Majalah Ilmiah Fisioterapi Indonesia
Indonesian Scientific Journal of Physiotherapy

Original Research Articles
ISSN (Print): 2303-1921
ISSN (Online): 2722-0443
Volume 13, Number 3, Pages 512-516 (2025)
DOI: https://doi.org/10.24843/mifi.000000365

Online Gaming Duration and Thumb Pain: A Cross-Sectional Study in Adolescents

Ririn Andasari[1*], Pandu Dwi Panulat[2], Saleha Salihun[3], Irvan Meizia Maulana[4], Cintya Setiadi[5]

[1,2,3,4,5]STIKes RS Dustira, Cimahi Tengah

*Corresponding author:
E-mail: andasarririn@gmail.com

Received 12 July 2025; Revised 31 July 2025; Accepted 02 Augst 2025; Published 01 September 2025

Abstract

Introduction: Online gaming has become increasingly popular among adolescents and is associated with musculoskeletal complaints, particularly affecting the thumb. Repetitive movements and poor ergonomics during gaming are key contributing factors.

Methods: This quantitative, non-experimental study employed a cross-sectional design to investigate the relationship between online gaming duration and thumb musculoskeletal disorders in adolescents at STIKes RS Dustira. Independent variables included age, sex, and gaming duration, while the dependent variable was thumb pain. De Quervain's syndrome was assessed using the Finkelstein test, performed by enclosing the thumb in the fist and deviating the wrist ulnarly. A purposive sampling technique was applied.

Results: A total of 50 participants (32 males, 18 females) were analyzed, with an average daily gaming duration of 3.58 hours. The Finkelstein test was positive in 30 participants (60%), indicating thumb pain consistent with De Quervain's syndrome, while 20 participants (40%) tested negative.

Conclusion: Online gaming duration was significantly associated with thumb musculoskeletal complaints in adolescents. Preventive strategies, including ergonomic education and limiting screen time, are recommended to reduce the risk of De Quervain's syndrome.

Keywords

online gaming, musculoskeletal pain, thumb disorders, De Quervain's syndrome, adolescents

Introduction

The advancement of Information and Communication Technology (ICT) has brought significant changes to various aspects of human life. Today, nearly all daily activities involve the use of technological devices such as smartphones, computers, and televisions. One clear indicator of ICT progress is the increasing use of smartphones, particularly among adolescents and university students. Smartphones are no longer merely communication tools but have become primary devices for accessing information, entertainment, data storage, email, and online gaming. The ease of access to various applications has led many adolescents, especially students, to become accustomed to—and even addicted to—playing online games for extended periods.[1,2]

Indonesia has the highest number of smartphone users in Southeast Asia.[1] According to the Ministry of Communication and Information Technology of the Republic of Indonesia, the country is projected to become the fourth-largest smartphone market in the world after China, India, and the United States.[2] Data from the Central Bureau of Statistics reported that smartphone usage in 2018 reached approximately 62.41%, significantly higher than laptop usage at around 20.05%.[3] However, excessive smartphone use has been shown to negatively impact health, particularly musculoskeletal health.[3]

Frequent smartphone use often leads to excessive thumb activity, especially during prolonged gaming sessions involving repetitive movements. For instance, players of *PlayerUnknown's Battlegrounds* (PUBG) Mobile frequently perform repetitive actions, which may result in stenosing tenosynovitis. Continuous gameplay for 2–3 hours without rest can increase the risk of thumb pain. The hand plays a crucial role in various activities, from light tasks to heavy labor, and any impairment can hinder daily functioning. One such impairment affecting the hand is De Quervain's Syndrome.

Online gamers—especially those using handheld devices or controllers—tend to perform repetitive thumb movements for hours. These repeated motions can lead to muscle strain or inflammation in the thumb joints, resulting in pain. The problem is exacerbated by prolonged gaming sessions without adequate rest. De Quervain's syndrome, a condition involving inflammation of the tendons controlling thumb movement, is a commonly reported issue. It arises from repetitive motions or excessive strain on the thumb's muscles and tendons.[4] Biomechanically, the thumb undergoes repeated stress during radial deviation and flexion movements, particularly in non-ergonomic positions. This contributes to the risk of repetitive strain injuries such as De Quervain's Syndrome, characterized by pain, stiffness, and swelling in the thumb region. Gamers who use their thumbs extensively to press buttons or operate joysticks are especially vulnerable to developing this condition over time.[4]

Prolonged online gaming can also place excessive stress on the thumb joints, resulting in pain, stiffness, and swelling. Non-ergonomic thumb positions—such as excessive bending or unnatural movements—further aggravate the issue. De Quervain's Syndrome is an inflammatory condition of the synovial sheath surrounding the extensor pollicis brevis and abductor pollicis longus tendons, accompanied by pain.[4] The incidence of this condition is relatively high, particularly among individuals engaging in repetitive hand activities. A study by Rudiyanto found a significant relationship between duration of activity and symptoms.[5]

Research has shown a significant association between smartphone usage duration and online gaming intensity with the occurrence of musculoskeletal complaints in the thumb, including De Quervain's Syndrome. Nanda reported a statistically significant link between gaming duration and thumb pain in the dominant hand, triggered by repetitive tendon movements.[5] These findings are supported by AlAbdulwahab and Kachanathu, who emphasized that smartphone addiction and poor ergonomic posture during digital activity contribute to chronic musculoskeletal disorders, particularly in the upper extremities.[6]

Based on this background, the present study aims to explore the relationship between the duration of online gaming and the incidence of musculoskeletal disorders among adolescents at STIKes RS Dustira. This research site was selected based on preliminary observations indicating that many students at STIKes RS Dustira frequently engage in prolonged online gaming sessions and have reported thumb pain. These symptoms suggest the potential presence of disorders such as De Quervain's Syndrome. Therefore, this study seeks to analyze the association between online gaming duration and the occurrence of thumb-related musculoskeletal disorders (De Quervain's Syndrome) among adolescents at STIKes RS Dustira, while also examining the influence of age and gender on the condition.

Methods

This study employed a quantitative, non-experimental design with a cross-sectional approach to analyze the relationship between online gaming duration and the incidence of musculoskeletal disorders among adolescents. The primary objective was to examine the association between the duration of online gaming and the occurrence of musculoskeletal complaints, specifically thumb pain, among adolescents at STIKes RS Dustira. This cross-sectional study considered age and gender as confounding variables, while the dependent variable was the presence of musculoskeletal disorders (i.e., thumb pain indicative of De Quervain's Syndrome). The main independent variable was daily online gaming duration (in hours/day). Prolonged gaming sessions have been shown to contribute to musculoskeletal issues, including De Quervain's Syndrome—an inflammatory condition involving the abductor pollicis longus and extensor pollicis brevis tendons surrounding the thumb. Online gaming on handheld devices such as smartphones often involves high-intensity repetitive thumb motions, including tapping, swiping, and pressing virtual buttons continuously.

The target population consisted of adolescents enrolled at STIKes RS Dustira. The sampling was conducted using a total population approach, including only those who met the inclusion criteria. A purposive sampling technique was applied to select participants who met specific criteria aligned with the study objectives—namely, students with a habitual pattern of online gaming within a defined age range. The final sample comprised 50 participants, including 32 males and 18 females. Inclusion criteria were adolescents aged 19 to 25 years enrolled at STIKes RS Dustira. Participants who did not consent to participate in the study were excluded. The study was conducted from April to May 2025, with participant recruitment taking place over a two-week period.

Data collection involved structured interviews and documentation. Information on daily online gaming duration was obtained through a questionnaire asking respondents to report their average gaming time over the past week. This variable was treated as a continuous numerical measure (hours per day) to allow for linear relationship analysis with thumb pain. For descriptive and comparative purposes, gaming duration was also categorized into three groups: light (<2 hours/day), moderate (2–4 hours/day), and heavy (>4 hours/day), based on literature guidelines concerning repetitive exposure and the risk of musculoskeletal disorders due to digital device use. The same data collection method was applied consistently across all participants, regardless of the presence or absence of thumb pain, to ensure valid comparisons between positive and negative cases. Participants were selected based on inclusion and exclusion criteria to ensure that the final sample was representative of the adolescent student population at STIKes RS Dustira and relevant to the study objectives.

Assessment for De Quervain's Syndrome was conducted using the Finkelstein test. Respondents were instructed to place their thumb inside their palm and cover it with the remaining four fingers to form a fist. The examiner then gently deviated the respondent's wrist in the ulnar direction (toward the little finger). A sharp pain on the radial side of the wrist (near the base of the thumb) during this maneuver was recorded as a positive result, indicating a likely case of De Quervain's Syndrome. Absence of pain was interpreted as a negative result. To minimize information bias, all assessments followed a standardized Finkelstein test protocol performed by a trained examiner. Selection bias was addressed by consistently applying the established inclusion and exclusion criteria.

Univariate analysis was conducted to describe the distribution of variables. Bivariate analysis was performed using binary logistic regression to determine the relationship between online gaming duration and the results of the Finkelstein test. Confounding variables such as age and gender were adjusted in the model. A p-value of <0.05 was considered statistically significant.

Results

To provide a comprehensive overview of the findings, descriptive data are presented below in the form of tables summarizing participant characteristics based on mean values and percentages. Table 1 presents the age distribution of the respondents who participated in the study.

Table 1. Distribution of Respondents by Age (N=50)

Age Range (years)	n	%
17–20	28	56
21–25	22	44

As shown in Table 1, the majority of respondents were aged between 17 and 20 years (56%), while the remaining 44% were in the 21–25 age group. Table 2 shows the gender distribution among the respondents.

Table 2. Distribution of Respondents by Gender (N=50)

Gender	n	%
Male	32	64
Female	18	36

Table 2 indicates that the majority of respondents were male (64%), while females accounted for 36%. Table 3 details the descriptive statistics of daily online gaming duration in hours, including mean, standard deviation, minimum, and maximum values.

Table 3. Descriptive Statistics of Daily Online Gaming Duration (in Hours)

Statistic	Value
Mean	3.58
Standard Deviation (SD)	2.57
Minimum	1
Maximum	12

The daily gaming duration ranged from 1 to 12 hours, with a mean duration of 3.58 ± 2.57 hours. The Finkelstein test was used to assess the presence of thumb pain indicative of De Quervain's syndrome among participants. Table 4a presents the descriptive statistics of the test results measured on a two-point scale, providing an overview of score distribution across the sample. To enhance interpretability, Table 4b further classifies these results into categorical outcomes, distinguishing between positive responses (thumb pain present) and negative responses (thumb pain absent).

Table 4a. Descriptive Statistics of Finkelstein Test Results (Scale 1–2)

Statistic	Value
Mean	1.40
Standard Deviation (SD)	0.49
Minimum	1
Maximum	2

Table 4b. Categorical Distribution of Finkelstein Test Results (N=50)

Finkelstein Test Result	n	%
Positive (thumb pain)	30	60
Negative (no pain)	20	40

As shown in Table 4b, 60% of respondents (n = 30) tested positive for thumb pain (De Quervain's Syndrome), while 40% (n = 20) reported no pain. The average test score was 1.40 on a 2-point scale.

Statistical Analysis Results

The main focus of this study was to assess the association between online gaming duration and the presence of thumb pain using the Finkelstein test. A chi-square analysis was conducted to evaluate the relationship. To examine the core relationship explored in this study, a chi-square test was conducted. The statistical analysis is summarized in Table 5, which assesses the association between online gaming duration and thumb pain based on the Finkelstein test.

Table 5. Chi-Square Test Results for the Association Between Online Gaming Duration and Thumb Pain

X^2 Value	Degrees of Freedom (df)	p-value	Interpretation
33.09	2	0.000000065	Highly significant ($p < 0.001$)

The chi-square test revealed a statistically significant association between daily gaming duration and the presence of thumb pain ($X^2 = 33.09$, $df = 2$, $p < 0.001$), indicating that increased gaming duration is strongly associated with De Quervain's Syndrome symptoms among adolescents.

Discussion

Demographic Characteristics of Respondents

The study sample consisted of 50 adolescents who were active undergraduate students at STIKes RS Dustira, aged between 17 and 25 years. The majority of participants (56%) were within the 17–20-year age group, categorized as late adolescence—a developmental phase strongly associated with high digital device usage, including online gaming.[7]

In terms of gender distribution, males predominated at 64%, while females made up 36%. This proportion is consistent with broader trends indicating that male adolescents are more likely to engage in online gaming, particularly competitive mobile or console-based games.[8]

Daily online gaming durations varied, with an average of 3.58 hours per day. This average exceeds the World Health Organization's (WHO) recommendation, which advises a maximum of two hours of recreational screen time per day for adolescents, excluding academic use.[9,10] The minimum recorded duration was 1 hour, while the maximum reached 12 hours per day.[11]

Finkelstein test results revealed that 30 respondents (60%) experienced thumb pain suggestive of De Quervain's Tenosynovitis, a repetitive strain injury affecting the thumb tendons.[12] These findings demonstrate a clear association between prolonged gaming and thumb pain—central to the focus of this study.

Association Between Age and Incidence of De Quervain's Syndrome

Findings indicated a potential association between respondent age and the occurrence of musculoskeletal disorders, particularly thumb pain suggestive of De Quervain's Syndrome. Among the 50 participants, 28 (56%) were aged 17–20, while 22 (44%) were aged 21–25. Interestingly, a greater incidence of thumb pain was observed among the younger age group.[13]

Early adolescence (ages 17–20) is a period characterized by intensive use of digital devices—such as smartphones and mobile gaming platforms—for entertainment, communication, and virtual social interaction. These activities are often performed with poor ergonomic awareness and insufficient breaks. High-frequency and prolonged gaming sessions in younger individuals tend to impose repetitive mechanical stress on the thumb's musculoskeletal structures. Physiologically, adolescent tendons and muscles may not yet have developed the same adaptive strength as adults, making them more vulnerable to overuse injuries such as De Quervain's Tenosynovitis.[11]

Finkelstein test data reinforced these findings, with 60% of respondents testing positive for thumb pain, indicating early signs of musculoskeletal strain. Although no statistical test was conducted specifically to assess significance across age groups, the distribution pattern clearly suggests that younger individuals (17–20 years) were more affected. These results underscore the urgent need for early ergonomic education among adolescents regarding safe device usage.[14]

Association Between Online Gaming Duration and Incidence of De Quervain's Syndrome

This study demonstrated a statistically significant association between daily online gaming duration and the incidence of musculoskeletal disorders, particularly De Quervain's Syndrome, among adolescents. The average daily gaming time was 3.58 hours, with some respondents playing for up to 12 hours. These figures notably exceed the WHO's screen time guideline for adolescents.[15]

Among the 50 respondents evaluated using the Finkelstein test, 30 individuals (60%) reported thumb pain—one of the hallmark symptoms of De Quervain's Tenosynovitis, characterized by inflammation of the abductor pollicis longus and extensor pollicis brevis tendons due to repetitive thumb motion. This finding aligns with previous studies indicating that excessive digital activity involving repetitive thumb use—such as touchscreen tapping or joystick manipulation—significantly increases the risk of overuse injuries.[16]

The chi-square analysis further validated this association, yielding a χ^2 value of 33.09 and a p-value of 0.000000065 ($p < 0.001$), confirming a highly significant statistical relationship between gaming duration and the onset of thumb pain. Notably, all respondents who reported playing for more than four hours per day experienced thumb pain, whereas none of those who played for fewer than two hours reported such symptoms. This finding reinforces the conclusion that the longer the exposure to thumb-intensive gaming activities, the higher the risk of developing musculoskeletal disorders.

Extended gaming sessions contribute to sustained non-ergonomic hand positioning and repetitive motions without adequate breaks or stretching. Accumulated mechanical stress on the thumb tendons may lead to irritation, pain, and reduced functionality. Several participants reported playing for over six hours continuously without rest—an identified trigger for the onset of thumb and wrist discomfort.[17]

Therefore, increased online gaming duration is directly associated with a heightened risk of musculoskeletal strain in adolescents, particularly De Quervain's Syndrome. Ergonomic education, structured screen-time management, and the inclusion of active breaks during gaming sessions are essential preventative measures. The development of health-oriented digital usage guidelines targeted toward adolescents is strongly recommended.[18,19]

Study Limitations

Gaming duration was measured via self-reported data, wherein participants estimated their average daily gaming hours over the past week. This approach is susceptible to information bias, particularly recall bias, as respondents may misremember or over-/underestimate their actual gaming time.

Conclusion

This study demonstrates a significant association between prolonged online gaming and the incidence of thumb pain among adolescents, a symptom indicative of De Quervain's tenosynovitis. The majority of respondents were male adolescents aged 17 to 20 years, with an average daily gaming duration of 3.58 hours—exceeding the World Health Organization's recommended safe screen time limit. Approximately 60% of participants reported thumb pain as confirmed by a positive Finkelstein's test. These findings suggest that excessive and repetitive gaming activity without adequate rest breaks may contribute to the development of musculoskeletal disorders, particularly affecting the thumb. Therefore, education on ergonomic posture, time restrictions for gaming, and the implementation of regular active breaks is essential to prevent musculoskeletal problems in adolescents, especially among frequent users of digital devices.

Author Contribution

Ririn Andasari conceptualized the study, designed the methodology, and drafted the initial manuscript. Pandu Dwi Panulat contributed to data collection and analysis. Saleha Salihun assisted in the interpretation of findings and literature review. Irvan Meizia Maulana supported data validation and statistical processing. Cintya Setiadi participated in manuscript editing and critical revisions. All authors read and approved the final version of the manuscript.

Acknowledgments

The researcher extends sincere gratitude to the Research and Community Service Institute (LPPM) of STIKes RS Dustira for organizing the institutional research grant program, which enabled the successful execution of this study. Appreciation is also conveyed to the research team and all respondents whose participation and cooperation significantly contributed to the smooth implementation and success of this research.

Conflict of Interest Statement

The authors declare that there are no conflicts of interest related to this study.

Funding Sources

This study did not require ethical approval as it involved non-invasive procedures and did not include sensitive or personally identifiable information. Participation was voluntary, and informed consent was obtained from all respondents prior to data collection.

Ethics Statement

This study was conducted in accordance with the ethical principles of the Declaration of Helsinki. Ethical approval was not required as the study involved only non-invasive procedures (blood pressure measurement and questionnaire surveys) and posed minimal risk to participants. Informed consent was obtained from all participants prior to their inclusion in the study, and confidentiality was strictly maintained.

References

1. Retalia R, Soesilo TD, Irawan S. Pengaruh penggunaan smartphone terhadap interaksi sosial remaja. *Scholaria: J Educ Cult.* 2022;12(2):139–49
2. Maulida L, Pratomo Y. Indonesia masuk 5 besar pengguna smartphone terbanyak di dunia. *Tekno Kompas*. 2025 Jun 30. (cited 2025 Aug 1)
3. Tengkue AA, Manein AP, Elisabeth A, Ilat IP. Dampak penggunaan gadget berlebihan terhadap kesehatan fisik dan mental remaja. *Mathesi J Pendidik dan Bimbing Konseling.* 2024;1(1):16–26
4. Hidayat AS, Diyono, Dyah WA. Hubungan durasi bermain game online terhadap nyeri Carpal Tunnel Syndrome pada pengguna Wi-Fi corner di Telkom Sragen. *Physio J.* 2024;4(1):6–13
5. Rudiyanto W. Hubungan durasi bermain game online dengan kecemasan pada remaja. *J Keperawatan Jiwa.* 2024;12(3):507–12
6. Ahmed S, Mishra A, Akter R, Shah MH, Sadia AA. Smartphone addiction and its impact on musculoskeletal pain in neck, shoulder, elbow, and hand among college going students: a cross-sectional study. *Bull Fac Phys Ther.* 2022;27(1):1–8
7. Pew Research Center. Teens, social media and technology 2022. *Pew Research Center Internet & Tech.* 2022 Aug 10. (cited 2025 Aug 1)
8. Kurnisari M. Hubungan antara kesepian dan kontrol diri dengan intensitas bermain game online pada siswa di Yogyakarta. *J Bimbing dan Konseling Pandohop.* 2021;1(2):20–7
9. WHO. WHO guidelines on physical activity and sedentary behaviour. Geneva: World Health Organization; 2020
10. Santrock JW. Life-span development. 17th ed. New York: McGraw-Hill; 2019
11. Leonhardt M, Overå S. Are there differences in video gaming and use of social media among boys and girls?—a mixed methods approach. *Int J Environ Res Public Health.* 2021;18(11):6085
12. Asad MR, Ahmad RK, Almalki HA, Alkhathami KM, Alqahtani B. Prevalence of De Quervain's tenosynovitis among teenage mobile users: a cross-sectional study. *J Pharm Bioallied Sci.* 2024;16(4):3341–4
13. Nie X, Huang L, Hou J, Dai A, He L, Zheng P, et al. Smartphone usage behaviors and their association with De Quervain's tenosynovitis (DQT) among college students: a cross-sectional study in Guangxi, China. *BMC Public Health.* 2023;23(1):2257
14. Iqbal S, Khattak HG, Aman S, Anwar K, Ali B, Malakandi HB. Frequency of De-Quervain syndrome in mobile users among undergraduate students of allied health sciences Peshawar. *Found Univ J Rehabil Sci.* 2021;1(1):15–8
15. Arvidsson I, Dahlqvist C, Enquist H, Nordander C. Action levels for the prevention of work-related musculoskeletal disorders in the neck and upper extremities: a proposal. *Ann Work Expo Health.* 2021;65(7):741–7
16. Khan SM, Rashid A, Waheed A, Khaliq N, Ismail K, Rafiq I, et al. Prevalence of De Quervain's tenosynovitis among smartphone users due to text messages in undergraduate students of Gujranwala. *Prof Med J.* 2024;31(8):1242–7
17. Wang D, Tang L, Wu H, Gu D. Analysis of the effect of overusing thumbs on smartphone games. *J Int Med Res.* 2019;47(12):6244–53
18. Pradnyadewi PP, Dewi AANTN, Wahyuni N, Nugraha MHS. Duration of playing Mobile Legends on the incidence of De Quervain syndrome among e-sport players. *Phys Ther J Indones.* 2024;5(1):43–6
19. Lestari IP, Kinandana GP, Utama AAGES, Wiryanthini IAD. Adiksi smartphone dan risiko kejadian De Quervain syndrome pada mahasiswa. *Maj Ilm Fisioter Indones.* 2024;12(2):147–58