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*Original Research*

# Prevalence of and factors associated with musculoskeletal disorders among Thai esports athletes

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***Abstract***

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Esports athletes often engage in prolonged gaming sessions that involve repetitive movements and sustained static postures, placing them at increased risk of work-related musculoskeletal disorders (WMSDs). Given the limited regional evidence, this study is among the first to investigate the prevalence and associated factors of WMSDs among Thai esports athletes. Participants aged 15–35 years were recruited through esports club pages and the Thailand Esports Federation, with eligibility criteria including training with a coach and gaming more than four hours per day. They completed a self-administered questionnaire covering general and risk factors, musculoskeletal pain, vision, and gaming stress levels. The prevalence of WMSDs among Thai esports athletes was 63.1%, with a higher rate among professionals (67.4%) compared to university-level players (61.3%). The most affected regions were the neck (40.7%) and lower back (36.2%). Significant factors associated with WMSDs included age over 21 years (OR = 1.75, $p < 0.05$), overweight BMI (OR = 1.16), smoking (OR = 1.54), and sleeping less than six hours per night (OR = 2.18). In addition, longer gaming experience exceeding five years (OR = 1.64), daily gameplay over five hours (OR = 1.74), and psychological stress during gaming (OR = 1.80) were identified as key risk factors. These findings highlight that WMSDs are highly prevalent among Thai esports athletes, particularly in the neck and lower back, and suggest that limiting daily playtime to under five hours, ensuring adequate rest, and incorporating pre- and post-gaming relaxation routines may help reduce WMSD risk and promote musculoskeletal health.

Keywords: Prevalence, athletes, risk, musculoskeletal pain

## Introduction

The rapid rise of esports has transformed it into a global competitive industry, drawing millions of participants and spectators worldwide. As esports continues to grow in popularity, players are increasingly recognized as athletes who invest significant time and effort into training and competing.[1] This evolution has led to discussions about esports' inclusion in major sporting events such as the Olympic Games and the Asian Games. The 2022 Asian Games marked a significant milestone by featuring esports as a competition sport with titles such as Arena of Valor, EA Sports FC Online, Street Fighter V, League of Legends, Dream Three Kingdoms 2, Peace Elite, and Dota 2.[2]

In Thailand, the popularity of esports has demonstrated a steady and pronounced upward trajectory in recent years. This development has been driven by increased societal acceptance, strong governmental and private sector support, and the establishment of structured training

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and professional competition systems. Since 2017, esports have been officially recognized as a sport under the Sports Act B.E. 2558 (2015), allowing for the creation of national associations and the advancement of athlete development at the international level.[3] The expansion of esports has also been shaped by shifting consumer behavior and the growing accessibility of digital technologies. The integration of gaming with social media platforms has enhanced visibility, engagement, and ease of access, transforming gaming from a niche leisure activity into an integral component of daily life.[2] As gaming becomes embedded in everyday routines, individuals are spending increasing amounts of time on computers and mobile devices. This behavioral shift poses emerging challenges for public health, particularly concerning musculoskeletal disorders and other sedentary-related injuries linked to prolonged gameplay and screen exposure.[5]

Despite the recognition of esports as a professional discipline, the physical demands of prolonged gaming sessions pose significant health risks. Esports athletes frequently engage in repetitive movements and maintain static postures, making them increasingly susceptible to work-related musculoskeletal disorders (WMSDs).[4] Prolonged exposure to suboptimal ergonomic conditions and repetitive stress can lead to chronic pain, decreased performance, and potentially career-ending injuries.[5] Understanding the prevalence and contributing factors of these disorders is essential for developing effective preventive measures, thereby promoting athlete well-being and sustainability within the esports ecosystem.

Studies from the United States, Canada, Denmark, and the United Kingdom have reported that esports athletes commonly experience musculoskeletal pain, particularly in the neck and back.[6-8] Extended gaming hours and more years of gaming experience contribute to the cumulative strain on muscles and joints, increasing the risk of injury.[1,6,8] Given the increasing recognition of esports as a professional sport and the growing evidence of its associated health risks, there is a pressing need to better understand the musculoskeletal implications of competitive gaming. Therefore, this study aimed to determine the prevalence, affected body regions, and severity stages of WMSDs among esports athletes in Thailand. In addition, it sought to examine the associations between WMSDs and individual characteristics, visual problems, and physical activity levels. It was hypothesized that (1.) the prevalence of WMSDs would be high, particularly in the neck, shoulder, and lower back regions; (2) individual factors such as age, sex, years of gaming experience, and daily gaming duration would be significantly associated with WMSDs; and (3) the presence of visual problems would be positively associated with WMSDs.

## Methods

This cross-sectional study was conducted among professional esports athletes (who earn income from competitive gaming) and amateur esports players in Thailand. The study obtained ethical approval from the Mahidol University Human Research Ethics Committee, with the project code MU-CIRB 2023/061.1804. The participants were asked to provide their informed consent. They received information about the study, including its aims, methods, and self-questionnaires. This research was carried out fully in accordance with the ethical standards of the International Journal of Exercise Science.

### *Participants*

Participants were recruited through the official pages of esports clubs, the Thailand Esports Federation, or university esports representatives. The inclusion criteria were as follows: individuals aged between 15 and 35 years who engaged in gaming for more than 4 hours per day.

Participants were excluded if they declined to participate, withdrew consent, or were unable to complete the questionnaire for any reason. Additionally, individuals who participated in esports without a coach or formal training supervision were excluded.

The sample size was initially calculated using a single population proportion formula with an anticipated prevalence of 46%,[6] a 95% confidence level (Z = 1.96), and a margin of error of 5%, resulting in a required sample size of 382 participants. However, due to limitations in participant availability during the data collection period, only 290 participants were recruited. A post hoc evaluation (effect size = 0.5, $\alpha$ = 0.05, two-tailed) confirmed that this sample size remained statistically adequate, as it retained sufficient power (≥80%) to detect the primary outcomes with acceptable precision.

*Protocol*

The self-Esports questionnaire was validated by each professional field including physical therapist, sport scientist (psychological field) and committee of Thailand Esports Federation. The items of the questionnaire were restructured when the Index of Item–Objective Congruence (IOC) value was less than 1. The completed questionnaire consisted of three sections: 1) general and risk factor information, 2) musculoskeletal pain and vision, and 3) gaming stress level. The IOC was determined by presenting all questionnaire items and their corresponding response methods to a panel of experts. Each expert rated the appropriateness of every item using a three-point scale: 1 = appropriate, 0 = uncertain or no opinion, and –1 = requires revision, and also provided comments for improvement. Items with an IOC score lower than 1 were revised based on the experts' collective recommendations, which primarily involved changing open-ended questions to multiple-choice formats—for example, questions related to player type and competition league.

1. Section 1: Individual and Game-Related Information.

This section collected demographic and gaming-related data, including age, gender, height, weight, underlying diseases, average sleep duration, primary game played (e.g., League of Legends), and daily training hours.

2. Section 2: Work-Related Musculoskeletal Disorders (WMSDs) and visual Problems.

Participants were asked to report musculoskeletal symptoms experienced during the previous 7 days and 12 months. Pain locations were categorized into twelve body regions: neck, shoulders, upper back, lower back, arms, elbows, forearms, wrists and hands, hips and thighs, knees, legs, and feet. Participants were instructed to identify the most painful area and rate their pain intensity. Awareness of musculoskeletal prevention practices, including workstation adjustment and rest breaks, as well as the presence of visual-related problems, were assessed using dichotomous ("Yes" or "No") questions.

3. Section 3: Psychosocial Factors

Psychosocial stress was evaluated using the Thai version of the Perceived Stress Scale–10 (T-PSS-10), a widely validated instrument for assessing perceived stress in daily life.

The questionnaires were distributed through the official addresses of esports clubs and the Thailand Esports Federation. Additionally, data collection was conducted during the 2024 University Esports Tournament, which included esports athletes representing 42 universities across Thailand.

*Statistical Analysis*

Statistical analyses were conducted in IBM SPSS Statistics, v21.0 (IBM Corp., Armonk, NY, USA) Descriptive statistics particularly illustrated the prevalence of WMSDs in each area of the body over the previous seven days and twelve months, including vision problems and ocular discomfort. Logistic regression analyses were conducted to estimate the odds ratios of reporting musculoskeletal pain based on individual factors, playing game related factors, visual problems and physical activity among esports athletes. The significant level was set at $\alpha = 0.05$.

## Results

A total of 290 esports athletes participated in this study, with a mean age of 21.53 ± 4.02 years and a mean body mass index (BMI) of 22.63 ± 5.57 kg/m². On average, participants had 9.31 years of gaming experience, encompassing both recreational and competitive play. Table 1 presents the distribution of gaming duration based on years of experience and daily playing time. In addition, this study included self-administered questionnaires from both university-level and professional-level athletes. The participants reported an average of 9.97 hours of gameplay per day, including both structured and unstructured practice sessions.

**Table 1.** Demographic of esports athlete (n=290).

| Variables | n (%) | Mean±SD |
|---|---|---|
| Age (year) | 21.53 (4.02) | |
| Sex, n male (%) | 236 (81.4%) | |
| BMI (kg/m² ) | 22.63 (5.57) | |
| Dominant hand | | |
| - Right | 253 (87.2%) | |
| - Left | 29 (10%) | |
| - Both | 8 (2.8%) | |
| Smoking status (n reporting 'Yes' (%) | 55 (19%) | |
| Esports participation | | |
| - university-level athletes | 204 (70.3%) | |
| - professional-level esports athletes | 86 (29.7%) | |
| Game experience (year) | | 9.31± 5.43 |
| Hours of structured esports/ day | | 5.38 ± 2.73 |
| Hours of unstructured esports or streaming or other related activities/ day | | 4.59 ± 3.20 |

Note: Values are presented as mean ± SD.
Abbreviations: SD = Standard Deviation; BMI = Body Mass Index (kg/m²).

Prevalence of Work-related musculoskeletal disorders (WMSDs), pain area and stage of WMSDs among e-sport athletes.

The prevalence of work-related musculoskeletal disorders (WMSDs) was 63.1% among all participants, with 67.44% reported in professional-level esports athletes and 61.27% in university-level athletes. The most common areas of musculoskeletal pain among esports athletes were the neck (40.7%) and lower back (36.2%), reported over the previous seven days. These findings were consistent with the prevalence patterns observed over the past 12 months. Other affected body regions are presented in Figure 1.

1. Association between individual factors and WMSDs

Table 2 presents the characteristics of all participants (n = 290), including those with work-related

musculoskeletal disorders (WMSDs; n = 183) and those without WMSDs (n = 107) during the past 12 months. Factors significantly associated with the presence of WMSDs included being older than 21 years (odds ratio, OR = 1.75, $p < 0.05$), having an overweight body mass index (BMI; OR = 1.16), smoking (OR = 1.54), and sleeping less than six hours per night (OR = 2.18).

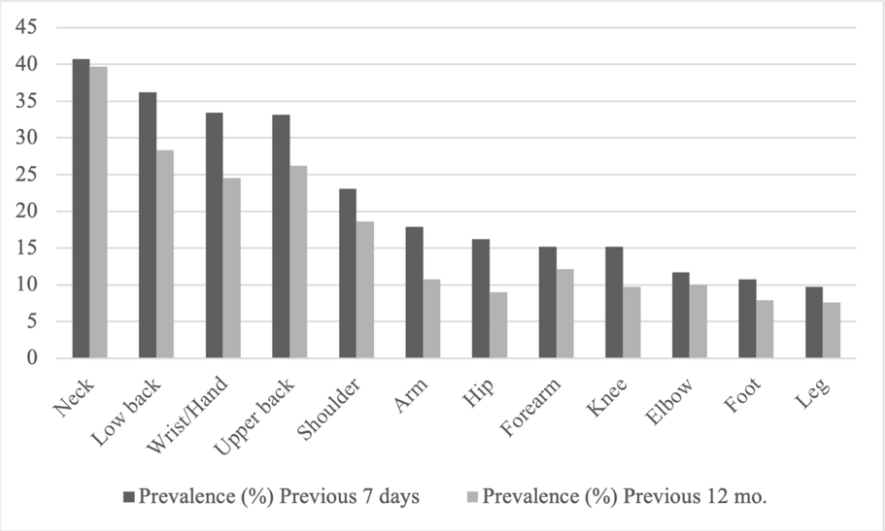


**Figure 1.** Prevalence of musculoskeletal pain in different body regions among esports athletes over the past 7 days and 12 months.

**Table 2**. Association between individual factors and WMSDs during the past 12 months among esports athletes.

| Variables | Total (n = 290) | WMSDs Have (n=183) | Not have (n= 107) | OR | 95% CI | p-value |
|---|---|---|---|---|---|---|
| Age | | | | | | |
| ≥ 22 years | 101 | 72 | 29 | 1.75 | 1.04-2.93 | <0.035* |
| < 22 years | 189 | 111 | 78 | 1 | - | - |
| Gender | | | | | | |
| Male | 236 | 149 | 87 | 1.01 | 0.55-1.86 | 0.981 |
| Female | 54 | 34 | 20 | 1 | - | - |
| BMI (kg/m$^2$) | | | | | | |
| Underweight (BMI < 18.5) | 61 | 36 | 25 | 0.83 | 0.44-1.57 | 0.572 |
| Normal (BMI = 18.5-22.9) | 120 | 76 | 44 | 1 | - | - |
| Overweight (BMI = 23-27.5) | 42 | 28 | 14 | 1.16 | 0.55-2.43 | 0.698 |
| Obesity (BMI > 27.5) | 67 | 43 | 24 | 1.04 | 0.56-1.93 | 0.908 |
| Underlying disease | | | | | | |
| Have | 40 | 25 | 15 | 0.97 | 0.49-1.93 | 0.932 |
| Do not have | 250 | 158 | 92 | 1 | - | - |
| Smoke | | | | | | |
| Yes | 55 | 39 | 16 | 1.54 | 0.81-2.92 | 0.183 |
| No | 235 | 144 | 91 | 1 | - | - |
| Drink alcohol | | | | | | |
| Yes | 132 | 86 | 46 | 1.18 | 0.73-1.90 | 0.509 |
| No | 158 | 97 | 61 | 1 | - | - |
| Hours of sleep | | | | | | |
| < 6 hours | 27 | 21 | 6 | 2.18 | 0.85-5.59 | 0.097 |
| ≥ 6 hours | 263 | 162 | 101 | 1 | - | - |

Note: Values are presented as Odds Ratio (OR) with 95% Confidence Interval (CI). Asterisks (*) indicate significant differences at p < 0.05.
Abbreviations: WMSDs = Work-Related Musculoskeletal Disorders; BMI = Body Mass Index (kg/m$^2$).

2. Association between playing game related factors and WMSDs.

The results from Table 3 showed that esports athletes with more than five years of gaming experience and those who played for more than five hours per day were significantly associated with work-related musculoskeletal disorders (WMSDs), with odds ratios of 1.64 and 1.74, respectively. In addition, psychological stress during gameplay was identified as a significant risk factor for WMSDs, with an odds ratio of 1.80. Furthermore, being a professional-level athletes was also associated with a higher prevalence of WMSDs, with 67.44% of professional-level athletes reporting cumulative injuries compared with 61.27% among university-level athletes.

**Table 3**. Association between playing game related factors and psychosocial factors and WMSDs during the past 12 months among esports athletes.

| Variables | Total (n = 290) | WMSDs | | Unadjusted | | | Adjusted by age | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Have □n=183 □ | Not have (n = 107) | OR | 95% CI | p-value | OR | 95% CI | p-value |
| Athlete level | | | | | | | | | |
| professional level | 86 | 58 | 28 | 1.31 | 0.77-2.23 | 0.32 | 1.21 | 0.70-2.07 | 0.500 |
| university-level athletes | 204 | 125 | 79 | 1 | - | - | 1 | - | - |
| Playing game experience | | | | | | | | | |
| ≥ 5 years | 153 | 106 | 47 | 1.64 | 1.01-2.67 | 0.045* | 1.53 | 0.93-2.51 | 0.049* |
| < 5 years | 133 | 77 | 56 | 1 | - | - | 1 | - | - |
| League | | | | | | | | | |
| International | 34 | 23 | 11 | 1.32 | 0.61-2.86 | 0.478 | 1.11 | 0.50-2.47 | 0.794 |
| National | 52 | 35 | 17 | 1.30 | 0.68-2.48 | 0.422 | 1.26 | 0.66-2.41 | 0.485 |
| University | 204 | 125 | 79 | 1 | - | - | 1 | - | - |
| Continuous playing | | | | | | | | | |
| > 30 minutes | 47 | 32 | 15 | 0.71 | 0.24-2.16 | 0.546 | 0.64 | 0.21-2.00 | 0.443 |
| 10-30 minutes | 133 | 86 | 219 | 0.52 | 0.2-1.35 | 0.171 | 0.54 | 0.21-1.43 | 0.215 |
| 5-10 minutes | 24 | 18 | 6 | 1 | - | - | 1 | - | - |
| Machine type | | | | | | | | | |
| Mobile | 223 | 139 | 84 | 0.87 | 0.49-1.53 | 0.619 | 1.02 | 0.56-1.86 | 0.940 |
| PC/Console | 67 | 44 | 23 | 1 | - | - | 1 | - | - |
| Racing hours/day | | | | | | | | | |
| ≥ 5 hours | 147 | 102 | 45 | 1.74 | 1.07-2.81 | 0.025* | 1.68 | 1.03-2.73 | 0.037* |
| < 5 hours | 143 | 81 | 62 | 1 | 1 | - | - | 1 | - |
| Game Type | | | | | | | | | |
| PubG | 28 | 19 | 9 | 1.21 | 0.52-2.82 | 0.661 | 1.06 | 0.44-2.54 | 0.899 |
| Volarant | 25 | 17 | 8 | 1.22 | 0.5-2.97 | 0.666 | 1.11 | 0.45-2.76 | 0.815 |
| ROV | 184 | 117 | 67 | 1 | - | - | 1 | - | - |
| Others | 53 | 30 | 23 | 0.75 | 0.40-1.39 | 0.356 | | | |
| Stress by playing games | | | | | | | | | |
| Yes | 175 | 120 | 55 | 1.80 | 1.11-2.93 | 0.017* | 1.85 | 1.13-3.03 | 0.014* |
| No | 115 | 63 | 52 | 1 | - | - | 1 | - | - |
| PSS 10 | | | | | | | | | |
| Moderate to High stress | 232 | 144 | 88 | 0.8 | 0.43-1.47 | 0.465 | 0.79 | 0.43-1.46 | 0.458 |
| Low stress | 58 | 39 | 19 | 1 | - | - | 1 | - | - |

Note: Values are presented as Odds Ratio (OR) with 95% Confidence Intervals (CI). Asterisks (*) indicate significant differences at $p < 0.05$.

Abbreviations: WMSDs = Work-Related Musculoskeletal Disorders; PC = Personal Computer; PUBG = Player

Unknown's Battlegrounds; ROV = Realm of Valor; Valorant = Tactical first-person shooting game developed by Riot Games; PSS-10 = Perceived Stress Scale–10 (Thai version).

### Association between visual problems and WMSDs

The findings showed that nearsightedness was the most common visual problem among esports athletes, reported by 48.97% of participants, followed by itchy eyes (18.28%) and eye fatigue (14.83%) out of a total of 290 athletes. Furthermore, as presented in Table 4, visual problems were not significantly associated with the occurrence of work-related musculoskeletal disorders (WMSDs) among esports athletes.

**Table 4**. The secondary outcomes were stress level and visual problem.

| Variables | Total (n = 290) | WMSDs | | Unadjusted | | | Adjusted by age | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Have (n=183 ) | Not have (n = 107) | OR | 95% CI | p-value | OR | 95% CI | p-value |
| Visual problems | | | | | | | | | |
| Nearsightedness | | | | | | | | | |
| Yes | 142 | 92 | 50 | 1.15 | 0.72-1.86 | 0.560 | 0.84 | 0.52-1.37 | 0.488 |
| No | 148 | 91 | 57 | 1 | - | - | 1 | - | - |
| Astigmatism | | | | | | | | | |
| Yes | 16 | 11 | 5 | 1.31 | 0.44-3.86 | 0.630 | 0.75 | 0.25-2.23 | 0.602 |
| No | 274 | 172 | 102 | 1 | - | - | 1 | - | - |
| Itchy eyes | | | | | | | | | |
| Yes | 53 | 34 | 19 | 1.06 | 0.57-1.97 | 0.861 | 1.04 | 0.56-1.94 | 0.908 |
| No | 237 | 149 | 88 | 1 | - | - | 1 | - | - |
| Eyes fatigue | | | | | | | | | |
| Yes | 43 | 25 | 18 | 0.78 | 0.41-1.51 | 0.465 | 0.74 | 0.38-1.45 | 0.384 |
| No | 247 | 158 | 89 | 1 | - | - | 1 | - | - |
| Blur vision | | | | | | | | | |
| Yes | 16 | 8 | 8 | 0.56 | 0.20-1.54 | 0.255 | 0.55 | 0.20-1.52 | 0.246 |
| No | 273 | 175 | 98 | 1 | - | - | 1 | - | - |
| Aching eyes | | | | | | | | | |
| Yes | 16 | 11 | 5 | 1.31 | 0.44-3.86 | 0.630 | 1.55 | 0.54-4.46 | 0.417 |
| No | 274 | 172 | 102 | 1 | - | - | 1 | - | - |

Note: Values are presented as Odds Ratio (OR) with 95% Confidence Interval (CI). Asterisks (*) indicate significant differences at $p < 0.05$.
Abbreviations: WMSDs = Work-Related Musculoskeletal Disorders; BMI = Body Mass Index (kg/m²).

## Discussion

This study aimed to investigate the prevalence and associated factors of work-related musculoskeletal disorders (WMSDs) among esports athletes in Thailand. The findings revealed a high prevalence of WMSDs (63.1%), indicating that musculoskeletal symptoms are common in this population. The most frequently affected body regions were the neck (40.7%) and lower back (36.2%), likely due to prolonged static postures and repetitive upper-body movements during gameplay. Several individual and lifestyle factors were significantly associated with an increased likelihood of developing WMSDs, including having an overweight BMI (OR = 1.16), smoking (OR = 1.54), and sleeping less than six hours per night (OR = 2.18). Greater gaming exposure—particularly more than five hours of gameplay per day—was associated with higher odds of WMSDs both before (OR = 1.74) and after age adjustment (OR = 1.68). Likewise, longer gaming

experience showed significant associations with WMSDs in both unadjusted (OR = 1.64) and age-adjusted models (OR = 1.53). In contrast, visual problems were not significantly associated with the occurrence of WMSDs among esports athletes.

1. Prevalence of WMSDs and Visual problem

This study illustrated the prevalence of work-related musculoskeletal disorders (WMSDs) at 63.1% among esports athletes in Thailand. The most affected body regions were the neck (40.7%) and lower back (36.2%), which were particularly prominent compared with other body areas. This pattern aligns with several previous studies reporting similar findings among esports players. DiFrancisco-Donoghue et al. (2019) observed that 42% of collegiate esports athletes experienced musculoskeletal pain, primarily in the neck and back (8), while Linberg et al. (2020) also identified these regions as the most frequently affected among Danish esports players (6). These consistent results across studies suggest that the neck and lower back are highly vulnerable areas due to prolonged static postures, repetitive upper-body movements, and sustained forward head positions commonly adopted during gaming.

The overall prevalence in our study (63.1%) is comparable to previous reports, which ranged from 42.6% to 62.5% (6, 8, 10), indicating a persistent burden of musculoskeletal symptoms within the global esports community. Moreover, a similar pattern has been observed among computer users, who frequently report discomfort in the neck and shoulders caused by prolonged sitting and limited movement (4, 5). However, the prevalence of musculoskeletal pain in our study was lower than that among computer users (13), likely because esports athletes have shorter gaming sessions and more structured breaks during training (1).

Regarding visual problems, our study found a relatively low prevalence (5.52–18.28%) compared with previous reports, possibly due to fewer structured training hours per day among participants (1, 8).

2. Association between individual factors, playing game related factors, psychosocial factors and WMSDs.

This study found that individual factors contributing to work-related musculoskeletal disorders (WMSDs) included being older than 21 years (odds ratio, OR = 1.75, $p < 0.05$). Age-related physiological changes may reduce neuromuscular responsiveness and recovery capacity, whereas younger individuals generally exhibit faster tissue healing and greater musculoskeletal adaptability (11, 14). Linberg et al. (2020) reported that 42.6% of esports athletes with a mean age of 17.1 years experienced musculoskeletal pain, while 62.5% of athletes aged 18 years or older had at least one affected body region (1, 6).

In addition, athletes with an overweight body mass index (BMI; OR = 1.16), those who smoked (OR = 1.54), and those who slept less than six hours per night (OR = 2.18) showed a higher risk of developing WMSDs, although these associations were not statistically significant. Previous studies have suggested that sleeping more than eight hours per day may serve as a protective factor among professional gamers (1).

Our findings that longer gaming duration and greater years of gaming experience increased the risk of WMSDs are consistent with previous research (1, 6). Ekefjard et al. (2024) reported that playing for more than 35 hours per week was associated with an odds ratio of 8.01 ($p = 0.018$)

(1). Similarly, longer daily practice hours have been positively correlated with the prevalence of musculoskeletal pain (1, 8). Prolonged sitting and repetitive upper-limb movements are known risk factors for WMSDs in individuals with sedentary behaviors (4, 5). Moreover, Exercise Deficit Disorder (EDD) has been observed among youth who perform less than 60 minutes of physical activity per day (12). DiFrancisco-Donoghue et al. (2018) also found that 40% of participants reported no physical activity, and 60% experienced musculoskeletal pain (8).

Stress related to gaming, as assessed through a self-reported measure, was identified as a risk factor for WMSDs (OR = 1.85). However, the Perceived Stress Scale–10 (T-PSS-10) did not demonstrate a consistent association, likely because it measures general life stress rather than stress specifically induced by gaming. Visual problems also showed no significant associations with WMSDs.

This study has several limitations. First, the majority of participants were university-level athletes, which may limit the generalizability of the findings to the overall esports athlete population. Second, the self-administered questionnaire did not account for specific gaming postures or in-game movements, which could be important in understanding the mechanisms underlying the development of work-related musculoskeletal disorders (WMSDs). Future studies should assess specific gaming postures and evaluate the ergonomic design of gaming equipment to better understand their influence on the development of work-related musculoskeletal disorders (WMSDs).

Esports athletes should avoid playing for more than five hours per day, as extended gaming duration has been identified as a contributing factor to work-related musculoskeletal disorders (WMSDs). Moreover, incorporating relaxation before and after gaming sessions is recommended, as psychological stress experienced during gameplay has also been associated with an increased risk of WMSDs.

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