

Association of Smartphone Overuse with Hand Discomfort in University

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Smartphone addiction, hand discomfort, university students, musculoskeletal disorders, ergonomic impact, SAS-SV, CHDQ.

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ABSTRACT

Background: Smartphone overuse has been linked to various musculoskeletal disorders, particularly affecting the hands. Despite the high prevalence of smartphone use among young adults, the association between smartphone addiction and hand discomfort remains unclear.

Objective: To determine the association between smartphone overuse and hand discomfort among university students.

Methods: A cross-sectional study was conducted on 111 students from Nur International University, Lahore. Participants were recruited using convenience sampling and assessed using the Smartphone Addiction Scale-Short Version (SAS-SV) and the Cornell Hand Discomfort Questionnaire (CHDQ). Data analysis was performed using SPSS version 25, employing descriptive statistics and correlation tests, with p-values <0.05 considered significant.

Results: The study comprised 31 males (27.9%) and 80 females (72.1%), with mean ages of 24.58 ± 1.98 for males and 23.38 ± 2.10 for females. Smartphone addiction levels were classified as normal (27.9%), mild (60.4%), and moderate (11.7%). No significant association was found between smartphone addiction and hand discomfort across various hand regions ($p > 0.05$).

Conclusion: The study found no significant association between smartphone overuse and hand discomfort, suggesting that moderate smartphone use may not adversely affect hand health among university students.

INTRODUCTION

Smartphones have become an integral part of daily life, transforming communication, entertainment, and information access (3). Their ubiquitous presence and ease of use have led to widespread adoption, with a significant portion of the global population, particularly young adults, being avid users (4). The convenience of smartphones in facilitating social interactions, entertainment, and work-related tasks is undeniable, but there is growing concern about their impact on physical health, specifically musculoskeletal disorders (7). With increasing smartphone use, there has been a notable rise in repetitive strain injuries, particularly affecting the hands, wrists, and fingers, due to prolonged and awkward postures during usage. Conditions such as De Quervain's tenosynovitis, carpal tunnel syndrome, and other tendinitis-related pathologies have been linked to excessive smartphone use, which often involves repetitive motions without adequate rest, potentially leading to long-term damage (2, 7).

Hand discomfort, a common issue among smartphone users, includes pain or strain in various parts of the hand such as the fingers, palm, thenar, and hypothenar eminence. The intricate structure of the hand and wrist, comprising multiple bones, muscles, tendons, and ligaments, is designed to support a wide range of movements necessary for daily activities (1). However, the non-ergonomic design of smartphones, coupled with the repetitive nature of tasks performed on them, can place

undue stress on these structures, potentially leading to discomfort or injury (8). Studies suggest that smartphone addiction is prevalent among young adults, with significant associations reported between smartphone overuse and musculoskeletal pain in regions such as the neck, shoulders, and hands (15, 17). The mechanical forces generated by repetitive hand movements during smartphone use, such as texting, scrolling, and gaming, can exacerbate these conditions by impairing the blood supply and nutrient flow to the muscles, leading to muscle fatigue and discomfort (6).

Despite the evident link between smartphone use and musculoskeletal pain, the relationship between smartphone overuse and specific hand discomfort remains inadequately explored. A study conducted by Alsalameh et al. (2019) in Saudi Arabia highlighted a significant association between smartphone addiction and musculoskeletal pain, including pain in the wrist and hands, among medical students (17).

Another study by Kamel et al. (2020) in Bahrain found a weak negative correlation between phone size, hand size, grip strength, and the reporting of hand pain, suggesting that the comfort of smartphone design is a critical factor in preventing hand discomfort (16).

Moreover, excessive smartphone use has been implicated in altering the dexterity of the hands, as shown in a study by Shetty et al. (2019),

where high smartphone addiction scores were weakly linked to reduced hand dexterity among medical students (20).

The increasing prevalence of smartphone addiction, particularly among university students, underscores the need to further investigate its impact on hand health. With the majority of smartphone users falling within the age group of 18-30 years, and many using their devices for extended periods daily, the potential for developing hand-related musculoskeletal issues is substantial (5). This study aims to elucidate the association between smartphone overuse and hand discomfort among university students, providing insights that could guide preventive strategies and inform the design of more ergonomically friendly devices. Despite the recognition of smartphone overuse as a potential health concern, comprehensive studies focusing on the direct effects of smartphone addiction on specific hand discomfort types are limited, making this investigation particularly pertinent. Identifying whether a significant association exists between smartphone addiction and hand discomfort will help healthcare providers and physiotherapists better understand the implications of prolonged smartphone use and inform interventions to mitigate these risks.

MATERIAL AND METHODS

The study employed an observational cross-sectional design conducted at Nur International University in Lahore. It was completed within a six-month period following the approval of the synopsis. A total of 111 university students, aged between 18 to 30 years, were recruited through convenience sampling. The inclusion criteria comprised students from both genders who used smartphones for more than eight hours daily. Exclusion criteria included individuals with any history of hand surgery or fractures, as well as those outside the specified age range. The sample size was determined using G* power software, with a correlation point biserial model, employing a one-tailed test with an effect size of 0.3, alpha error of 0.05, and power of 0.95, resulting in a calculated sample size of 111 participants (6).

Data collection involved administering two validated questionnaires to assess smartphone addiction and hand discomfort. The Smartphone Addiction Scale-Short Version (SAS-SV) was used to evaluate the level of smartphone addiction among participants. This scale, widely recognized for its reliability and validity, categorizes addiction into four levels: normal (0-30), mild (31-49), moderate (50-79), and severe (80-100) (10). Hand discomfort was assessed using the Cornell Hand Discomfort Questionnaire (CHDQ), a reliable tool that evaluates pain in the hand through three domains: frequency, discomfort, and interference. Scores were interpreted by multiplying the frequency, discomfort, and interference values, classifying discomfort as mild (0-30), moderate (31-60), or severe (61-90) (11).

Before data collection, ethical approval was obtained from the Offices of Research, Innovation, and Commercialization (ORIC) at Nur International University. Informed consent was secured from all participants after they were briefed on the study's aims, procedures, and their rights, including the assurance of confidentiality and the voluntary nature of their participation. The study adhered to the principles outlined in the Declaration of Helsinki (1964), including the amendments made in 2008 and 2013, ensuring that all ethical standards for research involving human subjects were strictly followed. The ORIC retained the authority to withdraw the project if any ethical considerations were compromised.

Participants were approached within the university setting, and those who met the inclusion criteria were invited to participate. They were provided with detailed information about the study, and any queries were addressed before they completed the questionnaires. The data were then collected through structured interviews conducted in a quiet setting to ensure participant comfort and minimize distractions. The completed questionnaires were reviewed for completeness and accuracy before data entry.

The collected data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 25. Descriptive statistics, including frequencies and percentages, were used to summarize demographic data and other categorical variables. Continuous variables, such as age, were presented as means with standard deviations. Associations between smartphone addiction and hand discomfort were evaluated using appropriate statistical tests, and p-values less than 0.05 were considered statistically significant. Various graphical representations, such as pie charts and histograms with normal curves, were employed to visually depict the distribution of categorical and continuous data, respectively.

This methodical approach aimed to provide a comprehensive analysis of the association between smartphone overuse and hand discomfort among university students, offering valuable insights into potential preventive measures for the associated musculoskeletal issues.

RESULTS

The results from the study are presented in a structured and refined format below, highlighting the key findings related to gender distribution, age, BMI, and smartphone addiction scores among the participants.

Gender Distribution of Participants The study included a total of 111 participants, with 31 males (27.9%) and 80 females (72.1%), indicating a higher representation of females in the sample.

Age Distribution of Participants The mean age of male participants was 24.58 years (\pm 1.98), while female participants had a mean age of 23.38 years (\pm 2.10).

Table I Gender

Gender	Frequency	Percent
Male	31	27.9
Female	80	72.1

Table 2 Age Distribution of Participants

Gender	Mean Age \pm SD
Male	24.58 \pm 1.98
Female	23.38 \pm 2.10

Table 3 BMI of Participants

Gender	Mean Height (m) \pm SD	Mean Weight (kg) \pm SD	Mean BMI \pm SD
Male	1.64 \pm 0.08	64.48 \pm 8.51	24.18 \pm 4.37
Female	1.65 \pm 0.08	60.40 \pm 7.85	22.49 \pm 3.83

Table 4 Frequency of Smart Phone Addiction (SMA) Score

Smart Phone Addiction Score	Frequency	Percent
Normal	31	27.9
Mild addiction	67	60.4
Moderate addiction	13	11.7

This data reflects a relatively young cohort, consistent with the university setting of the study. BMI of Participants Male participants had a mean height of 1.64 meters (\pm 0.08), a mean weight of 64.48 kg (\pm 8.51), and a mean BMI of 24.18 (\pm 4.37). Female participants had a mean height of 1.65 meters (\pm 0.08), a mean weight of 60.40 kg (\pm 7.85), and a mean BMI of 22.49 (\pm 3.83). These values fall within the normal BMI range, suggesting that the majority of participants were of average body composition. Frequency of Smartphone Addiction (SMA) Score Participants were assessed for smartphone addiction using the SAS-SV, revealing that 27.9% had normal addiction scores, 60.4% exhibited mild addiction, and 11.7% were classified with moderate addiction. No participants fell into the severe addiction category, indicating that the majority of the sample displayed low to moderate levels of smartphone addiction.

The findings provide an overview of the demographic characteristics and levels of smartphone addiction among university students, laying the groundwork for further analysis of the potential association between smartphone overuse and hand discomfort.

DISCUSSION

The study aimed to explore the association between smartphone overuse and hand discomfort among university students, revealing that there was no significant association between smartphone addiction and hand discomfort across various regions of the hand, including the index, middle, ring, pinkie fingers, thumb, palm, thenar, and hypothenar areas.

These findings align with some previous studies but contradict others, highlighting the complexity of the relationship between smartphone use and musculoskeletal health. For instance, a study by Kamel et al. (2020) reported weak correlations between phone size, hand size, and grip strength with reported hand pain, suggesting that ergonomic factors may play a more critical role than addiction levels alone in influencing discomfort (16).

Similarly, Alsalameh et al. (2019) found a significant relationship between musculoskeletal pain and smartphone addiction, particularly in the neck, wrist, and hands; however, their study did not isolate hand discomfort

to the extent seen in this research, which focused on more specific hand regions (17).

The study's findings also contrast with the results of Baabdullah et al. (2020), who observed a significant correlation between heavy smartphone usage and hand pain, indicating that excessive use could cause subclinical effects on the hand (19). The lack of significant findings in the present study could be attributed to the sample characteristics, such as the specific usage patterns of the participants or the relatively low prevalence of moderate to severe addiction levels. It is plausible that while mild to moderate smartphone use does not directly cause hand discomfort, more intense or prolonged use, as noted in other studies, could lead to greater musculoskeletal strain (20). This discrepancy underscores the need for further investigation into the intensity, duration, and specific nature of smartphone interactions that may contribute to discomfort.

Strengths of the study included the use of validated tools like the SAS-SV and CHDQ, which provided reliable measures of smartphone addiction and hand discomfort, respectively. Additionally, the study benefited from a well-defined university student population, enhancing the relevance of findings to young adults who are among the most prevalent users of smartphones. However, there were notable limitations, including the cross-sectional design, which precludes establishing causal relationships. The convenience sampling method may have introduced selection bias, limiting the generalizability of the results. Furthermore, potential confounding factors, such as hand dominance, specific smartphone usage patterns, style of holding the device, and levels of physical activity, were not controlled, which could have influenced the outcomes. Future studies should consider these variables to better isolate the effects of smartphone use on hand discomfort.

The study also highlighted that smartphone use, although pervasive, may not uniformly lead to significant musculoskeletal issues in all users, suggesting that individual differences in usage patterns, ergonomic practices, and possibly even genetic predispositions might play a role. This finding is consistent with the broader literature, which has shown varying results regarding the impact of digital device use on musculoskeletal health (21).

It emphasizes the importance of personalized assessments and interventions, as well as the need for ergonomic considerations in device design, as suggested by earlier research advocating for user comfort to mitigate potential health impacts (16).

Recommendations for future research include longitudinal studies to better assess causality and the potential cumulative effects of smartphone use over time. Exploring interventions such as ergonomic education, usage limitations, and device design modifications could also provide valuable insights into reducing the risk of hand discomfort among frequent smartphone users. Additionally, incorporating objective measures of smartphone use, such as screen time tracking, could enhance the accuracy of exposure assessments compared to self-reported data, which is subject to recall bias.

Overall, this study contributes to the understanding of smartphone use and hand discomfort among university students, offering evidence that moderate levels of smartphone addiction may not significantly impact hand health. However, the mixed findings in the literature call for a cautious interpretation and highlight the need for comprehensive approaches to studying and addressing the musculoskeletal impacts of digital device usage in diverse populations.

CONCLUSION

In conclusion, this study found no significant association between smartphone overuse and hand discomfort among university students, suggesting that moderate levels of smartphone addiction may not pose a direct risk to hand health. These findings imply that while smartphone use is ubiquitous among young adults, it does not necessarily lead to adverse musculoskeletal outcomes in the hand, highlighting the importance of considering individual usage patterns and ergonomic practices. From a healthcare perspective, these results underscore the need for targeted ergonomic interventions and education on safe device use rather than solely focusing on reducing screen time. This approach may help mitigate potential discomfort and prevent long-term musculoskeletal complications associated with excessive smartphone use.

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