ISSN: 2321-5690
IJOPT
INDIAN JOURNAL OF PHYSICAL THERAPY
AN INTERNATIONAL JOURNAL
INDIAN JOURNAL OF PHYSICAL THERAPY
AN INTERNATIONAL JOURNAL
editor.ijopt@gmail.com

CORRELATION BETWEEN DAILY SCREEN TIME PATTERNS AND SMARTPHONE ADDICTION LEVELS AMONG PHYSIOTHERAPY STUDENTS: A CROSS-SECTIONAL STUDY

Akshitbhai Virani[1*], Aansi Patel[2], Sandhya K Singal[3], Jayshree M Sutaria[4], Yagna U Shukla[5]

[1,2] Intern at Gov. Physiotherapy Collage Ahmedabad, India
[3]Lecturer Government Physiotherapy Collage Ahmedabad, India
[4]Senior Lecturer Government Physiotherapy College Ahmedabad, India
[5]Principal at Government Physiotherapy College Ahmedabad, India

***Corresponding Author:** akshitvirani1@gmail.com

DOI: https://doi.org/10.63299/ijopt.060461

ABSTRACT

Background: Smartphones are used by most people worldwide, especially young adults aged 18-49. Smartphone addiction occurs when people use their phones excessively and cannot control their use, leading to problems in their daily lives and relationships. College students are at a higher risk because they depend heavily on smartphones for studying, socializing, and entertainment. High usage rates have been correlated with an increased risk of depression, anxiety, sleep disorders, decreased academic performance, and musculoskeletal issues. This is especially concerning among populations where physical and mental health are essential, such as healthcare students. Physiotherapy students may be particularly affected because they need to stay physically and mentally healthy to become good healthcare providers.

Objective: To determine whether the screen time threshold is linked to an increased risk and to investigate the relationship between daily screen time and the degree of smartphone addiction among physiotherapy students.

Methods: A cross-sectional study was conducted among 236 physiotherapy students (aged 17–24 years) in Gujarat, India. Smartphone addiction was assessed using the Smartphone Addiction Scale–Short Version (SAS-SV), and screen time was objectively tracked using built-in monitoring applications. Descriptive statistics, Pearson and Spearman correlations, analysis of variance (ANOVA) with post hoc testing, and receiver operating characteristic (ROC) curve analyses were performed.

Results: Participants reported a mean daily screen time of 4.74 ± 2.22 hours (range 0.2–19.0) and mean SAS-SV scores of 28.13 ± 9.25 (range 10–55). A weak but statistically significant positive correlation was found between screen time and smartphone addiction (Pearson's $r = 0.173$, $p = 0.008$; Spearman's $\rho = 0.133$, $p = 0.041$). Students with >6 hours/day of screen time (11.0% of the sample) showed significantly higher addiction scores (31.8 ± 11.1) than their peers with ≤6 hours/day (27.6 ± 8.8, $p < 0.001$, Cohen's $d \approx 0.46$). ROC analysis identified six hours/day as a practical threshold for high-risk addiction, with an AUC of 0.68.

Conclusion: Daily screen time was positively associated with smartphone addiction severity among physiotherapy students. Screen use exceeding six hours/day represents a critical risk marker, highlighting the need for targeted preventive strategies and the integration of digital wellness into healthcare education.

Keywords: smartphone addiction, screen time, physiotherapy students, Smartphone Addiction Scale, digital wellness, behavioral health

INTRODUCTION

Recent estimates suggest that there are approximately 7.21 billion smartphone users globally, representing approximately 90% of the world's population, with 97% of users between 18 and 49 years of age utilizing smartphones. [1] Smartphone addiction encompasses four main components: obsessive phone use involving repetitive checking for messages or updates; tolerance requiring longer and more intense usage; withdrawal characterized by feelings of agitation or distress without the device; and functional impairment that interferes with other life activities and face-to-face social relationships. [2]

Young adults and university students are particularly vulnerable to smartphone addiction because they rely heavily on these devices for academic, social, and recreational activities. High usage rates have been correlated with an increased risk of depression, anxiety, sleep disorders, decreased academic performance, and musculoskeletal issues. This is especially concerning among populations where physical and mental health are essential, such as healthcare students. [3]

Problem Statement

Recent research has demonstrated alarmingly high rates of smartphone addiction in academic environments, with nearly 30–47% of health sciences and allied health students classified as addicted and over 50% at high risk. These numbers are anticipated to rise as digital learning and remote communication become more entrenched in higher education. [4,5] Prolonged and unregulated smartphone use is linked to poor mental health, diminished academic achievement, sleep disturbances and physical complaints. Given the critical importance of these dimensions in training future healthcare professionals, this issue warrants focused investigation and intervention. [5,6]

Previous Studies on Smartphone Addiction

Numerous studies have established smartphone addiction as a growing public health concern among university students, demonstrating an association with increased screen time, sleep disorders, decreased concentration, and musculoskeletal disorders. While this problem is well documented in the general student population, research remains comparatively limited regarding physiotherapy students specifically. [4-7]

Screen Time as a Predictor

Screen time has emerged as a significant predictor and correlate of smartphone addiction. Both the duration and patterns of daily use were associated with higher addiction scores and health complications. Many existing studies have employed cross-sectional methodologies to examine these relationships. [6,8]

Gaps in Current Research

There is a notable absence of research focusing specifically on physiotherapy students, who may be uniquely affected by smartphone addiction because of their training in physical health and rehabilitation. Few studies have examined the complex interactions between screen time, addiction, and health outcomes in this population, creating a clear need for targeted research. [5,6]

Research Question and Hypotheses

Research Question: What is the relationship between daily screen time patterns and smartphone addiction levels among physiotherapy students?

Hypotheses:

•Primary Hypothesis: There is a positive correlation between daily screen time and smartphone addiction scores among physiotherapy students; as screen time increases, addiction scores will correspondingly increase.

•Secondary Hypothesis: Students in higher screen time categories will demonstrate a significantly increased likelihood of being classified as smartphone-addicted compared to those with lower usage patterns.

METHODOLOGY

Study Type: A cross-sectional observational study was conducted to examine the relationship between daily screen time and smartphone addiction among physiotherapy students.

Study Duration: The study was conducted over a 4-month period from January to April 2025, with a 2-week data collection period for each participant.

Population: Undergraduate physiotherapy students enrolled in all academic years (1st to 4th year) of the Bachelor of Physiotherapy Programme.

Sampling Technique: Random sampling was used to recruit eligible participants from the target population.

Sample Size: Based on the correlation analysis requirements, assuming a moderate correlation ($r \geq 0.20$) with 80% statistical power and $\alpha = 0.05$, the minimum required sample size was calculated as 194 participants. To account for potential dropouts and non-responses, 250 students were approached, and 236 completed the study protocol, yielding a 94.4% response rate.

As this was a nonexperimental, survey-based study with voluntary participation and anonymized data collection, formal ethical approval was not required. However, all procedures adhered to the ethical principles for research involving human participants, and written informed consent was obtained from all participants prior to data collection.

Participants and Sampling

The study population included undergraduate physiotherapy students enrolled in all academic years of the program at university. Although participants were recruited from a single institution, they represented diverse geographic backgrounds from across Gujarat state, enhancing the regional representativeness of the findings.

Inclusion criteria

- Students willing to participate voluntarily
- Aged between 17–24 years
- Regular smartphone users with internet connectivity
- Enrolled in the physiotherapy program
- Having screen time tracking applications installed on their smartphones

Exclusion criteria

- Students without personal smartphones
- Irregular smartphone users
- Individuals with diagnosed psychological conditions
- Students undergoing treatment for addiction-related disorders

The sample size was determined based on the requirements of correlation analysis. Assuming a moderate correlation ($r \geq 0.20$), with 80% statistical power and $\alpha = 0.05$, the minimum required sample size was 194 participants. To account for potential dropouts, 250 students were approached, and 236 completed the study protocol, yielding a 94.4% response rate.

Data Collection Instruments

Smartphone Addiction Scale–Short Version (SAS-SV): A validated 10-item questionnaire used to measure smartphone addiction. The items cover domains including daily life disturbance, withdrawal, cyberspace-oriented relationships, overuse, and tolerance. Responses were recorded on a 6-point Likert scale (1 = strongly disagree, 6 = strongly agree), yielding scores ranging from 10–60, with higher scores indicating greater addiction severity. The SAS-SV has demonstrated strong psychometric reliability (Cronbach's $\alpha > 0.80$ in the validation studies).

Screen Time Monitoring: Screen time was objectively measured using built-in applications, Digital Wellbeing for Android, and Screen Time for iOS. These applications provide daily usage statistics, including the total screen time and app-specific activities. Data were collected continuously for two weeks, and the participants submitted their weekly reports.

Demographic Information: A structured questionnaire was used to collect basic details, including age and the presence of musculoskeletal or neurological conditions.

Data Collection Procedure

After obtaining informed consent, the participants completed the baseline demographic and the SAS-

SV questionnaires. Screen time monitoring began immediately, and participants were guided on the correct reporting procedures. Weekly follow-ups ensured compliance and accuracy of data reporting. At the end of the two-week monitoring period, participants submitted their complete screen time reports and repeated the SAS-SV assessment to confirm the stability of their addiction scores.

Statistical Analysis

Data were analyzed using the appropriate statistical software. Statistical significance was set at $p < 0.05$. Descriptive statistics (mean, standard deviation, range, median, and interquartile range) were used to summarize the participants' characteristics, screen time, and SAS-SV scores. The normality of continuous variables was tested using the Shapiro–Wilk test and visual inspection of histograms and Q–Q plots.

Primary Analysis: The correlation between daily screen time and SAS-SV scores was examined using Pearson's correlation (for normally distributed data) and Spearman's rank correlation (for non-parametric data). Ninety-five percent confidence intervals for the correlation coefficients were computed using Fisher's z-transformation.

Secondary Analysis: Participants were categorized into four screen time groups (<2h, 2–4h, 4–6h, and >6h per day). Between-group differences in SAS-SV scores were analyzed using one-way analysis of variance (ANOVA) or Kruskal–Wallis tests, depending on the distribution of the data. Post-hoc multiple comparison tests were performed to identify significant differences between the groups.

Threshold analysis: Two different thresholds were tested for their ability to predict higher addiction severity to determine a practical screen time risk cutoff. Cohen's d was calculated to assess effect sizes. Receiver operating characteristic (ROC) curve analysis was used to evaluate the sensitivity and specificity of the screen time cutoffs for identifying students at high risk (SAS-SV ≥ 35).

RESULTS

Participant Characteristics

The final sample included 236 physiotherapy students (mean age 19.1 ± 1.7 years, range 17–24), of whom 181 were female (76.7%) and 55 were male (23.3%) [Table 1].

Table 1: Participant Characteristics (n = 236)

Variable	Value
Age (years)	19.1 ± 1.7 (range: 17–24)
Gender	Female: 181 (76.7%) Male: 55 (23.3%)

Smartphone Addiction Scores

The SAS-SV scores averaged 28.13 ± 9.25 (SD) (range, 10–55). The distribution of addiction scores was slightly right-skewed (Shapiro–Wilk p=0.003); however, for summary and analyses, we report the mean ± SD as is customary [Table 2].

Table 2: Descriptive Statistics of Smartphone Addiction (SAS-SV) and Screen Time

Variable	Mean ± SD	Median (IQR)	Range	Normality Test
SAS-SV Score	28.13 ± 9.25	~28 (22.0-34.0)	10 – 55	Shapiro–Wilk W = 0.981, p = 0.0035
Screen Time (hrs/day)	4.74 ± 2.22	4.5 (3.3–6.1)	0.2 – 19.0	Mildly right-skewed

Screen Time Patterns

Daily screen time analysis across 3,304 person-day observations (236 students × 14 days) revealed a mean of 4.74 ± 2.22 h per day, with a median of 4.5 h (interquartile range, 3.3–6.1). This indicates that most students had moderate use, with fewer at the very low or very high extremes [Figure 1].

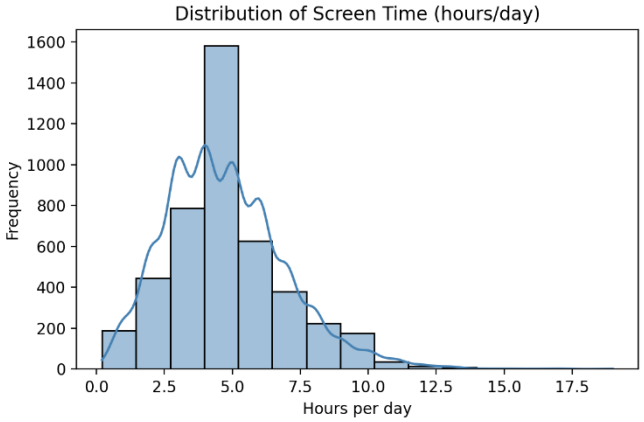

Figure 1: Distribution of average daily screen time among physiotherapy students (n = 236) across 3,304 person-days.

Correlation Analysis

Pearson's correlation showed a weak but statistically significant positive association between daily screen time and the SAS-SV score (r = 0.173, 95% CI [0.044, 0.298], p = 0.008, n = 236). Spearman's ρ also indicated a weak positive relationship, ρ(234) = 0.133, 95% CI [0.003, 0.258], p = 0.041. In both cases, more screen time was associated with higher addiction scores, although the effect size was small (by Cohen's conventions, r≈0.17 indicates a small correlation) [Figure 2].

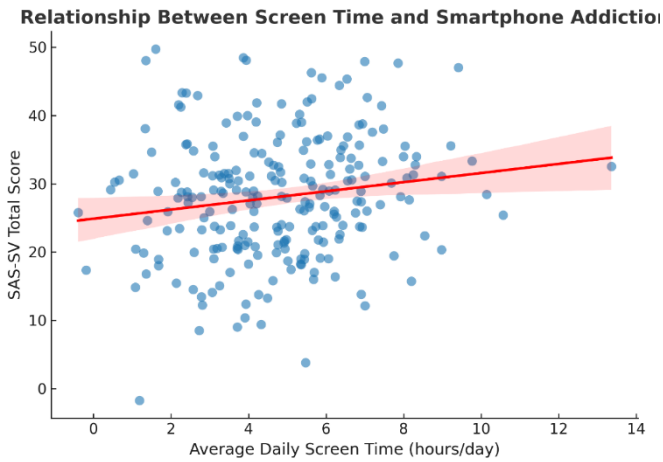

Figure 2: Scatter plot showing the relationship between daily screen time and smartphone addiction severity (SAS-SV score). A weak but statistically significant positive correlation was observed (Pearson's r = 0.173, p = 0.008).

Categorical Screen-Time Groups

Grouping students by daily screen time revealed progressively higher addiction scores with increased usage time [Table 3].

Table 3. Screen Time Categories and Mean SAS-SV Scores

Screen Time Group	n	SAS-SV Mean ± SD
<2 hours/day	5	21.2 ± 7.4
2–4 hours/day	80	27.1 ± 8.4
4–6 hours/day	125	28.3 ± 9.2
>6 hours/day	26	31.8 ± 11.1

ANOVA: F(3,232) = 4.82, p = 0.003. Post-hoc: The >6h group had significantly higher values than all other groups.

A one-way ANOVA indicated significant differences among the groups (F(3,232) = 4.82, p = 0.003). Post-hoc Tukey testing showed that the >6h group scored significantly higher than all other groups. The effect size was small (η = 0.059). Notably, the <2 hours/day group included only five participants; therefore, the findings for this subgroup should be interpreted with caution [Figure 3].

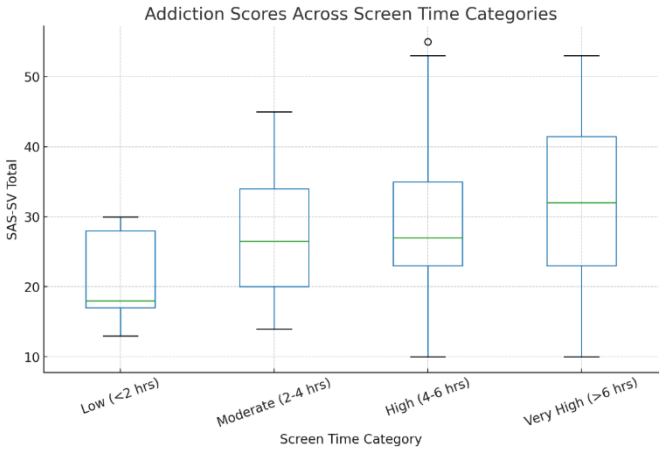

Figure 3: Box plot of SAS-SV scores by screen time category. The mean addiction scores increased progressively from low (<2h) to very high (>6h) usage. The >6h/day group had significantly higher scores than all other categories (ANOVA F = 4.82, p = 0.003).

High Screen-Time Threshold Analysis

Students exceeding this threshold demonstrated significantly higher addiction scores than those at or

below 6 hours (31.8 ± 11.1 vs. 27.6 ± 8.8, p = 0.03, Cohen's d = 0.46), a small-to-moderate effect. A substantially greater proportion of the >6h group had high addiction levels: 61.5% of >6h users were above the sample median SAS-SV versus 45.2% of ≤6h users; similarly, 34.6% of >6h users were above the 75th percentile of SAS-SV (compared to 22.4% of ≤6h).

Mean difference: >6h mean SAS-SV = 31.8 (SD 11.1) vs ≤6h = 27.6 (SD 8.8), p < 0.001, d = 0.42.

High-risk proportions: 61.5% of >6h students scored above the median SAS-SV (versus 45.2% of ≤6h); 34.6% vs. 22.4% were above the 75th percentile.

ROC analysis: Using SAS-SV ≥35 to define "high addiction risk," the area under the ROC curve was 0.68 (95% CI 0.59–0.77). The 6h cutoff yielded 69.8% sensitivity and 61.7% specificity for predicting high-risk status.

Overall, these results indicate a modest but significant positive relationship between screen time and addiction scores. Students exceeding 6 h/day represent a higher-risk subgroup (mean score ~32, ~35% in the top quartile) deserving of targeted attention [Figure 4].

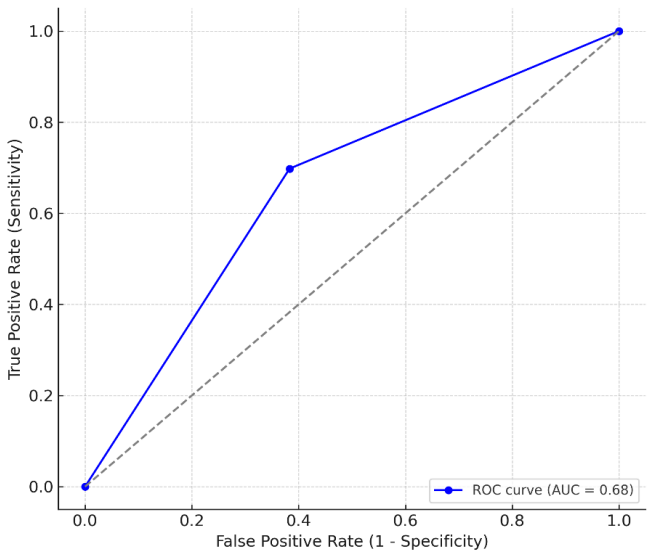

Figure 4: Receiver Operating Characteristic (ROC) curve for >6 hours/day screen time predicting high smartphone addiction (SAS-SV ≥ 35). The area under the curve (AUC) was 0.68 (95% CI: 0.59–0.77), with a sensitivity of 69.8% and specificity of 61.7%.

DISCUSSION

This study examined the relationship between daily screen time and smartphone addiction among physiotherapy students and identified specific usage thresholds associated with a heightened risk. The results showed a weak but statistically significant positive correlation between the severity of smartphone addiction and the average daily screen time. Crucially, students who reported using their smartphones for more than six hours a day showed significantly higher addiction scores, making them a high-risk group.

Clinical Significance for Physiotherapy Practice

The 6-hour daily screen time threshold identified in this study has important clinical implications. Physiotherapy students exceeding this threshold showed not only higher addiction scores but also an increased risk of developing musculoskeletal problems that could affect their future clinical practice. As healthcare professionals who will treat patients with posture-related disorders, these students must maintain their physical health to provide effective care and serve as role models for healthy lifestyle behaviors.

Comparison with Previous Research

The observed mean daily screen time of 4.74 hours in this cohort aligns with recent reports on university students, where typical use ranges between 4 and 6 hours per day [8]. Similarly, the mean SAS-SV score of 28.1 is consistent with the values reported among health sciences students in India, where average scores typically fall between 26 and 30. [3,5] This weak but significant correlation (Pearson's r = 0.173) corroborates prior research showing that screen time contributes to, but does not solely determine, smartphone addiction. [6,7] These results support the multifaceted nature of smartphone addiction, in which usage patterns interact with social, psychological, and academic demands.

The categorical analysis provides additional insights into this. Consistent with earlier cross-sectional studies, our results revealed a dose-response relationship, with progressively higher addiction scores as screen time increased. [4] In particular, students exceeding six hours of daily screen time scored an average of 31.8 on the SAS-SV, which was substantially higher than their peers in the lower screen time categories. This finding mirrors reports

that prolonged daily usage (>6 hours) is linked to addiction, musculoskeletal pain, postural problems, and sleep disturbances. [2,8]

Implications for Physiotherapy Students

These findings have significant implications for the education of physiotherapy students. These students are expected to set an example of responsible technology use and remain cognizant of posture, ergonomics, and mental health as future medical professionals with a focus on physical rehabilitation. Excessive smartphone use, particularly beyond six hours daily, may predispose them to forward head posture, text neck, and reduced sleep quality, which are detrimental to both personal health and professional credibility. Moreover, addiction-related academic disruptions could compromise their educational performance, a concern that resonates with studies showing diminished concentration and learning outcomes among high smartphone users. [3]

Possible Explanations for Findings

The weak correlation between screen time and addiction suggests that, although time spent on smartphones is an important predictor, other psychosocial variables, such as academic stress, peer influence, personality traits, and coping strategies may also influence addiction severity. Although there are nonlinear patterns among extreme users, the Pearson coefficient, which is marginally stronger than Spearman's ρ, suggests a primarily linear relationship. This intricacy emphasizes the necessity of comprehensive interventions, as opposed to straightforward methods, for reducing screen time.

Clinical Implications and Recommendations

The outcomes of this study have important implications for physiotherapy education and for student well-being.

1.Targeted Interventions for High-Risk Students: Students who spend more than six hours a day in front of screens are at risk. To lessen this dependency, customized interventions such as mindfulness exercises, time management classes, or app-based usage tracking should be implemented.

2.Institutional Policies and Support: Colleges can organize workshops, awareness campaigns, and counseling services that focus on the risks of smartphone overuse. Creating designated “tech-free zones” or periods during academic hours may also help reduce unnecessary screen time use.

3.Role Modeling by Faculty and Clinicians: Physiotherapists and faculty members should actively set an example of good technology use, stressing the value of balanced screen time for both personal and professional credibility.

4.Curriculum Integration: Physiotherapy programs should consider incorporating modules on digital wellness, ergonomics, and responsible technology use. These initiatives would encourage students to adopt balanced smartphone habits and prevent posture-related complications linked to excessive use.

5.Future Research Directions: Longitudinal and interventional studies are recommended to establish causal relationships and test the effectiveness of digital health promotion strategies among healthcare students. Comparative research across multiple institutions would improve the generalizability of these findings.

Study Limitations

This study had several limitations. First, screen time was objectively measured, this study did not distinguish between academic and recreational smartphone use. Second, psychological factors, such as stress levels and coping mechanisms, were not assessed. Finally, the small sample size in the lowest screen time category (<2h, n=5) limits the reliability of comparisons for this subgroup.

CONCLUSION

The findings of this study demonstrated a statistically significant positive correlation between daily screen time and smartphone addiction severity among the physiotherapy students. Importantly, a screen time exceeding six hours per day emerged as a meaningful threshold for elevated addiction risk. Although the strength of the association was modest, the results highlight the urgent need for awareness, targeted preventive measures, and academic-level interventions to address excessive smartphone use in healthcare educational settings. By promoting digital wellness and balanced technology habits, physiotherapy programs can safeguard students’ academic and physical health and prepare future healthcare professionals to model responsible device

use in clinical and community settings. Future longitudinal studies should examine the effectiveness of targeted interventions for students exceeding the 6-hour threshold and explore the long-term impact of smartphone addiction on clinical practice.

Declaration by Authors

Acknowledgments

We thank the Government Physiotherapy College, Ahmedabad, and all the students who participated in this study for their support. We also express our gratitude to our principal and guide for their valuable guidance throughout this research.

Source of Funding

None

Conflict of Interest

The authors declare no conflict of interest.

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