STM JOURNALS

Research & Reviews: A Journal of
Bioinformatics

ISSN: 2393-8722
Volume 12, Issue 2, 2025
May—August
DOI (Journal): 10.37591/RRJoBI

https://journals.stmjournals.com/rrjobi

Research RRJoBI

A Correlational Analytical Study on Smartphone Usage, Physical Activity, and Sleep Quality Among Health Science Students

P.R. Vigashini[1,*], Thanushree C.L.[2], M. Syed Afroz[2], Merina Basnet[2], Harshith Vivek[2], Nisuvaya S.[2]

Abstract

Introduction: *Physical activity refers to any bodily movement generated by skeletal muscles that results in the use of energy. It is considered risk factor for various cardiovascular disease leading to higher mortality and morbidity. Sleep is naturally occurring condition marked by a change in consciousness, a significant reduction in sensory activity and the suppression of most voluntary movements. Technological advancements over the past two decades have resulted in rise in smartphone usage which has both positive and negative impact in students.* ***Objective:*** *To measure physical activity, sleep quality and smartphone usage among undergraduate students using objective tools. (IPAQ, PSQI, SAS-SV)* ***Methods:*** *The study included a sample size of 278 subjects and was conducted over a duration of two months. Participants were selected based on specific inclusion and exclusion criteria.* ***Inclusion Criteria:*** *Inclusion criteria for the study were individuals aged between 18 and 25 years, including both males and females. Exclusion criteria included any physical or mental condition that limited motor, sensory, or cognitive abilities; the presence of a primary sleep disorder, such as primary insomnia; and any neurologic or medical disorder diagnosed within the past six months.* ***Exclusion Criteria:*** *It's included individuals with insomnia, any known neurological disorders, and those currently taking medications* ***Conclusion:*** *In conclusion, the study demonstrated a significant inverse correlation between smartphone usage and sleep quality, as well as a positive association between physical activity and improved sleep quality among undergraduate health science students.*

Keywords: Physical activity, sleep quality, smartphone usage, PSQI, IPAQ, SAS-SV

INTRODUCTION

Physical activity is given as the "any movement of the body produced by skeletal muscles that leads to the energy expenditure" [1, 2]. It is divided into three primary subcategories: high/vigorous intensity (more than 6.0 METs/more than 7kcal/min) moderate intensity (3.0–6.0 METs/3.5–7 kilocal/min) and less intensity (up to 3.0 METs/and up to 3.5 kcal/min) [2]. Non-communicable lifestyle diseases, like Diabetes and joint diseases, are often the result of insufficient physical activity and physical inactivity is considered a risk factor for cardiovascular disease resulting in higher mortality and morbidity in the world [2, 3]. 36.9% of Indians are found to be physically inactive as per the study published recently [2, 3].

WHO recommends a minimum of 150–300 minutes of moderate-intensity or 75–100 minutes of vigorous-intensity aerobic physical activity throughout the week. According to the research carried out by the Indian Council of Medical

***Author for Correspondence**
P.R. Vigashini
E-mail: vigashinipr@gmail.com

[1]Associate Professor Department of Physiotherapy, Aditya College of Physiotherapy, Maharashtra, India
[2]BPT Intern, Department of Physiotherapy, Aditya College of Physiotherapy, Maharashtra, India

Received Date: January 11, 2025
Accepted Date: April 03, 2025
Published Date: June 02, 2025

Citation: P.R. Vigashini, Thanushree C.L., M. Syed Afroz, Merina Basnet, Harshith Vivek, Nisuvaya S. A Correlational Analytical Study on Smartphone Usage, Physical Activity, and Sleep Quality Among Health Science Students. Research & Reviews: A Journal of Bioinformatics. 2025; 12(2): 22–32p.

Research, an analysis of Physical Activity behaviors among adults throughout India was conducted. The findings revealed that among 14227 participants examined 54.4% were classified as inactive, 31.9% as active, and 13.7% were highly active. This trend raises concerns, as the proportion of the inactive population seems to be notably substantial. A total of 259 medicine students aged 18–22 were surveyed using the Physical Activity Questionnaire (IPAQ). The findings stated that 41.3% has shown high levels of physical activity, 43.2% showed moderate levels and 15.4% displayed low levels of physical activity [3–5].

Sleep is a vital restorative process for the human body, rejuvenating the mind and alleviating tiredness [5, 6]. It is estimated that individuals spend around one-third of their lives sleeping. Adequate sleep is considered one of the three fundamental pillars of good health by the Global community, with insufficient or poor sleep posing significant health risks [6]. The detrimental effects of insomnia and chronic sleep irregularities are substantial. Recent research indicates that among students, those who averaged less than 9 hours of sleep per night showed reduced brain regions associated with memory, intelligence, and overall, well–being compared to their well-rested friends [7–10]. Notably, these differences remained evident two years later, suggesting that sleep deprivation can lead to lasting cognitive impairments. Thus, the quality of sleep is undeniably a critical factor in maintaining human health [8–11].

Sleep is a naturally occurring condition marked by a change in consciousness, a significant reduction in sensory activity, and the suppression of most voluntary movements. Sleep significantly influences the functioning of an organism and is crucial for both cognitive and systemic physiological processes within the body [12]. Disruption in sleep quality may indicate the presence of underlying medical issues or could result in significant complications, potentially being directly or indirectly linked to mortality. Insufficient sleep can have adverse effects on regular growth, cognitive function, and physiological processes, including immunity [13]. A night of sufficient and uninterrupted sleep is essential for both physical and mental health. College is frequently considered a challenging period in an individual's life as they navigate the crucial transition from adolescence to adulthood. University life is marked by various lifestyle and behavioral adjustments, including moving away from home, leading to more independence and less oversight, increased social engagements, alterations in friend circles, rigorous academic timetables, and sometimes the emergence of unhealthy habits like substance misuse. As an outcome of these lifestyle and behavioral modifications, college students are especially prone to experiencing insufficient sleep and experiencing notable disruptions in both the amount and quality of their sleep [7–14].

According to WHO individual aged between 18 to 35 years needs 7 to 8 hours of sleep per night. A recent study conducted across 26 countries revealed that 59.2% of university students have a sleep duration of less than 6 hours. Moreover, 55–60% of university students claim to have poor quality sleep, with 43%stating that it takes more than 30 minutes to fall asleep at least once a week. As academic pressures and stress levels rise, the quality of sleep among students continue to decline [8–15].

Technological advancements over the past two decades have resulted in a rise in internet, smartphone, and social media use, ultimately contributing to the prevalence of a sedentary lifestyle that discourages physical activity [9]. In addition to the convenience that smart phones offer in various aspects of life, like business, education, entertainment, communication, and commerce, the growing amount of time spent in the phone has raised concerns about addiction among individuals. Research indicates that the utilization of smartphones leads to a rise in phone addiction among individuals, resulting in various physical and mental health issues yet fostering collaboration and knowledge exchange among students [9–16].

Excessive smartphone use resulting in mobile phone addiction diminishes not only the quality of sleep and triggers negative feelings, like burnout and procrastination, but also amplifies screen time and sedentary habits, ultimately disrupting the different types of physical activities among college students.

Students who are addicted to their mobile phones often find themselves engaging in various activities, such as browsing the internet and performing technical tasks which can lead to a decrease in physical activity. As a result, their time and resources are consumed by excessive screentime and sedentary behaviours (Tables 1-6) [8–17].

Consequently, individuals who are addicted to their phones may lack the motivation and interest to exercise regularly resulting in physical activity levels that fall below the recommended standards. This addiction to mobile phones can contribute to an increase in sedentary behaviour and a decrease in physical activity creating a cycle that is difficult to break. This detrimental cycle can greatly impair the sleep quality of college students. The incidence of inadequate sleep quality linked to smartphone use has risen markedly, especially since the COVID-19 pandemic [8]. Adolescents and young adults are the most frequent users of smartphones. Studies on college-aged individuals indicate that this group spends 4 to 8 hours daily using these devices with the most frequent users engaging with their smartphone almost constantly [10].

AIMS

- The aim of the study is to assess the relationship between physical activity levels, smartphone usage and sleep quality among health science students and how they show an impact on each other.

OBJECTIVES

- To evaluate the physical activity levels, sleep quality and mobile usage among health science students.
- To determine the higher levels of physical activity correlate with better sleep quality and reduced smartphone usage.

METHODS & METHODOLOGY

Questionaries were given to health sciences students of Aditya institutions through google form to collect the sample.

SCALES

- International Physical Activity Questionnaire (IPAQ).
- Pittsburgh Sleep Quality Index (PQSI).
- Smartphone Addiction Scale-Short Version Scale (SAS-SV).
- *Study Type:* Observational Study.
- *Study Design:* Analytical correlational study.
- *Study setting:* Aditya Group of Institutions.
- *Sample size:* 278 subjects.
- *Study Duration:* 2 months.
- *Materials Used:* Google Form Questionnaire

SELECTION CRITERIA

Inclusion Criteria

- *Age:* 18–25 years.
- *Gender:* both male and female.

Exclusion Criteria

- Physical and mental condition that limits motor, sensory, or cognitive abilities
- Primary sleep disorder (example: primary insomnia)

Any neurologic or medical disorder less than six months.

PROCEDURE

The study design was correlational and analytical which aimed to examine the relationship between physical activity, sleep quality, and smartphone usage among undergraduate health science students. The data was collected through survey method. 278 undergraduate health science students were taken in this study. The informed consent was obtained from each participant. Inclusion criteria were age 18 to 25 years and gender both male and female were included. Exclusion criteria were specified as physical and mental condition that limits motor, sensory or cognitive abilities, primary sleep disorders, such as insomnia, and any neurologic or medical disorder less than six months. The sample size was determined at 278 through the sample size calculator. Physical activity was measured through International Physical Activity Questionnaire (IPAQ), whereas sleep quality and smartphone usage were measured through Pittsburgh [18].

Sleep Quality Index (PSQI) and Smartphone Addiction Scale-short version scale (SAS-SV). For the full version of these forms, please refer to the annexure section. Participants were recruited through google form questionnaire. They provide informed consent to participate in the study. They completed an online questionnaire that included sections on physical activity, sleep quality, and smartphone usage. Surveys were administered over a period of 2 months. The study was given approval by the ethics committee at the Aditya Institutions. Participants anonymity and confidentiality were maintained, and data were only used for research purposes. Data were kept securely on encrypted drives and correlational analysis using Pearson's correlation was performed (Figures 1-6).

RESULT

- *Statistical analysis:* A significant negative correlation was found between physical activity (measured in MET minutes) and sleep quality (PSQI scores) (Figure 7). Pearson's correlation coefficient (rrr) was −0.5625–0.5625−0.5625 with a 95% confidence interval of −0.6379–0.6379−0.6379 to −0.4764–0.4764−0.4764. The coefficient of determination (R2R^2R2) was 0.3164, indicating that approximately 31.64% of the variance in sleep quality can be explained by physical activity levels. The correlation was statistically significant ($p < 0.0001$ $p < 0.0001$ $p < 0.0001$), confirming that individuals engaging in higher physical activity levels tend to report better sleep quality.
- A strong negative correlation was identified between physical activity (MET minutes) and smartphone usage (SAS) (Figure 8). Pearson's correlation coefficient (rrr) was −0.6639–0.6639−0.6639 with a 95% confidence interval of −0.7249–0.7249−0.7249 to −0.5926–0.5926−0.5926. The coefficient of determination (R2R^2R2) was 0.4408, suggesting that approximately 44.08% of the variance in smartphone usage can be explained by physical activity levels. The correlation was statistically significant ($p < 0.0001$ $p < 0.0001$ $p < 0.0001$), indicating that individuals with higher physical activity levels tend to have lower smartphone usage.
- A statistically significant but weak positive correlation was found between smartphone usage (SAS) and sleep quality (PSQI) (Figure 9). Pearson's correlation coefficient ($r = 0.3374r = 0.3374r = 0.3374$) suggests a mild relationship, with a 95% confidence interval ranging from 0.2288 to 0.4376. The coefficient of determination ($R2 = 0.1138$ $R^2 = 0.1138$ $R2 = 0.1138$) indicates that approximately 11.38% of the variance in sleep quality can be attributed to smartphone usage. The correlation was statistically significant ($p < 0.0001$ $p < 0.0001$ $p < 0.0001$), implying that higher smartphone usage is associated with poorer sleep quality.

Table 1. Gender wise distribution of study population.

Gender	Number of Students	Percentage
Male	79	28.4%
Female	199	71.6%
Total	278	100%

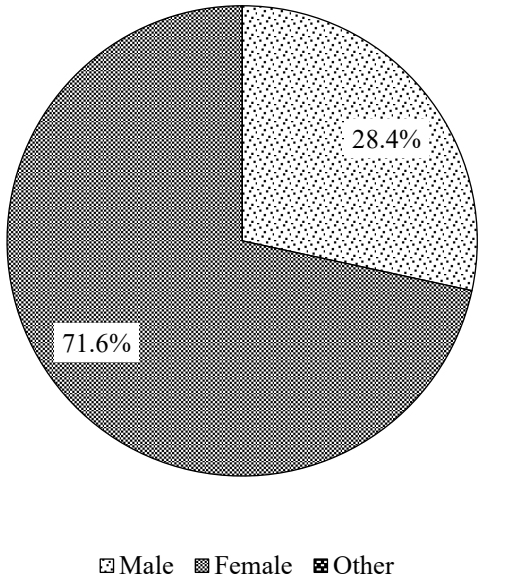

Figure 1. Gender wise distribution of study population.

Table 2. Department wise distribution of study population.

Department	Total Number of Students	Percentage
Physiotherapy	116	41.7%
Ahs	16	5.7%
Pharmacy	72	25.9%
Nursing	74	26.6%
Total	278	100%

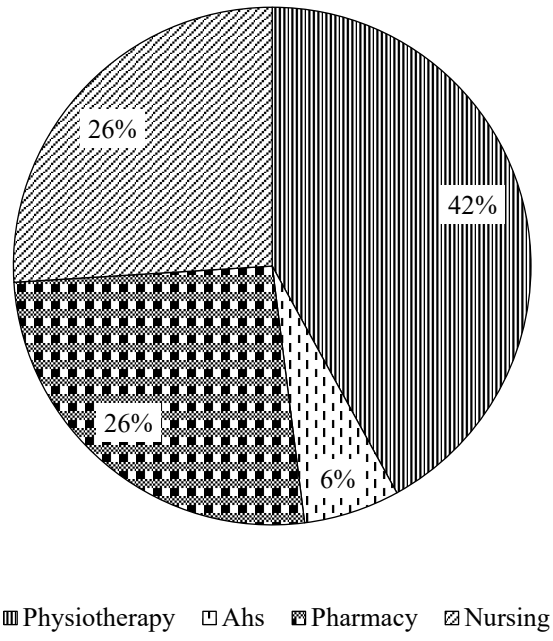

Figure 2. Department wise distribution of study population.

Table 3. Year wise distribution of study population.

Year	Total Number of Students	Percentage
1st Year	89	32.00%
2nd Year	45	16.20%
3rd Year	51	18.30%
4th Year	62	22.30%
5th Year	1	0.40%
Intern	30	10.80%
Total	278	100%

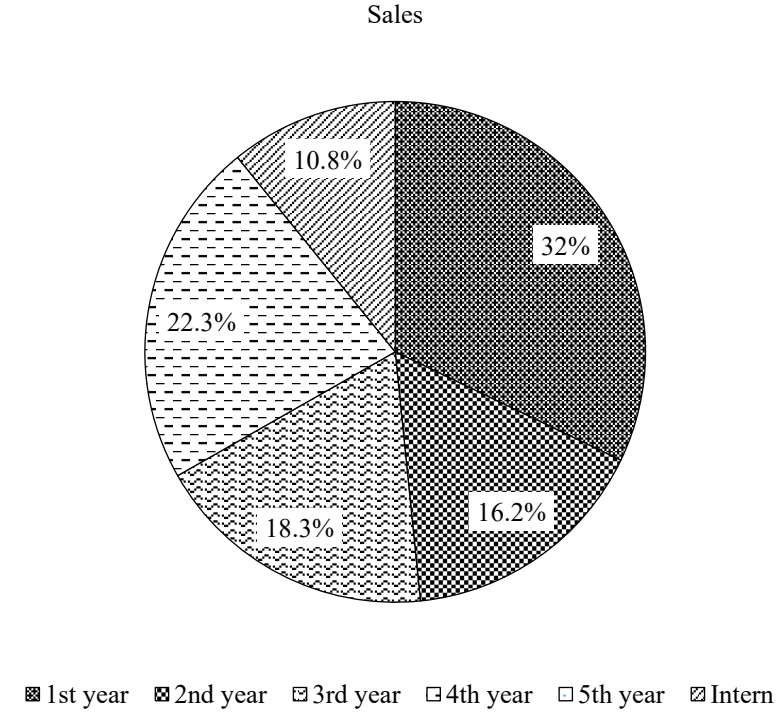

Figure 3. Year wise distribution of study population.

Table 4. Distribution of study population based on physical activity.

Department	Active	Inactive	Minimally Active	Mode
Physiotherapy	16	70	30	Inactive
AHS	2	9	5	Inactive
Pharmacy	8	44	20	Inactive
Nursing	10	54	10	Inactive
Total	36	177	65	Inactive

Table 5. Distribution of study population based on sleep quality.

Department	Number of Students with Good Sleep	Percentage	Number of Students with Poor Sleep	Percentage
Physiotherapy	53	19.06%	63	22.66%
AHS	4	1.43%	12	4.3%
Nursing	25	9%	49	17.62%
Pharmacy	32	11.56%	40	14.38%
Total	114	41.3%	164	59.7%

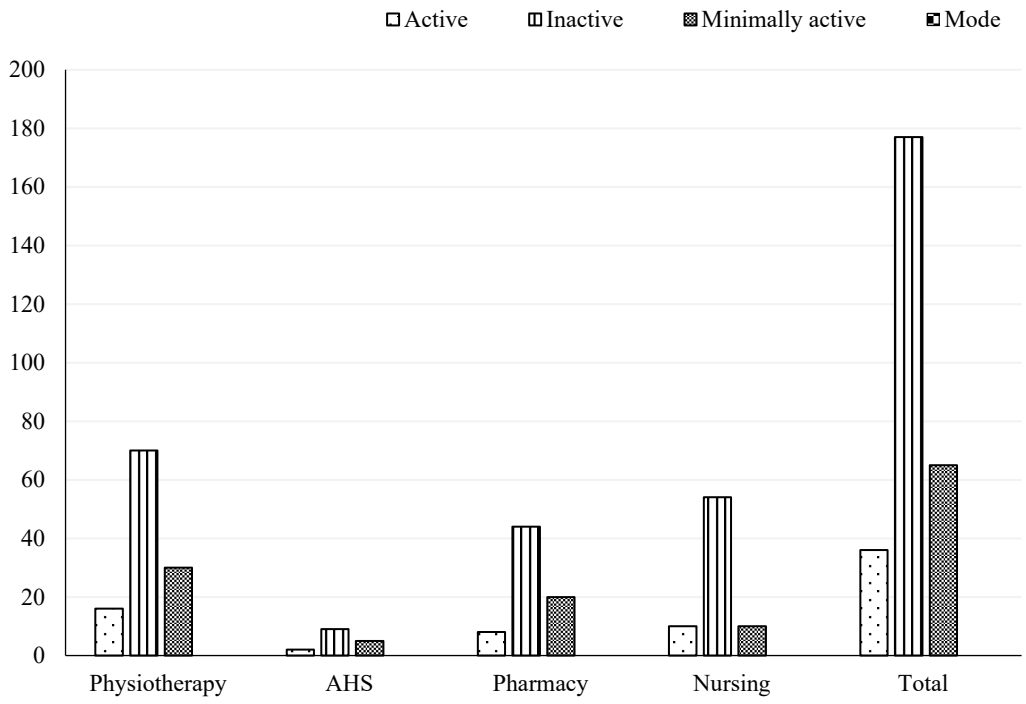

Figure 4. Distribution of study population based on physical activity.

Table 6. Distribution of population based on smartphone addiction.

Department	Highly Addicted	Moderately Addicted	Low Addiction	Mode
Physiotherapy	22	66	28	Moderately addicted
Ahs	2	11	3	Moderately addicted
Pharmacy	12	49	11	Moderately addicted
Nursing	16	52	6	Moderately addicted
Total	52	178	48	Moderately addicted

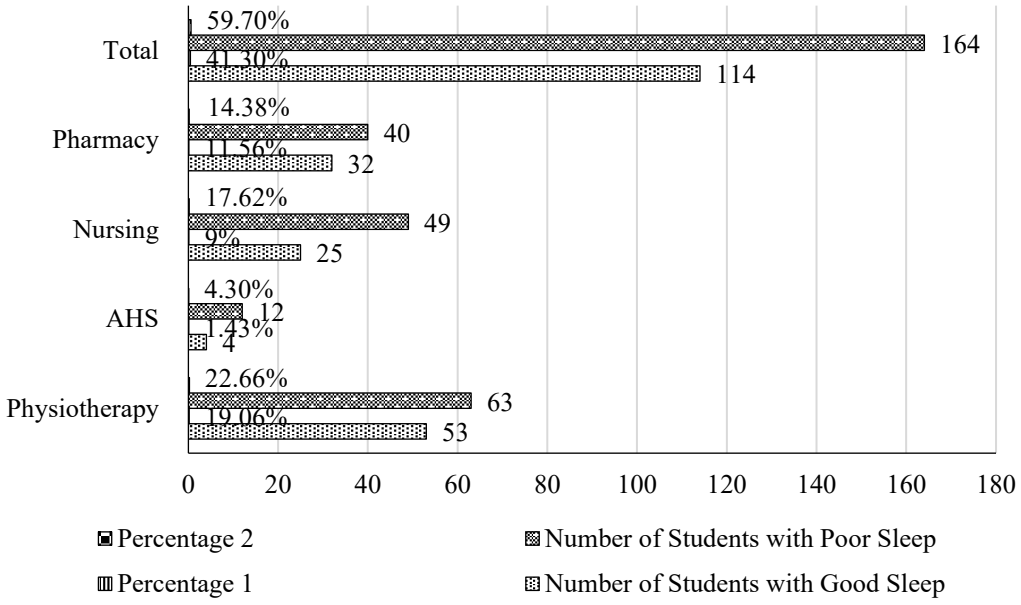

Figure 5. Distribution of study population based on sleep quality.

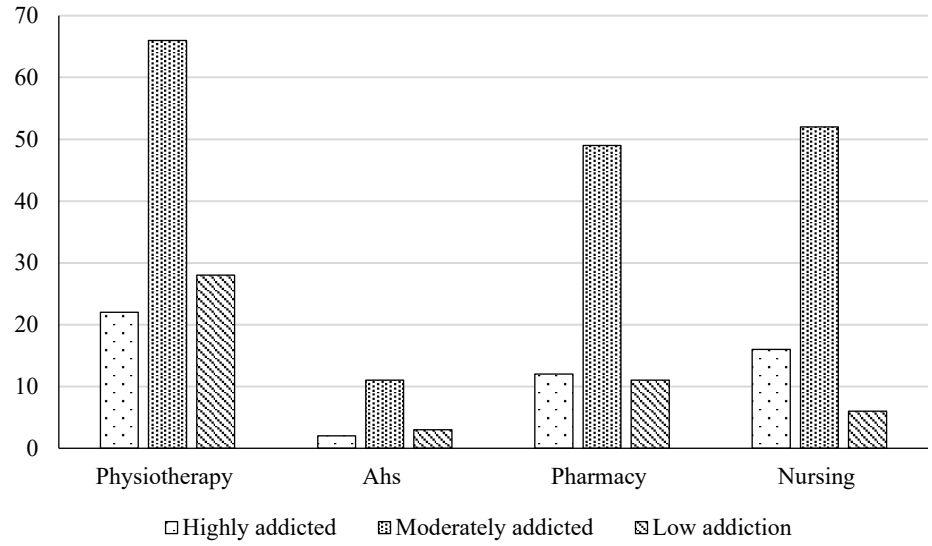

Figure 6. Distribution of population based on smartphone addiction.

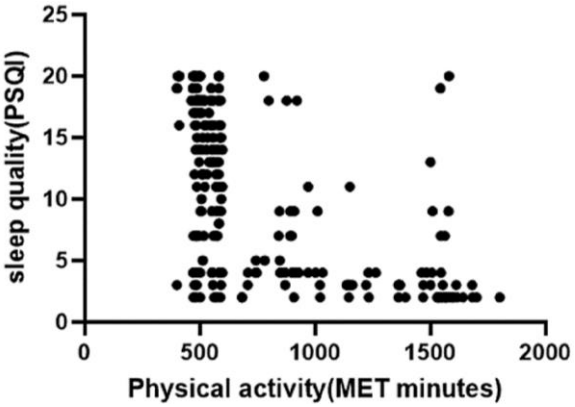

Figure 7. Sleep quality vs physical activity.

Pearson r r –0.5625 95% confidence interval
–0.6379 to –0.4764 R squared 0.3164
P value P (two-tailed) <0.0001
P value summary **** Significant? (alpha = 0.05)
Yes Number of XY Pairs 278

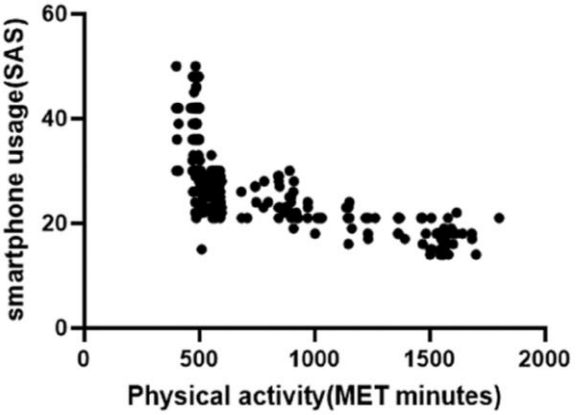

Figure 8. Smartphone usage vs physical activity.

Pearson r R –0.6639 95% confidence interval
–0.7249 to –0.5926 R squared
0.4408 P value P (two-tailed)
<0.0001 P value summary **** Significant? (alpha = 0.05)
Yes Number of XY Pairs 278

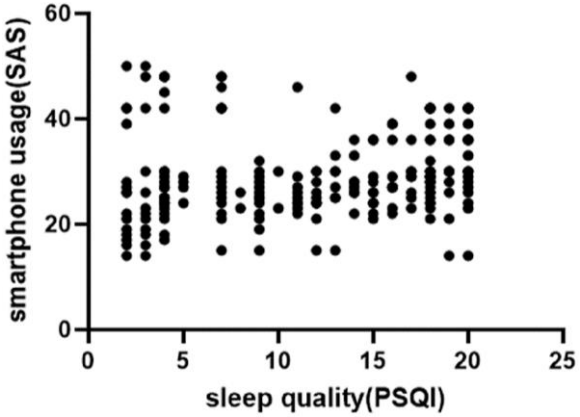

Figure 9. Smartphone usage vs sleep quality.

Pearson r R 0.3374 95% confidence interval
0.2288 to 0.4376 R squared 0.1138 P value
P (two-tailed) <0.0001 P value summary
**** Significant? (alpha = 0.05)
Yes Number of XY Pairs 278

The main purpose of this study was to investigate the connection between physical activity, sleep quality and phone usage among UG health science students. The study aimed to determine how these factors are interrelated and how they impact the well-being of students. Out of 278 students, 199 students account for female population with the percentage of 71.6%, and 79 students with male population having 28.4% according to Table 1 (Figure 1). From Table 2 (Figure 2), we can find physiotherapy students are more in comparison to other department i.e. 41.7%, followed by Nursing 26.6%, Pharmacy 25.9% and Allied Health Science 5.7% with reference to Table 3 (Figure 3). 1st year to 5th year and interns participated in this study. Out of which 32% is covered by 1st year, 16.2% by 2nd year, 18.3% by 3rd year, 22.3% by 4th year, 0.4% by 5th year student and 10.8% by interns. Study Population was distributed based on physical activity on Table 4 (Figure 4). International Physical activity Questionnaire was used m which we found higher number of students were inactive. 177 students were inactive, 65 students were minimally active, and 36 students were active. In Physiotherapy department out of 116 students, 16 were active, 70 were inactive and 30 were minimally active. In Allied Health science department, only 2 students were active, 9 students were inactive and 5 were physically active. In pharmacy department, 8 students were active, 44 students were inactive, 20 students were minimally active out of 72 students. In Nursing department, 10 students were active, 54 students were inactive, 10 students were active. This Table 4 shows that in every department the number of physically inactive students were more in comparison to minimally active and active students. In Table 5 (Figure 5), students were distributed according to their sleep quality. Pittsburgh Sleep Quality Index was used to evaluate the sleep quality of students, which says good sleep quality ranges from 0–10, and poor sleep quality ranges more than 11. With reference to this range, it was found that 114 students had good sleep accounting 41.3%., and 164 students had poor sleep with 59.7%. In every department most of students had poor sleep quality. Smartphone Addiction scale-Short Version (SAS-SV) was used to assess the smartphone usage among the students which was clarified in Table 6 (Figure 6). This scale uses 1 to 60 score to interpret the results. In this scale 10–30 score was determined as low addiction, 31–40 score as moderate addiction and more than 40 as high addiction. From Table 6 we

found that students were moderately addicted to smartphone followed by highly addicted and lower addiction. 178 students were reported moderate smartphone usage whereas 52 students were reported to be highly addicted and 48 students had low addiction of smartphone. The results showed a significant negative connection between the smartphone usage and sleep quality, suggesting that increased smartphone use is associated with poorer sleep quality. In contrast, physical activity was positively correlated with better sleep quality, although no strong relationship was found between physical activity and smartphone usage. These findings are consistent with previous research, which has shown that excessive smartphone use can negatively affect sleep quality by delaying bedtime and reducing sleep duration. Similarly, our results corroborate studies that have established the positive impact of physical activity on sleep quality. However, the lack of a significant correlation between physical activity and smartphone usage differs from studies that suggest a potential link between sedentary behavior and high screen time. The negative correlation between smartphone usage and sleep quality has important implications for health science students, whose academic demands may already place them at risk of sleep deprivation. Poor sleep quality could compromise cognitive function and academic performance, potentially hindering their training and future healthcare practice. Encouraging reduced smartphone use and promoting physical activity could, therefore, enhance students' overall well-being.

CONCLUSIONS

Based on these findings, universities and health professionals could implement educational programs plan of action that raise awareness about the risks of excessive smartphone use and the benefits of physical activity for sleep quality. These interventions could contribute to better mental and physical health outcomes for students. Future research should consider investigating these relationships longitudinally to better understand the casual links between smartphone usage, physical activity, and sleep quality. Additionally, objective measures of physical activity and smartphone usage could provide more accurate data to further support these findings. In conclusion, this study highlights the need to address smartphone overuse and promote physical activity among undergraduate health science students to enhance sleep quality and overall health, potentially improving their academic and future professional performance.

REFERENCES

1. Mahfouz MS, Ali SA, Bahari AY, Ajeebi RE, Sabei HJ, Somaily SY, et al. Association between sleep quality and physical activity in Saudi Arabian university students. Nat Sci Sleep. 2020 Oct 20;12:775–82.
2. Lele CD. The physical activity and sleep quality – a correlation analysis of young adults in India. Indian J Sci Technol. 2022 Mar 5;15(9):357–63.
3. B GB, Palla J, M SK, J SK. Evaluation of physical activity among medical students in South India. Eur J Cardiovasc Med. 2023 Jan 1;13(1).
4. Verma AK, Singh G, Patwardhan K. Patterns of physical activity among university students and their perceptions about the curricular content concerned with health: Cross-sectional study. JMIRx Med. 2022 Apr 29;3(2):e31521.
5. Pujitha V, Umashankar M, Rajshekhar B, Rao RL. A study to assess the relationship among sleep, physical health, psychological health, and quality of life among undergraduate students. Arch Ment Health. 2019 Jan 1;20(1):21–5.
6. Deka J, Das A, Das RR. A cross-sectional study on correlation of sleep quality with physical fitness and body mass index among young adults. Int J Acad Med Pharm. 2023;5(6):198–201.
7. Memon AR, Gupta CC, Crowther ME, Ferguson SA, Tuckwell GA, Vincent GE. Sleep and physical activity in university students: A systematic review and meta-analysis. Sleep Med Rev. 2021 Aug 1;58:101482.
8. Xu CY, Zhu KT, Ruan XY, Zhu XY, Zhang YS, Tong WX, et al. Effect of physical exercise on sleep quality in college students: mediating role of smartphone use. PLoS One. 2023 Nov 3;18(11):e0288226.
9. Ceylan A, Demirdel E. The relationship between academic performance and physical activity, smartphone use and sleep quality in university students. Clin Exp Health Sci. 2023;13(3):549–54.

10. Grimaldi-Puyana M, Fernández-Batanero JM, Fennell C, Sañudo B. Associations of objectively-assessed smartphone use with physical activity, sedentary behavior, mood, and sleep quality in young adults: A cross-sectional study. Int J Environ Res Public Health. 2020 May;17(10):3499.
11. Zhu W, Liu J, Lou H, Mu F, Li B. Influence of smartphone addiction on sleep quality of college students: The regulatory effect of physical exercise behavior. PLoS One. 2024 Jul 26;19(7):e0307162.
12. Ozcan B, Acimis NM. Sleep quality in Pamukkale University students and its relationship with smartphone addiction. Pak J Med Sci. 2021 Jan;37(1):206.
13. Dalal M, Madan J, Moitra P. Physical activity patterns and sleep patterns among school going children of age 10–12 years across Mumbai. Int J Physiol Nutr Phys Educ. 2019;4(2):209–15.
14. Gardani M, Bradford DR, Russell K, Allan S, Beattie L, Ellis JG, et al. A systematic review and meta-analysis of poor sleep, insomnia symptoms and stress in undergraduate students. Sleep Med Rev. 2022 Feb 1;61:101565.
15. Nowreen N, Ahad F. Effect of smartphone usage on quality of sleep in medical students. Natl J Physiol Pharm Pharmacol. 2018 Oct 1;8(9):1366.
16. Kurugodiyavar MD, Sushma HR, Godbole M, Nekar MS. Impact of smartphone use on quality of sleep among medical students. Int J Community Med Public Health. 2018 Jan;5(1):101–9.
17. Abdullah RY, Galary KM, Majid RA. Association between smartphone addiction and physical activity, sleeping hours among medical science students in Duhok City. Polytech J. 2020;10(2):10.
18. Chatterjee S, Kar SK. Smartphone addiction and quality of sleep among Indian medical students. Psychiatry. 2021 Apr 3;84(2):182–91.

