ORIGINAL ARTICLE

Wrist Pain, Technological Device Use, and Perceived Academic Performance Among Computer Studies Students in a Selected Higher Educational Institution

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Keywords:
Wrist pain; technological device use; perceived academic performance

Article history:
Received: 9 March 2026
Accepted: 8 May 2026
Published: 31 July 2026

ABSTRACT

Background: The increasing reliance on technological devices in higher education, particularly in computer-related academic programs, has raised concerns regarding the development of musculoskeletal complaints such as wrist pain. Prolonged use of laptops, desktops, and handheld devices may contribute to repetitive strain and discomfort, potentially affecting students' functional capacity and academic engagement. However, limited evidence exists regarding the relationship between wrist pain, device usage patterns, and academic performance among students in technology-intensive programs. This study aimed to determine the prevalence of wrist pain, identify the technological devices most frequently used, examine the association between frequency of device use and wrist pain, and determine whether a difference exists in perceived academic performance between students with and without wrist pain. **Methods:** A descriptive-correlational and comparative cross-sectional study design was employed. A structured, self-administered online questionnaire distributed via Google Forms was used to collect data from 180 computer studies students. Descriptive statistics, including frequency counts, percentages, means, and standard deviations, were used to determine the prevalence of wrist pain and describe the patterns of technology use among respondents. Spearman's rank-order correlation was used to examine the association between wrist pain and device use frequency, while an independent samples t-test compared academic performance between students with and without wrist pain. **Results:** Wrist pain prevalence among respondents was 40.55%. Laptops/desktops were identified as the most frequently used technological devices. Most students reported their perceived academic performance as "good." No statistically significant association was found between frequency of device use and wrist pain. However, a statistically significant difference in perceived academic performance was observed between students with and without wrist pain, with students without wrist pain reporting higher academic performance. **Conclusion:** Wrist pain was prevalent among computer studies students, with laptops/desktops identified as the most frequently used technological devices. Although the frequency of device use was not significantly associated with wrist pain, students with wrist pain reported significantly lower perceived academic performance compared to those without wrist pain. These findings suggest that wrist pain may negatively influence students' academic experiences and highlight the importance of ergonomic awareness and preventive strategies in technology-intensive academic environments.

INTRODUCTION

The rapid advancement of digital technology has fundamentally transformed higher education, particularly in computer-related academic programs where students rely extensively on laptops, desktop computers, tablets, and smartphones to complete academic tasks (Brohl et al., 2018). For students pursuing degrees in Computer Studies, prolonged screen exposure, repetitive typing, and sustained wrist postures have become integral components of daily academic routines. While technological integration enhances access to information and learning efficiency, it also raises concerns regarding potential musculoskeletal consequences, particularly wrist pain associated with repetitive strain and suboptimal ergonomics (Janwantanakul et al., 2008).

Computer programmers and information technology professionals routinely engage in prolonged coding, software development, and system testing (Colorado State University Global, 2021). However, improper workstation setup and sustained device use may contribute to overuse injuries (The Trustees of Princeton University, 2023). Wrist pain has been identified as a common complaint among individuals exposed to repetitive hand-intensive tasks, with established risk

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factors including repetitive motion, poor posture, prolonged computer use, inadequate rest breaks, ergonomic deficiencies, and psychosocial stressors (Mayo Clinic, 2022). Janwantanakul et al. (2008) reported an increased risk of musculoskeletal symptoms, including wrist and hand complaints, among individuals with prolonged computer exposure, while Ekşioğlu (2017) identified computer use exceeding four hours per day as a significant risk factor. Similarly, Amjad et al. (2020) found a significant association between extended mobile phone use and the development of wrist pain. These findings suggest that students in computer-intensive programs may be particularly vulnerable to wrist-related musculoskeletal symptoms.

Globally, adolescents and young adults spend substantial amounts of time engaged in screen-based activities. (Anderson & Jiang, 2018; Sampasa-Kanyinga et al., 2022). A review by Juul-Kristensen et al. (2024) highlighted the growing impact of modern technology on hand-intensive tasks and the development of overuse injuries. Bröhl et al. (2018) further emphasized that desktop computers, laptops, tablets, and smartphones have become embedded in daily life. In academic contexts, information and communication technologies (ICT) play a central role in shaping study habits. Mbah (2010) reported that 83% of students rely on computers to support, learning and perceived ICT as positively influencing their study practices. Additionally, educational technologies have been shown to enhance interactivity, accessibility, and engagement in learning environments (Ponti et al., 2017; Vyad 2022). Thus, while technological devices provide clear academic advantages, their extensive use may also introduce health-related risks.

Pain associated with wrist pathology can impair an individual's ability to perform routine tasks, including writing, typing, and manipulating devices—activities essential for academic productivity. Beyond physical discomfort, chronic or recurrent pain may influence broader aspects of school functioning. Gorodzinsky et al. (2011) demonstrated that chronic pain in children and adolescents is associated with school absenteeism, sleep disturbances, reduced concentration, emotional distress, and impaired academic competence. Logan et al. (2008) similarly reported a close association between chronic pain symptoms and decreased academic performance. Importantly, school functioning extends beyond attendance and encompasses cognitive, emotional, and social domains that influence academic outcomes (Gorodzinsky et al., 2011). Persistent wrist pain may therefore compromise not only task performance but also overall academic engagement and well-being.

Evidence suggests that musculoskeletal complaints are already present among students in information technology related fields. Sirajudeen et al. (2018) reported that 20.5% of information technology and computer science students experienced wrist and hand symptoms. Despite these findings, limited research has examined the relationship between wrist pain, patterns of technological device use, and perceived academic performance within a localized university setting. While wrist pain is prevalent in the general population and may interfere with functional activities, its potential academic implications among computer studies students remain insufficiently explored.

Given the heavy reliance on digital devices in computer-based programs, investigating the association between technological device use and wrist pain and examining whether wrist pain relates to perceived academic performance, is warranted. Therefore, this study aimed to (1) determine the prevalence of wrist pain among Computer Studies students, (2) identify the technological devices most frequently used, (3) examine the association between frequency of device use and wrist pain, and (4) determine whether a difference exists in perceived academic performance between students with and without wrist pain. The findings may inform preventive strategies, ergonomic guidelines, and health promotion initiatives to support musculoskeletal well-being and optimize academic performance in technology-intensive educational environments.

MATERIALS AND METHODS

A descriptive correlational and comparative research design was employed in this study. The descriptive component, grounded in quantitative methodology, was utilized to systematically describe the prevalence of wrist pain, patterns of technological device use, and perceived academic performance among students. This design enabled the researchers to generate accurate and relevant data aligned with the study objectives. The correlational component was used to examine the relationship between the frequency of technological device use and the incidence of wrist pain among students enrolled in the College of Computer Studies at Silliman University. This approach allowed for the investigation of associations between variables without manipulation or experimental intervention. Finally, a comparative design was incorporated to determine whether a significant difference existed in perceived academic performance between students with wrist pain and those without wrist pain. By integrating these three methodological approaches, the study was able to comprehensively describe, analyze relationships, and compare outcomes

relevant to the research problem.

The study was conducted at the College of Computer Studies of Silliman University, located along Hibbard Avenue, Dumaguete City, during the second semester of the Academic Year 2023–2024. The College is housed in the Uytengsu Foundation Computer Center, situated behind Ausejo Hall, and is equipped with modern computer laboratories, technology-enhanced classrooms, and access to comprehensive academic resources.

Silliman University is recognized for its commitment to academic excellence and holistic student development, making it an appropriate setting for investigating health-related concerns that may influence student performance. The College of Computer Studies offers undergraduate programs in computer science and related fields, where students routinely engage in prolonged use of technological devices for programming, coding, and other computer-based academic tasks.

The selection of this setting was purposive and aligned with the objectives of the study. Students enrolled in computer-related programs represent a population with high exposure to repetitive wrist movements and sustained device use, potentially predisposing them to wrist pain. The department's accessibility to the target population, availability of technological infrastructure, and supportive academic environment provided a suitable context for examining the association between wrist pain and perceived academic performance.

The study included undergraduate students enrolled in the College of Computer Studies at Silliman University during the second semester of Academic Year 2023–2024. Inclusion criteria were: (1) official enrollment in the College of Computer Studies; (2) regular use of technological devices such as laptops/desktops, tablets/iPads, or mobile phones for academic activities; and (3) voluntary consent to participate in the study. Students with recent wrist injuries due to direct trauma or those who had undergone wrist-related surgical procedures were excluded to minimize confounding effects unrelated to technology use.

The study population consisted of 430 students across four programs: Bachelor of Science in Information Technology (n = 218), Bachelor of Science in Computer Science (n = 183), Bachelor of Library and Information Science (n = 21), and Bachelor of Science in Information Systems (n = 8). The minimum sample size of 208 respondents was determined using Slovin's formula with a 5% margin of error.

Stratified random sampling was employed to ensure proportional representation of each academic program. Student lists were arranged alphabetically, and participants were selected using an online random number generator corresponding to the assigned list numbers within each stratum.

A structured survey questionnaire was used to collect data for this study. The instrument consisted of five sections: demographic profile, pre-screening criteria, wrist pain assessment, frequency of technological device use, and perceived academic performance.

The pre-screening section was designed based on the study's inclusion and exclusion criteria. Wrist pain prevalence was determined using a direct binary question: "Do you experience any form of pain or discomfort in the wrist area?" Responses were used to establish the presence or absence of wrist pain among participants.

Frequency of technological device use for academic purposes was measured using a five-point Likert scale (Always, Often, Sometimes, Seldom, and Never), corresponding to percentage usage ranges of 76–100%, 51–75%, 26–50%, 1–25%, and 0%, respectively (Likert, 1932). Prior to data collection, this section underwent face validation by four experts, including the researchers' adviser and three faculty members from the College of Computer Studies at Silliman University. Feedback from the experts primarily focused on improving grammar and clarity, while confirming the relevance and structure of the instrument.

The questionnaire also underwent pilot testing involving ten students from the Institute of Rehabilitative Sciences Physical Therapy program. The pilot testing followed recommended practices for preliminary survey testing, which suggest that small pilot sample of approximately 10-30 participants are acceptable for evaluating clarity, feasibility, and administration procedures prior to full-scale implementation (Hertzog, 2008; Johanson & Brooks, 2010). The pilot testing followed the guidelines for survey item testing and revealed no negative feedback regarding instrument administration.

Perceived academic performance was assessed using the Academic Performance Questionnaire developed by McGregory et al. (2015), an open-access instrument with demonstrated internal consistency reliability ($\alpha = 0.89$), two-week test–retest reliability ($r = 0.85$), and satisfactory concurrent validity. Total scores were computed by summing weighted responses, with performance categorized as Excellent (33–40), Good (25–32), Moderate (17–24), Poor (9–16), and Failing (0–8) based on established scoring parameters.

Prior to data collection, the research proposal was reviewed and approved by the Silliman University Research Ethics Committee (UREC) on February 23, 2024. Following ethical approval, the researchers conducted face validation and pilot testing of the questionnaire sections measuring frequency of technological device use and overall instrument reliability.

A formal correspondence was then sent to the College of Computer Studies of Silliman University to request permission for survey dissemination. Data were collected using Google Forms to facilitate efficient distribution and response recording. The survey link was sent to the official email addresses of eligible students from the Bachelor of Science in Information Technology, Bachelor of Science in Computer Science, Bachelor of Library and Information Science, and Bachelor of Science in Information Systems programs.

Informed consent was presented at the beginning of the online survey, where participants were provided with information regarding the study objectives and procedures. Participant confidentiality was strictly maintained throughout the research process.

The survey was disseminated during the second week of March 2024, with responses collected until March 30, 2024. To encourage participation, the researchers provided an incentive in the form of a raffle, offering ₱100 prizes to ten randomly selected participants.

Data encoding, analysis, and interpretation were completed by the first week of April 2024, and the study was finalized on 5thApril, 2024. Subsequent time prior to presentation was allocated for manuscript refinement and revisions.

All responses were encoded and organized using an electronic spreadsheet. The digital file used for data storage was password-protected, and access to raw data was restricted to the researchers, research adviser, and statistician to ensure data confidentiality.

Demographic characteristics including age, sex, year level, and academic program were summarized using descriptive statistics. Age was presented using range distribution, while frequencies and percentages were used to describe categorical variables such as sex, year level, and course.

Wrist pain prevalence was determined by calculating the percentage of respondents reporting the presence or absence of wrist pain. Device usage frequency across academic purposes was summarized using weighted means. Responses were measured using a five-point Likert scale, and verbal interpretations were derived by computing scale intervals using the formula (highest scale − lowest scale) ÷ number of categories, resulting in an interval width of 0.8 for scale interpretation.

Spearman's rank correlation coefficient was used to examine the relationship between frequency of technological device use and wrist pain, as the variables were ordinal in nature. Responses indicating the presence of wrist pain were coded as 1, while absence of wrist pain was coded as 0 for analysis.

Perceived academic performance was assessed using the Academic Performance Questionnaire developed by McGregory et al. (2015). Responses were scored on a five-point scale (5 = Strongly Agree to 1 = Strongly Disagree), with total scores categorized as Excellent (33–40), Good (25–32), Moderate (17–24), Poor (9–16), and Failing (0–8).

An independent samples t-test was conducted to determine whether a significant difference existed in perceived academic performance between students with and without wrist pain. Statistical analyses were performed using appropriate software, with significance levels set at conventional thresholds.

Participants were provided with an informed consent form outlining the study objectives, procedures, potential risks, and benefits to ensure voluntary and informed participation.

The researchers adhered to established ethical standards throughout the conduct of the study, prioritizing participant welfare, privacy, and confidentiality. Data collected through Google Forms were automatically encrypted, and access to the password-protected database and electronic spreadsheet was restricted to the researchers, statistician, and research adviser. Only information necessary to address the research objectives was collected, and no personally identifiable information was retained. Any personal identifiers provided by respondents were removed through data de-identification procedures.

All collected data were securely stored and will be permanently deleted after the completion and successful defense of the study to ensure respondent anonymity. Any discrepancies or issues identified in the questionnaire responses were promptly addressed.

The study also upheld the ethical principles of voluntariness and transparency in accordance with the Declaration of Helsinki. Participation was entirely voluntary, and respondents were informed of their right to

withdraw from the study at any time without consequence. Participants were also provided with information regarding the study purpose, methods, and potential risks and benefits. The researchers assumed responsibility for ensuring the accuracy and integrity of the research findings. Regular consultation with the research adviser was conducted to ensure the ethical and scientific soundness of the study.

RESULTS

Demographic Profile of the Respondents

The study included 180 eligible respondents. In terms of year level distribution, Level 1 students comprised 35.6% of the sample, followed by Level 2 students at 31.1%, Level 3 students at 22.2%, and Level 4 students at 11.1%. The respondents' ages ranged from 18 to 31 years old. In terms of sex distribution, 63.3% of the participants were male and 36.7% were female.

Wrist Pain Prevalence

Table 1 presents the prevalence of wrist pain among College of Computer Studies students. Of the 180 respondents, 73 (40.55%) reported the presence of wrist pain, while 107 (59.44%) reported absence of wrist pain. Among the respondents with wrist pain, 36 were from BS IT, 33 from BS CS, 3 from BLIS, and 1 from BSIS. The data indicate a substantial proportion of students experiencing wrist pain within the College of Computer Studies population. The prevalence ratio of approximately 2.3 suggests that for every five students in the department, two reported experiencing wrist pain.

Table 1: Prevalence of wrist pain among the students in the College of Computer Studies in Silliman University

Wrist Pain	Course				Total *n = 180*	Percent (%)	Prevalence (Ratio)
	BS IT *n = 87*	BS CS *n = 82*	BL IS *n = 8*	BS IS *n = 3*			
Presence	36	33	3	1	73	40.55%	~2:3
Absence	51	49	5	2	107	59.44%	

Frequency of Technological Device Use

Table 2 presents the frequency of technological device use among College of Computer Studies students for academic purposes. Laptops/desktops obtained the highest weighted mean (4.511), interpreted as "Always". Mobile phones followed with a weighted mean of 4.183, interpreted as "Often", while tablets obtained the lowest weighted mean (1.911), interpreted as "Seldom". These results suggest that students rely more heavily on laptops/desktops and mobile phones than tablets for academic activities such as programming, studying, and completing assignments.

Table 2: Frequency use of technological devices among the College of Computer Studies students in Silliman University

Gadget	Weighted Mean	Verbal Description
Mobile Phone	4.183	Often
Tablet	1.911	Seldom
Laptop/Desktop	4.511	Always

Scale: 4.3-5.0 Always; 3.5-4.2 Often; 2.7-3.4 Sometimes; 1.81-2.6 Seldom; 1 - 1.80 Never

Perceived Academic Performance

Table 3 shows the perceived academic performance of the respondents based on the Academic Performance Questionnaire developed by McGregory et al. (2015). The respondents obtained a mean score of 29.7, interpreted as "Good Performance", indicating that most College of Computer Studies students viewed their academic performance positively. The results may be explained using Walberg's theory of academic performance, which posits that learning outcomes are influenced by a combination of student motivation, cognitive characteristics, and environmental factors. The predominance of respondents reporting good performance suggests the presence of favorable learning attitudes and adequate academic engagement among the students.

Table 3: Perceived academic performance among the College of Computer Studies students in Silliman University

Academic Performance	Mean Score
Good Performance	29.7

Relationship Between Technological Device Use and Wrist Pain

Table 4 presents the relationship between frequency of technological device use and wrist pain among respondents. The results showed no statistically significant association between wrist pain and the use of mobile phones (rs = -0.0796, p = 0.288, tablets, (rs = -0.0941, p =

0.2088), and laptops/desktops (rs = -0.0619, *p* = 0.4094). The results suggest that device usage frequency alone may not be strongly associated with wrist pain occurrence in this population

Table 4: Test of relationship between frequency of use of technological device and presence of wrist pain

Variables	r_s values		Decision	Remarks
	Computed	P-value (a= 0.05)		
Mobile phone and wrist pain	-0.0796	0.288	Failed to reject null hypothesis	Not significant
Tablet and wrist pain	-0.0941	0.2088	Failed to reject null hypothesis	Not significant
Laptop/Desktop and wrist pain	-0.0619	0.4094	Failed to reject null hypothesis	Not significant

Difference in Perceived Academic Performance Between Students With and Without Wrist Pain

Table 5 presents the difference in perceived academic performance between respondents with and without wrist pain. The *p*-value (0.0132) indicates a statistically significant difference in perceived academic performance between the two groups. Respondents without wrist pain obtained a higher mean score (M = 30.39) compared to respondents with wrist pain (M = 28.72).

Table 5: Test of difference between perceived academic performance and presence or absence of wrist pain

Variables	t-values		Decision	Remarks
	Computed	P-value (a = 0.05)		
Difference on the perceived academic performance between respondents with wrist pain ($\bar{x}$ = 28.72) *and* without wrist pain ($\bar{x}$ = 30.39)	2.50	0.0132	Reject null hypothesis	Significant difference

DISCUSSION

The study revealed that wrist pain was prevalent among College of Computer Studies students, with approximately 40.55% reporting wrist discomfort. This finding is consistent with previous research that reported high rates of musculoskeletal symptoms among students who frequently use digital devices (Sirajudeen et al. 2018; Bubric & Hedge, 2016; Amjad et al., 2020). Prolonged typing, repetitive wrist movements, and suboptimal ergonomic positioning are recognized risk factors for musculoskeletal discomfort in technology-dependent populations (Mustafaoglu et al., 2021). The result supports the cumulative load theory, which posits that repetitive mechanical stress may gradually contribute to tissue strain and pain development (Kumar, 2001).

Students reported high reliance on laptops/desktops and mobile phones for academic activities, with laptops/desktops being the primary device used. This aligns with studies indicating that digital devices are essential tools in higher education for research, programming, and academic communication (Norries et al., 2011; Bowen & Matthew., 2012; Amjad et al., 2020). According to Walberg's theory of academic performance, learning outcomes are influenced by individual, instructional, and environmental factors. Frequent use of technology may indirectly affect academic behavior and ergonomic exposure, which may contribute to musculoskeletal risk.

The respondents generally reported good perceived academic performance (mean = 29.7), suggesting favorable academic engagement among students. This finding is supported by studies indicating that academic achievement is influenced by motivation, interest, and self-discipline (Alani & Hawas, 2021; Sikhwari et al., 2019). However, academic performance is a multifactorial outcome influenced by personal, cognitive, and environmental determinants.

Statistical analysis showed no significant relationship between frequency of technological device use and wrist pain. This result is consistent with studies reporting weak or inconsistent associations between device usage duration and musculoskeletal symptoms (Thorburn, Pope, & Wang., 2021; Xie, Szeto, & Dai., 2017). The finding suggests that wrist pain development may be influenced by factors beyond usage frequency, such as ergonomics, posture, psychosocial stress, and individual physiological differences (Xie, Szeto, & Dai., 2017; Wærsted, Hanvold, & Veiersted., 2010).

Although no significant relationship was observed between device use frequency and wrist pain, students without wrist pain demonstrated significantly higher perceived academic performance scores than those with wrist pain. Pain-related discomfort may act as a cognitive distractor, reducing attention span, learning efficiency, and productivity (Oosterman et al, 2012; Grimby-Ekman et al., 2018; Logan et al., 2008). This supports evidence that physical discomfort can negatively influence academic functioning.

Limitations of the Study

The study employed a cross-sectional design, limiting causal inference between technological device use, wrist pain, and academic performance. Data were obtained through self-reported questionnaires, which may introduce recall and response bias. The study also measured perceived academic performance rather than objective academic indicators such as official academic grades. Other potential confounding factors, including ergonomic workstation setup, duration of continuous device use, physical activity level, and psychosocial stress, were not assessed.

Implications of the Study

The findings highlight the need for ergonomic health promotion programs among students in technology-intensive academic programs. Educational institutions may consider integrating ergonomic awareness education, promoting proper posture during device use, and encouraging regular rest breaks to reduce musculoskeletal strain. Early screening for wrist discomfort may also help identify at-risk students. Future research should explore additional behavioral, environmental, and biomechanical factors affecting wrist pain and academic performance using longitudinal or experimental designs.

CONCLUSION

The study revealed that wrist pain was prevalent among College of Computer Studies students, with approximately two out of five respondents reporting the presence of wrist pain. Laptops/desktops were identified as the most frequently used technological devices for academic purposes, followed by mobile phones, while tablets were least utilized. The study found no significant relationship between the frequency of technological device use and the presence of wrist pain, suggesting that device usage frequency alone may not be a determining factor in wrist pain development among students. However, a significant difference was observed in perceived academic performance between students with and without wrist pain, with higher performance scores reported among students without wrist discomfort. These findings indicate that while technological device use frequency may not directly influence wrist pain occurrence, the presence of wrist pain may have potential implications for students' academic performance.

RECOMMENDATIONS

Based on the findings of the study, several recommendations are proposed for different stakeholders. For physical therapists, it is suggested that educational interventions be provided to promote proper ergonomic practices and increase awareness of wrist pain prevention among students. These programs may help reduce the risk of musculoskeletal discomfort and support early management of wrist-related symptoms.

For the College of Computer Studies, it is recommended that awareness campaigns, seminars, and workshops be conducted to educate students, faculty, and staff about wrist pain, its risk factors, and preventive strategies. Integrating ergonomic education into academic activities may help promote healthier technology use among students.

For students, especially those experiencing wrist pain, adopting ergonomic adjustments such as maintaining appropriate desk height, using wrist support during prolonged device use, and performing wrist-strengthening exercises is encouraged. Taking regular breaks to stretch, stand, and move during prolonged device use may help reduce wrist strain. Students without wrist pain are advised to practice preventive measures such as maintaining proper posture, setting up ergonomic workstations, and engaging in regular stretching exercises.

For future researchers, it is recommended to increase sample size or extend the study duration to improve statistical power and reliability of results. Expanding the study population and including additional variables such as sex, year level, duration of device use, and occupational or academic performance factors are also suggested to provide a more comprehensive understanding of the relationship between wrist pain and technological device exposure.

ACKNOWLEDGEMENT

This research was not funded by any grant.

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