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Game over: Unraveling the prevalence and associations between bruxism, TMD and psychosocial factors in the Esports arena

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ABSTRACT

Background: The professionalization of electronic sports (Esports) and streaming has introduced new challenges to players' physical and mental health, including chronic stress, sleep disruption and pain-related dysfunction. These factors are linked to bruxism and temporomandibular disorders (TMD), yet their prevalence and psychosomatic correlations within this community remain unknown. This study aimed to investigate the occurrence of bruxism and TMD among Esports players and streamers as well as their associations with psychosomatic and gaming-related variables.

Methods: This cross-sectional study included 97 Esports players and streamers that completed validated self-report instruments screening for TMD (TMD pain-screener), bruxism, sociodemographic data, oral behaviors, sleep quality, perceived stress, anxiety, somatic symptoms, pain vigilance, and gaming/streaming habits. In addition to standard statistical tests, orthogonal partial least squares-discriminant analysis (OPLS-DA) were applied to identify group differences and multivariate associations.

Results: Nearly half of the participants screened positive for TMD (49.5 %) and 78.4 % reported self-reported bruxism. Increased daily gaming hours correlated significantly with higher perceived stress and oral parafunctions. Multivariate analyses further showed that anxiety, somatic symptoms, poor sleep and perceived stress were key factors distinguishing participants with TMD from those without, and those with combined sleep and awake bruxism from those with only awake bruxism.

Conclusion: TMD and bruxism are highly prevalent among Esports players and streamers, with greater daily gaming exposure linked to psychosomatic stress and oral parafunctions. Digital athletes with combined sleep and awake bruxism and/or TMD, experience greater psychosocial distress, indicating a subgroup that needs closer attention through early screening and targeted preventive strategies.

1. Introduction

The exponential growth of electronic sports (Esports) has transformed digital gaming into a highly structured and competitive global phenomenon (Cabeza-Ramírez et al., 2021, 2022), attracting a projected audience of over 640 million players and viewers by 2025 (Clement, 2025). As a result, Esports has transitioned from a recreational activity to a professional domain. Professional and semi-professional Esports athletes now face strict demands that extend beyond casual play, involving extensive hours of gameplay, strict schedules, cognitive load and constant performance pressure (DiFrancisco-Donoghue et al., 2019). Parallel to this development is the rise of gaming streamers, individuals who broadcast their gameplay in real time through platforms such as Twitch-, YouTube- and Facebook-gaming (Edwards et al., 2022; Pollack et al., 2020). Many streamers maintain demanding schedules to build large, monetized audiences through prolonged screen time, social interaction and content creation, often in high-pressure environments (Gandhi et al., 2021). Together, Esport players and streamers represent a new growing population of digital athletes whose physical and mental health needs are only beginning to be understood (Palanichamy et al.,

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2020; Sanz-Matesanz et al., 2023).

While not physically demanding as traditional sports, these digital athletes need sustained psychomotor coordination, fine motor precision, heightened cognitive alertness and emotional regulation (Gandhi et al., 2021; Kang et al., 2020; Trotter et al., 2021). Therefore, unlike traditional athletes, they rarely suffer acute musculoskeletal injuries but are instead exposed to other unique health risks. Their prolonged static posture, repetitive upper limb movements, irregular sleep patterns (Rudolf et al., 2020; Smith et al., 2022; Thomas et al., 2019) and constant cognitive and emotional arousal (Gandhi et al., 2021; Kang et al., 2020; Trotter et al., 2021) that are common within this population, have been linked with chronic stress, eye fatigue and musculoskeletal pain (low back, shoulder) (Lam et al., 2022; Monteiro Pereira et al., 2022; Rudolf et al., 2020; Trotter et al., 2021). Furthermore, digital athletes often report elevated levels of depression, anxiety as well as both physiological and psychological stress, potentially as a consequence of the competitive demands inherent to this rapidly evolving field (Palanichamy et al., 2020).

These stressors are not merely performance challenges, they may also lead to increased muscle tension and oral behaviors such as bruxism (i.e. involuntary clenching and/or grinding of the teeth), which in turn increases the risk of pain and dysfunction in the orofacial region (Bair et al., 2013; Lobbezoo et al., 2013). Interestingly, recent observational findings have reported masseter tenderness and dental wear in video game players compared to non-gamers, suggesting possible alterations in the stomatognathic system due to excessive muscle activity or parafunctional habits during gameplay (Ionia et al., 2024). However, the lack of studies specifically addressing the orofacial region, highlights a critical and urgent gap in current Esports health research.

In the orofacial region, temporomandibular disorders (TMD) are among the most prevalent chronic pain conditions, impacting approximately 30 % of the population in Europe (Zieliński et al., 2024). TMD is an umbrella term for painful and non-painful conditions in the masticatory muscles, joints and associated structures (Schiffman et al., 2014). Beyond physical discomfort, individuals with TMD frequently also experience reduced quality of life, impaired functionality, increased psychological and economic stress (Lundberg & Axelsson, 2006; National Academies of Sciences et al., 2020; White et al., 2001). The etiology of TMD is regarded as multifactorial, arising from interactions between biological, psychological and social stressors over time (i.e. the biopsychosocial model of pain) (Wan et al., 2025). In addition, the Orofacial Pain Prospective Evaluation and Risk Assessment Study (OPPERA), found that there were predominant effects on TMD incidence for people that reported either multiple or frequent parafunctional behaviors and modest influence of stress and anxiety (Slade et al., 2013). Therefore, individuals with TMD and/or bruxism are often exposed to psychological and physiological stressors such as work/life pressure, long-term stress, sleep disturbances and sedentary lifestyle, commonly also found among Esports players and streamers (Kemp et al., 2021; Lindberg et al., 2020; Palanichamy et al., 2020).

However, despite this clear overlap between the psychosocial demands of digital athletes and known biopsychosocial risk factors for bruxism and TMD (Wan et al., 2025), the prevalence or psychosomatic interactions of these conditions in Esport players and streamers remain unknown. Identifying at-risk subgroups within this population is not only important for prevention and long-term health but may also support their performance. The aim of this study was therefore to investigate the prevalence of bruxism and TMD among Esports players and streamers as well as explore their associations with psychosomatic variables and gaming-related behaviors. We hypothesize that greater gaming exposure and higher psychosomatic distress (stress, anxiety, somatic symptoms, sleep quality and oral parafunctions) are associated with greater prevalence of TMD and bruxism. Using this behavioral health perspective, our findings may provide novel insights into the development of preventative and therapeutic strategies for this rapidly growing population.

2. Material and methods

2.1. Ethical considerations

This study received approval from the Research Ethics Committee of Egas Moniz School of Health and Scie (PT-211/24). All participants provided written informed consent to participate in this project. The study adhered to the Helsinki Declaration and was performed at the online platform. The reporting of the data followed the Strengthening the Reporting of Observational Studies in Epidemiology (STROBE) guidelines (von Elm et al., 2014).

2.2. Study population

The study population consisted of professional, or semi-professional Esports players and streamers engaged in electronic gaming activities. Since there are no previous studies on this topic, the present study employed a non-probabilistic, convenience sampling strategy, enrolling 97 participants to achieve a sample of sufficient size and variability to support robust statistical analysis. All participants were invited to volunteer through online advertisements posted on Esports forums, streaming platforms, and social media.

Likewise, given the lack of similar studies in these populations, our sample size calculation was based on a conservative assumption of a 50 % probability of exposure (i.e. psychosocial and behavioral variables) associated with TMD and bruxism. A relative risk of 50 %, a significance level of 0.05 and a power of 90 % were applied, determining that a minimum sample size of 85 participants would be sufficient to find correlations between the variables. In order to avoid underpowering due to missing data, 97 participants were included (PS Power and Sample Sixe Calculations, v 3.0) (Dupont & Plummer, 1990).

2.3. Inclusion criteria

The participating individuals were included in the study based on the following criteria: male and female individuals aged between 18 and 40 years, who are professional or semi-professional Esports players or streamers, with at least 12 consecutive months of involvement in electronic gaming activities. Streamers must have a consistent live-streaming schedule of at least three days per week.

2.4. Exclusion criteria

Exclusion criteria include individuals with a history of TMD prior to their involvement in Esports or streaming, those with systemic or neurological conditions such as fibromyalgia, multiple sclerosis, or rheumatoid arthritis, and individuals using medications that affect the central nervous system (e.g., anxiolytics or antidepressants), which may interfere with the development of TMD, or orofacial pain. Additionally, participants who are not actively engaged in Esports or streaming during the data collection period were excluded.

2.5. Study protocol

Participants were invited to complete a structured, self-administered online questionnaire, developed using Google Forms. The survey included an informed consent form that each participant had to read and agree prior to participation. The questionnaire was organized into three distinct sections: (a) *Sociodemographic and occupational data*, including professional role, preferred streaming platform, and the frequency and duration of training sessions or live broadcasts; (b) *Assessment of oral behaviors*, utilizing the validated Portuguese version of the Oral Behaviors Checklist (OBC) to evaluate self-reported awake and sleep bruxism as well as other oral parafunctional habits; and (c) *Evaluation the presence of TMD and psychosocial distress* through the TMD Pain Screener (Gonzalez et al., 2011) and other validated questionnaires included in the Diagnostic Criteria for TMD (DC/TMD) axis II (Schiffman et al., 2014) capturing self-reported experiences of orofacial pain, stress, anxiety and emotional distress. Recruitment was conducted digitally through targeted advertisements on websites and social media platforms, which included a direct link to the questionnaire. Data collection was carried out electronically between December 2024 and March 2025.

2.6. Assessment instruments

2.6.1. Oral Behavior Checklist (OBC)

The OBC consists of 21 questions regarding oral parafunctional behaviors that contribute to the onset of TMD (such as tooth-clenching, chewing gum and tensing jaw muscles) over the last 30 days. For each item, participants answer on a likert scale from 0 = "none of the time" to 4 = "all of the time". Total scores range from 0 to 62 and a score of 0–16 represent normal oral behaviors, while a total score of 17–24 represent a risk for TMD and 25–62 represent a high risk for TMD (Markiewicz et al., 2006; Ohrbach et al., 2008, 2011, 2013).

2.6.2. Awake bruxism

Self-reported AB was identified using the corresponding item from the OBC. Participants were classified as positive for self-reported AB if they responded "yes" with a reported frequency of at least "some of the time" to one of the following questions: *Grind teeth together during waking hours?, Clench teeth together during waking hours?, Press, touch, or hold teeth together other than while eating? And hold, tighten, or tense muscles without clenching or bringing teeth together?*

2.6.3. Sleep bruxism

Self-reported sleep bruxism (SB) was identified using also the corresponding item from the *OBC*: *"Do you grind or clench your teeth during sleep based on any information you may have?"* Participants were classified as positive for self-reported SB if they responded "yes" with a reported frequency of at least 1–3 nights per week. The frequency of self-reported SB was quantified using a five-point Likert scale: (0) never, (1) less than once a month, (2) 1–3 nights per month, (3) 1–3 nights per week, and (4) four or more nights per week (Markiewicz et al., 2006).

2.6.4. Patient Health Questionnaire (PHQ-15)

The presence and severity of physical symptoms associated with TMD was evaluated by the *Patient Health Questionnaire–15 (PHQ-15)*, in accordance with Axis II of the DC/TMD. This instrument assesses 15 common somatic symptoms such as back pain, joint pain, abdominal discomfort, headaches, fatigue, and sleep disturbances, over the preceding four weeks. Each symptom is rated on a 3-point Likert scale (0 = "not at all", 1 = "several days", 2 = "more than half days" and 3 = "nearly every day"), yielding a total score of 0–30. Higher scores indicate a greater somatic symptom burden, classified into four categories: minimal (0–4), mild (5–9), moderate (10–14), and severe (15–30) (Kroenke et al., 2002).

2.6.5. Pain vigilance Awareness Questionnaire (PVAQ)

Attentional processes, conscious awareness, and vigilance related to pain perception were assessed by the *Pain Vigilance and Awareness Questionnaire (PVAQ)*. This validated self-report measure consists of 16 items rated on a 6-point Likert scale (0 = "never" to 5 = "always"), evaluating the frequency with which individuals attend to and monitor pain sensations. Participants were asked to base their responses on pain-related behaviors and experiences over the past two weeks. Total scores (maximum of 70), calculated by summing item responses, show the individual's level of pain vigilance (Roelofs et al., 2003).

2.6.6. Pittsburgh Sleep Quality Index (PSQI)

The validated Pittsburgh Sleep Quality Index (PSQI) was used to assess the overall sleep quality of the participants during the last month. It consists of 19 items regarding e.g. sleep latency, sleep duration, sleep disturbances, daytime dysfunction and use of sleep medication, rated on a 0–3-point interval scale. The total score ranges from 0 to 21, where a scores between 0 and 4 indicates good sleep quality, 5–10 indicates poor sleep quality and a total score of more than 10 indicates a sleep disorder (Bertolazi et al., 2011; Buysse et al., 1989).

2.6.7. Perceived Stress Scale (PSS)

Perceived stress levels among participants were measured using the European Portuguese version of *Perceived Stress Scale (PSS-10)*, a widely validated instrument. It consists of 10 items, six positively stated and four negatively stated, rated on a 5-point Likert scale ranging from "Never" (0) to "Very Often" (4). Total scores range from 0 to 40, where 0–13, 14–26 and 27–40 indicates low, moderate and high perceived stress respectively (Cohen et al., 1983).

2.6.8. General Anxiety Disorder Assessment-7 (GAD-7)

Generalized anxiety and its severity were measured using the General Anxiety Disorder Assessment-7 (GAD-7). The scale is composed of 7 items, each rated on a 3-point Likert scale (0 = "not at all", 1 = "several days", 2 = "more than half days" and 3 = "nearly every day"), yielding a total score ranging from 0 to 21. Scores of $\geq$10 indicate high likelihood of GAD and it has been suggested that scores of 5, 10 and 15 might be used to represent mild, moderate and severe levels of generalized anxiety (Spitzer et al., 2006).

2.7. Data analysis

The standard statistical analysis of the data collected in this study was carried out using SigmaPlot v16 (Systat Software, Inc., San Jose, CA, USA). A Shapiro-Wilk test was used to test the frequency distribution between the groups and to evaluate their normal distribution. A threshold of alpha level equal to 0.05 was used for statistical significance.

The presence of painful TMD and bruxism was considered the dependent variable whereas demographics, gaming and psychosocial variables were defined as independent variables.

Descriptive statistics were used to characterize the sample and compare demographics, gaming and psychosocial variables between those with painful TMD and bruxism. As the variables analyzed in the present study were either ordinal or had a non-normal distribution, non-parametric statistics (chi-squared test or, Mann-Whitney U rank sum) were used to identify the statistical differences between the groups. Spearman ranked correlation test was used to test the relationships between gaming variables and oral behavior as well as psychological symptoms. False discovery rate (FDR) was used for multiple comparisons in case of significant differences. These standard methods quantified individual gaming/streaming habits but did not account for potential interrelationships among them.

To evaluate interrelationships and interactions between background variables (i.e. psychosocial variables, behaviors associated with gaming/streaming) and painful TMD as well as bruxism, multivariate data analyses were preformed using SIMCA-P+ (version 18.0; Umetrics Inc., Umeå, Sweden). Prior to analysis, all variables were mean-centered, scaled and if needed, log-transformed. Outliers were identified and excluded using score plots in combination with Hotelling T^2, a standard method for detecting significant outliers. Orthogonal partial least squares regression (OPLS/OPLS-DA) was used to analyze group membership (i.e. painful TMD vs No TMD, Bruxism vs no bruxism and Sleep bruxism vs Awake bruxism) using background variables (i.e. psychosocial variables, behaviors associated with gaming/streaming) as regressors (X-variables).

Due to the natural interdependence among our psychosomatic variables (regressors), OPLS-DA was used, rather than traditional approaches, to model their joint contribution. Traditional approaches, such as multiple linear regression, estimate the independent effect of each predictor in isolation, making these models unstable and hard to interpret when predictor variables overlap (multicollinearity) and are interrelated such as in this study including populations with biopsychosocial contexts (TMD, bruxism and potentially also digital athletes). In contrast, OPLS-DA is specifically designed to overcome these issues by treating the variables as a system and analyzing all variables simultaneously (i.e. relate multiple X-variables to one or more Y-variable). Thus, it automatically accounts for the intercorrelations within the X-block and their relationship to Y while simultaneously offering a holistic view that traditional regressions may not provide. It also reduces the number of separate test as well as associated type-I and/or type-II error inflation that may arise from repeated hypothesis testing and after p-value corrections, respectively.

The validity of the OPLS-DA model was determined using cross validation. For each regression we report R^2Y, Q^2, VIP and P (corr). R^2Y indicates the total sum of variation in Y explained by the model, a higher score means that the model more accurately describes the difference between study groups (i.e. TMD/no TMD or bruxism/no bruxism). Q^2 is the goodness of prediction, indicating how well the model can predict the grouping for new unseen individuals. The VIP metric helps rank the individual psychological and behavioral variables by their overall contribution to the models ability to predict the group differences. In other words, it illustrates the importance of each variable in driving the observed group separation, hence a higher VIP indicates a more important variable for the model. P (corr), a correlation coefficient, reflects the strength and reliability of variables contribution to the models predictive component. It notes the direction of the relationships, and the closer p (corr) is to 1 or -1, the stronger the correlation. A variable is considered significant when a cut-off of VIP$>$ 1 is used in combination with p (corr) $>$ 0.4. Cross-validation analysis of variance (CV-ANOVA) was used to calculate a *p-value* for each model, determining the validity of the model and the significance ($p < 0.05$) of the observed group separation (Wheelock & Wheelock, 2013).

While intercorrelations among psychosocial variables such as anxiety, stress, somatic symptoms and sleep quality are conceptually expected, OPLS-DA was applied as an exploratory multivariate technique to model the shared variance structure among these related measures and to identify the variables most strongly contributing to group separation. The approach was not intended to correct for multicollinearity per se, but to provide an integrated interpretation of multivariate relationships. Model validity was confirmed through cross-validation (R^2Y, Q^2, CV-ANOVA $p < 0.05$), supporting the robustness of the results given the moderate sample size and exploratory nature of the study.

3. Results

3.1. Participant characteristics

The sociodemographic, gaming/streaming and psychosomatic characteristics of the total study sample are presented in detail in Tables 1 and 2.

3.1.1. Sociodemographic characteristics

A total of 97 participants were included in this study. The median age of participants was 25.0 (IQR:12.0) years, 77.3 % being male. Most participants reported having completed at least secondary education, with a good representation across the different education levels (range secondary-master/doctoral education). Moreover, most participants identified as European (62.9 %) or South American (32.0 %), were single and mainly working (employed/self-employed; 60 %) or studying (27.8 %). The frequency of physical activity ranged from no activity to 5–6 times a week with relatively balanced proportions (most prevalent being 3–4 times a week) (Table 1).

3.1.2. Gaming and streaming

Participants reported playing Esports/streaming median 3.0 (IQR 3) hours per day and had engaged in these activities during a median of 10.0 (IQR 10.0) years (Table 2). Most participants used a headset when playing Esports/streaming (75.3 %). Drinking energy drinks every day was reported by 32.0 % of participants (Table 1). Participants of this

Table 1
Characteristics of the total study sample.

	Number (%)
Gender	
Male	75 (77.3)
Female	21 (21.6)
Missing	*1 (1)*
Education Level	
Basic education	2 (2.1)
Secondary education	34 (35.1)
Vocational education	24 (24.7)
Higher education (Bachelor, master, doctoral)	37 (38.1)
Background	
Europe	61 (62.9)
South America	31 (32.0)
Other (Africa, Middle East, Asia)	5 (5.1)
Occupation	
Employed/self-employed	60 (61.9)
Unemployed	7 (7.2)
Student	27 (27.8)
Missing	*3 (3.1)*
Marital	
Single	61 (62.9)
Partner/married	33 (34.0)
separated/divorced	3 (3.1)
Gaming/streaming accessories	
Headset	73 (75.3)
Earphones	23 (23.7)
Physical activity	
no	26 (26.8)
1-2 times a week	19 (19.6)
3-4 times a week	33 (34.0)
5-6 times a week	14 (14.4)
Everyday	5 (5.2)
Energy drinks	
no	28 (28.9)
1-2 times a week	18 (18.6)
3-4 times a week	15 (15.5)
5-6 times a week	5 (5.2)
Everyday	31 (32.0)
TMD	
Yes	48 (49.5)
No	49 (50.5)
Bruxism	
No	21 (21.6)
Yes	76 (78.4)
Only Awake bruxism	32 (33.0)
Only sleep bruxism	4 (4.1)
Sleep + Awake bruxism	40 (41.2)

TMD: Temporomandibular disorders.

Table 2
Psychosocial variables and gaming characteristics of the total study sample.

	Median (IQR)
Years playing Esports	10.0 (10.0)
Hours playing Esports per day	3.0 (3.0)
OBC	20.0 (15.0)
GAD-7	4.0 (14.0)
PHQ-15	4.0 (5.0)
PVAQ	35.0 (23.0)
PSQI	5.0 (4.0)
PSS	27.0 (10.0)

Data presented as median (interquartile range).
Abbreviations: IQR, interquartile range; OBC, Oral behavior checklist; GAD-7, General Anxiety Disorder-7; PHQ-15, 15-item Patient Health Questionnaire; PVAQ, Pain Vigilance Awareness Questionnaire; PSQI, Pittsburgh Sleep Quality Index; PSS, Perceived Stress Scale.

sample primarily played FPS-games (First-Person Shooter) and the most used streaming platform was PC (data not shown).

3.1.3. Painful TMD and self-reported bruxism

Approximately half of all included participants met the criteria for painful TMD, and almost 80 % for self-reported bruxism. Of those with painful TMD, almost 80 % also had bruxism with a significantly higher proportion having combined sleep and awake bruxism compared to awake bruxism alone ($p = 0.02$) (Table 1).

3.1.4. Psychosomatic characteristics

Participants reported high levels of stress and pain vigilance, whereas the scoring from the questionnaires indicated normal levels of anxiety, somatic symptoms and sleep quality. According to the OBC scoring, the total study sample reported with oral parafunctional behaviors that indicate a risk for developing TMD (Table 2).

3.2. Bivariate associations between TMD, bruxism, psychosocial, behavioral and demographic variables

When it comes to the bivariate associations, they include comparisons between painful TMD versus No TMD, bruxism versus no bruxism, as well as awake versus combined sleep and awake bruxism. The results of these analyses are presented in detail in Tables 3 and 4. Below follows a description of the findings.

3.2.1. Painful TMD versus No TMD

No significant differences were found regarding age, gender distribution, education level, occupation, marital status or physical activity between those with painful TMD or without TMD. Similarly, no significant differences were found between those with painful TMD and without TMD regarding streaming/gaming characteristics. Those with TMD reported a higher frequency of consuming energy drinks compared to those without, however this did not reach statistical significance ($p = 0.06$) (Table 3). However, Esport players/streamers with painful TMD reported significantly higher levels of anxiety (GAD-7, $p < 0.001$), somatic symptoms (PHQ-15, $p < 0.001$), sleep quality (PSQI, $p = 0.045$) and stress (PSS-10, $p = 0.006$) and oral parafunctional behaviors linked to development of TMD (OBC, $p = 0.002$) compared to those without TMD (Table 4).

3.2.2. Bruxism versus no bruxism

No significant differences were found when it comes to demographic characteristics between both groups. The bruxism group played Esports three years longer than those without (10.0 IQR 10.0 years compared to 7.0 IQR 11.5 years). However, this difference did not reach statistical significance ($p = 0.1$) (Table 3). Esport players/streamers with bruxism scored significantly higher on oral parafunctional behaviors linked to development of TMD when compared to those without bruxism (OBC, $p < 0.001$). Based on this OBC scoring, Esport players/streamers with bruxism report a risk for TMD while those without bruxism show no risk of developing TMD (Table 4).

3.2.3. "Awake and sleep" bruxism versus "only awake" bruxism

There was a significant difference in gender distribution across "Awake and Sleep" bruxism versus "Only Awake" bruxism ($p = 0.028$), with 90.6 % male in "Awake and Sleep" bruxism group and 69.2 % male in "Only Awake" bruxism group. These groups also differed regarding occupational level, with a higher proportion of unemployment amongst those with "Awake and Sleep" bruxism compared to "Only Awake" bruxism ($p = 0.046$). No significant differences were found regarding gaming/streaming characteristics, following the same trend as the whole sample (Table 3).

There was a significant difference in the prevalence of TMD, where 65 % of those with "Awake and Sleep" bruxism presented painful TMD, whereas 37.5 % of the group with "Only Awake" bruxism had painful

Table 3
Crosstabulation of TMD and bruxism by individual characteristics.

	TMD	No TMD	Bruxism	No bruxism	Only awake Bruxism	Awake + sleep Bruxism
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
Total	48	49	76	21	32	40
Gender						
Male	36 (76.6)	39 (79.6)	59 (78.7)	16 (76.2)	29 (90.6)	27 (69.2) *
Female	11 (23.4)	10 (20.4)	16 (21.3)	5 (23.8)	3 (9.4)	12 (30.8)
Education Level						
Basic education	2 (4.2)	0 (0.0)	2 (2.6)	0 (0.0)	2 (6.3)	0 (0.0)
Secondary education	19 (39.6)	15 (30.6)	25 (32.9)	9 (42.9)	10 (31.3)	15 (37.5)
Vocational education	12 (25.0)	12 (24.5)	19 (25.0)	5 (23.8)	9 (28.1)	9 (22.5)
Higher education (Bachelor, masters or doctoral)	15 (31.3)	22 (44.9)	30 (39.4)	7 (33.3)	11 (34.4)	16 (40.0)
Background						
Europe	29 (60.4)	32 (65.3)	45 (59.2)	16 (76.2)	19 (59.4)	25 (62.5)
South America	16 (33.3)	15 (30.6)	27 (35.5)	4 (19.0)	12 (37.5)	13 (32.5)
Other (Africa, middle East, Asia)	3 (6.3)	2 (4.0)	4 (5.2)	1 (4.8)	1 (3.1)	2 (2.8)
Occupation						
Employed/ self-employed	25 (54.3)	35 (72.9)	47 (62.8)	13 (68.4)	22 (71.0)	22 (55.0) *
Unemployed	4 (8.6)	3 (6.2)	7 (9.3)	0 (0.0)	0 (0.0)	7 (17.5)
Student	17 (37.0)	10 (20.8)	21 (28.0)	6 (31.6)	9 (29.0)	11 (27.5)
Missing	*2*	*1*	*1*	*2*	*1*	*0*
Marital						
Single	28 (58.3)	33 (67.3)	48 (63.2)	13 (61.9)	21 (65.6)	24 (60.0)
Partner/ married	19 (39.6)	14 (28.6)	27 (35.5)	6 (28.6)	10 (31.3)	16 (40.0)
separated/ divorced	1 (2.1)	2 (4.1)	1 (1.3)	2 (9.5)	1 (3.1)	0 (0.0)
Gaming/streaming accessories						
Headset	33 (68.8)	40 (81.6)	58 (76.3)	15 (71.4)	26 (81.3)	28 (70.0)
Earphones	13 (27.1)	10 (20.4)	18 (23.6)	5 (23.8)	6 (18.8)	12 (30.0)
Physical activity						
no	12 (25.0)	14 (28.6)	22 (28.9)	4 (19.0)	8 (25.0)	14 (35.0)
1-2 times a week	10 (20.8)	9 (18.4)	11 (14.4)	8 (38.1)	3 (9.4)	7 (17.5)
3-4 times a week	16 (33.3)	17 (34.7)	25 (32.9)	8 (38.1)	14 (43.8)	11 (27.5)
5-6 times a week	6 (12.5)	8 (16.3)	14 (18.4)	0 (0.0)	6 (18.8)	5 (12.5)
Everyday	4 (8.3)	1 (2.0)	4 (5.3)	1 (4.8)	1 (3.1)	3 (7.5)
Energy drinks						
no	11 (22.9)	17 (34.7)	22 (28.9)	6 (28.5)	11 (34.4)	11 (27.5)
1-2 times a week	12 (25.0)	6 (12.2)	15 (19.7)	3 (14.2)	6 (18.8)	9 (22.5)
3-4 times a week	9 (18.8)	6 (12.2)	11 (14.5)	4 (19.0)	4 (12.5)	7 (17.5)
5-6 times a week	0 (0.0)	5 (10.2)	5 (6.6)	0 (0.0)	4 (12.5)	0 (0.0)
Everyday	16 (33.3)	15 (30.6)	23 (30.0)	8 (38.0)	7 (21.8)	13 (32.5)
TMD						
Yes			39 (51.3)	9 (42.9)	12 (37.5)	26 (65.0) *

(continued on next page)

Table 3 (*continued*)

	TMD	No TMD	Bruxism	No bruxism	Only awake Bruxism	Awake + sleep Bruxism
	N (%)	N (%)	N (%)	N (%)	N (%)	N (%)
No			37 (48.7)	12 (57.1)	20 (62.5)	14 (35.0)
Bruxism						
No Bruxism	9 (18.8)	12 (24.5)				
Only Awake bruxism	12 (25.0)	20 (40.8)	32 (42.1)			
Only sleep bruxism	1 (2.1)	3 (6.1)	4 (5.3)			
Sleep + Awake bruxism	26 (54.2)	14 (28.6)	40 (52.6)			

Note: *denotes significant differences (P < 0.05, Chi-Square Test).
Abbreviations: TMD, Temporomandibular disorders.

TMD (p = 0.02). Similarly, participants with “Awake and Sleep” bruxism scored significantly higher regarding oral behaviors linked to development of TMD (OBC, p < 0.001) – i.e. they have a significantly higher risk of developing TMD – as well as significantly higher levels of anxiety (GAD-7, p = 0.004) and somatic symptoms (PHQ-15, 0.005) (Table 4).

3.3. Correlations

3.3.1. Hours playing per day vs TMD, bruxism and psychosocial variables

Spearman rank-order correlations revealed a significant positive association between the number of hours spent playing Esports/streaming per day and increased levels of perceived stress (p = 0.02) (Fig. 1A). The number of hours playing/streaming was also significantly and positively correlated with higher risk for TMD based on participants level of oral parafunctional behaviors (OBC, p = 0.015) (Fig. 1B), including placing the tongue between teeth (OBC question 9, p = 0.0008), biting/chewing/playing with tongue, cheek or lips (OBC question 10, p = 0.006), and playing a musical instrument (OBC question 14, p = 0.03). On the other hand, significant negative correlations were found between the daily gaming hours and participants age (p = 0.001), pain vigilance (PVAQ, p = 0.04) and frequency of physical activity (p = 0.04).

3.3.2. Years playing/streaming

A significant correlation was only found between more years playing/streaming and higher age (p = 0.002) as well as lower frequency of playing a musical instrument (p = 0.02).

3.4. Multivariate regression to determine group membership using gaming and psychosocial variables as regressors (X-variables)

Results from the OPLS-DA are shown in Table 5.

In the OPLS-DA model, we observed a significant group separation of Esport players/streamers with painful TMD from those without TMD (P (CV- ANOVA) = 0.002). Based on the VIP (i.e. ranked list of important variables driving the group separation) and p (corr) values (i.e. reliability and direction of predictive variables), the model pinpointed that elevated levels of somatic symptoms (PHQ-15), anxiety (GAD-7), perceived stress (PSS-10), poor sleep quality (PSQI) and oral parafunctional behaviors increasing risk of TMD (OBC) were the most predictive variables in differentiating between the two study groups (VIP >1, p

Table 4
Age, psychosocial variables and gaming characteristics of those with TMD and bruxism.

	TMD	No TMD	Bruxism	No bruxism	Awake bruxism	Awake + sleep bruxism
Age (yr)	24.0 (13.5)	27.0 (13.5)	25.0 (10.8)	25.0 (15)	24.5 (11.5)	25.5 (11.0)
Years playing Esports	10 (20)	10 (10)	10.0 (10.0)	7.0 (11.75)	10.0 (9.5)	10.5 (12.8)
Hours playing Esports per day	3 (3.8)	3 (2)	3.0 (3.0)	3.0 (2.5)	3 (3.0)	3 (3.0)
OBC	23.5 (16.5) #	16.0 (16.0)	22.0 (12.5)	8.0 (7.5) ¤	16.5 (13.0)	25.0 (10.8) *
GAD-7	7.0 (8.8) #	2.0 (7.0)	4.0 (7.8)	5.0 (9.0)	2 (7)	7 (8.8) *
PHQ-15	6.0 (5.0) #	2.0 (5.0)	4.0 (5.0)	4.0 (5.5)	3.0 (5.5)	6 (5.8) *
PVAQ	35.0 (40.0)	35.0 (30.5)	35.0 (22.0)	31.0 (38.0)	39.5 (22.5)	35 (19.8)
PSQI	5.0 (4.0) #	4.0 (5.0)	5.0 (4.8)	5.0 (4.0)	4 (4)	5.5 (6.5)
PSS-10	28.0 (10.0) #	24.0 (11.0)	26.5 (9.8)	28.0 (11.0)	24.5 (11.5)	27.5 (9.8)

Data presented as median (interquartile range).
Note: # denote significant differences between “TMD” and “No TMD”, ¤ denote significant differences between “Bruxism” and “No bruxism”, * denote significant differences between ”Awake bruxism” and “Awake + Sleep bruxism” (p < 0.05, Mann-Whitney *U* test): OBC (p < 0.001).
Abbreviations: OBC, Oral behavior checklist; GAD-7, General Anxiety Disorder-7; PHQ-15, 15-item Patient Health Questionnaire; PVAQ, Pain Vigilance Awareness Questionnaire; PSQI, Pittsburgh Sleep Quality Index; PSS, Perceived Stress Scale.

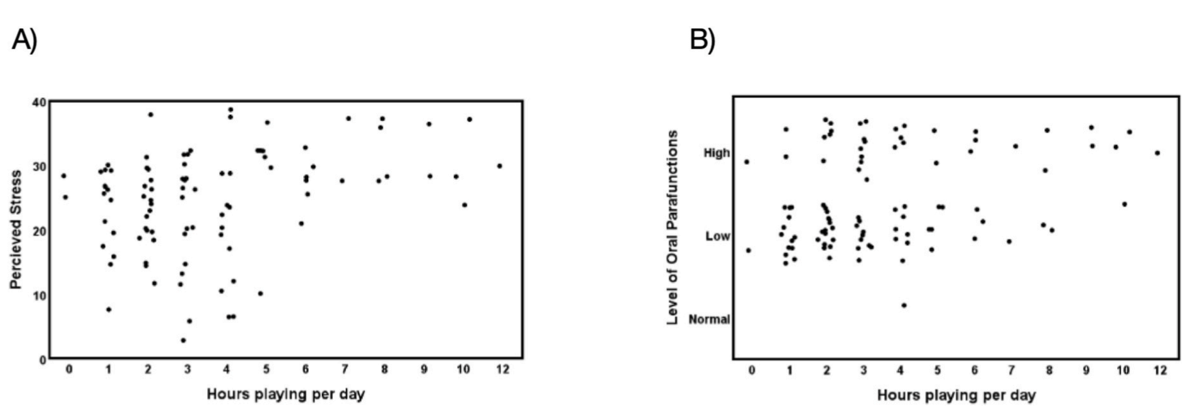

Fig. 1. A–B. Correlations between number of hours spent playing Esports/streaming per day and (A) Perceived Stress (PSS) as well as (B) the level of oral parafunctional behavior increasing the risk for TMD (OBC). Data were obtained with Spearman ranked correlation test, P < 0.05.

Table 5
OPLS-DA regressions of group memberships (Painful TMD vs No TMD, Bruxism vs no bruxism, Sleep bruxism vs Awake bruxism) using gaming and psychosocial factors as regressors (X-variables).

Painful TMD vs No TMD			Bruxism vs No bruxism			Sleep bruxism vs Awake bruxism		
X-variable	VIP	P(corr)	X-variable	VIP	P(corr)	X-variable	VIP	P(corr)
PHQ-15	1.78	−0.88	OBC	2.93	0.85	GAD-7	1.63	0.83
GAD-7	1.74	−0.86	$Playing_{(yr)}$	1.32	0.40	PHQ-15	1.62	0.83
PSS	1.23	−0.64	$Playing_{(hrs/d)}$	1.10	0.33	PSQI	1.43	0.73
PSQI	1.17	−0.60				OBC	1.30	0.66
OBC	1.17	−0.53				PSS	1.18	0.60
$R^2X = 0.245$			$R^2X = 0.339$			$R^2X = 0.26$		
$R^2Y = 0.188$			$R^2Y = 0.394$			$R^2Y = 0.223$		
$Q^2Y = 0.125$			$Q^2Y = 0.238$			$Q^2Y = 0.108$		
P (CV- ANOVA) = 0.002			P (CV- ANOVA) = 4.8×10^5			P (CV- ANOVA) = 0.02		

OPLS-DA: Orthogonal partial least squares regression-discriminant analysis; For each regression model, R^2Y, Q^2, VIP, P(corr), and the p-value from CV-ANOVA are reported in the bottom rows. R^2Y; total variation in Y explained by the model, Q^2; the model's predictive accuracy. VIP; the importance of variables in driving group separation. P(corr); correlation coefficient. VIP >1 and P(corr) > 0.4–0.5 indicates significant metabolites. In painful TMD vs No TMD, a negative P(corr) denotes higher values for painful TMD compared to No TMD, and in bruxism vs no bruxism, it indicates higher values for bruxism and in sleep bruxism vs awake bruxism, it indicates higher values for sleep bruxism. The CV-ANOVA p-value indicate model validity and the significance of group separation, $p < 0.05$ is considered significant.

(corr) > 4–5). This suggests a strong association between these variables and the presence of painful TMD in digital athletes. In addition, the strong p-value indicates that the model's ability to separate between Esport players/streamers with and without TMD using the above-mentioned psychosocial variables is reliable when tested on unseen data (via cross validation).

We observed a strong statistical group separation between esport players/streamers with bruxism and without bruxism (p (CV-ANOVA) = 4.8×10^5). The key predictors for this separation were oral parafunctional behaviors (OBC) and the number of years engaged as a streamer/esport player (VIP >1, p (corr) > 4–5), suggesting that individuals who played for more years and with increased parafunctions were more likely to be found in the bruxism group. The strong p value indicates that the model is reliable to discriminate between the two groups using unseen data.

Likewise, elevated anxiety, somatic symptoms, poor sleep quality, oral parafunctions and perceived stress were found to be the most important variables (VIP >1, p (corr) > 4–5) driving the significant separation of "Awake and Sleep" bruxism group from "Only Awake" bruxism (p (CV-ANOVA) = 0.02). Similarly, the significant p-value yielded during cross validation indicates that the model is reliable when differentiating between these two groups using the abovementioned psychosocial variables. This is visualized more clearly in the SUS-plot (Fig. 2) identifying which of the variables have the same effect (shared structure, seen as red dots in plot) and which variables have differentiating effects (unique structures, green dots) between digital athletes with combined "Sleep + Awake" bruxism versus "Only Awake" bruxism. As such, the variables close to the diagonal contribute similarly to both models (shared effects), while those along one axis are unique for either "Only Awake" or combined "Sleep + Awake" bruxism (unique effects). Accordingly, OBC (red dot) is seen in the upper right corner, indicating same effects for digital athletes with both sleep and awake

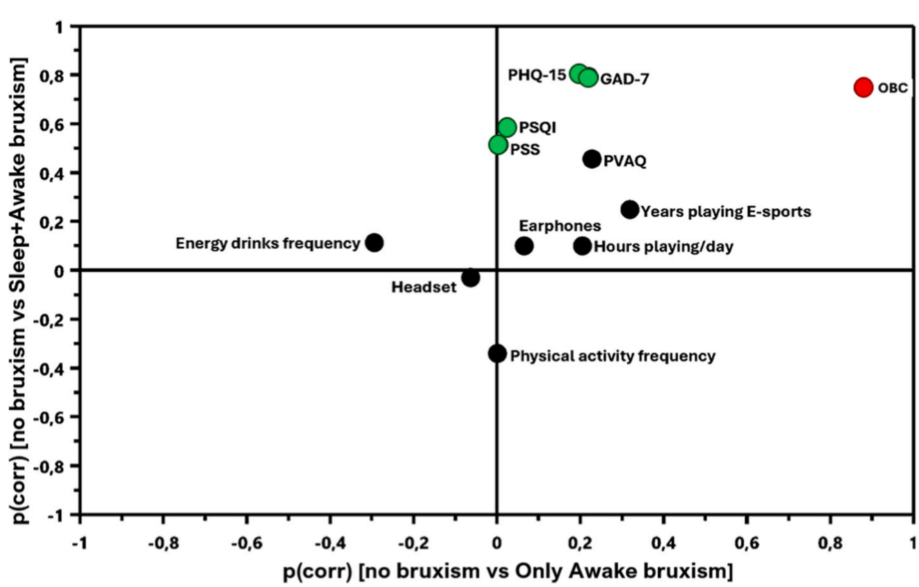

Fig. 2. Shared and Unique Structures (SUS) plot comparing gaming and psychosocial variables contributing to the model separating no bruxism vs Awake bruxism (x-axis) with that of the model separating no bruxism vs Sleep + Awake Bruxism (y-axis). The variables that are altered similarly regardless of awake or sleep bruxism are clustered along the diagonal (in red color). Thus, the red colored variable OBC (Oral behaviors) found in the upper right corner indicate the same effect for both groups and is not useful for differentiating awake from sleep bruxism. On the other hand, the variables located along the y-axes are specifically altered in "Sleep + Awake" bruxism (green) and x-axes are specifically altered in "Only Awake" bruxism (none). Thus, the green color variables PSS-10 (Perceived stress), GAD-7 (anxiety), PHQ-15 (somatic symptoms) and PSQI (poor sleep quality) clustered along the y-axis, suggest that they are specifically altered in the combined "Sleep + Awake" bruxism group, but not in "Only Awake" bruxism, and thus good candidates for differentiating between the two. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)

bruxism, and is thus not useful in differentiating between the groups in this population. On the other hand, the psychosocial variables PSS-10, GAD-7, PHQ-15 and PSQI (green dots in the SUS-plot) were clustered along the y-axis, meaning that they were specifically altered in the combined "Sleep + Awake" bruxism group, but not in "Only Awake" bruxism and thus good candidates for differentiating between the two in digital athletes. The variables that were driving in the separation between painful TMD vs No TMD are all (but OBC) located in this region (i.e. the y-axis, unique effects for "Sleep + Awake" bruxism).

4. Discussion

This is the first study to examine the prevalence and psychosocial associations of bruxism and painful TMD in professional and semi-professional Esports players and streamers. Our findings suggest that this population may be particularly at risk to the development of painful TMD and bruxism, with approximately half of all participants meeting the TMD screening criteria and 80 % reporting bruxism. Interestingly, increased daily gaming hours significantly correlated with elevated perceived stress and higher level of oral parafunctional behaviors that increase the risk for TMD. Supervised multivariate analysis showed that elevated anxiety, somatic symptoms, perceived stress, pain vigilance and sleep disturbances in the Esports players were strong drivers in separating those with painful TMD from those without TMD as well as those with combined sleep + awake bruxism from those with only awake bruxism. Combined, our results offer novel insights into the links between digital performance environments and orofacial pain risks, which may inform not only future research strategies, preventative and therapeutic interventions but could also be important for teams and users in the implementation of sustainable training strategies for long-term success.

The demographic profile of our study sample, consisting of predominantly young male, highly engaged in Esports or streaming activities, reflects the general competitive gaming communities (Sanz-Matesanz et al., 2023). While demographic variables were comparable, we found that those with painful TMD as well as those with combined awake and sleep bruxism had significantly higher levels of anxiety, somatic symptoms, perceived stress, poor sleep quality and oral parafunctional behaviors increasing their risk of TMD (i.e. OBC). In the supervised multivariate models, these psychosocial variables were also found to be the most important for driving the separation of painful TMD-cases from non-cases. This finding aligns with the well-established biopsychosocial model of TMD (Maixner et al., 2016; Suvinen et al., 2016) but also highlights its presence and relevance within the population of Esports players and warrants further attention.

On the other hand, only oral parafunctional behaviors – increasing the risk of TMD – (i.e. the OBC-scores) and number of years playing/streaming were significant variables in distinguishing individuals with bruxism from those without. The absence of psychological variables as predictors in this model suggests that bruxism may be common and behaviorally driven in this population, but that its clinical and psychosocial impact may vary by bruxism subtype. This was further clarified in the SUS-plot, comparing the importance and interactions of psychosocial and gaming related variables in bruxism subtypes (i.e. comparing the multivariate models '"Only Awake" bruxism versus no bruxism' and '"Sleep + Awake" bruxism versus no bruxism'). In this plot, oral parafunctional behaviors increasing risk for TMD (i.e. the OBC-scores) were found to be equally important, further suggesting that these oral parafunctional behaviors may be general Esports-/streaming-related habits or accompanying mechanisms during intense play in the present sample (Schneider et al., 2007). In contrast, high anxiety, somatic symptoms, poor sleep quality and perceived stress loaded uniquely in the "Awake and Sleep" bruxism model (i.e. high p (corr)) for this model but not for the "Only Awake" bruxism model), indicating psychological or physiological differences between these subgroups in digital athletes. Although, previous studies have found that individuals with awake bruxism seem to have a higher degree of psychosocial distress, our findings suggest that the combination of both sleep and awake bruxism is associated with an even greater psychological burden and impaired function in digital athletes. Interestingly, these variables were the same variables that also drove the separation between the painful TMD and no TMD groups, supporting the view that sleep bruxism and painful TMD may share common stress-reactive pathophysiology (Filho et al., 2025), different from only awake bruxism. Moreover, the co-occurrence of sleep bruxism may suggest a more severe psychosocial burden (Filho et al., 2025; Voβ et al., 2024) rather than just an extension of daytime oral parafunctions, proposing a potential marker of psychological/physiological dysregulation in Esports players and streamer. As such, the environments of these Esports players may contribute to differentiated risk profiles, not only due to extended screen time, but also via its increased psychological demands (e.g. cognitively demanding tasks, increased performance pressure) and disrupted recovery patterns (e.g. irregular sleep and schedule) (Kemp et al., 2021; Palanichamy et al., 2020). This combination may create conditions that increase vulnerability to stress-induced muscle activity, particularly during sleep when inhibitory control is reduced (Lavigne et al., 2008; Lobbezoo et al., 2013, 2018). While this may indicate a sub-group at increased risk, longitudinal studies are needed to determine whether it reflects true clinical vulnerability or a transient state due to stressful circumstances.

Furthermore, our analysis revealed that the number of hours spent playing or streaming each day was significantly correlated with increased perceived stress, higher level of oral parafunctions (tongue pressing, cheek/lip biting) recognized as contributing to the onset and exacerbation of painful TMD (Bair et al., 2013; Greene & Manfredini, 2021; Keela et al., 2024). These findings imply that the intensity of daily engagement in gaming activities may be more critical for psychosocial and physiological dysregulation among these Esports players than the total years of experience. Additionally, the observed negative correlations between gaming hours and physical activity, as well as age and pain vigilance, suggest that individuals that dedicate more time to play or stream tend to be younger, less physically active, and less aware of bodily discomfort or early warning signs which may contribute to the inadequate recognition of their musculoskeletal symptoms.

4.1. Strengths and implications

To our knowledge, this is the first study to comprehensively examine TMD and bruxism in Esport players and streamers. The use of an extended battery of validated questionnaires in this study ensures strong and reproducible measurements of psychosocial, behavioral and orofacial health variables. Additionally, the combination of conventional statistical analysis and OPLS-DA provided robust, multidimensional framework for modeling complex interrelationships between variables, increasing the validity of our findings. Together, this multimethod statistical design makes our findings easier to interpret and reproduce.

Moreover, the analysis allowed to identified potential psychosocial risk factors for orofacial pain and dysfunction in the Esports and streaming community. The findings support a hypothesis of an integrated model in which high daily gaming exposure disrupts health behaviors and emotional regulation, increasing the risk for oral parafunctions, bruxism and painful TMD. The integration of behavioral intensity, poor recovery and increased psychosomatic burden may help identify a high-risk subgroup of this population, further emphasizing the need for early preventive strategies tailored to digital athletes.

In practical terms, brief chairside questionnaires assessing the mentioned variables could be incorporated into standard patient intake protocols. Preventive counseling should include education on ergonomics, sleep hygiene, and awareness of oral parafunctions. These findings also inform future research within this field and target interventions focusing on sleep hygiene, stress management, and oral health education. Additionally, our results highlight the relevance of integrating health literacy tools in Esports and streaming platforms such as in-game prompts to monitor screen time, sleep and stress, to support both the sustainability of the environment and the long-term health and performance of Esports players. For those presenting with early signs of painful TMD and bruxism, behavioral interventions such as biofeedback, relaxation training, and guided breaks during gaming sessions may help mitigate parafunctional activity and muscle overload.

4.2. Limitations and future directions

While this study offers novel insights into the psychosocial and behavioral factors underlying TMD pain and bruxism in Esports players and streamers, several limitations should be noted. First, the cross-sectional design of this study prevents conclusion regarding causality, warranting the need for longitudinal studies to clarify the associations of Esports/streaming, orofacial pain and bruxism. Second, the self-reported measures used in this study may have introduced selection and recall bias. Although the instrument employed to classify patients with painful TMD (TMD Screener) has high sensitivity (99 %) and specificity (97 % ((Gonzalez et al., 2011); recruitment through Esports forums and social media may have attracted individuals with heightened health awareness and/or existing orofacial symptoms. This self-selection bias could have led to an overestimation of the prevalence of painful TMD (49.5 %) and bruxism (78.4 %) compared to general population estimates (approximately 30 % for TMD). Consequently, these figures should be regarded as upper-bound estimates within an at-risk Esports/streaming cohort rather than representative population values. Nevertheless, the associations observed between psychosocial and behavioral variables remain informative for understanding vulnerability within this subgroup. As the first study to explore TMD and bruxism specifically in the Esports and streaming population, these findings might serve as an important starting point. All psychometric instruments employed in this study (e.g., PHQ-15, PSQI, PSS-10, GAD-7) have been validated in adult populations comparable in age to our sample (18–40 years), minimizing the potential influence of age-related differences in questionnaires performance. However, self-report measures may not fully capture the factors influencing health among Esports players and streamers. Incorporating qualitative approaches such as interviews in future studies may offer further insight. Additionally, integrating clinical evaluations and objective methods (e.g. EMG or polysomnography) could enhance diagnostic accuracy and deepen understanding of TMD and bruxism in digital athletes (44). Third, the sample included in this study consisted of mainly young adult males, which further limits the generalizability of our results regarding gender specific risk factors in Esports players. This should thus be addressed in future studies, including a larger cohort, with balanced distribution of age and gender. Also, measures like ‘daily gaming hours’ may not be representative of the professional/semiprofessional behavior as different Esports and streaming contexts may have varied cognitive/emotional demands (Miao et al., 2024). Fourth, although the OPLS-DA models demonstrated statistical validity (CV-ANOVA $p < 0.05$), their Q^2 values were modest (0.108–0.238), suggesting limited predictive power beyond the current dataset. This indicates that the models better describe existing relationships among variables rather than accurately predicting outcomes for new individuals. Given the exploratory nature and sample size of this study, these results should therefore be interpreted as descriptive rather than predictive. Lastly, future studies should include a comprehensive assessment including e.g. game genre, performance pressure and audience dynamics (Manci et al., 2024; Sharpe et al., 2024). As such, given that this study is the first to explore TMD and bruxism in this population of digital athletes, our findings should mainly serve as an important starting point.

4.3. Conclusion

This study provides evidence that TMD and bruxism are highly prevalent among Esports players and streamers. Longer daily gaming or streaming hours were significantly associated with elevated stress levels and oral parafunctional behaviors, both of which increase the risk of developing painful TMD. Importantly, individuals presenting with both sleep bruxism and TMD seemed to represent a particularly vulnerable subgroup, characterized by heightened psychosomatic burden and impaired recovery patterns common in competitive gaming environments.

These findings confirm our hypothesis that increased gaming exposure and higher psychosomatic distress are linked to greater prevalence of TMD and bruxism. Beyond prevalence estimates, this study underscores how technology-mediated performance demands, such as performance pressure, irregular schedules, and sustained screen time, can contribute to somatic dysfunction. Although the cross-sectional design limits causal inference, this study provides an essential first step in identifying risk profiles in this rapidly expanding digital athlete population. Therefore, highlighting the importance of early screening and targeted preventive interventions, including stress management, sleep hygiene and oral health education.

Taken together, supporting the physical and mental health of Esports players is crucial not only to reduce the burden of TMD and bruxism but also to sustain long-term well-being and performance within rapidly evolving digital performance ecosystems. Future longitudinal and mixed method studies are warranted to validate these associations, explore underlying mechanisms and inform targeted strategies for digital athletes.

Artificial intelligence

No artificial intelligence has been used in any part of the analysis or writing.

CRediT authorship contribution statement

Flávia Paula Da Silva Cardoso: Investigation, Data curation. **Golnaz Barjandi:** Writing – review & editing, Writing – original draft, Investigation, Formal analysis. **Dyanne Medina Flores:** Writing – review & editing, Writing – original draft, Methodology, Conceptualization. **Rodrigo Lorenzi Poluha:** Writing – review & editing, Formal analysis. **Nikolaos Christidis:** Writing – review & editing. **Giancarlo De la Torre Canales:** Writing – review & editing, Writing – original draft, Project administration, Methodology, Formal analysis, Conceptualization.

Ethics approval and consent to participate

This study received approval from the Research Ethics Committee of Egas Moniz School of Health and Science (PT-211/24), and it adhered to the Helsinki Declaration.

Consent for publication

Written informed consent was obtained by all participants.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

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Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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Data availability

Data will be made available on request.

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