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The prevalence of neck pain and low back pain among personal computer gamers in Saudi Arabia

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ABSTRACT

Introduction: Neck pain and low back pain are serious health concerns that affect both adults and children. Personal computer (PC) gamers Wasted a lot of time playing computer games. Therefore, they may be prone to increased neck and back pain. *Aims:* To determine the prevalence of neck and low back pain among PC gamers in Saudi Arabia. *Methods:* A cross-sectional study was conducted on PC gamers in Saudi Arabia using an online questionnaire distributed in Arabic from January 1st to 10th, 2022. The questionnaire collected data on socio-demographic characteristics, daily physical activity, neck pain disability, and low back pain disability. *Results:* This study included 389 PC gamers, 73.5% of whom were male. The most populated group included gamers from 18 to 25 years of age. 6.7% of the respondents played computer games for more than 10 hours per day, and 11.1% played computer games on 30 days per month. Regarding neck and back trauma, 10.3% reported previous neck injury, whereas 27.2% reported previous back injury. *Conclusion:* Our study demonstrates the significant association between increased hours of daily computer usage and increased pain in multiple body regions. The most important risk factors for pain are previous trauma to the neck or back, leaning forward while sitting in a chair, playing computer games for more than 10 hours per day, and playing computer games on 30 days per month. Thus, it is essential to raise awareness of the appropriate sitting position, importance of daily physical activity, and dangers of a sedentary lifestyle among PC gamers.

Keywords: Pain, neck, back pain, low, Saudi Arabia

1. INTRODUCTION

Neck pain (NP) and low back pain (LBP) are serious health concerns that affect both adults and children (Balagué et al., 1999). NP has become one of the most prevalent and long-lasting pain complaints reported in the musculoskeletal system (Mikkelsson et al., 1997; Mikkelsson et al., 1999). Age, female gender, parental history of LBP, history of spinal trauma, disk degeneration, high level of physical activity, increased height and sitting height, smoking, television viewing, depression, and stress increase the risk of non-specific LBP (Balagué et al., 1999). In today's work environment, lengthy periods of computer use have become standard (Wahlström et al., 2004). In addition, work-related upper quadrant musculoskeletal pain (WRUQMP) is increasing, notably among people who often use computers (Cagnie et al., 2007). This rise in WRUQMP among computer users is a source of personal and financial concern (Wærsted et al., 2010) because it leads to absenteeism, lost production, and increased healthcare costs (Andersen et al., 2008).

Despite attempts to address WRUQMP in the workplace, prevalence rates have not decreased over the last three decades, which is a cause for worry. The multimodal character of this problem, including non-modifiable and modifiable risk variables, makes it even more challenging to achieve workplace solutions. The non-modifiable risk factors are high age (more than 30 years), female gender, and a history of previous neck discomfort (Dave et al., 2019). The modifiable risk factors include the physical office environment, psychosocial workplace characteristics, and postural workstation factors. Moreover, physical and psychosocial variables in the workplace influence neck discomfort; given that strong supervisor support has been demonstrated to buffer physical risk factors such as increased frivolous time spent on computer activities and increased time spent on the phone (Kennedy et al., 2010).

Crucially, NP and LBP are prevalent musculoskeletal illnesses that are among the main causes of disability globally (Ye et al., 2017). In the Global Burden of Diseases Study by the World Health Organization (WHO), NP and LBP were placed fourth and 10th in the list of all health problems that affect adolescents aged from to 15–19 years based on the number of years lived with disability, outranking common problems such as drug and alcohol use, asthma, and road traffic accidents (Ben et al., 2019). Ranasinghe et al., (2011) reported that NP is the second most expected area of work-related pain (Ranasinghe et al., 2011). Assessed a total of 417 office workers and classified their NP and LBP using two different systems: the Northwick Park Neck Pain Questionnaire (NPQ) and the Oswestry Low Back Pain Disability Index (ODI). Furthermore, they determined that female gender, a hot environment, sitting in front of a computer screen, and using a computer for more than eight hours per day are significant risk factors for NP and LBP (Ye et al., 2017).

Another article identified the work environment, keyboard position relative to the body, task load, and muscle use or tension as potential risk factors (Jun et al., 2017). Critically, the current literature on the modifiable determinants of NP and LBP among personal computer (PC) gamers in Saudi Arabia is insufficient. Hence, this study aims to determine the prevalence of NP and LBP among PC gamers in Saudi Arabia.

2. METHODS

A cross-sectional study was conducted on PC gamers in Saudi Arabia from December 2021 to March 2022. This study included 389 Saudi and non-Saudi gamers who were at least 18 years of age. The calculated sample size was 385, with an alpha error of 5%, a power of 80%, and a 95% confidence interval. The study distributed a self-administered online questionnaire in Arabic from January 1st to 10th, 2022. The questionnaire collected data on socio-demographic characteristics (e.g., age, gender, marital status, and education level) and computer use (e.g., "How many days do you use a computer per month?" and "How many hours do you use a computer per day?"), and it also included the NPQ (Sim et al., 2006) and ODI (Sheahan et al., 2015) to measure NP and LBP, respectively (Ye et al., 2017). Based on the previous literature, the potential risk factors (e.g., number of years of PC use, number of hours of PC use per day, and type of chair and desk) were determined by self-report.

Sample size

This study used a convenient sample size of 385 from 1,000 individuals in the target population. The sample size calculated by this is formula:

$$n=Z 2 * (p) * (1-p)/c 2$$

Where n is the sample size, Z is the level of confidence (two-sided 95% confidence interval [CI], Z=1.96 for 95% CI), and P is the expected true proportion (P=0.5, desired precision=5%) while taking into account the 40% non-response rate.

Statistical analyses

Categorical variables were presented using numbers and percentages, while continuous variables were expressed as means and standard deviations (SDs). The Shapiro-Wilk test was applied to determine the normality of the quantitative data. The Mann-Whitney Z-test and Kruskal-Wallis H-test were conducted to compare the overall mean percentage scores of the NPQ and ODI with the socio-demographic characteristics. The Pearson correlation coefficient was used to determine the relationship between the NPQ and ODI scores. Some of the data were displayed with appropriate graphs. A p-value of less than 0.05 was considered to be significant. The data were analyzed using Statistical Packages for Social Sciences (SPSS) version 26 (Armonk, NY: IBM Corp).

Ethical Considerations

The study obtained approval from the Biomedical Research Ethics Committee of Umm Al-Qura University, the number (HAPO-02-K-012-2021-11-862) in 30/11/2021.

3. RESULTS

Of 389 Saudi who responded to the online self-administered questionnaire. Table 1 presents the socio-demographic characteristics of the respondents. The most populated age group was from 18 to 25 years (48.1%), and most respondents were male (73.5%). 46.3% were educated to the bachelor's degree level. Nearly half (49.4%) were students, and 57.1% were single. 24.4% reported that they smoked. 46.5% of the respondents had a normal body mass index (BMI), and 29.6% were overweight. In addition, 30.8% had spent more than a decade playing computer games.

Table 1 The socio-demographic characteristics of the PC gamers $^{(n=389)}$

Study variable	N (%)
Age in years	
18–25 years	187 (48.1%)
26–35 years	106 (27.2%)
>35 years	96 (24.7%)
Gender	
Male	286 (73.5%)
Female	103 (26.5%)
Educational level	
Intermediate or less	34 (8.7%)
Secondary	94 (24.2%)
Bachelor's degree	180 (46.3%)
Master's degree	63 (16.2%)
PhD degree	18 (4.6%)
Occupation	
Student	192 (49.4%)
Doctor	29 (7.5%)
Teacher	62 (15.9%)
Engineer	8 (2.1%)
Soldier	11 (2.8%)
Nurse	5 (1.3%)
Security guard	3 (0.80%)
Pharmacist/therapist	6 (1.5%)
Administrative/officer	6 (1.5%)
Housewife	14 (3.6%)
Retired	18 (4.6%)
Unemployed	35 (9.0%)
Marital status	
Single	222 (57.1%)
Married	149 (38.3%)
Widowed	12 (3.1%)
Divorced	6 (1.5%)
Smoking status	
Smoker	95 (24.4%)

Non-smoker	294 (75.6%)
BMI level	
Underweight (<18.5 kg/m²)	43 (11.1%)
Normal (18.5–24.9 kg/m²)	181 (46.5%)
Overweight (25–29.9 kg/m²)	115 (29.6%)
Obese (≥30 kg/m²)	50 (12.9%)
Number of years playing computer games	
Less than 1 year	98 (25.2%)
1–5 years	103 (26.5%)
6–10 years	68 (17.5%)
More than 10 years	120 (30.8%)

Figure 1 displays the most commonly used devices for playing games. The mobile phone and tablet (50.4%) were the most popular devices, followed by the computer (41.4%) and the PlayStation and Xbox (40.6%). As shown in Figure 2, exciting games (51.7%) and violent games (47.3%) were the most frequently played types of games. Figure 3 demonstrates that the most commonly identified factors to improve the gaming environment of the computer were an office chair (54%), a healthy gaming session (49.1%), and an eye-level desk (39.6%).

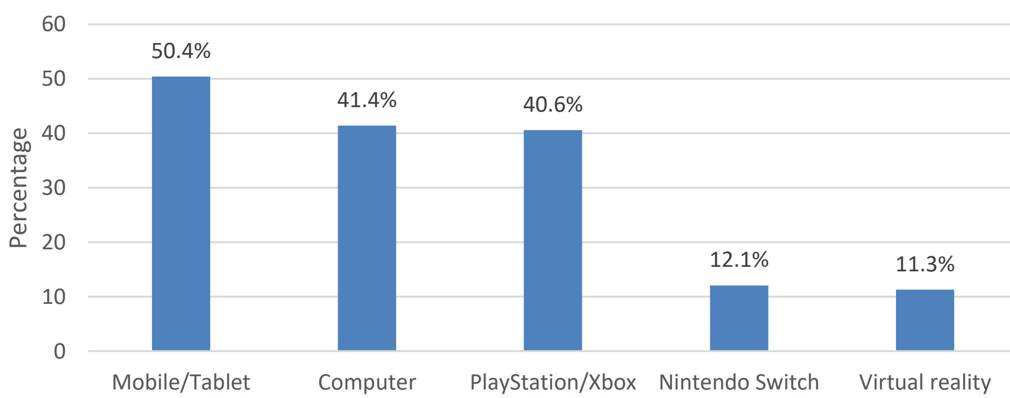

Figure 1 The most common devices for playing games

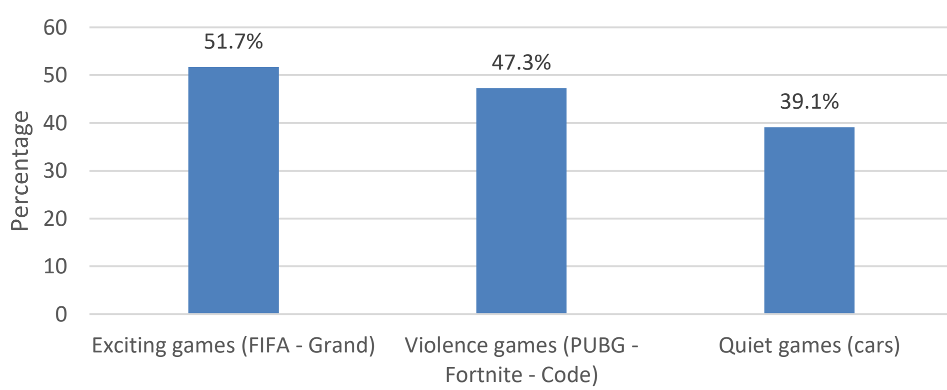

Figure 2 The types of games played on the devices

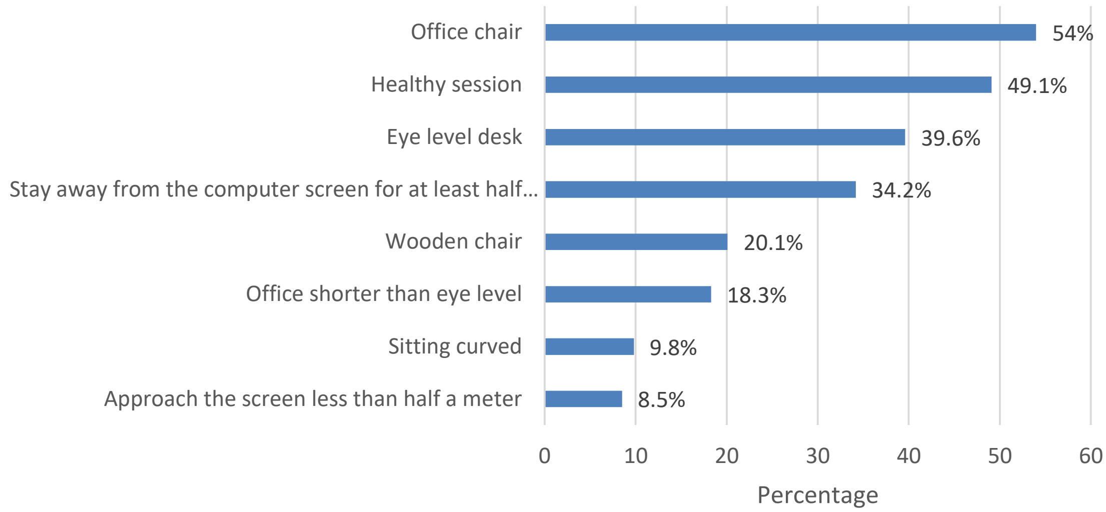

Figure 3 Factors that may improve the gaming environment of the computer

As shown in Table 2, 45% of the respondents indicated that they played computer games on less than 10 days per month. Many respondents played in cold (26.0%) or very cold (22.6%) environments. 27.2% felt very tired while playing computer games, and most respondents played for 1–3 hours per day. Furthermore, 32.1% sat in an armchair during their playing time, while 34.2% used a floor table. 48.1% sat in a chair and played for a long time without getting up. 54% leaned forward while sitting in a chair. Approximately 36.8% of the respondents reported that the computer screen was 25–49 cm away from their eyes.

Table 2 The participants characteristics while playing games on a computer (n=389)

Variable	N (%)
Number of days that you play games on the computer per month	
Less than 10 days	175 (45.0%)
10–19 days	97 (24.9%)
20–29 days	74 (19.0%)
30 days	43 (11.1%)
Temperature of the environment that you play computer games in	
Very cold	88 (22.6%)
Cold	101 (26.0%)
Moderate	166 (42.7%)
Hot	19 (4.9%)
Too hot	15 (3.9%)
Pressure felt while playing games on the computer	
Very tired	106 (27.2%)
Too much pressure	64 (16.5%)
Moderate	157 (40.4%)
Little pressure	32 (8.2%)
Very little pressure	30 (7.7%)
Duration of daily computer game use	
1–3 hours	217 (55.8%)
4–6 hours	102 (26.2%)
7–9 hours	44 (11.3%)
≥10 hours	26 (6.7%)
Type of chair	
Armchair	125 (32.1%)

Armless chair	39 (10.0%)
Wooden chair	40 (10.3%)
Hammock chair	22 (5.7%)
Sofa chair	104 (26.7%)
Office chair	37 (9.5%)
Rolling chair	22 (5.7%)
Desk height	
Floor table	133 (34.2%)
0.5 meters	94 (24.2%)
1 meter	110 (28.3%)
More than 1 meter	52 (13.4%)
Getting up from the computer	
I sit in a chair for a long time and rarely get up	187 (48.1%)
I get up from the chair from time to time	202 (51.9%)
Sitting style in front of the computer	
I sit properly with my back against the chair	179 (46.0%)
I lean forward while sitting in the chair	210 (54.0%)
The distance of the computer screen from your eyes	
Less than 25 cm	114 (29.3%)
25–49 cm	143 (36.8%)
50–99 cm	66 (17.0%)
At least 1 meter	66 (17.0%)

Table 3 displays the incidence of back pain and physical activity among PC gamers. 27.2% of the respondents reported previous back injury. 67.4% did not take any vacation time even after the incidence of neck or back pain. Only 15.4% conducted strenuous physical activities on 5–7 days of the previous week, and 8.5% did so for more than an hour per day. 20.6% conducted moderate-intensity physical activity on 1–2 days of the previous week. 22.1% conducted moderate-intensity physical activity for half an hour per day. Also, 34.7% regularly walked for 15 minutes per day. 35.5% and 44.7% of the respondents indicated that their neck or back was affected by their exercise activities, respectively.

Table 3 Incidence of neck or back pain and physical activities (n=389)

Variable	N (%)
Previous injury to the neck or back	
Back injury	106 (27.2%)
Neck injury	40 (10.3%)
Neck and back injury	40 (10.3%)
No previous injury	203 (52.2%)
How many vacation days have you taken because of your neck or back pain?	
Did not take any vacation days	262 (67.4%)
Less than a week	64 (16.5%)
1–2 weeks	39 (10.0%)
2–4 weeks	9 (2.3%)
More than a month	15 (3.9%)
Number of days that you conducted strenuous physical activities on over the last week	
None	185 (47.6%)
1–2 days	75 (19.3%)
3–4 days	69 (17.7%)
5–7 days	60 (15.4%)
Time usually spent doing strenuous physical	

activities each day	
None	189 (48.6%)
15 minutes	59 (15.2%)
Half an hour	58 (14.9%)
An hour	50 (12.9%)
More than an hour	33 (8.5%)
Number of days that you conducted moderate-intensity physical activities on over the last week	
None	207 (53.2%)
1–2 days	80 (20.6%)
3–4 days	64 (16.5%)
5–7 days	38 (9.8%)
Time spent doing moderate-intensity physical activities each day	
None	173 (44.5%)
15 minutes	61 (15.7%)
Half an hour	69 (17.7%)
An hour	55 (14.1%)
More than an hour	31 (8.0%)
Number of days that you went for a walk on over the last week	
I didn't go for a walk	110 (28.3%)
1–2 days	82 (21.1%)
3–4 days	92 (23.7%)
5–7 days	105 (27.0%)
Time usually spent walking each day	
15 minutes	135 (34.7%)
Half an hour	96 (24.7%)
An hour	96 (24.7%)
More than an hour	62 (15.9%)
Do you conduct exercises that affect the neck or stretching exercises?	
Yes	138 (35.5%)
No	251 (64.5%)
Do you conduct exercises that affect the back?	
Yes	174 (44.7%)
No	215 (55.3%)

As seen in Table 4, the mean NPQ score was 44.5 (SD=19.2), while the mean ODI score was 37.5 (SD=19.1). Minimal, moderate, severe, crippled, and bedridden disabilities were found among 21.9%, 46%, 16.5%, 13.9%, and 1.8% of the respondents, respectively. Figure 4 demonstrates that, the correlation between the ODI and NPQ scores were significant (r=0.787; p<0.001), indicating that the increase in the ODI score was correlated with the increase in the NPQ score.

Table 4 The descriptive statistics of the NPQ and ODI scores (n=389)

Variable	Mean ± SD
Total NPQ score (%)	44.5 ± 19.2
Total ODI score (%)	37.5 ± 19.1
Level of disability	N (%)
Minimal (0 –20%)	85 (21.9%)

Moderate (21–40%)	179 (46.0%)
Severe (41–60%)	64 (16.5%)
Crippled (61–80%)	54 (13.9%)
Bedridden (81–100%)	7 (1.8%)

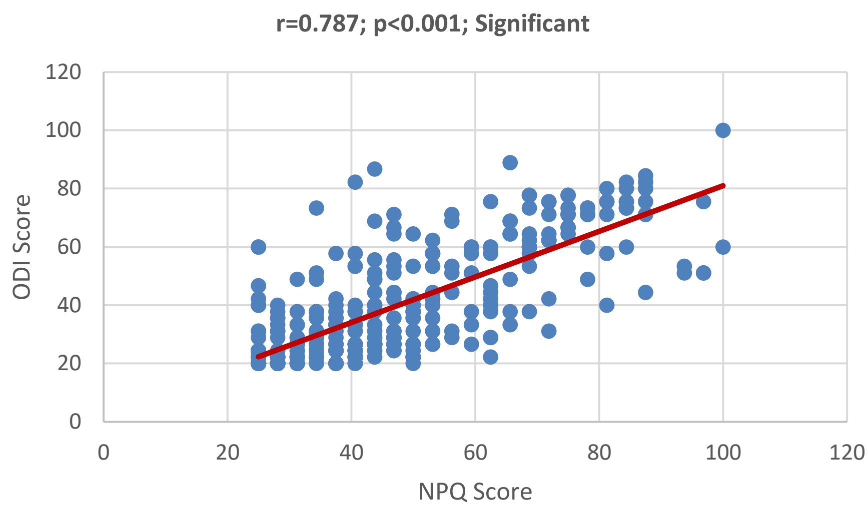

Figure 4 The correlation between the NPQ and ODI scores (Pearson's r)

As seen in Table 5, a non-parametric test was performed using the Mann-Whitney Z-test and Kruskal-Wallis H-test to determine the differences between the NPQ and ODI scores. A high mean NPQ score was associated with a middle-aged adult group (age 26–35 years; (H=39.6; p<0.001), female gender (Z=1.99; p=0.046), unemployment (H=30.7; p<0.001), marriage (Z=4.38; p<0.001), smoking (Z=3.03; p=0.002), playing computer games on 30 days per month (H=29.5; p<0.001), playing computer games in a hot or very hot environment (H=44.5; p<0.001), playing computer games for at least 10 hours per day (H=39.8; p<0.001), leaning forward while sitting in a chair (Z=2.59; p<0.001), and previous injury to the neck or back (Z=6.54; p<0.001). Likewise, a significantly high mean ODI score was correlated with a middle-aged adult group (age 26–35 years) (H=23.9; p<0.001), female gender (Z=2.34; p=0.019), unemployment (H=17.5; p<0.001), marriage (Z=3.74; p<0.001) smoking (Z=3.81; p=<0.001), playing computer games on 30 days per month (H=34.2; p<0.001), playing computer games in a hot or very hot environment (H=11.2; p=0.004), playing computer games for at least 10 hours per day (H=38.6; p<0.001), leaning forward while sitting in a chair (Z=2.85; p=0.004), and previous injury to the neck or back (Z=7.14; p<0.001).

Table 5 The differences in the NPQ and ODI scores according to the socio-demographic and usage characteristics of PC gamers (n=389)

Factor	NPQ score (100%) Mean ± SD	Z/H-test; P-value	ODI score (100%) Mean ± SD	Z/H-test; P-value
Age group in years[a]				
18–25 years	38.3 ± 15.5	H=39.6; <0.001 **	32.6 ± 16.5	H=23.9; <0.001 **
26–35 years	51.9 ± 20.7		42.4 ± 20.3	
>35 years	48.5 ± 20.2		41.7 ± 20.2	
Gender[b]				
Male	43.4 ± 18.9	Z=1.99; 0.046 **	36.2 ± 18.5	Z=2.34; 0.019 **
Female	47.5 ± 19.6		41.3 ± 20.3	
Occupation [a]				
Student	39.7 ± 16.9	H=30.7; <0.001 **	33.8 ± 17.5	H=17.5; <0.001 **
Employed	47.1 ± 20.1		38.9 ± 18.5	
Unemployed	53.3 ± 19.8		45.4 ± 21.8	

Marital status[b]				
Single	40.8 ± 17.7	Z=4.38;	34.3 ± 17.4	Z=3.74;
Married	49.5 ± 20.1	<0.001 **	41.8 ± 20.4	<0.001 **
Smoking status[b]				
Smoker	49.7 ± 20.7	Z=3.03;	43.2 ± 19.6	Z=3.81;
Non-smoker	42.9 ± 18.4	0.002 **	35.7 ± 18.6	<0.001 **
Number of days that computer games are played on per month[a]				
Less than 10 days	38.8 ± 14.5		31.2 ± 13.9	
10–19 days	45.9 ± 20.2	H=29.5;	39.4 ± 19.6	H=34.2;
20–29 days	49.9 ± 22.0	<0.001 **	44.4 ± 22.6	<0.001 **
30 days	55.2 ± 21.3		47.2 ± 20.9	
Temperature of the environment[a]				
Very cold/Cold	42.3 ± 17.1	H=44.5;	35.1 ± 16.8	H=48.4;
Moderate	41.9 ± 18.1	<0.001 **	35.2 ± 18.5	<0.001 **
Hot/Too hot	69.3 ± 18.8		62.2 ± 16.6	
Pressure felt while playing computer games[a]				
Very tired/too much pressure	43.9 ± 17.6	H=18.8;	37.8 ± 18.9	H=11.2;
Moderate	41.2 ± 18.6	<0.001 **	34.3 ± 17.4	0.004 **
Little/very little pressure	54.3 ± 21.9		44.8 ± 21.6	
Hours spent playing computer games per day[a]				
1–3 hours	39.1 ± 14.9		31.9 ± 14.6	
4–6 hours	48.2 ± 21.2	H=39.8;	41.6 ± 20.6	H=38.6;
7–9 hours	52.6 ± 22.7	<0.001 **	46.0 ± 22.5	<0.001 **
≥10 hours	62.0 ± 19.3		54.0 ± 21.7	
Sitting style in front of the computer[b]				
Sit properly with my back against the chair	42.1 ± 18.3	Z=2.59;	34.7 ± 17.6	Z=2.85;
Lean forward while sitting in the chair	46.6 ± 19.8	0.010 **	39.9 ± 20.0	0.004 **
Previous injury to the neck or back[b]				
Yes	50.8 ± 19.8	Z=6.54;	44.1 ± 19.7	Z=7.14;
No	38.8 ± 16.7	<0.001 **	31.5 ± 16.3	<0.001 **

[a] P-value calculated using the Kruskal-Wallis H-test.

[b] P-value calculated using the Mann-Whitney Z-test.

** Significant at p<0.05.

4. DISCUSSION

In the our study, we identified the following significant risk factors for NP and LBP using the NPQ and ODI: age, occupation, marital status, smoking status, number of days that computer games are played on per month, environment, play pressure, hours spent playing computer games per day, and previous neck or back injury. The mean NPQ score was 44.5 (SD=19.2), while the mean ODI score was 37.5 (SD=19.1). The respondents aged 26–35 years had the highest mean NPQ and ODI scores of 51.9 and 42.4, respectively, followed by those respondents aged more than 35 years, who had mean scores of 48.5 and 41.7. This result can be explained by the different lifestyles of people older than 26 years of age and younger people. Our study showed that 47.6% of not all respondents completed any strenuous exercise, 53.2% had not completed any moderate exercise, and 28.3% had not spent any time walking within the previous week. Nearly one-third of the respondents who walked spent 15 minutes walking, while the other respondents spent half an hour or more walking. Similarly, Ben et al., (2019) stated that regular physical activity plays a significant role in decreasing musculoskeletal pain among adolescents. Our findings are supported by the higher mean NPQ and ODI scores of the unemployed respondents (53.3 and 45.4, respectively).

This study found that married people exhibited more disabling and severe pain (mean NPQ score=49.5 and mean ODI score=41.8) than single people. Furthermore, we determined that smoking was a considerable risk factor. Pain scores were higher in the smoker community. In contrast to (Ye et al., 2017), we concluded that playing video games in a hot or too hot temperature environment may be a contributing factor for NP and LBP. Although 40.4% of the respondents felt moderate pressure while playing video games, we also found an association between little or no pressure felt while playing video games and high pain scores. This lack of pressure may prolong playing time or unhealthy sitting. The majority of the respondents (55.8%) spent 1–3 hours playing computer games per day, while 6.7% spent more than 10 hours.

According to our results, those respondents who played computer games for more than 10 hours per day had more severe pain than their peers. Support our findings regarding daily computer usage time (Ranasinghe et al., 2011). Overall, increased hours of daily computer usage are associated with pain in multiple body regions. We observed moderate pain in 54% of the respondents who leaned forward while sitting in a chair. In addition, we determined that previous neck or back injury plays a crucial role in pain severity, given that the respondents with prior injuries had high mean pain scores on the NPQ and ODI (55.8 and 44.1, respectively).

There are some limitations to this study. Since our study used a cross-sectional design and a small sample size, we can only assess associations rather than determine causations. Plus, we cannot apply our results to teenagers because we only included participants above the age of 18. Therefore, caution must be exercised when extrapolating our findings to other populations. Lastly, our use of self-reported measures and questionnaires might have generated systematic bias.

5. CONCLUSION

We found that physical activity plays a significant role in decreasing musculoskeletal pain among adolescent PC gamers. Based on our results, smoking is a crucial risk factor. Pain scores were higher in the smoker community. Furthermore, we determined that playing video games in a hot or too hot environment contributes to NP and LBP. Those respondents who played computer games for above 10 hours per day experienced more severe pain than their peers. This is an example of the association between increased hours of daily computer usage and increased pain in multiple body regions. We observed moderate pain in 54% of the respondents who leaned forward while sitting in a chair.

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Author Contributions

GMA, FSA and HHT contributed to study design, LHG and AA contributed to data collection and analysis, MTA and LHG contributed manuscript writing. All authors have critically reviewed and approved the final draft and are responsible for the manuscript's content and similarity index.

Informed consent

Informed consent was obtained from all individual participants included in the study.

Ethical approval

The study was approved by the Medical Ethics Committee of Umm Alqura University (ethical approval code: HAPO-02-K-012-2021-11-862).

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Conflicts of interest

The authors declare that there are no conflicts of interests.

Data and materials availability

All data associated with this study are present in the paper.

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