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Study on the Impact of Smartphone Use and Posture among College Students

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Smartphones have become an indispensable part of daily life among college students, but prolonged use, particularly during weekends, is often associated with poor postural habits and neck-related musculoskeletal complaints. The present study assessed smartphone usage patterns, postures adopted during use, associated ergonomic risk among 100 undergraduate students at the Community Science College and Research Institute (CSC&RI), Madurai, using a cross-sectional descriptive design. Data were collected over four consecutive weekends using a demographic questionnaire, the Daytime Smartphone Use Posture Questionnaire During Weekend (DT-SUP), the SmarTaxo taxonomy of 41 standardized postures, and a structured ergonomic risk-assessment protocol for each posture. Weekend smartphone use remained consistently high, averaging 363–372 minutes per day, with peak use between 12.00 p.m. and 6.00 p.m. ($p < 0.001$). Lying and sitting were the most common postures; most postures carried low ergonomic risk, though several lying, standing and phone-calling postures fell into the medium-risk category. The findings underline the need for ergonomic awareness, posture correction and structured breaks to reduce smartphone-related musculoskeletal disorders among college students.

Introduction

Smartphones have evolved from simple communication devices into multifunctional tools central to education, entertainment and social interaction, particularly among university students (1). Extensive use, often for several hours a day without adequate breaks, exposes students to musculoskeletal risk, with the neck, shoulders and upper back most affected (5,7,8). Smartphone use typically involves a forward head posture and sustained neck flexion, which increases mechanical loading on cervical structures and can accelerate muscular fatigue and discomfort (2,4,6). Weekend smartphone use, unconstrained by academic schedules, tends to be more prolonged and is frequently conducted in sitting or lying postures, which may further elevate musculoskeletal risk (11,12), although some studies report no significant association between posture, duration of use and neck pain or disability (3). Ergonomic risk-assessment approaches have also been used to quantify the musculoskeletal loading associated with such postures (9,10). Despite growing literature on smartphone-related musculoskeletal health, limited work has specifically examined daytime weekend use, posture and neck disability together among college students. The present study was therefore undertaken to assess smartphone usage patterns, the postures adopted, the ergonomic risk of these postures and the level of neck disability among undergraduate students.

Methodology

The study entitled "Study on the Impact of Smartphone Use and Posture among College Students" was conducted among 100 undergraduate students at the Community Science

College and Research Institute (CSC&RI), Tamil Nadu Agricultural University, Madurai, using a cross-sectional descriptive design. Participants were selected by simple random sampling. A structured demographic questionnaire, the Daytime Smartphone Use Posture Questionnaire During Weekend (DT-SUP), the SmarTaxo taxonomy of 41 standardized smartphone-use postures was used as study tools; all instruments were pre-tested among 15 students before final administration. Smartphone screen-time data were obtained objectively from participants' Digital Wellbeing (Android) or Screen Time (iOS) records over four consecutive weekends. Data were analysed using descriptive statistics (frequency, percentage, mean, standard deviation) and inferential statistics, including the independent t-test, one-way ANOVA and the Kruskal–Wallis test, with significance set at $p < 0.05$.

Results and Discussion

Table 1. Details of Selected Participants

Parameter	Category	Percent (n=100)
Gender	Female	56.0
	Male	44.0
Age (years)	17–18	29.0
	19–20	55.0
	21–22	16.0
BMI	Underweight	25.0
	Normal	66.0
	Overweight/Obese	9.0

Of the 100 participants, 56% were female and 44% male, with the majority aged 19–20 years (55%). Most participants (66%) had a normal Body Mass Index, while 25% were underweight and 9% were overweight or obese, indicating that the sample largely maintained appropriate nutritional status.

Table 2. Smartphone Usage Characteristics of Participants

Parameter	Category	Percent (n=100)
Years of use	< 4 years	61.0
	> 4 years	39.0
Handedness	Right-handed	93.0
Hand used	Two hands	70.0
Brightness	Manual	73.0
Orientation	Both modes	61.0

Most participants (61%) had used smartphones for less than four years and were predominantly right-handed (93%). Two-handed operation (70%) and manual brightness control (73%) were preferred and 61% alternated between portrait and landscape orientation, reflecting varied usage contexts such as browsing and video viewing.

Table 3. Most Preferred Mobile Applications

Application	Weekdays (%)	Weekends (%)
Instagram	64.0	64.0
YouTube	19.0	23.0
WhatsApp	14.0	9.0
Others	3.0	4.0

Instagram was the most frequently used application on both weekdays and weekends (64%), followed by YouTube, whose usage rose from 19% on weekdays to 23% on weekends, indicating greater engagement in video streaming during leisure time. WhatsApp usage was comparatively higher on weekdays, consistent with academic communication needs.

Table 4. Weekend Smartphone Usage by Time of Day (averaged across four weekends)

Time Interval	Mean Usage (min)
12.00 a.m.–6.00 a.m.	19.8
6.00 a.m.–12.00 p.m.	104.4
12.00 p.m.–6.00 p.m.	135.6
6.00 p.m.–12.00 a.m.	115.1

Weekend smartphone usage remained consistently high across the four-week observation period, averaging 363-372 minutes (approximately 6-6.2 hours) per day. Usage was significantly higher between 12.00 p.m. and 6.00 p.m. across all four weekends (ANOVA, $p < 0.001$), while usage during the 12.00 a.m. - 6.00 a.m. period was minimal, reflecting typical sleep hours.

Table 5. Mean Duration of Postures Adopted During Smartphone Use

Posture	Percent of time spent
Sitting	25.82
Standing	6.49
Walking	4.22
Lying	63.47

Lying was the dominant posture during smartphone use, accounting for 63.47% of total time, followed by sitting (25.82%). Standing (6.49%) and walking (4.22%) together made up only about a tenth of use time, indicating that smartphone engagement was largely confined to relaxed, low-mobility positions rather than active postures.

Postural Patterns Across Time of Day

To further examine when each posture was adopted, mean durations for sitting, standing, walking, lying and phone-calling postures were plotted separately across four time-of-day periods (night, morning, afternoon and evening).

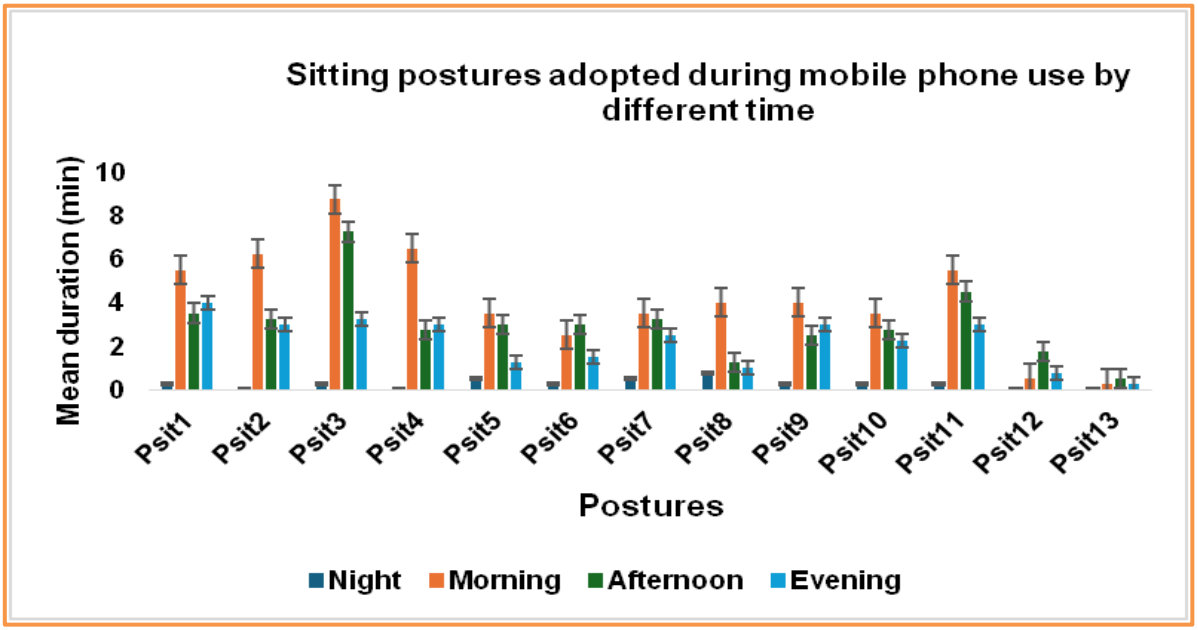

Figure 1. Sitting postures adopted during mobile phone use by different time

Sitting-posture duration varied considerably by posture and time of day. Psit3 recorded the highest duration overall, peaking in the morning (~8.5 min) and remaining high in the afternoon (~7.2 min), followed by Psit4 (~6.5 min, morning) and Psit2 (~6.2 min, morning). Night-time sitting use was minimal across all postures (well under 1 min) and Psit12 and Psit13 were rarely adopted at any time of day. Morning consistently showed the highest durations across most postures, followed by afternoon, with evening and night lowest.

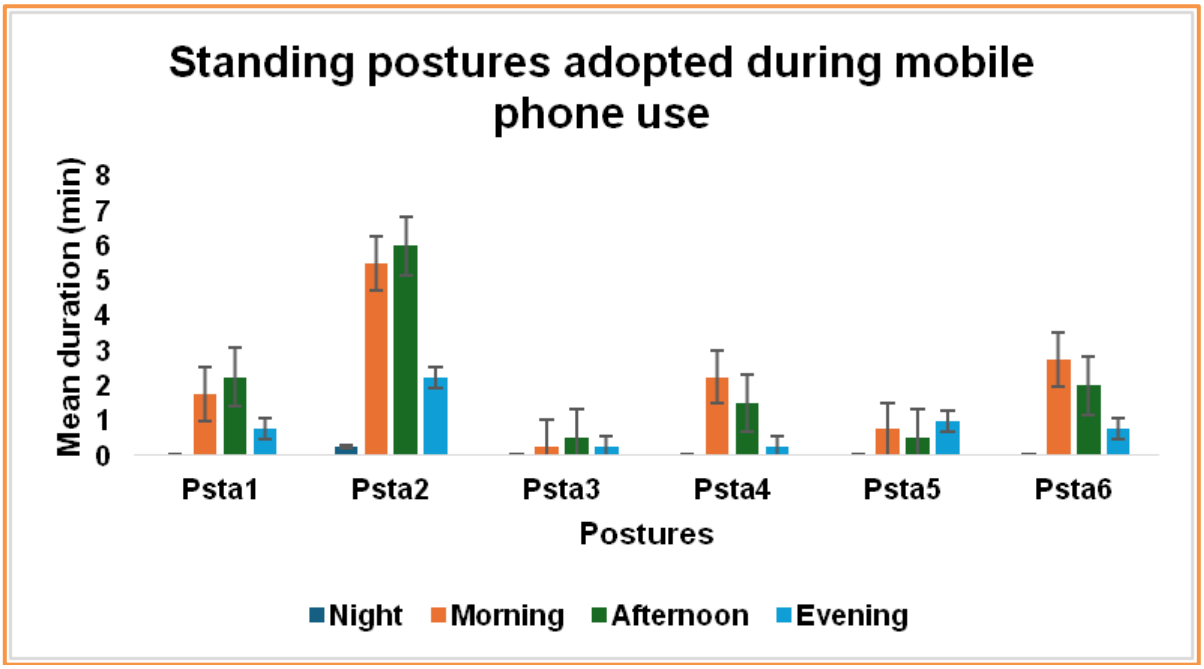

Figure 2. Standing postures adopted during mobile phone use by different time

Standing-posture durations were consistently shorter than sitting. Psta2 stood out clearly from the rest, peaking in the afternoon (~6.0 min) and morning (~5.4 min), several times higher than any other standing posture. Psta6 was the next-highest (~2.8 min, morning; ~2.1 min, afternoon), followed by Psta1 (~2.2 min, afternoon). Psta3 was rarely adopted at any time (well under 1.5 min) and night-time standing durations stayed close to zero across all postures.

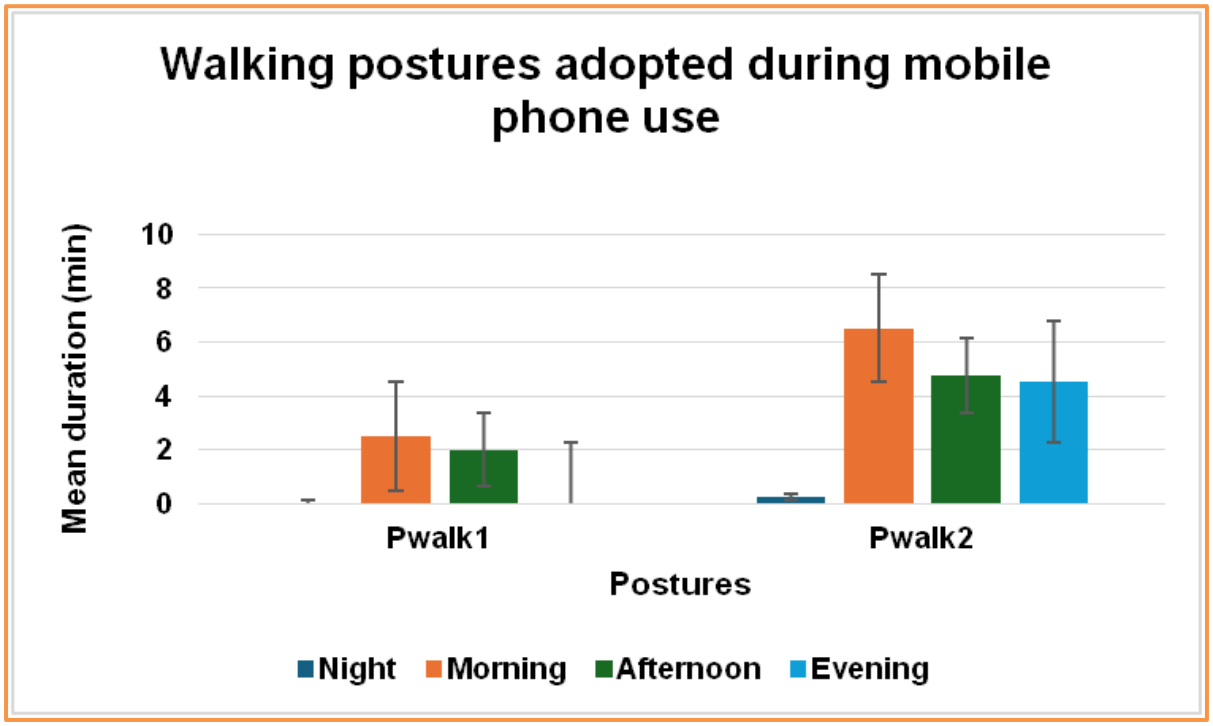

Figure 3. Walking postures adopted during mobile phone use by different time

Mobile phone use while walking was limited overall, and Pwalk2 was clearly more common than Pwalk1 at every time of day. Pwalk2 peaked in the morning (~6.3 min) and remained high in the afternoon (~4.7 min) and evening (~4.4 min), while Pwalk1 stayed much lower throughout (~2.5 min at most, in the morning). Night-time walking-posture use was minimal for both postures, suggesting participants generally avoided prolonged smartphone use while walking, likely due to safety concerns.

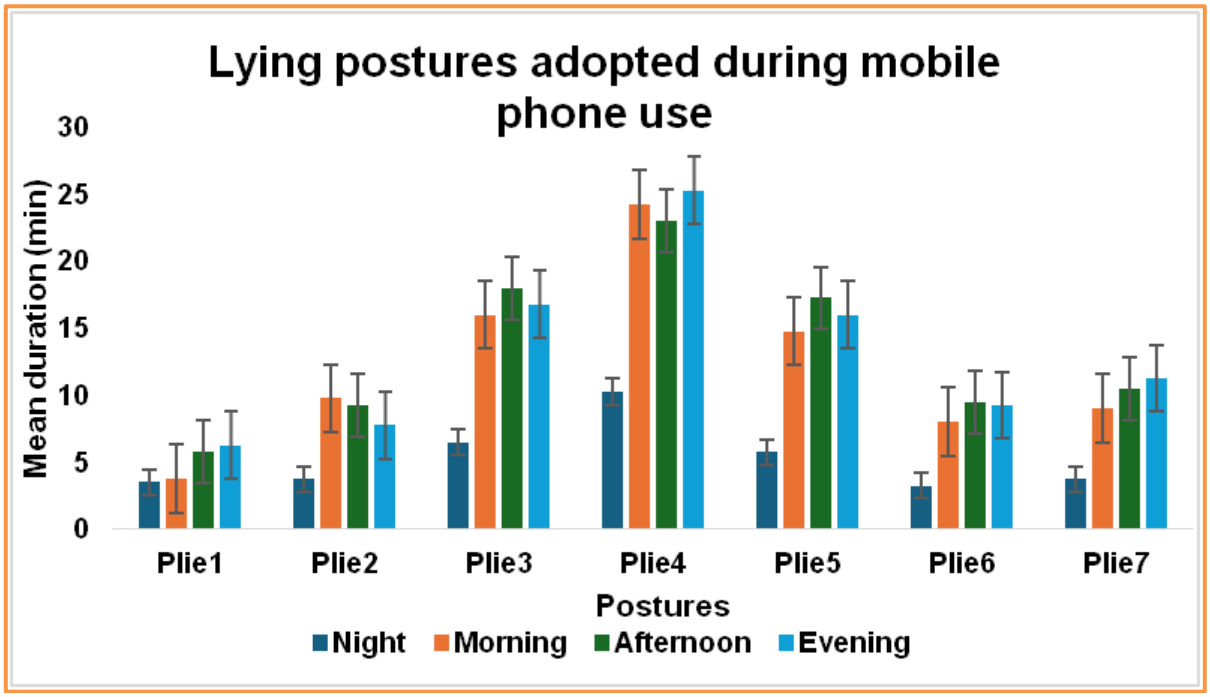

Figure 4. Lying postures adopted during mobile phone use by different time

Lying postures showed the longest smartphone-use durations of any posture category. Plie4 was the clear outlier, exceeding 23 minutes at every time of day (morning ~24, afternoon ~23, evening ~25.5) and remaining substantial even at night (~10.5 min). Plie3 (~16–18 min across morning, afternoon and evening) and Plie5 (~14–17 min) were next-highest, while Plie1, Plie2 and Plie6 stayed under 10 minutes throughout. These sustained durations, combined with prolonged neck and upper-limb flexion, may contribute to musculoskeletal discomfort.

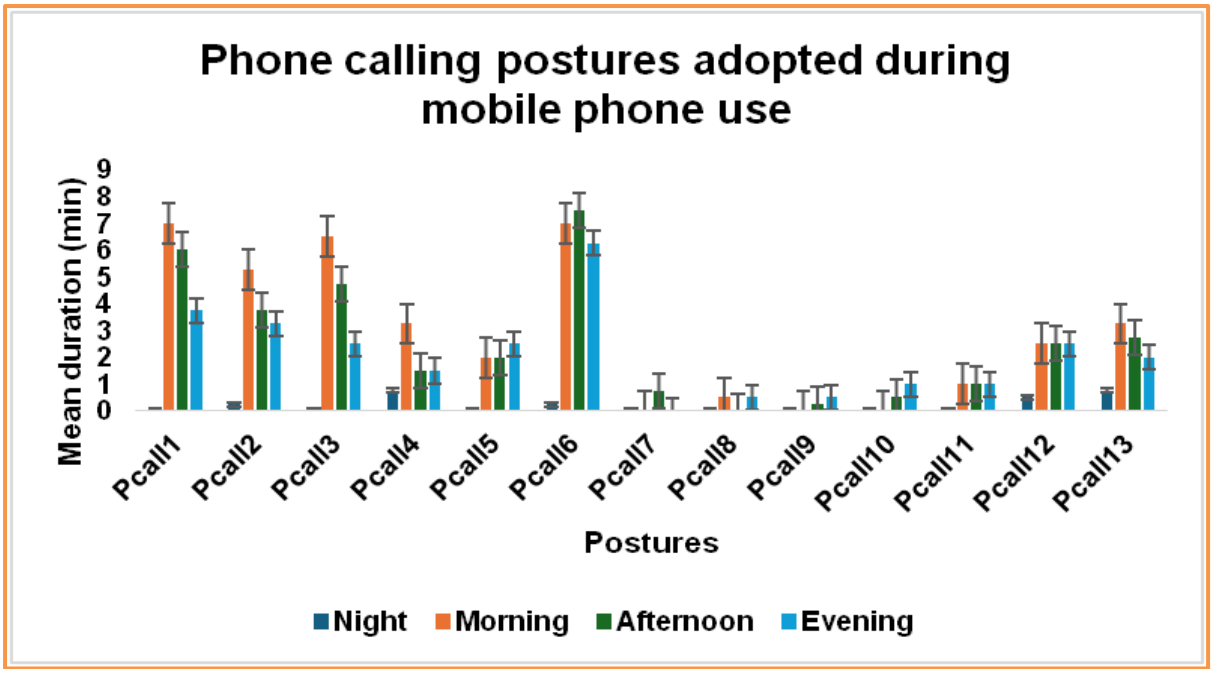

Figure 5. Phone-calling postures adopted during mobile phone use by different time

Phone-calling duration also varied by time of day. Pcall6 recorded the highest overall duration, peaking in the afternoon (~7.6 min) and morning (~6.8 min), closely followed by Pcall1 (~6.8 min, morning) and Pcall3 (~6.3 min, morning). Several postures (Pcall7–Pcall10) were rarely used for calls at any time (under 1 min) and night-time calling durations stayed minimal across all thirteen postures, indicating a clear preference for longer calls during the morning and afternoon.

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