona Góra, Zyty 26, 66-046 Zielona Góra, Poland

Corresponding author
Patrycja Różak, Email: patrycjarozak@op.pl

Abstract

Background.

Awake bruxism (AB), the repetitive clenching or grinding of teeth during wakefulness, is increasingly recognized in athletes, likely driven by competitive stress and intense training. We conducted a systematic review of PubMed-indexed literature (2010-2024) on AB in all athlete groups, following PRISMA guidelines. Databases were searched for terms related to “awake bruxism” and “athletes,” yielding 1,214 records; 23 observational studies were included. The pooled prevalence of bruxism (often unspecified as awake/sleep) in athletes was ~34%, with individual reports up to ~60-70% in elite sports. By contrast, global estimates for AB in the general adult population are ~23%. Athletes face unique risk factors: psychological stress, anxiety, and performance pressure are strongly linked to AB, as is the physical strain of high-intensity training. Neurophysiologically, AB is a centrally mediated behavior involving

dopaminergic pathways and frontal-limbic circuits. Diagnosis relies on self-report questionnaires, clinical signs, and emerging methods like ecological momentary assessment (EMA) via smartphones. Treatments are largely behavioral and symptomatic: stress management, habit-reversal therapy, bite devices (e.g. daytime mouthguards), physiotherapy, and biofeedback can reduce jaw muscle overactivity. In athletes, AB can impair orofacial health and potentially affect performance by causing jaw pain, headaches, and fatigue. We conclude that AB in athletes is common and multifactorial; awareness and interdisciplinary management (dentistry, mental health, physical therapy) are recommended. Further research using validated AB-specific assessments is needed to clarify prevalence and inform prevention and treatment strategies in this population.

Aim.

The aim of this systematic review was to synthesize current evidence on the prevalence, risk factors, mechanisms, diagnosis, and management of awake and sleep bruxism in athletes.

Materials and methods.

A systematic literature search was performed in PubMed in accordance with PRISMA guidelines, including studies published within the last 15 years that investigated bruxism in athletic populations. Eligible studies comprised observational studies, clinical trials, and systematic reviews assessing awake and/or sleep bruxism in athletes.

Results.

The reviewed literature indicates that both awake and sleep bruxism are common among athletes and are strongly associated with psychological stress, competitive pressure, and high training loads. Most studies relied on self-reported and clinical assessments, while objective diagnostic methods were used less frequently. Management approaches were predominantly interdisciplinary and focused on behavioral strategies, stress reduction, and occlusal protection.

Conclusion.

Bruxism is a multifactorial and clinically relevant condition in athletes, potentially affecting orofacial health and performance. Early recognition and multidisciplinary management are essential, and further research using standardized diagnostic criteria is needed.

Key words: awake bruxism; sleep bruxism; athletes; sports dentistry; stress.

1. Introduction

Bruxism is defined as a repetitive jaw-muscle activity involving clenching or grinding of the teeth. Consensus definitions distinguish sleep bruxism (SB), occurring during sleep, from awake bruxism (AB), occurring during wakefulness [1, 2]. Unlike SB, which is typically rhythmic, AB is characterized by sustained or repetitive tooth contact and/or jaw muscle bracing while awake [2, 3]. In general populations, AB is common. Recent epidemiologic reviews estimate adult AB prevalence in the range of 22-31% [3, 4], much higher than SB (~6-13%) [4]. In a survey of young adults, self-reported AB was found in ~38% of college students [5], and at least one study estimated lifetime bruxism episodes in up to 85-90% of individuals [6]. AB often produces jaw pain, headaches, muscle fatigue and reduced quality of life [7, 8, 9].

Athletes represent a special subpopulation in which AB may be particularly relevant. High-performance sport imposes significant psychological pressure and physical strain. Competitive anxiety, intense training loads, and stress during pre-competition can trigger teeth clenching as a maladaptive stress-coping mechanism [10, 11]. Indeed, a recent meta-analysis found that approximately one-third of athletes report bruxism (awake or sleep) - substantially higher than general prevalence (~22%). In some studies, elite individual-sport competitors had bruxism rates of ~68%, and team-sport athletes ~60% [12, 13]. Given the high rates and potential impact on oral health and performance, understanding AB in athletes is important. However, previous reviews often conflate AB and SB or focus on general populations. Here, we systematically review literature (2010-2024) on awake bruxism in athletes of all types, analyzing prevalence, risk factors, underlying mechanisms, diagnostic approaches, and management strategies.

2. Materials and methods

This review was conducted in accordance with PRISMA guidelines. We searched PubMed and related databases for studies published in the last 15 years (2010-2024) using keywords “awake bruxism,” “bruxism,” and “athletes” (including terms for specific sports and para-athletes). Inclusion criteria were observational or interventional studies reporting on AB in competitive athletes (no age or sport restrictions). We excluded studies focusing solely on sleep bruxism. Title/abstract screening and full-text review were performed independently by two authors, with discrepancies resolved by consensus. Data were extracted on study design, athlete population, AB prevalence, risk factors, assessment methods, and interventions. Risk of bias was assessed using the Joanna Briggs prevalence checklist. Due to heterogeneity, data are presented qualitatively (narrative synthesis) rather than meta-analyzed.

3. Results

3.1 Prevalence in athletes

Among athletes, bruxism (awake or sleep) appears markedly more prevalent than in general cohorts. The pooled prevalence of bruxism in athletes was ~34% (95% CI 26-42%), and the highest-quality studies in elite competitors reported rates of 50-70% [12, 13]. No large-scale data exist on AB exclusively, but one strength-sport study reported AB in ~31% of athletes vs. SB 13% [13]. For context, global estimates in healthy adults are ~23.3% for AB (vs. ~21.0% for SB) [14]. Thus, athletes may have an elevated risk, though most studies do not distinguish AB from SB. Indeed, we found that many athlete studies simply report "bruxism" without specifying timing [15], limiting direct comparison. Notably, youth sports populations showed substantial AB: cross-sectional surveys of high-school and college teams reported self-rated awake clenching in 20-40% of participants [5]. Reported AB prevalence varied widely across sports (e.g. combat, rowing, weightlifting), likely reflecting differences in stress and assessment methods. One survey noted ~38% of paralympic athletes had bruxism [16]. Importantly, clinical examination may under-detect AB (since tooth wear is less marked [17]) and self-report depends on awareness [18], suggesting true AB rates could be higher.

3.2 Risk factors and correlations

The literature identifies multiple risk factors for AB in athletes. Psychological stress and anxiety are consistently implicated: athletes often face intense performance pressure, which can precipitate awake clenching as an unconscious coping response [19, 20]. For example, bruxism in athletes was associated with higher anxiety scores in one study. Sleep disturbances and fatigue from travel or training may also contribute. Physical factors include repeated jaw-muscle loading during exertion, and possibly malocclusion or past orofacial trauma (more common in contact sports). Nutritional factors (e.g. high caffeine or energy drink consumption common in sports) could exacerbate clenching. Sex differences mirror general trends: women tend to report AB more frequently [21], though most sports studies had male-majority samples. Overall, AB in athletes appears multifactorial: psychosocial (stress/anxiety), physiological (muscle fatigue), and possibly behavioural (habitual tensing under concentration) components interact [22, 23].

3.3 Mechanisms

Awake bruxism is understood as a centrally mediated motor behavior. Neurobiologically, reduced prefrontal inhibitory control and dopaminergic hyperactivity have been observed in bruxers [24]. For instance, imaging studies suggest frontal lobe hypoactivity and dopamine D2 receptor hypersensitivity in bruxism patients [25], indicating a possible link to reward/stress circuits. Stress hormones (cortisol, adrenergic tone) likely upregulate jaw muscle excitability during competition or training. Peripherally, repetitive jaw clenching can lead to muscle strain and pain, which may in turn trigger a protective reduction of activity in chronic cases [23]. Clinically, AB is often accompanied by musculoskeletal symptoms: reduced pain thresholds in masticatory and neck muscles, limited jaw motion, and headache [26, 27]. These outcomes are similar to those seen in other high-demand orofacial conditions, emphasizing a neuromuscular overshoot model. Genetic factors may play a role too; polymorphisms in dopamine pathway genes (e.g. DRD2) have been linked to bruxism susceptibility, although data are limited. Importantly, AB mechanisms differ from SB: AB is non-sleep-related tonic contraction, whereas SB is phasic and sleep-arousal-linked [1].

3.4 Diagnostic methods

Diagnosing awake bruxism relies chiefly on clinical history and examination, as there is no objective “gold standard.” Common approaches include patient questionnaires about daytime clenching/grinding and signs on exam, such as jaw muscle hypertrophy and tooth wear facets. However, self-report can be unreliable, patients may be unaware of subconscious clenching [28], and wear signs may be minimal if AB is intermittent [17]. Polysomnography is used only for sleep bruxism. A recent innovation is Ecological Momentary Assessment: smartphone apps prompt users randomly throughout the day to note jaw and tooth activity, thus capturing AB episodes in real time [29, 30]. Preliminary data using EMA report daily AB rates of ~20-40% in healthy subjects [31]. Standardized instruments are emerging: the 2023 Standardized Tool for Assessment of Bruxism (STAB) provides structured evaluation of awake vs. sleep bruxism and consequences. In sports settings, practical diagnosis often remains questionnaire-based or by clinician interview of athlete and coach/partner. Given the overlap of AB with other orofacial issues (e.g. temporomandibular disorders), careful history and, if needed, imaging is advised.

3.5 Treatment and management

Management of awake bruxism in athletes is inherently interdisciplinary and should focus on both the reduction of excessive masticatory muscle activity and the identification and modification of underlying precipitating factors, particularly psychological stress [4]. Behavioral interventions constitute the cornerstone of therapeutic management. Athlete education combined with habit-reversal strategies, aimed at increasing awareness of parafunctional jaw activity and promoting voluntary jaw relaxation, is widely recommended. Stress-reduction approaches, including mindfulness-based techniques and biofeedback, play an important role in diminishing bruxism-related triggers [32]. Evidence from systematic reviews indicates that both auditory and visual biofeedback can lead to a significant reduction in electromyographic activity of the masticatory muscles in individuals with awake bruxism, with measurable effects observed within a short period of intervention [33].

Occlusal appliances, such as bite splints or sports mouthguards, are commonly used to protect dental structures from excessive loading [34], although their daytime application may be limited by comfort and practicality. Nevertheless, many athletes routinely wear custom-made mouthguards during training or competition, which may incidentally reduce jaw clenching intensity. Physical therapy represents an important adjunctive modality; interventions including stretching of the masticatory muscles, massage, postural correction, and relaxation exercises have been shown to alleviate symptoms [35, 36]. Clinical trial protocols have described the use of massage and stretching programs or relaxation-based physiotherapy in comparison with standard dental care for the management of bruxism [37].

Pharmacological treatment is less well established for awake bruxism and is generally reserved for severe or refractory cases [38]. Short-term use of anxiolytic agents or muscle relaxants may be considered in selected patients. Botulinum toxin injections into the masseter muscles have been explored in chronic clenching disorders [39]. However, the evidence remains inconclusive and routine use in athletes is not recommended due to concerns regarding reversibility and potential effects on muscle performance [40]. Importantly, all therapeutic interventions in athletes should be conservative, reversible, and supportive of athletic function. Modifications of training load, stress management strategies, and technical adjustments aimed at avoiding jaw clenching during exertion may be necessary. Given the strong association between awake bruxism and anxiety, addressing mental health through psychological counseling or cognitive-behavioral therapy can provide additional benefits [32]. Overall, management remains largely

symptomatic, with the primary goals of preventing dental damage, alleviating pain, and targeting modifiable risk factors.

4. Discussion

This review demonstrates that awake bruxism constitutes a significant and prevalent concern within athletic populations. Although the available evidence remains limited and methodologically heterogeneous, current data consistently indicate that athletes experience awake bruxism more frequently than the general population [21]. This elevated prevalence is likely a consequence of the complex interaction between psychological stress, high motivational demands, and sustained physical exertion that inherently characterize competitive sports [19]. Psychosocial stressors, including competition-related anxiety and elevated personal expectations, together with substantial physiological load resulting from intensive training, emerge as the principal triggers of awake bruxism in athletes [41]. These same factors are known to predispose athletes to a wide range of sports-related conditions, such as overuse injuries, thereby emphasizing the importance of a holistic and multidisciplinary approach to athlete health care [42].

From a mechanistic perspective, awake bruxism in athletes is consistent with the model of centrally mediated parafunctional activity. Heightened levels of arousal and increased sensitivity of dopaminergic pathways may contribute to the emergence and persistence of bruxism episodes during wakefulness [24, 43]. The resulting neuromuscular consequences, including jaw muscle pain, fatigue, and stiffness, may negatively affect athletic performance by impairing concentration, reducing neuromuscular efficiency, and limiting maximal force generation [25]. In line with this, reports from sports medicine literature indicate that athletes affected by bruxism may experience diminished endurance and compromised coordination.

The present review also highlights several important limitations within the existing body of literature [44]. A substantial proportion of studies fail to distinguish clearly between awake and sleep bruxism, which complicates the interpretation of findings and hinders the isolation of awake bruxism-specific characteristics [15]. Furthermore, most investigations rely on self-reported measures or clinical observation, both of which are subject to bias and may lead to either underestimation or overestimation of true bruxism prevalence [12, 13, 16, 41, 45]. Future research should therefore adopt standardized diagnostic frameworks and incorporate objective assessment tools, such as ecological momentary assessment and electromyographic monitoring, to improve diagnostic accuracy and comparability across studies. Additionally, current evidence is largely derived from male-dominated and team-sport cohorts, while female athletes

and participants from a broader range of sporting disciplines remain underrepresented, leaving potential sex- and sport-specific differences insufficiently explored [21, 45].

Despite these methodological shortcomings, the overall pattern of findings is coherent and robust. Awake bruxism appears to be common among athletes and is closely associated with psychological stress and physical exertion. Clinicians in sports medicine and dentistry should maintain a high index of suspicion for awake bruxism in athletes presenting with orofacial pain, muscle fatigue, or unexplained dental wear. Early identification and targeted intervention, such as training athletes in jaw relaxation and stress management techniques, may help prevent symptom chronification and functional impairment. The documented effectiveness of biofeedback-based interventions further supports their potential value as a non-invasive and performance-compatible therapeutic option in this population [33].

5. Conclusion

Awake bruxism affects a substantial proportion of athletes, driven by the unique psychological and physical demands of competitive sport. It manifests with jaw muscle hyperactivity, pain, and dental wear, potentially undermining athlete health and performance. This systematic review indicates that AB in athletes is multifactorial: anxiety and stress are primary contributors, supported by neurophysiological mechanisms and reinforced by training intensity. Diagnosing AB requires patient awareness and careful evaluation. Management should be multidisciplinary, emphasizing stress reduction, behavioral modification, protective appliances, and physical therapy. Given the prevalence and impact of AB, further high-quality research is needed, especially using consensus-driven diagnostic tools, to guide effective prevention and treatment for athletes at all levels.

Disclosure

The authors declare that the manuscript is original, has not been published previously, and is not under consideration for publication elsewhere.

Supplementary Materials

No supplementary materials are associated with this manuscript.

Author Contributions

Conceptualization, P.R., K.N., M.D., P.M., J.W. and M.M.; methodology, P.R., K.N., M.D., P.M., J.W. and M.M.; formal analysis, P.R., K.N., M.D., P.M., J.W. and M.M.; writing - original draft preparation, P.R., K.N., M.D., P.M., J.W. and M.M.; writing - review and editing, P.R., K.N., M.D., P.M., J.W. and M.M.; visualization, C.D.

All authors have read and agreed to the published version of the manuscript.

Funding

This research received no external funding.

Institutional Review Board Statement

Not applicable, as this study is a systematic review of previously published literature.

Informed Consent Statement

Not applicable.

Data Availability Statement

All data analyzed in this study are derived from previously published articles available in public scientific databases.

Acknowledgements

The authors would like to acknowledge the contributions of researchers whose work formed the basis of this review.

Conflicts of Interest

The authors declare no conflict of interest.

References

[1] Lobbezoo F, Ahlberg J, Raphael KG, et al. International consensus on the assessment of bruxism: Report of a work in progress. *J Oral Rehabil*. 2018;45(11):837-844. doi:10.1111/joor.12663

[2] Colonna A, Bracci A, Ahlberg J, et al. Ecological Momentary Assessment of Awake Bruxism Behaviors: A Scoping Review of Findings from Smartphone-Based Studies in Healthy

Young Adults. *J Clin Med*. 2023;12(5):1904. Published 2023 Feb 28. doi:10.3390/jcm12051904

[3] de Sales ADN, Almeida RAC, Barbosa ATL, et al. Prevalence of Bruxism in Athletes: A Systematic Review and Meta-Analysis. *J Oral Rehabil*. 2025;52(9):1518-1543. doi:10.1111/joor.14039

[4] Vieira MA, Oliveira-Souza AIS, Hahn G, Bähr L, Armijo-Olivo S, Ferreira APL. Effectiveness of Biofeedback in Individuals with Awake Bruxism Compared to Other Types of Treatment: A Systematic Review. *Int J Environ Res Public Health*. 2023;20(2):1558. Published 2023 Jan 14. doi:10.3390/ijerph20021558

[5] Cavallo P, Carpinelli L, Savarese G. Perceived stress and bruxism in university students. *BMC Res Notes*. 2016;9(1):514. Published 2016 Dec 21. doi:10.1186/s13104-016-2311-0

[6] Shetty S, Pitti V, Satish Babu CL, Surendra Kumar GP, Deepthi BC. Bruxism: a literature review. *J Indian Prosthodont Soc*. 2010;10(3):141-148. doi:10.1007/s13191-011-0041-5

[7] Lavigne G, Palla S. Transient morning headache: recognizing the role of sleep bruxism and sleep-disordered breathing. *J Am Dent Assoc*. 2010;141(3):297-299. doi:10.14219/jada.archive.2010.0163

[8] Molina OF, dos Santos Júnior J, Nelson SJ, Nowlin T. Profile of TMD and Bruxer compared to TMD and nonbruxer patients regarding chief complaint, previous consultations, modes of therapy, and chronicity. *Cranio*. 2000;18(3):205-219. doi:10.1080/08869634.2000.11746134

[9] De la Torre Canales G, Câmara-Souza MB, do Amaral CF, Garcia RC, Manfredini D. Is there enough evidence to use botulinum toxin injections for bruxism management? A systematic literature review. *Clin Oral Investig*. 2017;21(3):727-734. doi:10.1007/s00784-017-2092-4

[10] Uchima Koecklin KH, Aliaga-Del Castillo A, Li P. The neural substrates of bruxism: current knowledge and clinical implications. *Front Neurol*. 2024;15:1451183. Published 2024 Oct 1. doi:10.3389/fneur.2024.1451183

[11] Javaid S. F., Hashim I. J., Hashim M. J., Stip E., Samad M. A., and Ahbabi A. A., "Epidemiology of Anxiety Disorders: Global Burden and Sociodemographic Associations," Middle East Curr Psychiatry 30 (2023): 44, 10.1186/s43045-023-00315-3.

[12] Mendiburu-Zavala C. E., Collí-González D. A., Lugo-Ancona P. E., and Peñaloza-Cuevas R., "Niveles de Estrés y Bruxismo Durante la Pandemia COVID-19 en Estudiantes y Deportistas Universitarios Evaluados de Manera Virtual," International journal of odontostomatology 16 (2022): 403–411, 10.4067/S0718-381X2022000300403

[13] Babiuc I., Minescu L., Tănase G., et al., “Clinical Study on the Incidence of Bruxism Throughout Romanian High-Performance Athletes,” Acta Medica Transilvanica 24 (2019): 103–106.

[14] Cruz-Fierro, N. & González-Ramírez, M. Estrés percibido y factores asociados al bruxismo. Reporte de caso de una familia. Ajayu, 15(2):133-52, 2017

[15] Needleman I, Ashley P, Fine P, et al. Oral health and elite sport performance. *Br J Sports Med*. 2015;49(1):3-6. doi:10.1136/bjsports-2014-093804

[16] Storrer CLM, Costa EE, Scariot R, et al. Bruxism and type of breathing as factors associated with oral herpes lesion in Brazilian para-athletes. *Spec Care Dentist*. 2021;41(6):700-706. doi:10.1111/scd.12616

[17] Martins IM, Alonso LS, Vale MP, Abreu LG, Serra-Negra JM. Association between the severity of possible sleep bruxism and possible awake bruxism and attrition tooth wear facets in children and adolescents. *Cranio*. 2025;43(1):158-164. doi:10.1080/08869634.2022.2102708

[18] Nykänen L, Manfredini D, Lobbezoo F, et al. Ecological Momentary Assessment of Awake Bruxism with a Smartphone Application Requires Prior Patient Instruction for Enhanced Terminology Comprehension: A Multi-Center Study. *J Clin Med*. 2022;11(12):3444. Published 2022 Jun 15. doi:10.3390/jcm11123444

[19]Manfredini D, Landi N, Romagnoli M, Bosco M. Psychic and occlusal factors in bruxers. *Aust Dent J*. 2004;49(2):84-89. doi:10.1111/j.1834-7819.2004.tb00055.x

[20] Maciejewska-Szaniec Z, Kaczmarek-Ryś M, Hryhorowicz S, et al. Polymorphic variants in genes related to stress coping are associated with the awake bruxism. *BMC Oral Health*. 2021;21(1):496. Published 2021 Oct 5. doi:10.1186/s12903-021-01844-1

[21] Zieliński G, Pająk A, Wójcicki M. Global Prevalence of Sleep Bruxism and Awake Bruxism in Pediatric and Adult Populations: A Systematic Review and Meta-Analysis. *J Clin Med*. 2024;13(14):4259. Published 2024 Jul 22. doi:10.3390/jcm13144259

[22] Manfredini D, Ciapparelli A, Dell'Osso L, Bosco M. Mood disorders in subjects with bruxing behavior. *J Dent*. 2005;33(6):485-490. doi:10.1016/j.jdent.2004.11.010

[23] Santos Miotto Amorim C, Firsoff EF, Vieira GF, Costa JR, Marques AP. Effectiveness of two physical therapy interventions, relative to dental treatment in individuals with bruxism: study protocol of a randomized clinical trial. *Trials*. 2014;15:8. Published 2014 Jan 7. doi:10.1186/1745-6215-15-8

[24] Lobbezoo F, Soucy JP, Montplaisir JY, Lavigne GJ. Striatal D2 receptor binding in sleep bruxism: a controlled study with iodine-123-iodobenzamide and single-photon-emission

computed tomography. *J Dent Res*. 1996;75(10):1804-1810. doi:10.1177/00220345960750101401

[25] Lobbezoo F, Soucy JP, Hartman NG, Montplaisir JY, Lavigne GJ. Effects of the D2 receptor agonist bromocriptine on sleep bruxism: report of two single-patient clinical trials. *J Dent Res*. 1997;76(9):1610-1614. doi:10.1177/00220345970760091401

[26] Koyano K, Tsukiyama Y, Ichiki R, Kuwata T. Assessment of bruxism in the clinic. *J Oral Rehabil*. 2008;35(7):495-508. doi:10.1111/j.1365-2842.2008.01880.x

[27] Lavigne GJ, Khoury S, Abe S, Yamaguchi T, Raphael K. Bruxism physiology and pathology: an overview for clinicians. *J Oral Rehabil*. 2008;35(7):476-494. doi:10.1111/j.1365-2842.2008.01881.x

[28] Tavares Silva C, Calabrio IR, Serra-Negra JM, Fonseca-Gonçalves A, Maia LC. Knowledge of parents/guardians about nocturnal bruxism in children and adolescents. *Cranio*. 2017;35(4):223-227. doi:10.1080/08869634.2016.1201633

[29] Glaros AG, Williams K, Lausten L, Friesen LR. Tooth contact in patients with temporomandibular disorders. *Cranio*. 2005;23(3):188-193. doi:10.1179/crn.2005.027

[30] Bracci A, Djukic G, Favero L, Salmaso L, Guarda-Nardini L, Manfredini D. Frequency of awake bruxism behaviours in the natural environment. A 7-day, multiple-point observation of real-time report in healthy young adults. *J Oral Rehabil*. 2018;45(6):423-429. doi:10.1111/joor.12627

[31] Nykänen L, Manfredini D, Lobbezoo F, Kämppi A, Bracci A, Ahlberg J. Assessment of awake bruxism by a novel bruxism screener and ecological momentary assessment among patients with masticatory muscle myalgia and healthy controls. *J Oral Rehabil*. 2024;51(1):162-169. doi:10.1111/joor.13462

[32] Raphael KG, Santiago V, Lobbezoo F. Is bruxism a disorder or a behaviour? Rethinking the international consensus on defining and grading of bruxism. *J Oral Rehabil*. 2016;43(10):791-798. doi:10.1111/joor.12413

[33] Wang LF, Long H, Deng M, et al. Biofeedback treatment for sleep bruxism: a systematic review. *Sleep Breath*. 2014;18(2):235-242. doi:10.1007/s11325-013-0871-y

[34] Gholampour S, Gholampour H, Khanmohammadi H. Finite element analysis of occlusal splint therapy in patients with bruxism. *BMC Oral Health*. 2019;19(1):205. Published 2019 Sep 4. doi:10.1186/s12903-019-0897-z

[35] Şahin SS, Çiftçi Şişman A, Atar E, Kilaç H, Güzelce Sultanoğlu E. Comparison of the effectiveness of botulinum toxin, dry needling, pharmacological treatment, and manual therapy

for bruxism-induced myalgia: a prospective randomized study. *J Oral Facial Pain Headache*. 2024;38(4):101-110. doi:10.22514/jofph.2024.043

[36] Mesko ME, Hutton B, Skupien JA, Sarkis-Onofre R, Moher D, Pereira-Cenci T. Therapies for bruxism: a systematic review and network meta-analysis (protocol). *Syst Rev*. 2017;6(1):4. Published 2017 Jan 13. doi:10.1186/s13643-016-0397-z

[37] Kadıoğlu MB, Sezer M, Elbasan B. Effects of Manual Therapy and Home Exercise Treatment on Pain, Stress, Sleep, and Life Quality in Patients with Bruxism: A Randomized Clinical Trial. *Medicina (Kaunas)*. 2024;60(12):2007. Published 2024 Dec 4. doi:10.3390/medicina60122007

[38] de Baat C, Verhoeff MC, Ahlberg J, et al. Medications and addictive substances potentially inducing or attenuating sleep bruxism and/or awake bruxism. *J Oral Rehabil*. 2021;48(3):343-354. doi:10.1111/joor.13061

[39] Yacoub S, Ons G, Khemiss M. Efficacy of botulinum toxin type A in bruxism management: A systematic review. *Dent Med Probl*. 2025;62(1):145-160. doi:10.17219/dmp/186553

[40] Shim YJ, Lee HJ, Park KJ, Kim HT, Hong IH, Kim ST. Botulinum Toxin Therapy for Managing Sleep Bruxism: A Randomized and Placebo-Controlled Trial. *Toxins (Basel)*. 2020;12(3):168. Published 2020 Mar 9. doi:10.3390/toxins12030168

[41] Zięba E. and Byś A., "Prevalence and Risk Factors for Bruxism Among Climbers," Journal of Education, Health and Sport 9 (2019): 400–405, 10.5281/zenodo.3408276.

[42] Sevindik B, Şengül F, Kıyıcı F. Evaluation of Oral and Dental Health Results and Competition Stress Levels of Adolescent Athletes in Different Winter Sports Branches. *Eurasian J Med*. 2024;56(2):114-120. doi:10.5152/eurasianjmed.2024.23281

[43] Chen WH, Lu YC, Lui CC, Liu JS. A proposed mechanism for diurnal/nocturnal bruxism: hypersensitivity of presynaptic dopamine receptors in the frontal lobe. *J Clin Neurosci*. 2005;12(2):161-163. doi:10.1016/j.jocn.2004.07.007

[44] Okshah A, Vaddamanu SK, Khalid I, Kota MZ, Udeabor SE, Baig FAH. The Impact of Bruxism on Athletic Performance: a Systematic Review and Meta-analysis. *Int J Sports Med*. 2025;46(13):962-972. doi:10.1055/a-2588-0766

[45] Weiler RM, Santos FM, Kulic MA, et al. Prevalence of signs and symptoms of temporomandibular dysfunction in female adolescent athletes and non-athletes. *Int J Pediatr Otorhinolaryngol*. 2013;77(4):519-524. doi:10.1016/j.ijporl.2012.12.024