

Smartphone Addiction among Adolescents in Southern Italy and Correlation with Other Risky Behaviors

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Abstract

Background: Addiction to smartphone is defined as the disability to cease using the device despite the physical, psychological, or social consequences. The diagnosis of this disorder is increasing exponentially among teenagers, even more so after Corona Virus Disease 2019 (COVID-19) pandemic. This study aims to analyze the risk of mobile phone addiction among teenagers in Italy and its relationship with other risk behaviors, such as drug consumption and emotional well-being, following the COVID-19 pandemic.

Methods: A cross-sectional observational study was conducted in Catania, Sicily, during 2022. The study sample comprised 342 students from a secondary education center that answered to a validated Italian version of the Smartphone Addiction Scale Short Version (SAS-SV) accessing through computers and mobile devices. Subjective Wellbeing was measured with the Personal Wellbeing Index-School Children (PWI-SC). Also, they completed the NIAAA Brief Alcohol Use Screener.

Results: Our results showed that 30.1% of students who participated in the survey were classified with a smartphone addiction. Besides, most of the participants used the

Smartphone for social networks (86.0%). Regarding the other aspects measured, the mean self-perceived well-being score measured with the PWI-SC was 55.5, and 36.2% of participants were categorized as “high risk” for depression. Finally, four out of ten participants were at “moderate or high risk” of an alcohol use disorder.

Conclusions: Our results suggest that the use of mobile phones is increasing in adolescents, an age group also exposed to social and health problems.

Keywords

addiction; smartphones; social networks; depression; well-being; drugs of abuse

Introduction

Over the past decade, the widespread use of smartphones has experienced exponential growth, marking a significant transformation in how we interact with technology. Mobile phones have become constant companions in our daily lives, especially for teenagers, playing a crucial role in their social interactions, access to information, and entertainment. Despite the myriad of interesting and useful functions smartphones offer in modern society, inappropriate use has been identified and linked to health problems, evolving into a noteworthy public health concern [1–4]. In fact, one prevalent issue associated with dysfunctional mobile phone use is addiction, being young individuals particularly vulnerable, especially adolescents, reaching values of 70% for smartphone addiction [5–10].

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Problematic Smartphone Use (PSU) or addiction to smartphone is generally described as excessive behaviour that interferes with the ability to cease using the device notwithstanding the potential adverse consequences it may entail such as various forms of physical, psychological, or social harm [11,12]. Regarding this terminology, Harris and colleagues (2020) [13] noted the lack of consensus naming this issue, emphasizing the need to establish a research-supported criterion for its identification. In this study, the term addiction will be used.

Adolescence is a stage in which there is a greater need for social interactions [14], and this is the main reason for the higher use of smartphones. The widespread utility and appeal of mobile phones among adolescents might lead to uncontrolled or excessive use that interferes with daily activities, alters interpersonal relationship dynamics, and can even impact the user's health and well-being [15–17]. In fact, this compulsive online behavior has been strongly correlated with symptoms of depression and loneliness in teenagers [18–20].

Moreover, the worldwide impact of the Corona Virus Disease 2019 (COVID-19) pandemic has intensified smartphone usage among adolescents. School closures, prolonged stays at home, and alterations in daily routines led to reduced social contact, increased feelings of loneliness, heightened conflicts with parents, and academic pressures due to abrupt changes in traditional learning methods [21,22]. These situations have contributed to a higher prevalence of misuse and addiction to these devices [23–25] and impacted their mental well-being [26–30]. In Italy, 69.3% of adolescents used their smartphones for at least 3 hours a day during the COVID-19 pandemic, and 18.5% of them during at least 6 hours a day [31].

In addition to the relationship between excessive mobile phone use and the disruption of health and well-being, studies have also found an association with alcohol abuse [32,33]. Tobacco and alcohol use have been found as risk factors for smartphone addiction [34,35]. Besides, there has been some controversy during the last years about the necessity of regulating the use of smartphones at schools. Some recommendations have been emanated about it, being mandatory to make a follow-up. In this sense, current research aims to analyze the risk of mobile phone addiction among teenagers in Italy and its relationship with other risk behaviors, such as drug consumption and emotional well-being, following the COVID-19 pandemic.

Materials and Methods

Sample

A cross-sectional observational study was conducted in Catania, Sicily, during May 2022. The study sample comprised 342 of 550 students (response rate = 62.1%) from a secondary education center. Regarding the age range, 34.5% of participants were 14 to 15 years old, 33.3% between 16 to 17 years, 30.7% between 18 to 19 years, and 1.5% were 20 years old or more. 79.8% of participants were female. The inclusion criteria were to have a smartphone and to be enrolled in the school of the study. Students who did not meet the criteria were excluded.

Procedures

The survey was administered using an electronic form accessible via the Internet for two weeks. Students accessed the questionnaire through computers and mobile devices, including smartphones and tablets, at their convenience. Researchers presented the survey to all the involved classes, addressing questions and concerns raised by the students.

All the students were invited to participate after being informed about the research objectives and assured of the survey's anonymity. Written consent from parents was secured, ensuring the confidentiality of collected data. The study was conducted according to the guidelines of the Declaration of Helsinki and ethical approval was obtained from the University of Murcia ethics committee (CEI 4772).

Measures

The assessment of smartphone addiction risk utilized the validated Italian version of the Smartphone Addiction Scale Short Version (SAS-SV) [36,37]. This instrument comprises 10 items to evaluate loss of control, disruption, disregard, withdrawal, preoccupation, and tolerance associated with smartphone usage. Respondents rate each item on a Likert scale ranging from 1 (strongly disagree) to 6 (strongly agree). Subsequently, individual scores for each question were aggregated to derive a cumulative score. The established threshold for identifying problematic smartphone use was gender-specific, with a cutoff score of 31 for boys and 33 for girls [37]. The internal consistency (Cronbach's α) for SAS-SV was 0.85.

Subjective Wellbeing was measured with the Personal Wellbeing Index-School Children (PWI-SC), which measures life satisfaction/happiness across seven domains [38].

Item scores ranged from 0 to 10, with higher scores indicating greater satisfaction/happiness. The PWI-SC score was calculated as the average of the seven relevant domains, standardized on a 0–100 scale. According to Tomyň *et al.* (2011) [39], self-perceived well-being serves as a potential indicator of depressive risk. The PWI-SC scoring system delineates distinct well-being categories, with scores of 70 or above signifying a state of normal well-being. Scores ranging between 51 and 69 points are indicative of diminished well-being, while a score of 50 points or lower suggests an elevated risk of depression. For the current sample, Cronbach's alpha was 0.93.

The NIAAA Brief Alcohol Use Screener was developed by the National Institute on Alcohol Abuse and Alcoholism (NIAAA) [40] categorizing adolescents into different risk categories (low risk, moderate risk, and high risk) after being asked about age and frequency of alcohol use in the past year: "In the past year, on how many days have you had more than a few sips of beer, wine, or any drink containing alcohol?"

Cannabis and other drugs use was measured by asking: "During the past year, did you smoke any marijuana or hashish?" and "Use anything else to get high?" ("anything else" includes illegal drugs, over the counter and prescription drugs, and things that you sniff or "huff"), answering "No/Yes".

The self-administered questionnaire covered demographic variables (age, gender, class) self-perception of excessive smartphone use (coded as yes/no), and most frequently used functions (coded as yes/no): social media engagement, music, video games, television series, gambling, others; and the purpose of use (coded as yes/no): boredom combat, emotion sharing, loneliness alleviation, curriculum catch-up and others.

Statistical Analysis

SPSS for Windows (ver. 22.0; SPSS Inc., Chicago, IL, USA) was used for variate and multivariate analysis. Analysis was conducted in four steps. First, participants were assigned to the smartphone addiction group or normal group using the aforementioned definitions of the instrument. Second, demographic, academic, PWI-SC, alcohol use disorders (NIAAA), substance use items, phone use (for social networks, music, video games, TV series, gambling), and purpose (fight boredom, share emotions, feel less alone and to be updated with the curriculum) characteristics were reported as frequency and percentage for the whole sample and two subsamples. In addition, Chi-

square, *t*-test (for age), and *p*-value were calculated between groups (addiction group and normal group). Third, normality test (specifically Kolmogorov-Smirnov) for demographic (age and sex) and academic (secondary school year) variables were calculated, finding a non-normal distribution ($p \leq 0.001$) of the variables. Fourth, a Chi-square test was performed to compare the characteristics of PWI-SC, NIAAA, substance use items, and phone use between addicted and non-addicted. Finally, stepwise multivariate logistic regression analyses, with bootstrapping (1000 resamples) and 95 percent corrected bias and accelerated confidence intervals, were performed to determine which specific variables (age, gender, NIAAA, social networks use, and self-perceived high use) distinguished risk status for smartphone addiction (addiction group versus normal group). The class was removed from the model in order to avoid overlap between variables (specifically age and class). A *p*-value of less than 0.05 was considered to indicate statistical significance.

Results

The mean age of the subjects was 16.43 (standard deviation [SD] = 1.63) and approximately four out of five participants were female (79.8%). Students at the 5th school year were the most prevalent (26.9%). The mean score obtained for self-perceived well-being was 55.5 (SD = 27.1) and 36.2% of participants were categorized as "high risk" for depression. Approximately, four out of ten participants were at "moderate or high risk" to suffer an alcohol use disorder. Exploring other substance uses, approximately one out of five (20.2%) smoked marijuana and only a small proportion of participants (2.9%) used a different drug. Regarding Smartphone use, most of the participants used the Smartphone for social networks (86.0%) and music (70.2%) and the most cited motive to use the mobile phone was to fight boredom (67.5%). In contrast, gambling was the least used motive (1.8%). Additionally, almost nine out of ten (91.2%) participants believed that they usually spend too much time on their mobile phone. Finally, 103 out of the 342 students who participated in the survey (30.1%) were classified with a smartphone addiction.

Table 1 also summarizes the participants' characteristics in both the normal group and the smartphone addiction group. The mean age in the normal group and addiction group was 16.60 ± 1.63 and 16.04 ± 1.57 , respectively, reporting statistical differences between the groups (*t*-value = 2.932; $p = 0.035$). Furthermore, other variables showed statistically significant differences between the two groups. In the addiction group was more frequent in the female sex ($\chi^2 = 5.221$, $p = 0.022$), risk of alcohol use disorder ($\chi^2 =$

10.046, $p = 0.018$), social networks use ($\chi^2 = 10.296$, $p \leq 0.001$) and excessive mobile phone use ($\chi^2 = 11.355$, $p \leq 0.001$). Contrary, well-being risk ($\chi^2 = 1.135$, $p = 0.567$) was not statistically significant after comparison between the groups.

Multivariate logistic regression analyses were performed to identify the variables associated with smartphone addiction (Table 2). All variables showing statistically significant differences between addiction group and the normal group were entered and analyzed using backward method. In the goodness-of-fit test of the regression analysis model, the $-2 \log$ likelihood was 262.158 and statistically significant ($p < 0.05$). Table 2 provides the results of the multivariate regressions, with smartphone addiction being regressed on age, gender (female as the reference group), NIAAA (low risk group as the reference group), social network use (no as reference group), and spend too much time at the mobile phone (no as reference group) variables. Our results showed the following odds ratio: Being younger (odds ratio [OR] = 0.766; 95% confidence interval [CI] [0.630–0.932], $p = 0.008$), female (OR = 2.119; 95% CI [1.102–4.075], $p = 0.023$), alcohol “high risk” (OR = 1.234; 95% CI [1.003–1.518], $p = 0.021$), social network uses (OR = 4.176; 95% CI [1.550–9.463], $p = 0.007$), and spend excessive time at the mobile phone (OR = 3.243; 95% CI [2.501–4.205], $p = 0.007$) increased the odds of smartphone addiction among participants.

Discussion

Current research was designed to analyze the risk of mobile phone addiction among adolescents in southern Italy (Catania) and its correlation with emotional well-being and other risky behaviours such as alcohol and substance consumption in post COVID-19 pandemic era.

In this study, 30.1% of the surveyed students exhibited a risk of phone addiction. A recent scoping review highlighted substantial variations in the prevalence of mobile phone addiction among adolescents (ranging from 4.3% to 70%) depending on geographical location, sample characteristics, and assessment instruments used for measuring addiction [7]. The prevalence outlined above may not seem particularly high, especially if it is noted the increased smartphone use during the COVID-19 pandemic when isolation feeling was enhanced and could have amplified the likelihood of device use and abuse [31,41,42]. For instance, in Italy, data collected before and during the pandemic demonstrated an escalation in addiction prevalence ranging from 26.1% to 46.7% [25].

A Recent cross-sectional study underscores the profound impact of COVID-19 on the mental health of children and adolescents due to fear, uncertainties, and home confinement [43]. Our sample revealed that nearly 20% of students were at risk of depression. These levels align with recent findings in Italy, that show a decrease in health-related quality of life together with an enhancement in conduct problems, attributable to the disruption of education, physical activities, and socialization [44,45]. Besides, research conducted worldwide has shown a significant increase in several mental health disorders such as depression, anxiety, substance abuse, post-traumatic stress disorders, and attention issues among adolescents during the COVID-19 pandemic [46,47]. Simultaneously, there was a substantial decrease in social support and connectivity [48,49]. Regarding this, the UK witnessed a notable rise in depressive symptoms, post-traumatic stress disorder, and externalizing difficulties [50], while the United States reported worsened psychological well-being and behavioral health among children and adolescents, compared to the pre-pandemic period [51,52].

Alcohol and other substances were consumed to cope with the COVID-19 pandemic [33,53]. Anxiety, depression, and the psychological distress associated with the lockdown in adolescents would explain the consumption of psychoactive substances [54–57]. Regarding alcohol use, our results indicate that approximately four out of ten participants presented a moderate or high risk of alcohol use disorder. Another study performed in Italy studying alcohol abuse in young adults after the pandemic, also reported 40% of participants classified as high-risk drinkers [58]. The Italian Istituto Superiore di Sanità, through its survey on alcohol abuse in young people, observed an increase in post pandemic consumption, especially in girls. Our results are in line with the findings of Biagioni *et al.* [59] where alcohol was the substance most consumed (43.1%) by adolescents in Italy during the lockdown.

Most studies coincide that alcohol was the most consumed substance during the pandemic [59–62], but there is no consensus about the consumption of other substances, with some authors stating that consumption increased [60] and some authors that it decreased [55,59,61]. A study in Italy observed a decrease in the consumption of substances (both legal and illegal) during the restriction period. 5.9% of adolescents consumed cannabis during lockdown, and only 0.9% used at least one illegal substance [59]. The Italian Istituto Superiore di Sanità reported a decrease in cannabis consumption by young adults compared with pre pandemic COVID-19 data. These data agree with the results of our study where around 20% of adolescents used

Table 1. Comparison of clinical characteristics for all the participants and between the addiction group and the normal group.

Variables	Total	Addiction group	Normal group	<i>t</i> -value	<i>p</i> -value
	n = 342 (100%)	n = 103 (30.1%)	n = 239 (69.9%)		
Age (mean ± SD)	16.43 ± 1.63	16.04 ± 1.57	16.60 ± 1.63	2.932	0.035
	n (%)	n (%)	n (%)	Chi-square	<i>p</i> -value
Sex				5.221	0.022
Female	273 (79.8)	90 (87.4)	183 (76.6)		
Male	69 (20.2)	13 (12.6)	56 (23.4)		
Secondary school year				12.706	0.034
1	77 (22.5)	33 (32.0)	44 (18.4)	<i>Ref</i>	
2	54 (15.8)	16 (15.5)	38 (15.9)		
3	54 (15.8)	19 (18.4)	35 (14.6)		
4	65 (19.0)	18 (17.5)	47 (19.7)		
5	92 (26.9)	17 (16.5)	75 (31.4)		
Personal wellbeing				1.135	0.567
Normal	134 (39.2)	43 (41.7)	91 (38.1)		
Low	84 (24.6)	27 (26.2)	57 (23.9)		
High risk of depression	124 (36.2)	33 (32.0)	91 (38.1)		
Alcohol risk				10.046	0.018
No risk	122 (35.7)	34 (33.0)	88 (36.8)	<i>Ref</i>	
Low risk	84 (24.6)	17 (16.5)	67 (28.0)		
Moderate risk	69 (20.2)	23 (22.3)	46 (19.2)		
High risk	67 (19.6)	29 (28.2)	38 (15.9)		
Marihuana use (yes)	69 (20.2)	18 (17.5)	51 (21.3)	0.254	0.416
Other drug use (yes)	10 (2.9)	4 (3.9)	6 (2.5)	0.352	0.158
Smartphone uses (yes)					
Social networks	294 (86.0)	98 (95.1)	196 (82.0)	10.296	≤0.001
Music	240 (70.2)	73 (70.9)	167 (69.9)	0.034	0.854
Videogames	49 (14.3)	15 (14.6)	34 (14.2)	0.007	0.935
Television series	162 (47.4)	49 (47.6)	113 (47.3)	0.002	0.961
Gambling	6 (1.8)	1 (1.0)	5 (2.1)	0.525	0.470
Smartphone use purpose (yes)					
Fight boredom	231 (67.5)	77 (74.8)	154 (64.4)	3.498	0.062
Share emotions	178 (52.0)	57 (55.3)	121 (50.6)	0.640	0.425
Feel less alone	116 (33.9)	42 (40.8)	74 (31.0)	3.093	0.079
Up to date with the curriculum	136 (39.8)	33 (32.0)	103 (43.1)	3.674	0.085
Self-report excessive smartphone use (yes)	312 (91.2)	102 (99.0)	210 (87.8)	11.355	≤0.001

Note: SD, standard deviation; Ref, reference group.

marijuana, and a small percentage (exclusively 2.9%) used other drugs, observing a post-pandemic increase.

In the scientific literature, several authors have found a link between alcohol or tobacco consumption and mobile phone addiction [34,35,63] in contrast to other studies [64,65]. A previous study has shown a higher use of social media as a factor that contributes to increased alcohol (or other substance) use [33]. Different studies have concluded that alcohol consumption leads to an increased time surfing on social networks [32,66]. Meanwhile, it has also been reported that the fact of sharing alcohol-related

content on social media may rise after alcohol consumption [66–68]. Although the literature has previously indicated the frequency of cross-addictions, additional studies are needed to understand the possible associations between smartphone addiction and other substance use, including alcohol and tobacco.

According to the logistic regression analysis, the risk of smartphone addiction is increased in younger adolescents, in girls, in those with frequent alcohol consumption, and in those who use social media extensively and spend excessive time checking their smartphone. We found that

Table 2. Multivariate logistic regression for all participants (n = 342).

	B	SD	Wald	OR	95% CI	p-value
Age	-0.266	0.099	7.093	0.766	0.630–0.932	0.008
Female (ref = male)	0.751	0.334	5.061	2.119	1.102–4.075	0.023
Alcohol medium risk (ref = low risk)	0.265	0.275	0.928	1.303	0.760–2.223	0.326
Alcohol high risk (ref = low risk)	0.210	0.106	3.948	1.234	1.003–1.518	0.021
Social networks use (ref = no)	1.362	0.475	8.264	4.176	1.550–9.643	0.007
Self-report excessive smartphone use (ref = no)	1.117	0.133	68.828	3.243	2.501–4.205	0.007
Log pseudo-likelihood	262.158					
Cox and snells R ²	0.377					
Nagelkerke's R ²	0.510					

Note: SD, standard deviation; OR, odds ratio; CI, confidence interval.

younger adolescents are more prone to develop smartphone addiction which is in line with previous results [64,69]. Nonetheless, we must take into consideration that the age of initiation in the use of smartphones is decreasing [70]. These results are contrary to another study also conducted in Italy [71].

Our results are in consonance with previous research showing that girls have twice more probability compared with boys of developing addiction [34,35,41,71]. Adolescent girls often use smartphones for social contact, spend more time, and use more frequently the smartphone for social networks [72]. The use of smartphones on social media has been consistently demonstrated to be associated with the likelihood of addiction in numerous studies [64,71,73,74].

As expected, self-reporting excessive time using the device is associated with addiction, and several studies report a relationship between number of hours of use and the probability to develop this disorder [64,73,74]. Smartphone abuse is often associated with a decrease in well-being [25,35,75–79]. However, this association does not appear in this study, which may be attributed to the circumstances arising from the COVID-19 pandemic. The use of smartphones and social media served as coping strategies for dealing with pandemic-related restrictions, providing a way to maintain online social connections and alleviate feelings of loneliness, anxiety, and distress [80,81].

The current study has certain limitations that should be taken into consideration: such as its cross-sectional design and the presence of selection bias, given that the data was collected online, potentially leading to an overestimation of problematic use. Additionally, participants' self-reported data may be influenced by social desirability or memory biases. Moreover, the increased dependence on remote learning during the mandatory quarantine period could be as-

sociated with smartphone misuse. Given these limitations, additional studies are required to comprehensively explore smartphone addiction.

Conclusions

Our data shows that there is an important number of adolescents with problematic smartphone use. This research provides valuable insights and highlights the importance of developing prevention plans for the correct use of new technologies, given that this is an age group vulnerable to other problems such as depression or alcohol disorders. Consequently, it is crucial to increase awareness and to educate at-risk groups to make intelligent and responsible use of smartphones.

Availability of Data and Materials

Data to support the findings of this study are available on reasonable request from the corresponding author.

Author Contributions

MAAC contributed to the data curation and performed the investigation. LFL contributed to the data curation and to write the original draft. JNZ contributed to visualization and to edit the manuscript. FCS contributed to the investigation and to write the original draft. Finally, MF contributed to the methodology, to write the original draft and supervised all the project. All authors contributed to important editorial changes in the manuscript. All authors read and approved the final manuscript. All authors have participated sufficiently in the work and agreed to be accountable for all aspects of the work.

Ethics Approval and Consent to Participate

The study was conducted according to the guidelines of the Declaration of Helsinki and ethical approval was obtained from the University of Murcia ethics committee (CEI 4772). Participants gave written informed consent to participate in this study.

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Conflict of Interest

Javier Navarro-Zaragoza was serving as one of the Editorial Board members of this journal. We declare that Javier Navarro-Zaragoza had no involvement in the peer review of this article and had no access to information regarding its peer review. Other authors declare no conflict of interest.

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