



Research Article

The Relationship Between Online Gaming Habits with Carpal Tunnel Syndrome Among High School Students in Jakarta

Andini Tania Zethira¹ | Lucia Yovita Hendrati^{2*}

¹Department of Public Health, Faculty of Public Health, Universitas Airlangga, Indonesia

²Department of Epidemiology, Population Statistics and Health Promotion, Faculty of Public Health, Universitas Airlangga, Indonesia

***Corresponding Author:**

Lucia Yovita Hendrati, Department of Epidemiology, Population Statistics and Health Promotion, Faculty of Public Health, Universitas Airlangga, Indonesia
Email: lucia-y-h@fkm.unair.ac.id

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ABSTRACT

The Indonesian online gaming industry is growing rapidly. The increasing number of online game players among teenagers can cause various health impacts, one of them being carpal tunnel syndrome. This research aims to determine the relationship between online gaming habits with carpal tunnel syndrome in high school students in Jakarta. This research is an observational study with a cross-sectional design and a total of 62 samples. Questionnaires used in data collection include playing habits, respondent knowledge, and the Boston Carpal Tunnel Syndrome Questionnaire (BCTSQ). The collected data was analyzed using the Chi-Square test. The results showed a relationship between playing duration ($p=0.042$), playing frequency ($p=0.026$), and repetitive movements ($p=0.026$) with complaints of Carpal Tunnel Syndrome. On the other hand, there was no significant relationship between gender ($p=0.523$), game type ($p=1.00$), gaming device ($p=0.287$), and knowledge ($p=0.744$) with complaints of Carpal Tunnel Syndrome. It would be better if the school provided further education to students and parents about the dangers of prolonged game duration and reminded them to regulate game-playing hours for students to avoid complaints of Carpal Tunnel Syndrome.

Keywords: Carpal tunnel syndrome, online game, playing time, repetitive movements, students

INTRODUCTION

Technological developments in the 21st century have made it easier for people to receive information from any part of the world at any time through the Internet. In 2023, as many as 78.19% of Indonesians were able to access the Internet for their daily life (APJII, 2023). This proves that almost all Indonesians can access the internet easily. The largest contributors to internet users range from age 13 to 18 years old (APJII, 2022). The most frequently accessed internet content includes social media, online chatting, online shopping, and online gaming. Indonesia has now become one of the largest game consumers in Southeast Asia, with a total of \$1.1 billion spent on gaming in 2018 (Zhou, 2019). Based on market research by Newzoo in 2019, there are 52 million smartphone users who are online game players.



The rapid developments of technology have made it easy for teenagers to access games through the Internet. This accessibility creates a problem where teenagers spend most of their time playing games. For many people, especially teenagers, playing games become a form of recreation and escapism from reality (Irawan, 2021). Teenagers tend to use gaming as a way to cope with loneliness, depression, and social anxiety (Maroney et al., 2019). Moreover, the type of game being played can influence a player's behavior to be more or less favorable. The positive impacts of gaming include practicing problem-solving skills, improving concentration, learning new languages, and generating creativity (Mertika & Mariana, 2020). However, the negative impacts of gaming can include mental disorders such as violence, aggressiveness, anxiety, and stress (Quwaider et al., 2019). These impacts can cause teenagers to get addicted to and spend extensive amounts of time playing.

Extensive gaming not only causes psychological impacts to players but also physical impacts. Playing games requires players to be in a monotonous position for a long time. Players also need to look at the screen for extended periods to focus on the task at hand. Active gamers tend to suffer from sleep disorders, vision problems, metabolic disorders, fatigue, neck pain, back pain, and also musculoskeletal disorders which are common physical issues among gamers (Zwibel et al., 2019).

One of the most common musculoskeletal disorders is carpal tunnel syndrome. Carpal tunnel syndrome causes pain, numbness, or tingling from the wrist to the fingers. It occurs due to the pressure on the nerves of the wrist joint (Wright & Atkinson, 2019). Risk factors for Carpal tunnel syndrome include genetics (e.g., diabetes and arthritis), age (45 years or older), obesity, pregnancy or menopause, history of a hand injury, prolonged use a device for more than 2 hours a day, repetitive movements for more than 2 hours a day, and forced movements for more than 2 hours a day (Osiak et al., 2022; Roquelaure, 2018).

Around 1.55% or 2.6 million, of the adult population suffers from carpal tunnel syndrome (Ratnawati & Putra, 2020). Generally, the incidence of carpal tunnel syndrome ranges from 1% to 5% in the population (Sevy et al., 2024). In the United States, the incidence of carpal tunnel syndrome occurs in 1 to 3 patients per 1000 (Gervasio et al., 2020). Carpal tunnel syndrome commonly affects workers due to work activities such as prolonged use of machines, exposure to vibration, and exposure to repetitive motions.

carpal tunnel syndrome is not only experienced by adults but can also occur in teenagers. The surge in online gaming popularity has influenced teenagers to partake in the gaming community. While gaming has its positive impacts, it can also increase the risk of injuries, especially the carpal tunnel syndrome

Research shows a significant relationship between the intensity of online gaming and wrist pain in teenagers (Sains et al., 2022). A study on e-sports athletes found that 36% of its respondents reported complaints of pain followed by numbness and tingling in the wrist (DiFrancisco-Donoghue et al., 2019). Another study on university student gamers showed that the majority of the respondents had mild symptoms, with numbness being the most common symptom (Majid et al., 2022). If not prevented and treated right, carpal tunnel syndrome in teenagers can lead to a more serious problems, such as the loss of productivity in learning.

The rapid growth of technology alongside the recent COVID-19 pandemic has encouraged students to normalize using the Internet as a primary tool for learning. Activities such as doing homework and exams are accessed through the internet. Additionally, living location can also be a driving factor in the use of the internet. Jakarta is one of the many metropolitan cities in Indonesia

with a fairly high technological development. One of these developments is in the proliferation of internet cafes where anyone can access online games with the click of a button. Internet cafes make it easier for students to play games with friends without needing to own computers or gaming consoles. For this reason, it is necessary to conduct research to determine the relationship between online gaming habits with carpal tunnel syndrome among high school students in Jakarta.

MATERIAL AND METHODS

This research used an analytical observational approach with a cross-sectional design. The data was collected from February to March 2024 at SMAN 6 Jakarta. The population of this research comprised all students from SMAN 6 Jakarta, totaling 972 students. The inclusion criteria for this research consisted of students who had been active online gamers for the past 6 months from the data collection period, while the exclusion criteria included students who had experienced hand injuries, students who joined professional sports teams (excluding e-sports teams), and students with a BMI ≥ 25 . The reason for these exclusions is that carpal tunnel syndrome occurs in people with a history of hand injuries, those who rarely exercise, and those with obesity. The sampling technique used to choose the sample was simple random sampling. The sample used in this research consisted of 62 students.

The independent variables in this research include gender, game type, gaming device, knowledge, playing duration, playing frequency, and repetitive motion. The dependent variable in this study was complaints of carpal tunnel syndrome. The instruments used for the data collection were a questionnaire about each variable and a questionnaire about carpal tunnel syndrome complaints using the Boston Carpal Tunnel Syndrome Questionnaire. The knowledge questionnaire consists of 6 questions, each scored 2 for the correct answer and 1 for the incorrect answer. Low knowledge is indicated by a score of 6-8, and high knowledge is indicated by a score of 9-12.

This research used a univariate test to determine the characteristics of the subjects, as well as bivariate tests to determine the relationship between the independent variables with the dependent variable. The bivariate data was analyzed using the chi-square test.

RESULTS AND DISCUSSION

Table 1 shows the characteristics of the respondent which are the independent variables. The majority of respondents were male (54.8%), with the most frequently played game type was Massively Multiplayer Online First Person Shooter (MMOFPS)/Massively Multiplayer Online Battle Arena (MMOBA) (59.7%). The most used device type was Smartphone/Tablet/Gaming Console (90.3%), and most respondents had low knowledge (59.7%). Additionally, 64.5% of respondents had a playing duration of more than 2 hours per day, 74.2% played more than twice a week, and 74.2% had 30 or more repetitive motions in one minute while playing a game.

Table 1. Characteristics of Respondents at SMAN 6 Jakarta

No.	Characteristics	Number of Respondents (n)	Percentage (%)
1	Gender		
	Male	34	54.8
	Female	28	45.2
2	Game Type		
	MMOFPS/MMOBA	37	59.7



	Other online games	25	40.3
3	Gaming Device Smartphone/Tablet/ Gaming Console	56	90.3
	Computer/PC	6	9.7
4	Knowledge Low	37	59.7
	High	25	40.3
5	Playing Duration >2 hours/day	40	64.5
	1-2 hours/day	22	35.5
6	Playing Frequency >2 times/week	46	74.2
	1-2 times/week	16	25.8
7	Repetitive Motion ≥30 motions/minute	46	74.2
	<30 motions/minute	16	25.8

Table 2. Distribution of Carpal Tunnel Syndrome Complaints

No.	Complaints	n	%
1.	Positive	51	82.3%
2.	Negative	11	17.7%
	Total	62	100%

Table 3. Cross-Tabulation between Respondent Characteristics and Carpal Tunnel Syndrome Complaints

No.	Variable	Carpal Tunnel Syndrome Complaints				P-value /PR	CI 95%	
		Positive		Negative			Lower	Upper
		n	%	n	%			
1.	Gender					0.523 (PR=1.582)	0.427	5.861
	Male	29	85.3	5	14.7			
	Female	22	78.6	6	21.4			
2.	Game Type					1.000 (PR=0.816)	0.212	3.146
	MMOFPS/MMOBA	30	81.1	7	18.9			
	Other online games	21	84	4	16			
3.	Gaming Device					0.287 (PR=2.611)	0.414	16.459
	Smartphone/Tablet/Gaming Console	47	83.9	9	16.1			
	Computer/PC	4	66.7	2	33.3			
4.	Knowledge					0.744 (PR=1.292)	0.347	4.803
	Low	31	83.8	6	16.2			
	High	20	80	5	20			
5.	Playing Duration					0.042 (PR=4.200)	1.069	16.499
	>2 hours/day	36	90	4	10			
	1-2 hours/day	15	68.2	7	31.8			
6.	Playing Frequency					0.026 (PR=4.920)	1.246	19.429
	>2 times/week	41	89.1	5	10.9			
	1-2 times/week	10	62.5	6	37.5			
7.	Repetitive Motions					0.026 (PR=4.920)	1.246	19.429
	≥30 motions/minute	41	89.1	5	10.9			
	<30 motions/minute	10	62.5	6	37.5			

Table 2 shows the distribution of carpal tunnel syndrome complaints among the respondents, which is the dependent variable. Most respondents reported positive complaints about wrist pain (82.3%). Table 3 shows the cross-tabulation of respondent characteristics with the distribution of carpal tunnel syndrome complaints. It is shown that there is no relationship between gender, type of game, gaming device, and knowledge with carpal tunnel syndrome complaints. Meanwhile, there is a relationship between playing duration, playing frequency, and repetitive motions.

There is no relationship between gender and carpal tunnel syndrome complaints in student gamers ($p > 0.05$). The result also shows there is no significant relationship between gender and carpal tunnel syndrome (PR=1.582 CI 95% Lower=0.427 Upper=5.861). This result differs from another study that showed a relationship between gender and carpal tunnel syndrome complaints in people who use electronic devices (Al Shahrani *et al.*, 2019). Carpal tunnel syndrome is more susceptible in females because of the small size of the carpal tunnel and hormonal imbalances (Cazares-Manríquez *et al.*, 2020). While typically carpal tunnel syndrome is more frequently seen in women ages 64 and older, in the case of gaming, male and female teenagers suffer the same risk of carpal tunnel syndrome due to prolonged periods of gaming and frequent repetitive movements.

There is no relationship between the type of game and carpal tunnel syndrome complaints in student gamers ($p > 0.05$). The results also show no significant relationship between the type of game and carpal tunnel syndrome (PR=0.816 CI 95% Upper=0.212 Lower=3.146). Games come in various genres and styles. In the last 20 years, gaming has become a form of competitive and organized sport, known as electronic sport (e-sport) (Yin *et al.*, 2020). The types of games played in many e-sports competitions include Massively Multiplayer Online First Person Shooter (MMOFPS), Massively Multiplayer Online Battle Arena (MMOBA), Battle Royale, and other action-based games (Bányai *et al.*, 2019). E-sports typically attract a younger audience, namely teenagers, which encourages many players, especially teenagers, to be influenced and prompted to play the same type of games played by their favorite e-sports teams. Genres like MMOFPS and MMOBA are among the most popular. These genres provide players with a sense of escapism and online social interaction without requiring real life interaction (Maroney *et al.*, 2019). Carpal tunnel syndrome complaints are generally not caused by the type of game students play but by prolonged periods of gaming and repetitive movements.

There is no relationship between gaming devices and carpal tunnel syndrome complaints in student gamers ($p > 0.05$). The results also show no significant relationship between gaming devices and carpal tunnel syndrome (PR=2.611 CI 95% Lower=0.414 Upper=16.459). This differs from another study that shows that e-sports athletes who competed using a computer exhibited symptoms of carpal tunnel syndrome than those who competed using game consoles (Urbiztondo *et al.*, 2022). The result of this research shows that the majority of the students play games using smartphones/tablets/gaming consoles rather than computers/laptops. This causes a significant difference between game players using computers and those using smartphones in how they hold and use their devices. Computer game players use keyboards and a mouse to control their gameplay, while smartphone game players use touchscreens. A study conducted on 50 e-sports athletes in a mobile MMOBA competition reported that most athletes experienced pain in the neck, fingers, and head, while, complaints of wrist pain were rarely reported (Lam *et al.*, 2022).

There is no relationship between knowledge and carpal tunnel syndrome complaints in student gamers ($p > 0.05$). The result also shows no significant relationship between knowledge and carpal tunnel syndrome (PR=1.292 CI 95% Lower=0.347 Upper=16.459). The research indicates that the majority of students have a low knowledge levels about carpal tunnel syndrome regardless

of whether they experience symptoms. . A lack of information contributes to the occurrence of carpal tunnel syndrome in students. Health education conducted by schools is necessary to foster good cognition regarding the physical effects of prolonged gaming (Anggraini & Yanto, 2022).

There is a relationship between playing duration and carpal tunnel syndrome complaints in student gamers ($p < 0.05$). This research also shows that students who play games 1-2 hours a day are 4.2 times less likely to suffer from carpal tunnel syndrome complaints. This result align with another study that showed students who use smartphones, computers, or gaming consoles for more than 5 hours a day have a higher probability of experiencing hand pain disorder (Saito & Saito, 2021). Another study also showed that there is a significant relationship between the length of playing time and carpal tunnel syndrome (Wahyuni & Putra, 2023). Prolonged use of electronic devices, such as a mouse, keyboard, joystick, or smartphone, followed by repetitive hand movements, causes pressure in the carpal tunnel resulting in pain or numbness (Woo et al., 2019).

There is a relationship between playing frequency with carpal tunnel syndrome complaints in student gamers ($p < 0.05$). This research also shows that students who play 1-2 times a week are 4.920 times less likely to suffer carpal tunnel syndrome complaints. This finding is also supported by another study that showed playing games for more than 1 hour a day for the past year fosters gaming addiction in students (Ratnawati & Putra, 2020).

There is a relationship between repetitive movements and carpal tunnel syndrome complaints in student gamers ($p < 0,05$). This result also shows that students who play games with fewer than 30 repetitive motions per minute are 4.920 times less likely to suffer from carpal tunnel syndrome. This finding aligns with another study that showed a relationship between repetitive movements in students who actively play games (Pramandani & Wirawan, 2021). The majority of games played by students are MMOFPS/MMOBA, which require players to move fast and accurately. The repetitiveness of mouse and button-pressing depends on the intensity of the game being played (Emara et al., 2020). Some genres of games can require up to 600 button presses in one minute (Migliore et al., 2021). These rapid repetitive movements can cause swelling in the carpal tunnel, Which can appear 30 to 60 minutes after using a device (Zwibel et al., 2019).

CONCLUSION AND SUGGESTION

Based on the findings of this research, 82.3% of the respondents reported positive complaints of carpal tunnel syndrome. The majority of these respondents were male, played MMOFPS/MMOBA games, use smartphones/tablets/gaming consoles as gaming devices, had low knowledge, played for more than 2 hours a day, played more than twice 2 a week, and performed more than 30 repetitive motions while playing. This research concludes that there is a significant relationship between playing duration, playing frequency, and repetitive movements with carpal tunnel syndrome in student gamers. Meanwhile, there is no significant relationship between gender, game type, gaming device, and knowledge with carpal tunnel syndrome in student gamers.

To prevent carpal tunnel syndrome in students, it is advised that schools educate students and parents about the dangers of prolonged gaming. Students are also encouraged to organize their playing hours so that gaming does not interfere with their learning process and to prevent the incidence of carpal tunnel syndrome from a young age. Additionally, schools are advised to limit their internet connection to learning purposes and to minimize student gaming time, helping them focus on studying and learning.

It is hoped that e further research will include more accurate measurement of carpal tunnel syndrome complaints and be conducted on a larger number of respondents.

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CONFLICT OF INTEREST

The authors declared there is no conflict of interest in carrying out this research.

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