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The impact of smartphone addiction on attention control and sleep in Egypt—an online survey

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Abstract

Background The widespread use of smartphones makes it imperative for researchers to study the adverse effect of smartphone addiction. We aimed to study the risk factors of smartphone addiction, insomnia, and attention deficit among smartphone users among a sample of Egyptian adolescents and adults.

Methods An online survey was disseminated among Egyptian social media groups. Participants were requested to complete Smartphone Addiction Scale-Short Version (SAS-SV), Insomnia Severity Index (ISI) scale, and attention control scale (ACS).

Results Two-thousand seven-hundred sixteen responded to our survey with a mean age of 31.4 ± 10.3 years. Smartphone addiction was documented in 2386 (87.8%) participants, with a median daily time for smartphone use of 5 h (*IQR*: 3–7). A significant association was found between smartphone addiction and younger age, higher educational levels, and urban residency (unadjusted or adjusted). Binary logistic regression analysis showed that the only factor affecting the probability of moderate to severe insomnia was the higher SAS-SV score, either unadjusted ($OR = 1.1$, 95% CI: 1.08–1.1) or adjusted ($OR = 1.09$, 95% CI: 1.08–1.11). Multiple linear regression analysis showed that higher scores on SAS-SV ($P < 0.001$) and ISI ($P < 0.001$), being female ($P < 0.001$), and being of rural residency ($P = 0.025$) were associated with lower total scores on ACS. On the other hand, older age ($P < 0.001$) and longer intervals between smartphone cessation and bedtime ($P = 0.004$) were found to increase the attention score.

Conclusion Smartphone addiction is prevalent in Egypt, which deserves special concern as it may have negative consequences such as insomnia and poor attention control, particularly in younger age groups.

Keywords Smartphone addiction, Insomnia, Attention control

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Background

The great development in the hardware and software of smartphones has become beyond imagination. Modern smartphones combine the functions of digital cameras, portable media players, and GPS navigation units. The recent generations of smartphones have the tasks of high-resolution touch screens and web browsers that can easily display standard web pages. One can simply access any information he wants at any place or time. It has many other advantages, such as entertainment, social media access, and health monitoring. So, many people became extremely interested in owning smartphones [1]. In 2019, Apple and Google collectively announced that there were more than 3.4 billion Apple or Google smartphone users [2].

Smartphone addiction was uniquely emphasized in research as being especially concerning. Generally, it is more or less similar to Internet addiction. It has four main components: compulsive behaviors, tolerance, functional impairment, and withdrawal [3]. A study conducted in Riyadh on 2367 university students revealed that 27.2% of the participants spent more than 8 h daily using their smartphones [4]. In another Lebanese study conducted on 688 university students, about 49% of the participants reported smartphone use more than 5 h per day [5].

Problematic attachment to smartphones was associated with poor social engagement [6]. Laramie (2007) reported that excessive reliance on mobile phones was associated with social anxiety [7]. Additionally, smartphone addiction was found to be related to multiple psychopathological disorders, including anxiety, depression, and poor sleep quality [8, 9]. Furthermore, excessive smartphone was reported to negatively impact cognitive function, especially attention [10].

This work aimed to investigate the risk factors of smartphone addiction among a sample of Egyptian adolescents and adult smartphone users. The second objective was to study the risk factors of insomnia and attention deficit among smartphone users.

Methods

A cross-sectional online questionnaire survey was conducted using different social network applications from 5th January 2023 until 5th April 2023. A Google Form, divided into three sections, was disseminated among Egyptian groups on Facebook and WhatsApp applications. Adolescents and adults were only allowed to participate in the survey. Participants under 12 years old and those suffering from chronic medical illness were requested to omit the survey. The purpose, background of the survey, and data consent were provided at the beginning of the survey. It took about 10 to 15 min to answer the questionnaire.

The first section included questions about sociodemographic data such as age, gender, education, and medical history. The second section was about smartphone use in which Smartphone Addiction Scale-Short Version (SAS-SV) was demonstrated. Three additional questions were included in the second section, including daily time spent on smartphones in hours, the interval between smartphone cessation and bedtime in minutes, and, finally, choosing which applications the participant spends the most time on: social media, games, or videos. The third section included the Insomnia Severity Index and attention control scale.

Smartphone Addiction Scale-Short Version (SAS-SV) [11]

The SmartphoneAddiction Scale-Short Version is widely used to measure smartphone addiction. It was developed by Kwon et al. [11] and consisted of 10 items describing the problematic use of smartphones. Each question is answered on a 6-point scale ranging from 1 = "strongly disagree" to 6 = "strongly agree." An example question is " I will never give up using my smartphone even when my daily life is greatly affected by it." A sum score is between 10 and 60, with higher scores indicating higher smartphone addiction. Cutoff scores are set at 31/60 for men and 33/60 for women to indicate the presence of smartphone addiction [11]. SAS-SV has been proven reliable and valid in the Arabic population [12].

Insomnia Severity Index (ISI) scale [13]

The insomnia severity index is a self-report measure for insomnia formed of seven questions that assess the different components of insomnia, including the following: (1) falling asleep problems, (2) interrupted sleep, (3) early awaking, (4) sleep satisfaction, (5) functional impairment due to sleep problems, (6) how noticeable to others, and (7) emotional distress. Each question is answered using a 5-point scale ranging from 0 (none) to 4 (very severe). Total scores range from 0 to up to 28, and the higher scores indicate increasing severity of symptoms (scores 0–7 denotes an absence of insomnia, 8–14 for sub-threshold insomnia, 15–21 for moderate insomnia, and 22–28 for severe insomnia) [13]. The ISI is used in screening and diagnosis, according to the criteria for insomnia in the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV) and International Classification of Sleep Disorders (ICSD). It also showed good reliability and validity among the Arab population [14].

Attention control scale (ACS) [15]

Attentional control was measured by attention control scale. The scale consists of 20 items that assess the ability to control attention, resist distraction, and put attentional priorities. It includes two main components: attention focusing (9 items) and attention shifting (11 items). Each item was rated on a 4-point scale ranging from 1 = "not at all" to 4 = "always" in which the higher scores indicate more attentional control (9). The scale was found to have sufficient internal reliability and predictive utility [16] and has also shown good validity [17].

Ethical statement

All participants were provided with their electronic informed consent before participating in the study. This study was approved by the ethical committee of the Faculty of Medicine, Beni-Suef University, number FMB-SUREC/04012023/Khalil, following the Declaration of Helsinki and the Cdes of Federal Regulations with no. FWA00015574.

Sample size calculation

The sample size was calculated using EpiCalc 2000, version 1.02, 1997, based on a 59.57% prevalence rate of smartphone addiction [18] and an alpha level of significance of 0.05. To test a null hypothesis of 64%, a total sample size of at least 2213 participants was required to achieve a statistical power of 99%. After adding 20% to compensate for potential nonresponse, the minimum required sample size was estimated at 2657.

Statistical analysis

We used SPSS to present the scale variables with normal distribution as mean and standard deviation and the non-normally distributed variables as median and interquartile range. The categorical variables were presented as frequency and relative frequency (%). The unadjusted odds ratio was calculated using univariate binary logistic regression analysis and the chi-squared test, while the adjusted models were done using multivariable binary logistic regression analysis. Comparison between the studied subgroups regarding the scale variables was reported using an independent *T*-test for parametric data and a Mann–Whitney *U*-test for nonparametric data. Linear correlation was done to detect the correlation between the ACS score and the other scores, and then multiple linear regression analysis was done for adjustment for age, sex, residence, and education in the presence of the studied scores. The *P*-value was considered significant at less than 0.05.

Results

This study included 2716 participants with a mean age of 31.4 ± 10.3 years. The majority of participants were females (75.5%), more than half of the participants were university graduates, and urban residents were 77.9% of the participants (Table 1).

The total score on SAS-SV was 40.9 ± 7.6. Smartphone addiction was documented in 2386 (87.8%) participants, and the median time spent on smartphones was 5 (*IQR*: 3–7). The median interval between smartphone cessation and bedtime was 15 (*IQR*: 0–15) min. The commonest used applications were social media (66.4%), followed by games (30%), and then videos (3.5%). This study showed a significant association between smartphone addiction and younger age, higher educational levels, and urban residence, either unadjusted or adjusted for each (Table 2).

The median insomnia severity index score was 10 (*IQR*: 6–14); it was absent in 863 (31.8%), subthreshold in 1256 (46.2%), moderate in 544 (20.0%), and severe in 53 (2.0%). Binary logistic regression analysis (adjusted and unadjusted) for predicting risk factors for insomnia showed that the only factor affecting the probability of moderate to severe insomnia was the higher smartphone addition score, either adjusted or unadjusted. Still, the interval between smartphone cessation and bedtime was only associated with moderate to severe insomnia in univariate analysis (Table 3).

The mean total score of the attention control scale was 49.7 ± 6.7. The mean score of attention-focusing domain was 21.9 ± 4.5, while the mean score of attention-shifting domain was 27.9 ± 3.8. The correlations between the total scores of ACS and its two domains with other scores are presented in Table 4.

Table 1 Baseline characteristics of the studied participants

Characteristics	Values (*n* = 2716) (*n*, %)
Age (mean ± SD)	31.4 ± 10.3
Sex	
Male	666 (24.5%)
Female	2050 (75.5%)
Education	
Until preparatory	54 (2.0%)
Secondary	223(8.2%)
University	1583 (58.3%)
Postgraduate	856 (31.5%)
Residence	
Urban	2116 (77.9%)
Rural	600 (22.1%)

Table 2 Binary logistic regression analysis (adjusted and unadjusted) for prediction of risk factors for smartphone addiction

Characteristics	Nonaddict (*n* = 330)	Addict (*n* = 2386)	Unadjusted OR	Adjusted OR
Age (mean ± SD)	33.4 ± 12.7	31.1 ± 9.9	0.98 (0.97 ± 0.99)*	0.97 (0.96–0.98)*
Sex				
Male	78 (11.7%)	588 (88.3%)	Reference	Reference
Female	252 (12.3%)	1798 (87.7%)	0.9 (0.7–1.2)	0.87 (0.66–1.1)
Education				
Until preparatory	15 (27.8%)	39 (72.2%)	Reference	Reference
Secondary	47 (21.1%)	176 (78.9%)	1.4 (0.7–2.8)	2 (0.99–4.1)
University	175 (11.1%)	1408 (88.9%)	3.1 (1.7–5.7)*	4.5 (12.3–8.5)*
Postgraduate	93 (10.9%)	763 (89.1%)	3.2 (1.7–5.9)*	5.3 (2.7–10.3)*
Residence				
Urban	243 (11.5%)	1873 (88.5%)	1.3 (1.004–1.7)*	1.5 (1.1–1.9)*
Rural	87 (14.5%)	513 (85.5%)	Reference	Reference

* *P*-value is significant

Table 3 Binary logistic regression analysis (adjusted and unadjusted) for prediction of risk factors for insomnia

Characteristics	No and subthreshold (*n* = 2119)	Moderate and severe (*n* = 597)	Unadjusted OR	Adjusted OR
Age (mean ± SD)	31.7 ± 10.4	30.5 ± 9.7	0.989 (0.980–0.998)*	0.996 (0.986–1.007)
Sex				
Male	541 (81.2%)	125 (18.8%)	Reference	Reference
Female	1578 (77.0%)	472 (23.0%)	1.3 (1.03–1.6)	1.1 (0.89–1.4)
Education				
Until preparatory	44 (81.5%)	10 (18.5%)	Reference	Reference
Secondary	170 (76.2%)	53 (23.8%)	1.4 (0.6–2.9)	1.4 (0.6–2.9)
University	1224 (77.3%)	359 (22.7%)	1.3 (0.6–2.6)	1.02 (0.5–2.2)
Postgraduate	681 (79.6%)	175 (20.4%)	1.1 (0.6–2.3)	0.94 (0.4–2.0)
Residence				
Rural	477 (79.5%)	123 (20.5%)	Reference	Reference 1.1 (0.9–1.4)
Urban	1642 (77.6%)	474 (22.4%)	1.1 (0.9–1.4)	
SAS-SV (mean ± SD)	39.9 ± 7.5	44.9 ± 7	1.1 (1.08–1.1)*	1.09 (1.08–1.11)*
Interval between smartphone cessation and bedtime Median (IQR)	15 (0–15)	0 (0–15)	0.993 (0.989–0.997)*	0.999 (0.995–1.003)
Most used applications				
Social media	1409 (78.1%)	395 (21.9%)	Reference	Reference
Videos	77 (80.2%)	19 (19.8%)	0.9 (0.5–1.5)	1.2 (0.67, 1.9)
Games	633 (77.6%)	183 (22.4%)	1.03 (0.8–1.3)	1.1 (0.9, 1.4)
Time spent on the smartphone (hours)				
Median (IQR)	5 (3.6)	6 (4.8)	1.1 (1.1–1.2)*	------

SAS-SV Smartphone Addiction Scale-Short Version

* *P*-value is significant

Multiple linear regression analysis for predicting risk factors affecting the total score of the ACS showed that higher smartphone addiction, higher insomnia score, being female, and being of rural residency were associated with lower total scores on ACS. On the other hand, older age and longer intervals between smartphone cessation and bedtime were found to increase the attention score (Table 5).

Table 4 Correlation between the scores of attention domains and its total score with the other scores

Independent variables	Attention shifting		Attention focusing		Attention total score	
	r	*p*-value	*r*	*p*-value	*r*	*p*-value
SAS-SV total score	−0.105	< 0.001*	−0.379	< 0.001*	−0.305	< 0.001*
Time spent on smartphone	−0.013	0.507	−0.158	< 0.001*	−0.111	< 0.001*
Interval between smartphone cessation and bedtime	0.072	< 0.001*	0.148	< 0.001*	0.136	< 0.001*
ISI total score	−0.142	< 0.001*	−0.330	< 0.001*	−0.292	< 0.001*

SAS-SV Smartphone Addiction Scale-Short Version, *ISI* Insomnia Severity Index scale

* *P*-value is significant

Table 5 Multiple linear regression analysis for prediction of risk factors affecting the total attention score

	Unstandardized coefficients		t	*p*-value	95.0% confidence interval for B	
	B	Std. error			Lower bound	Upper bound
Constant	58.996	0.918	64.248	< 0.001*	57.195	60.796
Total score of SAS-SV	−0.189	0.018	−10.474	< 0.001*	−0.224	−0.154
Interval between smartphone cessation and bedtime	0.014	0.005	2.890	0.004*	0.004	0.023
Total score ISI	−0.263	0.025	−10.437	< 0.001*	−0.313	−0.214
Age (years)	0.046	0.013	3.572	< 0.001*	0.021	0.072
Female sex	−1.013	0.290	−3.496	< 0.001*	−1.582	−0.445
Educated participants from university and above	0.550	0.422	1.301	0.193	−0.279	1.378
Rural residence	−0.700	0.312	−2.240	0.025*	−1.312	−0.087

SAS-SV Smartphone Addiction Scale-Short Version, *ISI* Insomnia Severity Index scale

* *P*-value is significant. Dummy variables for sex, education, and residence were done. Female was coded as 1, education from university and above was coded as 1, and rural residence was coded as 1

Discussion

As far as we know, this is the largest study investigating the relation of smartphone addiction with insomnia and attention among the general Egyptian population.

The current study shows that 87.8% of the participants are smartphone addicts; this percentage is higher than previous Egyptian and Middle Eastern studies, which demonstrated that the prevalence of smartphone addiction was 59.6% and 71% consecutively [18, 19]. The difference between the smartphone addiction percentage in the current study and those studies may be due to the difference in the target group. Both targeted a special population (university students), while we targeted a general population sample.

This study found that smartphone addiction is significantly higher among younger age groups, which aligns with many studies that stated a significant negative correlation between age and smartphone addiction [20, 21]. The increased smartphone use time in adolescence and early adulthood, which may lead to problematic use, can be explained by a lack of parental supervision and guidance at this age [22]; they have less self-control and appear more dependent on their smartphones for daily duties [23]. They also spend most of their smartphone time on gaming and social media apps that can help to meet some of the needs that are often satisfied through friendships, which decrease the necessity for in-person interactions with peers [24], and finally, compared to older age groups, they are more receptive to embracing new technologies [11].

Contrary to this finding, other studies revealed that older people are likelier to be smartphone addicts [25, 26]. Lane [25] also found that a high educational level predicts smartphone addiction, similar to our research findings. This can be attributed to increased stress related to studying, which mediates smartphone addiction [27], and people with higher educational levels tend to plan academic activities through smartphones [28]. However, a study by Luk et al. [29] found a lower risk of smartphone addiction in subjects with higher levels of education.

Furthermore, we discovered a significant association between high smartphone addiction and insomnia, indicating that smartphone addiction raises the likelihood of developing insomnia. This research finding is supported by many studies which suggested that insomnia and multiple sleep awakening, excessive daytime sleepiness, and poor sleep quality were adverse effects of smartphone addiction [30–32].

Although the exact cause of the connection between smartphone addiction and insomnia is not entirely understood, several possible explanations exist. For example, excessive smartphone use has a stimulating effect that impairs the ability to fall asleep, the decline in melatonin hormone secretion caused by exposure to smartphone screen blue light affects circadian rhythm, and, lastly, using social media in excess right before bed increases emotional and psychological stress [33–35].

The term "attentional control" describes the capacity to actively manage one's attention, including the capacity to focus and shift it [36]. This study reported that subjects with higher smartphone addiction levels have poorer control over their attention. This finding agrees with many studies that showed that participants reported severe interruption when receiving smartphone notifications [37], and only the presence of a smartphone around is enough to interfere with their primary task completion [38]. Moreover, other research findings reported that participants with smartphone addiction had shorter attention spans [39], delayed reaction times, and were at higher risk of motorcar accidents because of reading and texting while driving [40]. All of these findings are confirmed by a neuroanatomical study showing that heavy smartphone users had diminished early transcranial magnetic stimulation-evoked potentials in the right prefrontal cortex compared to nonusers, which are linked to self-reported attentional difficulties [10].

Despite many studies addressing the negative impact of smartphone addiction on attention, some research findings demonstrated the beneficial role of excessive smartphone usage in video game playing that helps improve brain synchronization in areas related to visual-spatial processing and sensory-motor coordination [41]. In a study conducted by Bleakley et al. [42], playing video games regularly improves cognitive functions.

There are two ways that smartphone addiction can distract attention either by internal drive (top-down) through consciously directing the attention focus to use it (intense urge to use) or by the presence of external cues (bottom-up), either visual (seeing someone handhelds his smartphone), hearing the ringtone, or feeling the vibrations [43, 44].

Although there was no statistically significant difference between males and females in smartphone addiction in our study, we found that the female sex is associated with poor attention control, which could be because women are more likely to use social networking and communication apps, which make them more distracted by voice calls and apps notifications, unlike men who spend most of their smartphone time in playing games and watching movies [45].

The current study also revealed that short intervals between smartphone cessation and bedtime and high scores on ISI are risk factors for poor attention control, and that lack of sleep can explain an impaired person's performance during the day, which may manifest as poor attention, and also, disturbance of the circadian rhythm by the blue light emitted from screen affects cognitive performance including attention [46, 47]. This finding is supported by several studies that demonstrated that people with good sleep quality experience less attentional deficits and are more able to respond to auditory and visual stimuli [48, 49].

The present study had some limitations. First, a cross-sectional study cannot establish a causal association between the study variables. Also, it reflects a specific point in time rather than conducting a longitudinal observation. Second, the smartphone addiction scale, Insomnia Severity Index scale, and attention control scale used in this study are self-report questionnaires that may inevitably include bias.

Conclusion

The prevalence of smartphone addiction in Egypt is alarming since it may have negative consequences such as insomnia and poor attention control, particularly in younger age groups.

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Authors' contributions
DK was responsible for participants recruitment and study design and helped draft the manuscript. RM was responsible for participants' recruitment and study design and helped draft the manuscript. MH was responsible for participants' recruitment and helped in drafting the manuscript. DMK was responsible for participants' recruitment, performed the data analysis, and helped draft the manuscript. AYI was responsible for participants' recruitment. SA was responsible for participants' recruitment. NA was responsible for participants' recruitment. MAA was responsible for participants' recruitment. ME was responsible for participants' recruitment. AME was responsible for participants' recruitment. AH was responsible for participants' recruitment. MA was responsible for participants' recruitment. EMN was responsible for participants' recruitment. SF was responsible for participants' recruitment. HMA was responsible for participants' recruitment. AGE was responsible for participants' recruitment. SD was responsible for participants' recruitment. MT was responsible for participants' recruitment, worked on data interpretation, and helped draft the manuscript. All authors thoroughly revised the manuscript's content before approving the final version.

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Availability of data and materials
Authors report that the datasets used and/or analyzed during the current study are available from the corresponding author upon reasonable request.

Declarations

Ethics approval and consent to participate
All participants were provided with their electronic informed consent before participating in the study. This study was approved by the ethical committee of the Faculty of Medicine, Beni-Suef University, number FMB-SUREC/04012023/Khalil, following the Declaration of Helsinki and the Codes of Federal Regulations with no. FWA00015574.

Consent for publication
Not applicable. The authors report that the content has not been published or submitted for publication elsewhere.

Competing interests
The authors declare that they have no competing interests.

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