Short Communication

Extent of Smartphone Addiction and its Association with Physical Activity Level, Anthropometric Indices, and Quality of Sleep in Young Adults: A Cross-Sectional Study

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Abstract

Background: Smartphone addiction among young adults is a growing concern that is often underestimated despite its significant health hazards. The objective of this study was to assess the extent of smartphone addiction and its association with physical activity level, anthropometric indices, and quality of sleep in young adults. **Material and Methods:** This cross-sectional study was conducted among 138 allied health sciences undergraduates of a tertiary care medical school in Puducherry, South India. The participants' extent of smartphone addiction, physical activity, and sleep quality were assessed using the Smartphone Addiction Scale (SAS), International Physical Activity Questionnaire, and Pittsburgh Sleep Quality Index (PSQI), respectively. Anthropometric indices (body mass index [BMI], waist-to-hip [W: H] ratio, waist-to-height [W: Ht] ratio, Conicity Index, and A Body Shape Index [ABSI]) were also measured following standardized procedures. Correlations between smartphone addiction, physical activity, anthropometric indices, and sleep quality were evaluated using Pearson's/Spearman's rank correlation coefficient. $P < 0.05$ was considered statistically significant. **Result:** Over 50% of participants showed smartphone addiction and poor sleep quality. Although a significant negative correlation was observed between SAS scores and physical activity levels, significant positive correlations were noted between SAS scores and BMI and SAS and PSQI scores. **Conclusion:** Smartphone addiction is associated with decreased physical activity, increased BMI, and poor sleep quality in young adults.

Keywords: Anthropometric indices, body mass index, physical activity, sleep quality, smartphone addiction

Introduction

In today's world, the usage of smartphones has increased severalfold, and India is one of the leading countries for the maximum number of smartphone users.[1] There is a considerable argument on the rampant usage and exploitation of smartphones and their subsequent impact on the health of adolescents and young adults.[2] Research suggests that overuse of smartphones is linked with several health hazards, such as musculoskeletal disorders, ocular manifestations, psychological disorders, social disturbances, and brain tumors.[3,4]

Addiction to smartphones results in habitual physical inactivity, leading to changes in body composition, risk of obesity, and associated comorbidities.[5,6] There is also growing evidence that chronic involvement with these devices may have a negative impact on users' quality of sleep, cognition, and emotion.[7,8]

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Knowledge regarding the association of smartphone addiction with physical activity levels, anthropometric indices, and quality of sleep in young adults is very limited, and hence, this study was conducted to address this lacuna.

Materials and Methods

This cross-sectional study was conducted from June to December 2020 in the Department of Physiology at a tertiary care medical school in Puducherry, South India. The study was

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conducted as per the ethical guidelines of the Declaration of Helsinki after obtaining approval from the Institute Research and Ethics Committee [IEC/2020/022].

Sampling method

Following the convenient sampling technique, 138 young adults (both males and females) aged 19–25 years pursuing Allied Health Science courses at the institute were included in the study after obtaining their written informed consent.

Assessment of smartphone addiction

The extent of smartphone usage and smartphone addiction of study participants was assessed using the 33-item Smartphone Addiction Scale (SAS),[9,10] a simple self-rating questionnaire that measures the level of addiction to smartphones based on 1. daily-life disturbance, 2. positive anticipation, 3. withdrawal, 4. cyberspace-oriented relationship, 5. overuse, and 6. tolerance. Subjects had to respond to the items based on a 6-point Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). The total score ranged from 33 to 198, and higher scores pointed toward an increased risk of smartphone addiction. The participants were classified as low or high smartphone users based on the median SAS score.

Assessment of physical activity level

The physical activity level of the subjects over the "last 7-day" period was assessed using the International Physical Activity Questionnaire (IPAQ)-short version. The metabolic equivalent of tasks (MET) was calculated, and the participants were classified into low, moderate, or high physical activity based on the criteria prescribed in the IPAQ.[11]

Assessment of anthropometric indices

The height, weight, hip circumference, and waist circumference of subjects were measured following the standard guidelines.

The waist-to-hip ratio (W: H ratio) and waist-to-height ratio (W: Ht ratio) were calculated by dividing the waist circumference (cm) by the hip circumference (cm) and waist circumference (cm) by the height (cm), respectively.

Conicity Index (CI), an index of central obesity, was calculated using the formula, CI = WC/0.109× (square root of bodyweight/height).

A Body Shape Index (ASBI), a predictor of percentage body fat and index of central obesity, was calculated using the formula: $ABSI = WC/(BMI^{2/3} \times height^{1/2})$.

Assessment of quality of sleep

The subjects' sleep quality over the past month was assessed using the **Pittsburgh Sleep Quality Index (PSQI)**,[12] which assessed sleep in the following seven components: 1. subjective sleep quality, 2. sleep latency, 3. sleep duration, 4. sleep efficiency, 5. sleep disturbance, 6. use of sleep medications, and 7. daytime dysfunction. Each component score has a value of "0" (no difficulty) to "3" (severe difficulty), and a global score was calculated by adding all seven component scores. Subjects with a global PSQI score <5 were considered "good" sleepers, whereas those with a PSQI score ≥5 were considered poor sleepers.

Statistical analysis

The correlation between smartphone addiction scale score and physical activity level, anthropometric indices, and quality of sleep was assessed using Pearson's/Spearman's rank correlation coefficient depending on the distribution of data. Comparison of study parameters between individuals with SAS scores above and below the median value was performed using the independent student's *t*-test or Mann–Whitney *U* test. All statistical analyses were carried out using the statistical software SPSS 19, and $P < 0.05$ was considered statistically significant.

Results

One hundred thirty-eight individuals with a mean age of 19.74 ± 1.51 years were included in the study. The mean (SD) SAS score and median (interquartile range [IQR]) MET scores of study participants were 97.49 ± 24.41 and 1386.00 (693.00, 2521.50), respectively [Table 1]. Nearly 51% of the participants had SAS scores, indicating high smartphone addiction, and almost 61% of the study participants were identified as poor sleepers [Table 1]. A statistically significant negative correlation was observed between SAS and MET scores. In contrast, statistically significant positive correlations were observed between SAS scores and BMI, W: Ht, CI, and PSQI scores [Table 2]. The comparison of study variables between low (SAS score <=97) and high (SAS score >97) smartphone users revealed significant differences in MET scores and PSQI scores [Table 3A]. Males had significantly higher SAS score, MET score, BMI, W: H ratio, W: Ht ratio, Conicity Index, and ABSI compared to females [Table 3B].

Discussion

This study was primarily conducted to assess the extent of smartphone addiction and its correlation with physical activity levels, anthropometric indices, and quality of sleep of young adults aged 19–25 years. Considering the median smartphone addiction scale (SAS) score of 97 as the cut-off value for smartphone addiction, a value higher than those reported in previous studies,[9,13] almost half of the study participants were identified as addicted to smartphones.

To add on, males exhibited an increased addiction to smartphones compared to females, a finding in agreement with studies by Bisen *et al*.,[14] and Subramani *et al*.[15] Nevertheless, the very finding of increased smartphone addiction in young adults signifies a critical health concern that demands immediate attention.

Studies by Lepp *et al*.,[5] and Penglee *et al*.,[16] have documented the disruption of physical activity due to excessive smartphone usage. Similarly, the study by Coban[17] revealed a significant association between smartphone addiction and body weight. In agreement with the results of the studies mentioned above,

Table 1: Characteristics of study participants with a percentage distribution of participants based on SAS, MET, and PSQI scores

Parameters	Values (n=138)	No. of participants (n=138)	% Distribution of participants
Age (years)	19.74±1.51		
SAS score	97.49±24.41		
>97		68	49.3
≤97		70	50.7
MET score[a]	1386.00 (693.00, 2521.50)		
<600-low physical activity		30	21.74
600–1499-moderate physical activity		49	35.51
≥1500-high physical activity		59	42.75
BMI (kg/m^2)	22.078±4.192		
W: H ratio	0.794±0.072		
W: Ht ratio	0.468±0.069		
CI[a]	1.18 (1.13, 1.24)		
ABSI	7.75±0.53		
PSQI[a]	4 (2,5)		
<5 (good sleepers)		54	39.1
≥5 (poor sleepers)		84	60.9

Values are mean±SD; [a]Values are median (IQR). SAS score=Smart Phone Addiction Scale Score, MET score=Metabolic Equivalent of Task score, BMI=Body Mass Index, W: H ratio=Waist to Hip ratio, W: Ht ratio: =Waist to Height ratio, CI=Conicity index, ABSI scores=A Body Shape Index, PSQI scores=Pittsburgh sleep quality index scores

Table 2: Correlation between SAS scores, MET scores, BMI, W: H ratio, W: Ht ratio, CI, ABSI, and PSQI scores

Variables	MET scores[a]	BMI	W: H ratio	W: Ht ratio	CI[a]	ABSI	PSQI scores
SAS scores	−0.377**	0.171*	0.134	0.182*	0.209*	0.120	0.243*

Values are Pearson's/[a]Spearman's correlation coefficient- *P<0.05, **P<0.001. SAS score=Smart Phone Addiction Scale Score, MET score=Metabolic Equivalent of Task score, BMI=Body Mass Index, W: H ratio=Waist to Hip ratio, W: Ht ratio: =Waist to Height ratio, CI=Conicity index, ABSI scores=A Body Shape Index, PSQI scores=Pittsburgh sleep quality index scores

the authors observed a significant negative correlation between smartphone addiction scores and physical activity levels and significant positive correlations between SAS scores, BMI, and Conicity Index. Smartphone usage for long hours, eventually leading to smartphone addiction, could deprive individuals of being physically active. This could result in decreased energy expenditure and, hence, an increase in body weight.

Anthropometric indices of general and central adiposity were significantly higher in males than females and non-significantly high in high smartphone users. It may be hypothesized that the increased levels of smartphone addiction observed in males could be the reason for their decreased physical activity, leading to increased BMI and central obesity in these individuals.

Poor quality of sleep was observed in 61% of study participants. Prolonged use of smartphones and exposure to smartphone screen light close to bedtime disrupt the circadian rhythm, leading to poor quality and quantity, fatigue, daytime sleepiness, and functional, behavioral, and social impairment.[18] In this study, the significant positive correlation between SAS and PSQI scores establishes poor sleep quality among high smartphone users, a finding similar to previous reports.[19,20] Poor quality of sleep is linked to overweight and obesity.[21,22] Although non-significant, the anthropometric indices of high smartphone users were marginally higher than low smartphone users, thus supporting the association between smartphone usage, sleep quality, and BMI.

The present study had the following limitations: First, the study's cross-sectional design could not establish the cause–effect relationship among the study parameters. Second, the self-reported questionnaires used in the study could introduce potential subjective bias compared to standard objective assessment methods. Third, the possible influence of extraneous variables on study parameters cannot be completely ruled out.

Conclusion

Smartphone addiction, an emerging health concern among young adults, is associated with reduced physical activity, increased BMI, and poor sleep quality. Preventive measures to curtail smartphone addiction at an early stage need to be initiated to protect the younger generation from the ill-health hazards of excessive smartphone usage.

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Table 3: (A) Comparison of study variables based on median SAS score

Variable	SAS >97	SAS ≤97	*P*
MET score[a]	1117.5 (198, 2697)	1413 (1036.3, 2425.5)	0.010[b]*
BMI (kg/m^2)	22.46±4.25	21.71±4.13	0.294
W: H ratio	0.80±0.07	0.79±0.07	0.333
W: Ht ratio	0.47±0.06	0.46±0.07	0.307
CI	1.19±0.09	1.18±0.10	0.471
ABSI	7.77±0.48	7.74±0.58	0.757
PSQI[a]	4 (3, 6)	3 (2, 5)	0.008[b]*

(B) Gender-based comparison of study variables

Variable	Male (*n*=69)	Female (*n*=69)	*P*
SAS score	102.38±23.93	92.65±24.08	0.019*
MET score	1518 (986.50, 2689.5)	1173 (577.75, 1979.50)	0.035[b]*
BMI (kg/m^2)	22.99±4.39	21.16±3.80	0.010*
W: H ratio	0.84±0.06	0.75±0.05	<0.001**
W: Ht ratio	0.49±0.07	0.45±0.06	0.001*
CI	1.24±0.08	1.14±0.08	<0.001**
ABSI	8.03±0.41	7.47±0.49	<0.001**
PSQI[a]	4 (3, 6)	3 (2, 5)	0.094[b]

Values are mean±SD; [a]Values are median (IQR), *P*: Independent *t*-test, [b]Mann–Whitney *U* test; **P*<0.05, ***P*<0.001. SAS score=Smart Phone Addiction Scale Score, MET score=Metabolic Equivalent of Task score, BMI=Body Mass Index, W: H ratio=Waist to Hip ratio, W: Ht ratio=Waist to Height ratio, CI=Conicity index, ABSI scores=A Body Shape Index, PSQI scores=Pittsburgh sleep quality index scores

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Conflicts of interest

There are no conflicts of interest.

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