



The association between mobile phone use and mental health

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Abstract

Aims: The goal of the current research was to determine whether there is a connection between excessive, problematic mobile phone use and mental health. It specifically looked at depression, perceived stress, and sleep, as well as how these factors differ between males and females.

Method: By examining all ages over 18, the current research aimed to strengthen and add to previous findings made in associated studies. Questionnaires assessing problematic mobile use, depression, perceived stress, and sleep quality were completed

by 204 participants. **Results:** Results showed that higher screentime and a higher score on the problematic mobile phone use scale was associated with higher levels of depression. Higher screentime was linked to lower perceived stress scores and a higher score on the problematic mobile phone use scale was linked with higher levels of perceived stress. Higher sleep quality was associated with higher screentime, whereas lower sleep quality was associated with a higher score on the problematic mobile phone use scale. Results also found that females scored greater in both depression and perceived stress and lower in sleep quality. **Conclusion:** The results of this research help us understand the connection between excessive, problematic mobile use and mental health.

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Literature Review

Global use of cellphones has increased significantly in recent years. According to a Pew Research Center report, there are over 2.5 billion mobile phone users worldwide. Mobile phone ownership is at least 90% in advanced countries like South Korea and Israel, compared to about 60% in emerging economies like Brazil and South Africa (Taylor and Silver, 2019). For the majority of people, a mobile phone is now a daily necessity due to its ease of information access, social connectivity, business platforms, and amusement (Oviedo-Trespalacios et al., 2019). Additionally, mobile phones are now becoming essential in the field of medicine, helping both clients and medical workers (Alosaimi et al., 2016). Moreover, physiological and psychological problems are starting to surface with problematic mobile phone use. The UK is described as a "mobile phone society" because 93% of people own a mobile phone and spend greater amounts of time online on their phone (an average of twenty hours per week) than on any other device (such as laptops and desktop-computers). Current trends indicate that mobile devices and the Internet have gotten more closely linked to allow "on-the-go" access to a variety of services (such as online browsing, interpersonal interaction, banking, shopping, and gaming) (Ofcom 2016). It is important to explore the link between the mobile phones and mental health as mobile phone usage has and continues to increase significantly and within young adults, mental health disorders have considerably increased over the past ten years (American Psychological Association., 2019).

Mobile phone addiction is the overuse of a mobile phone to the extent of lacking self-control and disrupting the user's daily life. (Demirci et al., 2014). Despite possible harm, the addicted individual feels pressured to continue using a mobile phone. Overusing mobile phones

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may result in a decline in concentration and memory, sleep disturbances, changes in eating habits, and physical abnormalities, along with other problems. (Choi et al., 2015; Alhazmi et al., 2018; Domoff et al., 2020; Kumar et al., 2019). Using a mobile phone while driving may cause distraction, which could lead to more road accidents. (Olsen et al., 2013). Additionally, it has been claimed that students' academic success was negatively influenced by mobile phone addiction. (Khan et al., 2019). Mobile phone addiction is much more severe compared to internet addiction for the simple reason that there are more addictive features and apps on mobile phones. (Alfawareh & Jusoh., 2014).

When a mobile phone user has not got access to their phone, they may experience "nomophobia," a symptom where they become anxious about the device's absence. (Yildirim & Correia., 2015). King and her colleagues (King et al., 2014) showed that students who were dependent on mobile phones and were deprived of access to them went through severe distress and anxiety. Another indication of mobile phone addiction is when a user repeatedly checks their device out of a desire to respond to messages that, in their opinion, require an instant response (Archer., 2023).

Problematic mobile phone use is the overuse or addiction of a mobile phone in everyday life that is followed by dysfunction and symptoms resembling a substance abuse disorder (Elhai et al., 2019). Both psychological (such as craving, anxiety, and feeling out of control) and physical (such as withdrawal and tolerance) reliance are common signs of problematic mobile phone use (Panova & Carbonell., 2018). Pedestrian and traffic incidents (Cazzulino et al., 2014), reduced physical activities (which can result in headaches, tiredness, dizziness, strain, loss of memory, and hearing problems) (Alosaimi et al., 2016), and academic issues (Lepp et al., 2014)

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have all been argued to be linked to problematic mobile phone use. Additionally, there are a number of studies demonstrating the damaging effect of problematic mobile phone use on mental health, like perceived stress (Harwood et al., 2014), reduced sleep quality (Cabre-Riera et al., 2019; Demir and Sümer, 2019), depression (Firat et al., 2018), and anxiety (Hawi and Samaha, 2017).

Mobile phones may affect the above issues due to exposure to electromagnetic fields (such as using a mobile phone at night). This may hinder the neurons in the brain (especially the pineal gland) and cause alterations in cerebral blood flow and brain electrical activity, which can result in worse sleep quality (Demirci et al., 2015). Blue light emitted from mobile phones has been suspected to impact melatonin levels and affects the brain's ability to produce melatonin (Thomee, 2018). Problematic mobile phone use may result in physical discomfort like headaches and muscle pain, which can disrupt sleeping patterns. (Demirci et al., 2015). A vital biological mechanism connected to mood regulation is sleep. (Thomee et al., 2011), Stress, depression, and anxiety can result from technology use that interferes with sleep. (Lemola et al., 2015). Furthermore, excessive use of mobile devices may result in depression and anxiety, both of which are linked to sleep issues. (Demirci et al., 2015). Working requirements to remain connected online may lead to stress and burnout (Derks and Bakker, 2014). Problematic mobile phone use has reduced time spent on other health-related hobbies like exercise and socializing (Thomee, 2018).

There have been a number of studies that have investigated the overlap between excessive mobile phone use and mental problems, as well as the connection to illness, inability to exercise, and sleep issues. Excessive mobile phone use has been linked to low psychological

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(Tangmunkongvorakul et al., 2019) and mental well-being (Bhatt & Gaur., 2019), social anxiety (Turgeman et al., 2020), depression (Demirci et al., 2015), shyness (Liu et al., 2016) and low self-esteem (Eichenberg et al., 2019). Excessive reassurance seeking was associated with greater problematic mobile phone use, and its interaction with worrying mediated the association between more severe depression and anxiety and problematic mobile phone use (Elhai et al., 2020). In this study the focus will be on mental health issues: depression, stress and sleep.

Depression

Prior literature (Panova & Lleras., 2016) showed excessive and problematic use of mobile phones was associated with depression. This research included depression as a criterion variable to strengthen the existing research on depression and adult excessive, problematic mobile phone use. An extended three-year study covering adolescent to emerging adulthood indicated that early problematic mobile phone use was a strong predictor of depression (Coyne et al., 2019). Excessive mobile phone use was linked to significant levels of depressive feelings, loneliness was found to be a moderator of this association, especially in men (Ivanova et al., 2020). Overuse of mobile phones was significantly linked to both depression and anxiety (Jeong et al., 2020). Mobile phone use on social networks was linked to depressive symptoms and also suicidal thoughts (Lee et al., 2020). Adolescents' poor sleep habits and depressive symptoms were both linked to the excessive use of mobile phones (Thomé et al., 2011). One of the most common effects of excessive mobile phone use is that social relationships will decline, people will become more socially isolated, and people who use mobile phones constantly will feel lonelier (Billieux et al., 2008). It has also been found that mobile phone addicts experience depression, confusion, and isolation without their device (Walsh et al., 2008). Several of the

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studies discussed use a self-report questionnaire. The main disadvantages to using a self-report questionnaire are honesty (instead of telling the truth, subjects might give the response that is more socially acceptable) and introspective ability (the participants might struggle to give themselves an accurate assessment).

Stress

Stress can result from both external factors and an individual's perspective on events (Ertan & Mehmet., 2016). Previous studies have found mixed correlation between stress and excessive mobile phone use, ranging from low correlation to high (Ertan & Mehmet., 2016; Zahra & Alyssa., 2018; Gligor., 2019). Therefore, in addition to including depression and sleep in our study, we also included stress to strengthen the existing research on stress and adult mobile phone use. It is probable that continuous stress would raise the risk of neurobiologically serious screen addiction (Zhu et al., 2015). Television was the first screen used in clinical studies on screen addiction (Meerlo.,1954; Sussman & Moran., 2013), which was subsequently carried out on computers, video games (Griffiths et al., 2012), the internet (Young., 1999), and more recently, mobile phones (Kuss et al., 2018). These studies highlight the link between screen use and stress-related psychopathology (Pera., 2018; Appel et al., 2016). Excessive mobile phone use has been linked to higher levels of stress in users who rarely shared their emotions and difficulties online, whereas those who did so reported less emotional issues (Karsay et al., 2019). It is challenging to sum up the connection between problematic mobile phone use and stress. Studies that link mobile phone use to higher levels of stress have produced mixed findings, some claim that stress causes people to use mobile phones (Jeong et al., 2016), while others claim mobile phone use causes stress (e.g., Murdock, 2013). Further research is required to explore the

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relationship between mobile phones and stress. A number of these studies discussed focus mainly on adolescence, this limits the findings to one age group and does not give a true representation of how it may affect adults of all ages.

Sleep

To improve the body of knowledge regarding the relationship between adult excessive, problematic mobile phone use and sleep, this study included sleep as a criterion variable. Previous documented negative effects of screen time on sleep show that mobile phones have great potential for interfering with sleep quality or quantity (Carter et al., 2016). In earlier studies, problematic mobile phone use was repeatedly linked to poor sleep (Yang et al., 2020), and excessive smartphone use was linked to tiredness during the day, a longer sleep latency, and shorter sleep duration (Chung et al., 2018; Kim et al., 2020). Particularly, it has been demonstrated that using a mobile phone just before going to sleep can delay the circadian rhythm and be linked to the overall amount of time spent sleeping, whereas prolonged use was linked to poor sleep (Lin et al., 2019). Additionally, there was a connection between high daily screen usage and issues with difficulty falling asleep (Ghekiere et al., 2019), obtaining sufficient sleep (Twenge et al., 2019), and experiencing insomnia (Tamura et al., 2017). When problematic mobile phone usage was stopped, it reduced the likelihood of sleep disruptions and emotional distress (Liu et al., 2019). Overuse of mobile devices is associated with poorer sleep quality and pattern (Ali et al., 2019). Sleep disturbances raises the chance of developing mental and physical problems (Kim et al., 2000). Sleep disturbance was a mediator of the link between media consumption before bed and depression (Lemola et al., 2015; Dewi et al., 2018). Compared to

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depression and perceived stress, few studies have been conducted to investigate the relationship between problematic mobile phone use and sleep quality.

Present Study

Studying potential negative health consequences of exposure is crucial given the rapid development and widespread use of mobile phones. Mobile phone usage has increased significantly, however there is not enough consideration given to the psychological and social impacts of prolonged use of this communication tool. Mental health is one of the most fundamental subjects in psychology and sociology. Despite the rise in mobile phone usage, the device has not yet been investigated enough to understand the psychological damage it can have on individuals. This study was aimed to investigate the relationship between excessive and problematic mobile phone usage with depression, stress and sleep among adults.

The current study's objective is to investigate the complicated relationship between the criterion variables (CVs), depression, perceived stress, and sleep, and the predictor variables (PVs), average screen time and problematic mobile phone use. The sample age of 18+ was chosen because adults of all ages may be affected by mobile phones in terms of their mental health, either negatively or positively. This research will also investigate the gender differences among these factors.

This research is significant because it will demonstrate the effects that mobile phones have on people's mental health, with a particular emphasis on depression, perceived stress, and sleep. The research questions are: Can average screentime and problematic phone use influence depression?, Can average screentime and problematic phone use affect perceived stress?, Can

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average screentime and problematic phone use disturb sleep quality? and do results for depression, perceived stress, and sleep quality differ between male and female?

Based on previous research, we hypothesize that a higher score in both the predictor variables average screen time and problematic mobile phone use scale will result in a higher score in the criterion variable depression. The second hypothesis states that a higher score in average screen time and problematic mobile phone use scale would result in higher levels of perceived stress. The third hypothesis suggests that sleep quality scores would be lower with higher average screen time and problematic mobile phone use scale scores. Our fourth and final hypothesis is that, when compared to men, women will score higher on depression and perceived stress and lower on sleep quality.

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Methods

Participants

In the present study, 204 participants were included in the sample. (Females: $n = 125$; Males: $n = 74$; Prefer not to say; $n = 5$) participants. The sample size was computed using the formula provided by Tabachnick and Fidell (2013), a sample size of $(N > 50 + 8m)$ is required for multiple regression analysis. Given that n is the total number of participants and m is the total number of predictor variables (PVs), my sample size must be at least $n = 82$. Consistent with ethical considerations, participants were over 18 years of age, averaging 26.08 years old ($SD = 9.78$). Participants did not provide any demographic data as it was not necessary in this current study. For recruiting participants, a non- probability, convenience sampling method was used, through the researcher's social media account (Instagram). This made sure the sample included people who were using their phones frequently, which could lead to more reliable responses to the research question. Prior to filling out the questionnaire, participants had to give their informed consent.

Materials

To construct the study questionnaire, demographic questions were combined with four distinct scales using the survey builder, Google Forms. To learn a little bit more about the study participants, demographic questions concerning their gender and age were asked.

Mobile Phone Problematic Use Scale (MPPUS-10): With an overall Cronbach's alpha of .85, the MPPUS-10 scale has good reliability. Modified in 2015 by Foerster et al., Using baseline data, principal component analysis (PCA) was used to reduce the 27-item original

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MPPUS to a 10-item assessment. The MPPUS-10 size accurately represents the original MPPUS. The MPPUS-10 questions are scored on a scale of 1 to 5, with 1 representing strongly disagree and 5 representing strongly agree.

Center for Epidemiologic Studies Depression Scale (CES-D): developed by Radloff in 1977, with an overall Cronbach's alpha of .90, the scale has good reliability. It is a 20-item questionnaire that asks participants to rate how frequently they felt symptoms of depression, like loneliness and restless sleep, during the previous week. For each item, there are four possible responses: 0 for rarely or none of the time, 1 for some or little of the time, 2 for moderately or much of the time, and 3 for most or almost all the time. High scores indicate more severe depressive symptoms. Scores vary from 0 to 60.

Perceived Stress Scale (PSS): is a 10-item questionnaire that was initially developed by Cohen et al (1983), it has an overall Cronbach's alpha of .70, the scale has good reliability. It is frequently used to measure people's degrees of stress. It evaluates how much a person has felt that life is unpredictable, uncontrollable and overwhelming over the previous month. The questions ask participants about their feelings and ideas from the preceding month. Respondents are questioned about their frequency of experiencing each emotion on a five-point scale from "never" to "very often.". The PSS total is then calculated by reserving scores for items 4, 5, 7, and 8, and then adding up all of the scores. Higher scores indicate feelings of greater stress.

Sleep Quality Scale (SQS): As a quick and useful way to evaluate sleep quality, the single-item sleep quality scale (SQS) was created by Snyder et al. (2018). A participant-reported rating of sleep quality over a 7-day recall timeframe is made possible by the single-item format. The question states During the past 7 days how would you rate your sleep quality overall? The

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participant then is required to mark one of the following boxes available, 0 = terrible, 1 to 3 = poor, 4 to 6 = fair, 7 to 9 = good and 10 is excellent.

Design

The current study's research design is cross-sectional because all the data was gathered at one particular time. Additionally, the study was quantitative in character, as the study used a questionnaire to gather the data. In order to evaluate the connection between the Criterion variables, Pearson's correlation was performed. To evaluate each hypothesis, three distinct multiple regression analyses were carried out. Four predictor variables (PVs), including gender, age, problematic phone use, and average screen time, were included in each multiple regression. Depression was the first criterion variable (CV). Perceived stress was the second CV, and sleep quality was the third.

Procedure

An online survey was used to gather the participants' data. The questionnaire used in the current study was a self-report questionnaire. Social media sites were mostly used to recruit participants for this study. The survey was shared in group chats on WhatsApp and uploaded to both Instagram and Snapchat. Some participants were recruited via mutual friends, and an email with a link to the questionnaire was sent directly to them. An information sheet outlining everything involved in participation and potential risks or benefits of participation was given to participants once they decided to click the link (see appendix VI). Before moving on to the questionnaire, participants had to complete a consent form and state that they were willing to participate in the study (see appendix VII). The questionnaire took roughly 10 minutes to complete, and participants completed it in their own time.

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There were five parts to the questionnaire. Three questions were included in the first part of the survey and they asked participants to state their age, gender and their daily average screentime on their mobile phone over the past seven days. The second section of the questionnaire was the Mobile Phone Problematic Use Scale (MPPUS-10; Foerster et al., 2015) (see appendix II) which was used to determine a participant's relationship with their mobile phone. The third section of the questionnaire was the Center for Epidemiologic Studies Depression Scale (CES-D; Radloff., 1997) (see appendix III) this was used in the current study to assess participants levels of depression. The fourth section of the survey was the Perceived Stress Scale (PSS; Cohen et al., 1983) (see appendix IV), in the current research, this was used to measure participants' perceptions of their stress levels. The fifth section was the single item Sleep Quality Scale (SQS; Snyder et al., 2018) (see appendix V), this assessed the quality of participants sleep. Participants were provided with a debriefing sheet (see appendix VIII) after completing the questionnaire.

Ethical Consideration

All information was gathered in compliance with NCI's ethical guidelines. There was no inducement to participate in the research; all participants gave informed consent after being fully informed of the risks and benefits. The debrief form provided details for helplines like the Samaritans and an SMS support helpline for those who felt distressed as a result of taking part in the study (see appendix VIII).

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Results**Descriptive statistics**

The present dataset is drawn from a sample of 204 people. (n = 204). This consisted of 61.27% females (n = 125), 36.27% males (n = 74) and 2.45% Prefer not to say (n = 5).

Descriptive statistics were performed for all variables including mobile phone use, average screen time, depression, sleep and stress. The following metrics were obtained: Means (M), Standard Deviations (SD), Medians (MD), and Range, as well as tests for normality. The data set conducted preliminary analysis, and the findings indicate that the normality assumptions were met for all continuous variables. Table 1 below shows the outcomes for all continuous variables. Additionally, histograms showed that the data was regularly distributed (See appendix).

Table 1

Descriptive statistics for all continuous variables, N=204

	Mean	Median	SD	Minimum	Maximum
Average Screen time	1.63	2	1.15	0	4
Problematic Mobile Phone Use	28.48	29	6.99	12	48
Depression	22.01	20	11.53	3	56
Stress	20.74	22	7.73	0	37
Sleep Quality	5.62	6	2.31	0	10

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Age	26.05	22	9.78	18	66
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Pearson product-moment correlation coefficient was used to analyse the association between average screen time, problematic mobile phone use, depression, perceived stress and sleep quality. In order to confirm that the assumptions of normality, linearity, and homoscedasticity were not violated, preliminary analyses were carried out. There was a moderate, positive correlation between the two independent variables average screen time and problematic mobile phone use ($r = .36$, $N = 204$, $p < .001$). The three dependent variables were also examined in the Pearson product-moment correlation coefficient to see their relationship with one another, depression and perceived stress strong, positive correlation ($r = .72$, $N = 204$, $p < .001$). Depression and sleep had a moderate, negative correlation between them ($r = -.36$, $N = 204$, $p < .001$). Lastly, perceived stress and sleep had a moderate, negative correlation between them ($r = -.32$, $N = 204$, $p < .001$) (See Table 2 below for full details).

Table 2:

Pearson's correlations between continuous variables

Variables	1	2	3	4	5
1. Average Screen-Time	1				
2. Problematic Mobile Phone Use	.36***	1			
3. Depression	.31***	.39***	1		

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4. Perceived Stress	.16*	.39***	.72***	1	
5. Sleep Quality	.07	-.11	-.36***	-.32***	1

Note. Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$

Preliminary analyses showed no violation of the assumptions of normality, linearity, and homoscedasticity. We examined the correlations between the model's criterion variable and predictor variables. The predictor variables problematic mobile phone use and average screen time were significantly correlated with the criterion variable depression and perceived stress. They were non-significant with sleep quality. The correlation between the predictor variables were also significant (See table 2). The data could be examined using a standard multiple regression analysis because the tests for multicollinearity showed that all Tolerance and VIF values were within acceptable bounds and that the assumption of multicollinearity had not been violated.

Depression

To determine the impact problematic mobile phone use and average screen time had on depression, a standard multiple regression analysis was conducted. A direct method was used for the analysis because no priori hypotheses had been developed to specify the order of entry of the predictor variables. The R-Squared for this model indicated that the model explained 26.2% of variance in depression ($F(4, 199) = 17.70, p < .001$). A higher depression score of 1.52 (SE = .67) was linked to a higher average screen time. A participant's level of depression score of .41 (SE = .11) was slightly greater if they scored highly on the problematic mobile phone use scale.

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Being female was associated with a higher level of depression score of 5.25 ($SE=1.66$) on average compared to males, $p=.002$ (See Table 3 below for full details).

Table 3

Standard multiple regression model predicting depression

	<i>R</i>	<i>R</i> ²	<i>B</i>	<i>SE</i>	β	<i>P</i>
Model	.51	.26				
Female			5.25**	1.66	.22	.002
Age			-.24**	.08	-.21	.001
Average Screentime			1.52*	.67	.15	.024
Problematic Mobile Phone use			.41***	.11	.25	<.001

Note. R^2 = R-squared; *B* = unstandardized beta value; *SE* = Standard errors of *B*; β =

standardized beta value; *N* = 204; Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$

Perceived Stress

A standard multiple regression analysis was conducted to determine the impact problematic mobile phone use and average screen time had on perceived stress. A direct method was used for the analysis because no priori hypotheses had been developed to specify the order of entry of the predictor variables. The R-Squared for this model indicated that the model explained 24.3% of variance in perceived stress ($F(4, 199) = 15.99, p < .001$). A lower perceived stress score of -.14 ($SE = .45$) was linked to a higher average screen time. A participant's level of

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perceived stress score of .32 ($SE = .08$) was slightly greater if they scored highly on the problematic mobile phone use scale. Being female was associated with a higher level of perceived stress score of 4.29 ($SE = 1.09$) on average compared to males, $p < .001$ (See Table 4 below for full details).

Table 4

Standard multiple regression model predicting perceived stress

	<i>R</i>	<i>R</i> ²	<i>B</i>	<i>SE</i>	β	<i>P</i>
Model	.49	.24				
Female			4.29***	1.09	.27	<.001
Age			-.18***	.05	-.23	<.001
Average Screentime			-.14	.45	-.02	.75
Problematic Mobile Phone use			.32***	.08	.29	<.001

Note. R^2 = R-squared; *B* = unstandardized beta value; *SE* = Standard errors of *B*; β =

standardized beta value; *N* = 204; Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$

Sleep Quality

A standard multiple regression analysis was conducted to determine the impact problematic mobile phone use and average screen time had on sleep quality. A direct method was used for the analysis because no priori hypotheses had been developed to specify the order of entry of the predictor variables. The R-Squared for this model indicated that the model

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explained 1.5% of variance in perceived stress ($F(4, 199) = .78, p < .001$). A higher sleep quality score of .12 ($SE = .15$) was linked to a higher average screen time. A participant's level of sleep quality score of -.04 ($SE = -.12$) was slightly lower if they scored highly on the problematic mobile phone use scale. Being female was associated with a lower level of sleep quality score of -.05 ($SE = .34$) on average compared to males, $p = .87$ (See Table 5 below for full details).

Table 5

Standard multiple regression model predicting sleep quality

	<i>R</i>	<i>R</i> ²	<i>B</i>	<i>SE</i>	β	<i>P</i>
Model	.12	.02				
Female			-.05	.34	-.01	.87
Age			.01	.02	.02	.79
Average Screentime			.12	.15	.06	.46
Problematic Mobile Phone Use			-.04	-.12	.03	.13

Note. R^2 = R-squared; *B* = unstandardized beta value; *SE* = Standard errors of *B*; β =

standardized beta value; *N* = 204; Statistical significance: * $p < .05$; ** $p < .01$; *** $p < .001$

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Discussion

The aim of the current research was to investigate the relationship between predictor variables (PVs) average screen time and problematic mobile phone use and criterion variables (CVs), depression, perceived stress, and sleep quality. Additionally, the research was also interested in looking at how gender differed for each criterion variable.

Hypothesis one was hypothesized from previous research, it stated that if an individual scored highly on predictor variables average screentime and the problematic mobile phone use scale it would result in higher levels of depression. A multiple regression analysis was conducted to explore the relationship between these variables. The overall model was non-significant. However, both average screentime and problematic mobile phone use did uniquely predict depression to a statistically significant level. The findings suggest that a higher average screentime and a higher score on the problematic mobile phone use scale can result in higher levels of depression. This is consistent with past research suggesting that excessive and problematic mobile phone use can cause greater depression levels (Thomée et al., 2011).

A second multiple regression analysis was used for hypothesis two to determine if a higher average screentime and a higher score on the problematic mobile phone use scale was linked to a higher perceived stress score. The overall model was non-significant. Average screentime was non-significant. However, problematic mobile phone use did uniquely predict perceived stress to a statistically significant level. The findings showed that a lower perceived stress score was linked to higher average screen time and a greater score on the problematic mobile phone use scale was associated with slightly greater levels of perceived stress. This conflicts with prior research (Ha et al. 2008; Panova and Lleras 2016) that found higher average

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screen time can affect perceived stress. However, it is consistent with past research suggesting that problematic mobile phone use can cause a slight increase in perceived stress levels (Lee et al., 2014).

For hypothesis three, a third multiple regression analysis was run, we predicted that higher average screen time and a higher problematic mobile phone use scale score would result in lower sleep quality. The overall model was non-significant. Both average screen time and problematic mobile phone use were non-significant. However, the results showed that a higher average screen time resulted in a higher sleep quality score, this goes against previous literature (Cabre-Riera et al., 2019), this may be due to the single item sleep quality scale used in this research. If a more in-depth scale was used it may have given a better view of sleep quality. A higher score on the problematic mobile phone use scale resulted in a lower score on the sleep quality scale, this agrees with prior research (Daniyal et al., 2022).

Lastly, hypothesis four suggested that females would have greater scores in both depression and perceived stress and lower scores in sleep quality. Results from the three multiple regressions within this study indicated that females scored greater in both depression and perceived stress and lower in sleep quality. This suggests that females are affected more by excessive and problematic mobile phone use than males. The above findings show hypothesis 1 and 2 are partly supported, hypothesis 3 is not supported and hypothesis 4 is supported.

Results are in line with and give support to earlier studies that have indicated an association between excessive, problematic mobile phone use and depression, perceived stress, and sleep quality. It's critical to comprehend the effects of excessive and problematic mobile phone use. Previous studies have connected frequent mobile device use to depressive symptoms,

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stress and poor sleep quality (Thomé et al., 2011). According to research, using mobile devices excessively may increase the chance of experiencing depression and sleep problems.

A number of studies have looked at excessive, problematic mobile phone use and its effect on depression. Like our study, several studies have found greater excessive, problematic mobile phone use negatively affects an individual's symptoms of depression. Depression is a psychological condition that results in observable changes in mood, energy, perfectionism, appetite, sleep, and reasoning (Bidi et al., 2012). It can also impair one's ability to function in daily life. Multiple variables, including genetic, social, mental, behavioral, external influences and stressors, contribute to the disorder of depression. In recent times one of the contributing factors in worsening mental illnesses, including depression and anxiety, is mobile phone addiction (Oqbaee et al., 2018). Numerous earlier studies found a link between excessive use of mobile phones and depression. In other words, it can be said that as people's levels of depression rise, so does their use of mobile phones, which is consistent with both the findings from this study and earlier ones (Jun., 2016). Mobile phone use by people who experience symptoms of depression to find social support and deal with feelings of loneliness and indifference may make them feel even more depressed and stressed (Murdock 2013).

According to estimates from 2017, 64% of Americans owned a mobile phone, a significant increase from prior years (Oviedo-Trespalacios et al., 2019). The American Psychological Association report from a year prior claimed that a growing number of adults were reporting experiencing high levels of stress (American Psychological Association, 2016). Some researchers have taken this relationship between increased mobile phone use and reported stress as evidence indicating that the rise in stress among adults may be partially due to the rise in

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cellphone use (Cheever et al., 2014) As stated in the paper's introduction, numerous studies have discovered a meaningful connection between mobile phone use and stress levels, but the majority of these effects are minor and inconsistent. (Vahedi & Saiphoo., 2018; Zeeni et al., 2018). These studies' findings are consistent with our findings as we did see problematic mobile phone use increased levels of perceived stress but only marginally. Additional studies (Jeong et al. 2016) have shown that stress is a predictor of mobile phone addiction. People may use their mobile phones as a coping mechanism to deal with daily stressors (such as interpersonal conflicts and social settings), and doing so can be viewed as troubling, similar to using the internet to resolve issues in one's life (Kuss et al. 2017).

Studies have found that excessive, problematic mobile phone use can lead to poor sleep quality (Kao., 2023). Our findings suggest that problematic mobile phone use can negatively affect sleep quality which ties in with prior findings: exposure to electromagnetic fields (such as using a mobile phone at night) can alter cerebral blood flow and brain electrical activity, which can result in poor sleep quality (Demirci et al., 2015). Blue light from mobile phones may also affect melatonin levels (Thomee, 2018) which can affect an individual's quality of sleep. Sleep is a crucial biological mechanism linked to mood regulation (Thomee et al., 2011), and problematic mobile phone use that disrupts sleep can lead to stress, depression, and anxiety (Elhai et al., 2017).

Our research showed that adult females are significantly more probable than males to have significantly lower levels of sleep quality and higher levels of depression and perceived stress. This observation supports prior research, a study conducted on young adults revealed additional potential causes of mobile phone addiction, including female gender and hours spent

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on mobile phone (Lopez-Fernandez et al. 2017). Females appear to prioritize social interactions more than males do, which could make them prone to issues brought on by increased usage of mobile phones. In a manner similar to how the use of mobile devices and activities related to them (such as sending texts and making calls) may have a habitualizing impact, including frequent checking (Kanjo et al. 2017), which might worsen issues related to addiction later on, this may result in symptoms of depression, perceived stress, and a decline in sleep quality.

Strengths and Limitations

A strength of the study was the sample size, as according to the formula ($N > 50 + 8m$) provided by Tabachnick and Fidell (2013) the sample size should be a minimum of 82 participants, the current study had 204 participants.

The research has a number of limitations. The first one being, The Mobile Phone Problematic Use Scale (MPPUS-10) has good reliability. However, it is an adapted version of the original 27 item problematic mobile phone use questionnaire. The 27-item questionnaire might have given a more in-depth look into the effects a mobile phone has on mental health.

Second, the sleep quality measure only had one item (Snyder et al., 2018). This might suggest that the measure wasn't precise or sensitive enough to accurately assess an individual's sleep quality. The present study did not report on the reliability of the modified single-item sleep quality scale. This scale has only recently been modified, so its validity has not yet been determined. However, this scale was deemed suitable for use in this research as it had previously been used in peer-reviewed publications.

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Third, the research only looked at the psychosocial effects associated with using a mobile phone. The possibility of biophysical paths resulting from electromagnetic field exposure has not been taken into account. Additionally, our research did not consider factors, such as personality traits or individual risk factors, which also affect an individual's mental health.

Fourth, this study was restricted to a cross sectional design because of the time we had to conduct it. Future studies may include a longitudinal design with a follow-up measurement to get a better understanding of the impact mobile phones can have on mental health.

Fifth, the data was gathered based on self-reports from individuals. Future research would benefit from using quantifiable measures of problematic mobile phone use, depression, stress, and sleep quality. Finally, our research is limited because non-English language papers were excluded from this study.

Implications

Overall, the results are consistent with prior research, and they showed that there is a relationship between excessive, problematic mobile phone use and mental health. The present study's findings have significant theoretical and practical implications. The current investigation demonstrates the significance of researching problematic mobile phone use and the amount of time an individual spends on their phone and how it may affect a person's mental health, focusing on depression, perceived stress and sleep. More research is required to examine how excessive and problematic phone use is associated with psychological outcomes. These findings have implications for the development of education and training to help individuals understand how excessive, problematic mobile phone use may affect their mental health and what they can do to improve their mental wellbeing. Future research should be conducted in order to advance

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our understanding of the affects mobile phones can have on our mental health and what can be done to prevent the negative effects of mobile phones.

Conclusion

This study broadens our knowledge of the affects mobile phones have on an individual's mental health. In relation to the criterion variables, depression and perceived stress, the current research supports earlier studies' findings that suggest problematic mobile phone use is associated with higher levels of depression and perceived stress and lower levels of sleep quality. However, the current study found higher screentime to be associated with higher sleep quality, whereas prior research suggested excessive screentime will result in lower levels of sleep quality, this result may have occurred due to the single item sleep quality scale used in this research not being in depth enough. The findings highlight the importance of studying mobile phones' effect on mental health. Further research is required to explore how excessive and problematic mobile phone use affects a person's mental health.

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Appendices**Appendix I**

Participants were asked to record their daily averages screentime

What is your average daily screen time on your phone over the past 7 days?

1 - 3 hours

3 – 5 hours

5 – 7 hours

7 – 9 hours

9+ hours

Appendix II

10-Item Mobile Phone Problematic Use Scale

Please select if you strongly disagree, disagree, neutral, agree or strongly agree to each question below.

1. I have used my mobile phone to make myself feel better when I was feeling down.

1. Strongly disagree

2. Disagree

3. Neutral

4. Agree

5. Strongly Agree

2. When out of range for some time, I become preoccupied with the thought of missing a call.

1. Strongly disagree

2. Disagree

3. Neutral

4. Agree

5. Strongly Agree

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3. If I don't have a mobile phone, my friends would find it hard to get in touch with me.

1. Strongly disagree

2. Disagree

3. Neutral

4. Agree

5. Strongly Agree

4. I feel anxious if I have not checked for messages or switched on my mobile phone for some time.

1. Strongly disagree

2. Disagree

3. Neutral

4. Agree

5. Strongly Agree

5. My friends and family complain about my use of the mobile phone.

1. Strongly disagree

2. Disagree

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3. Neutral

4. Agree

5. Strongly Agree

6. I find myself engaged on the mobile phone for longer periods of time than intended.

1. Strongly disagree

2. Disagree

3. Neutral

4. Agree

5. Strongly Agree

7. I am often late for appointments because I'm engaged on the mobile phone when I shouldn't be.

1. Strongly disagree

2. Disagree

3. Neutral

4. Agree

5. Strongly Agree

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8. I find it difficult to switch off my mobile phone.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

9. I have been told that I spend too much time on my mobile phone.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree
5. Strongly Agree

10. I have received mobile phone bills I could not afford to pay.

1. Strongly disagree
2. Disagree
3. Neutral
4. Agree

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5. Strongly Agree

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Appendix III**Center for Epidemiologic Studies Depression Scale (CES-D)**

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

1. I was bothered by things that usually don't bother me.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

2. I did not feel like eating; my appetite was poor.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

3. I felt that I could not shake off the blues even with help from my family or friends.

Rarely or none of the time (less than 1 day)

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Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

4. I felt I was just as good as other people.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

5. I had trouble keeping my mind on what I was doing.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

6. I felt depressed.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

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Most or all of the time (5-7 days)

7. I felt that everything I did was an effort.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

8. I felt hopeful about the future.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

9. I thought my life had been a failure.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

10. I felt fearful.

Rarely or none of the time (less than 1 day)

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Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

11. My sleep was restless.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

12. I was happy.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

13. I talked less than usual.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

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Most or all of the time (5-7 days)

14. I felt lonely.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

15. People were unfriendly.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

16. I enjoyed life.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

17. I had crying spells.

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Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

18. I felt sad.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

19. I felt that people dislike me.

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

20. I could not get “going.”

Rarely or none of the time (less than 1 day)

Some or a little of the time (1-2 days)

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Occasionally or a moderate amount of time (3-4 days)

Most or all of the time (5-7 days)

Appendix IV

PSS – Perceived Stress Scale

Below are possible ways you may have felt in the past month. Please tick the box which indicates the correct amount of time you have felt this way.

1. In the last month, how often have you been upset because of something that happened unexpectedly?

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

2. In the last month, how often have you felt that you were unable to control the important things in your life?

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

3. In the last month, how often have you felt nervous and stressed?

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

4. In the last month, how often have you felt confident about your ability to handle your personal problems?

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

5. In the last month, how often have you felt that things were going your way?

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

6. In the last month, how often have you found that you could not cope with all the things that you had to do?

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

7. In the last month, how often have you been able to control irritations in your life?

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

8. In the last month, how often have you felt that you were on top of things?

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0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

9. In the last month, how often have you been angered because of things that happened that were outside of your control?

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?

0 - never 1 - almost never 2 - sometimes 3 - fairly often 4 - very often

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Appendix V

Single-Item Sleep Quality Scale

During the past 7 days how would you rate your sleep quality overall. (please mark only 1 box)

Terrible	Poor			Fair			Good			Excellent
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
0	1	2	3	4	5	6	7	8	9	10

Appendix VI

Study Information Sheet

You are being invited to take part in a research study. Before deciding whether to take part, please take the time to read this document, which explains why the research is being done and what it would involve for you. If you have any questions about the information provided, please do not hesitate to contact me using the details at the end of this sheet.

What is this study about?

I am a final year student in the BA in Psychology programme at National College of Ireland. As part of our degree we must carry out an independent research project. For my project, I aim to investigate whether people with higher screen time on their smartphones experience higher levels of depression, stress and sleep deprivation than people with lower screentime.

What will taking part in this study involve?

Participants will be asked to complete an online survey. The survey will touch on the topics of depression, sleep and stress. The survey will take between 10-15 minutes. All participants will be kept completely anonymous.

Do I have to take part in this study?

Participation in this research is voluntary; you do not have to take part, and a decision not to take part will have no consequences for you. This questionnaire includes items asking about your feelings of depression, stress and quality of sleep. There is a small risk that these questions may cause some individuals upset or distress. If you feel that these questions may cause you to experience an undue level of distress, you should not take part in the study.

What are the possible risks and benefits to this study?

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There are no direct benefits to you from taking part in this research. However, the information gathered will contribute to research that helps us to understand how excessive screentime affects a persons daily life.

There is a small risk that some of the questions contained within this survey may cause minor distress for some participants. If you experience this, you are free to discontinue participation and exit the questionnaire.

Will taking part be confidential and what will happen to my data?

Responses to the questionnaire will be fully anonymised and stored securely in a password protected/encrypted file on the researcher's computer. Data will be retained and managed in accordance with the NCI data retention policy.

What will happen to the results of the study?

The results of this study will be presented in my final dissertation, which will be submitted to National College of Ireland.

Appendix VII

Consent Form

I give my permission to Megan Connell (researcher) to allow her to use my survey answers in a scholarly research paper.

I understand once the survey is submitted, I cannot withdraw it from the study as it will be unidentifiable.

I also understand the research title is “The association between smartphones and mental health”.

Please tick this box to indicate that you are providing informed consent to participate in this study.

- Yes
- No

Who should you contact for further information?

Megan Connell, x20509133@student.ncirl.ie

Fearghal O’Brien, Fearghal.OBrien@ncirl.ie

Appendix VIII

Debriefing Form

Project Title: The Association between Smartphone use and Mental Health

In this study, we wanted to see whether exposure to daily higher screen time (+5 hours) would have a negative or positive effect on an individual's mental health. In order to do this, participants were asked to report their average daily screentime over the past seven days. Each participant was also required to fill out a questionnaire containing scales for phone usage, depression, stress and sleep.

We predict that participants who have a daily higher screen time will experience higher levels of depression and stress, we also predict that their sleep will also be affected by their smartphone. In doing this research project, we hope to find how screentime is affecting our mental health.

Helplines:

50808 - Mental health text support helpline, anonymous, 24/7, free.

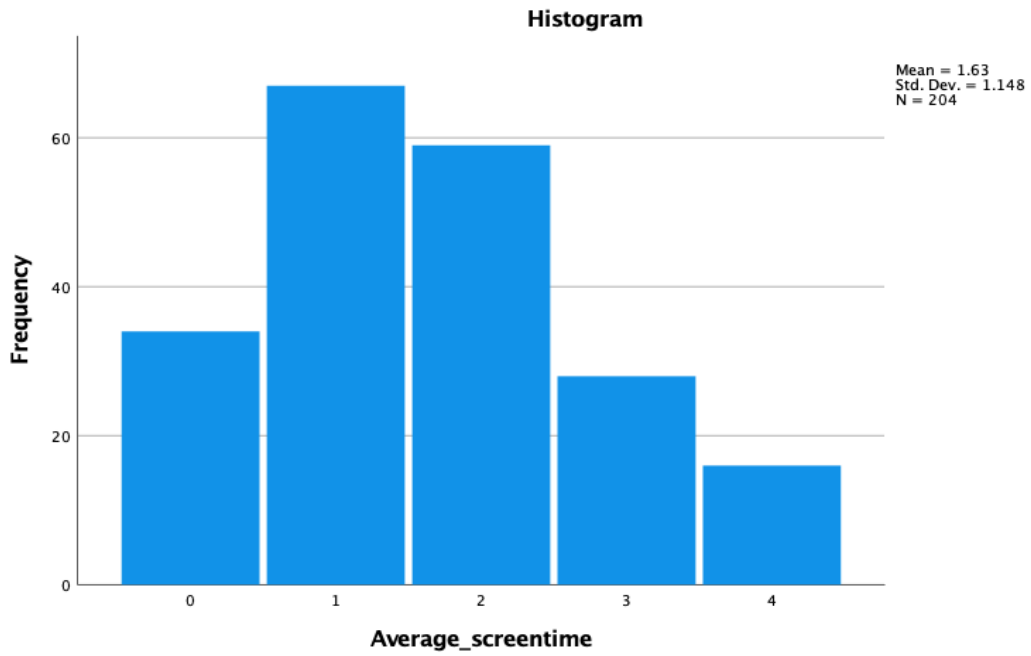
116 123 - Samaritans helpline, 24/7

If you have any further questions or comments, please contact researcher Megan Connell at x20503199@student.ncirl.ie. Thank you for participating in this study. Your response has been recorded.

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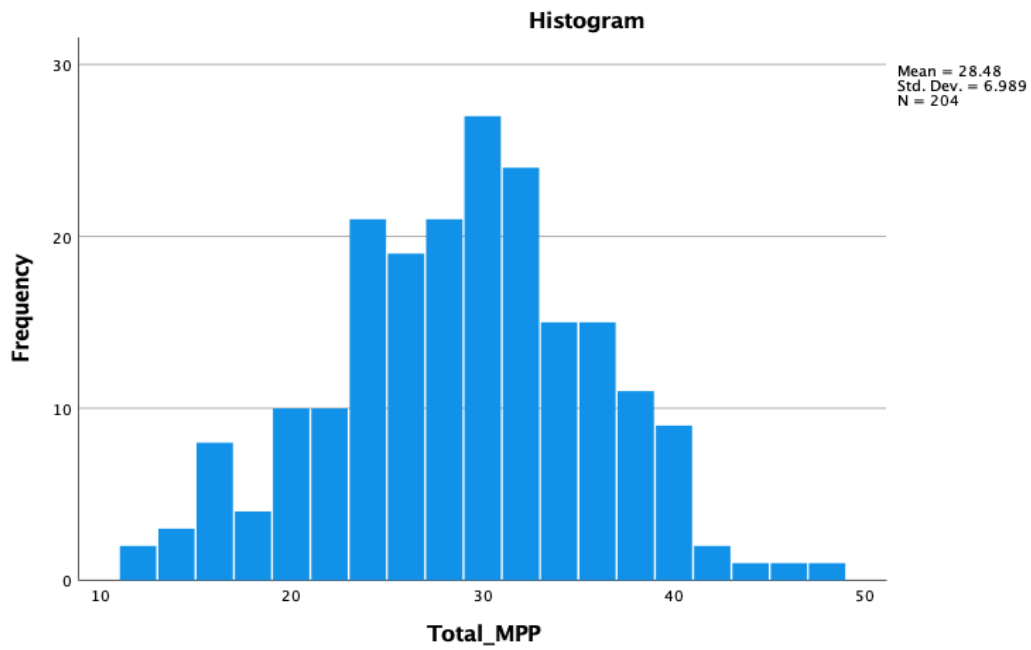
Appendix IX

Histogram for Average Screen Time



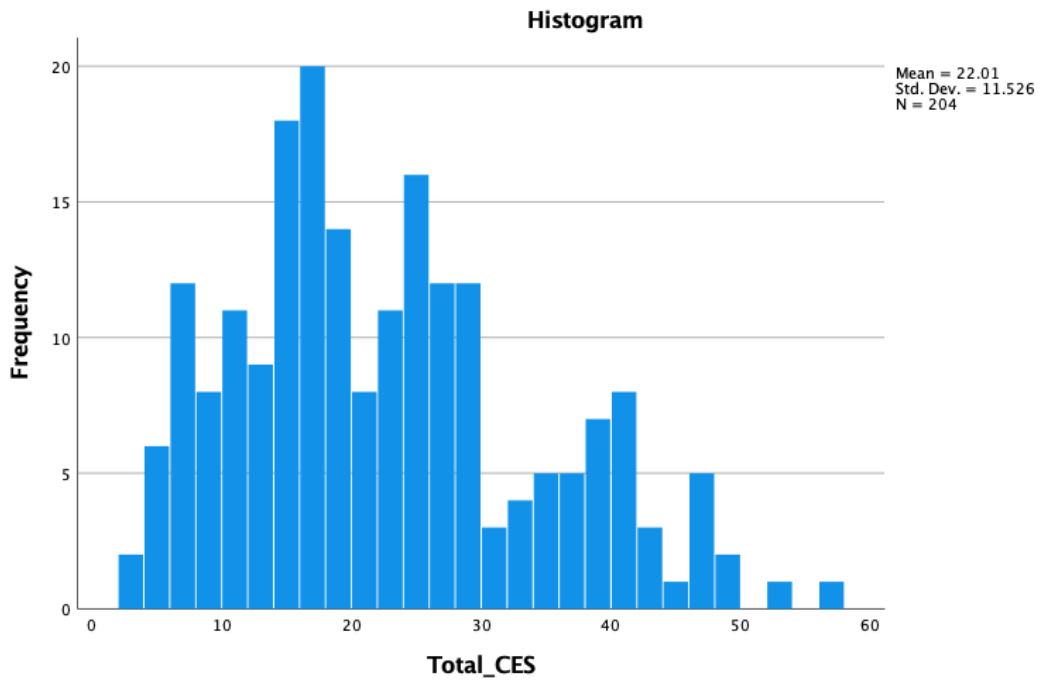
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Histogram for Mobile phone usage



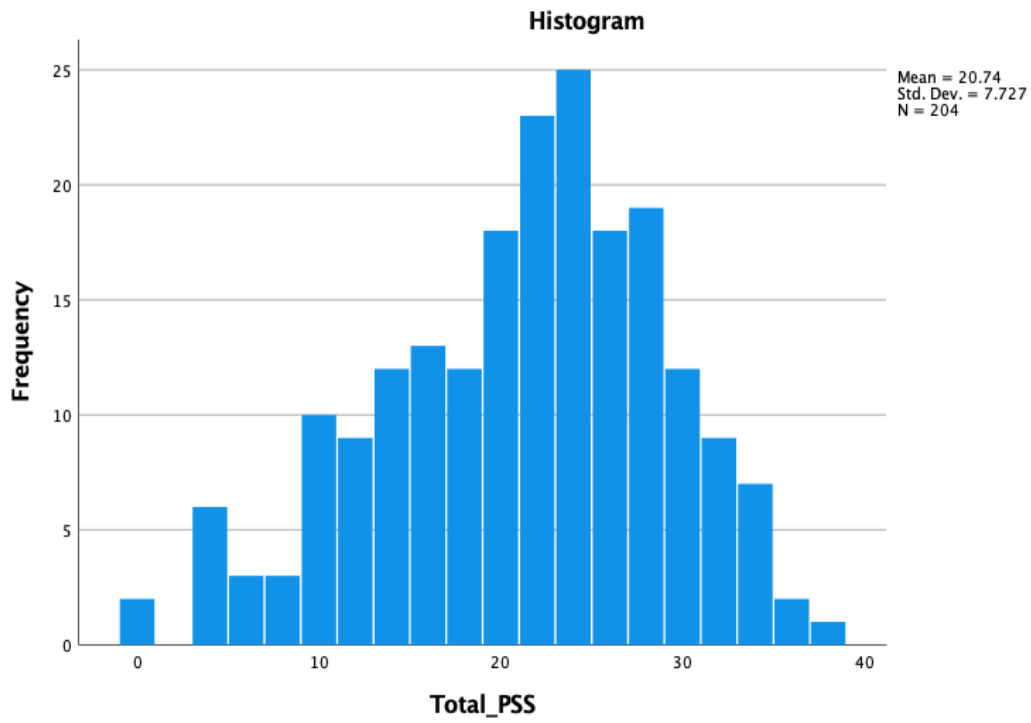
SCREENTIME AND PROBLEMATIC PHONE USE ON MENTAL HEALTH

Histogram for Depression



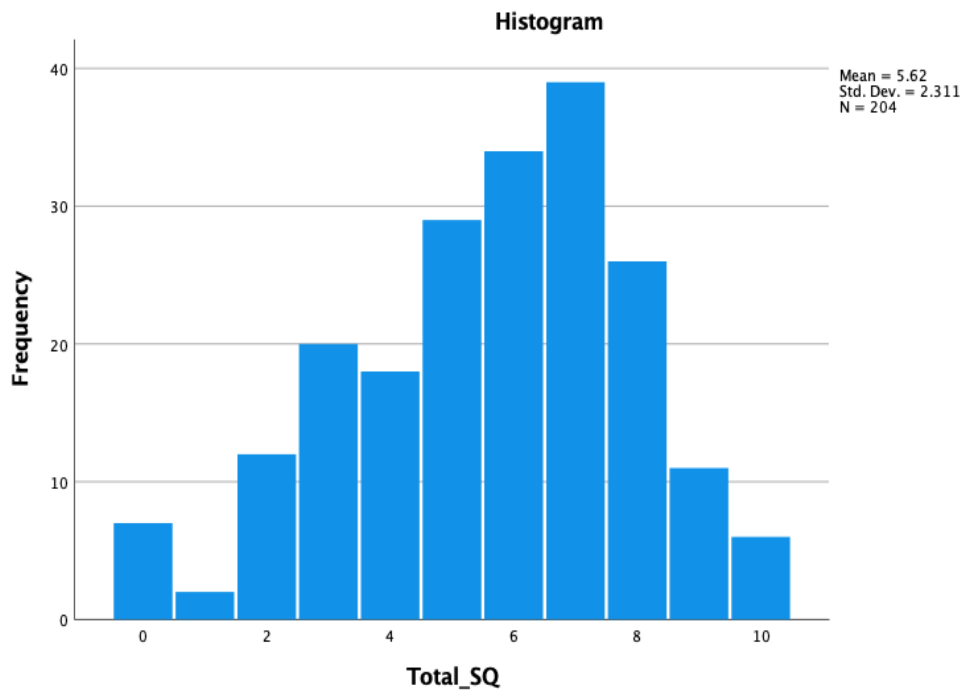
SCREENTIME AND PROBLEMATIC PHONE USE ON MENTAL HEALTH

Histogram for Perceived Stress



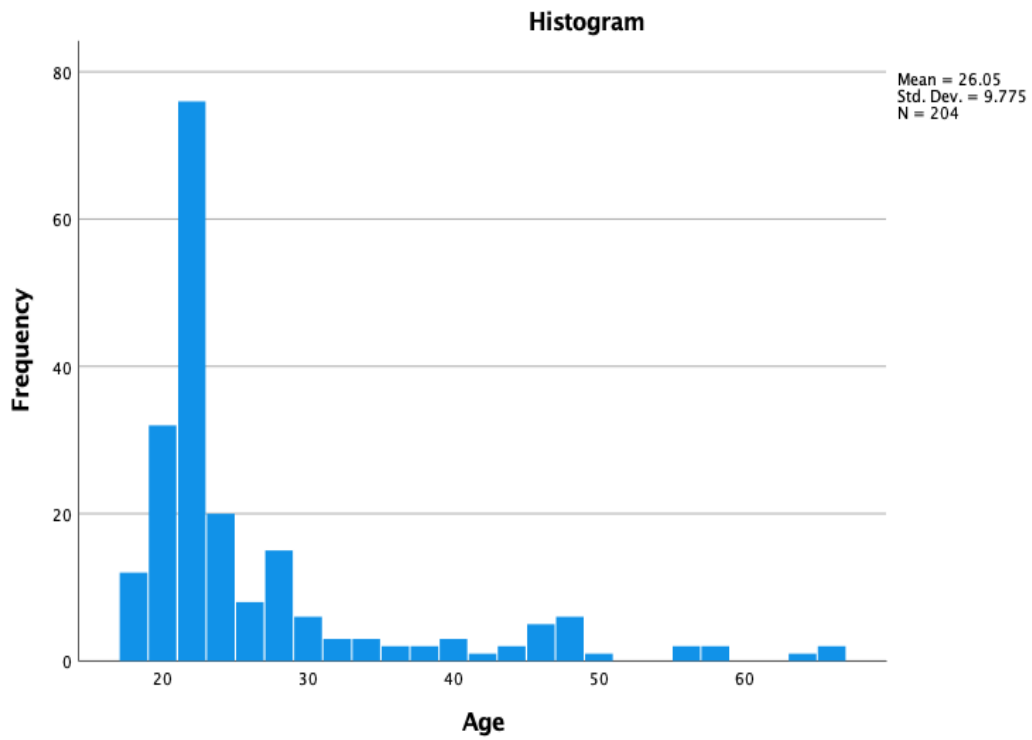
SCREENTIME AND PROBLEMATIC PHONE USE ON MENTAL HEALTH

Histogram for Sleep Quality



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Histogram for Age



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