Cellphone Addiction and Mental Health

by

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Abstract

This study explored the relationship between cell-phone addiction and mental health among college students. This thesis asked the following: Are students who are more addicted to their cell phones experiencing more anxiety and depression than their peers who are less addicted? Students were recruited to participate in this study based on their results on a cell phone addiction scale on a general pretesting survey. A short number of weeks after this initial survey, students took the addiction scale again, along with measures used to determine levels of anxiety and depression, and answered questions on frequency and the primary use of their phones. Results revealed that both anxiety and depression were statistically significantly correlated with the measure of cell phone addiction. The data shows potential positive results, and the researcher recommends further study with a larger sample size.

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Cellphone Addiction and Mental Health

Walk down any hallway in any building on MTSU's campus around class change and you will likely be greeted by the same sight time after time: students more preoccupied with their cellphones than their surroundings. These hallways are usually quiet, sometimes unnervingly so, as whatever on the phone's screen takes the uttermost priority. Students certainly do still interact face-to-face with their peers, so these hallways are not always so quiet. Despite the occasional exception, it cannot be denied that social interaction on both a present and face-to- face scale seems to be decreasing. At the same time, cellphone usage and digital communication seems to be increasing. This can be attributed to the overall progress of technology or changing times, but some speculate that something more sinister may be behind the curtain.

Cellphones have taken an increasingly crucial role in society over the past two decades. Today, cellphones can be seen everywhere in the hands of virtually everyone. According to the Pew Research Center, as of 2018, 95% of Americans owned a cellphone of some kind, with a total of 77% owning a smartphone. The age range of 18-29 has the highest ownership, with nearly 95% of the young population owning a smartphone. This one population has the highest usage for smartphones, but many other demographic groups researched by the Pew Research Center are not far behind. These findings show that cellphone ownership exceeded 85% in every category listed. Smartphone ownership tended to differ more, but ownership was still over 65% with the exception of two categories: individuals over the age of 65 and individuals who had less than a high school degree. With these two exceptions, both cellphone and smartphone ownership remains

remarkably stable across gender, race, income, education level, and geographic lifestyle (Pew Research Center, 2018). These results give boost to the argument that cellphones are essential to modern living.

For the sake of clarity, the difference between a cellphone and smartphone will be explained. A simple distinction would be as follows: "A smartphone is a cellphone with advanced features[.]…Technically, a smartphone is a cellphone, but a cellphone is not smart" (Fendelman, 2019, p. 1). Standard cellphones are designed to be more simple and straightforward, with their main purposes of instant messaging and calling. Smartphones have these same purposes, but they are more sophisticated and offer far more uses, including music, email, browsing the internet, games, and social media (Fendelman, 2019). In short, smartphones are small computers that people can carry with them wherever they go. This definition does not technically allow the terms of cellphone and smartphone to be used interchangeably. For the sake of simplicity, however, these terms will be used interchangeably in this paper. The sample in this study were all members of the young group as identified by the Pew Research Center, aged 18-29, and each participant in this study owns a smartphone. Whenever the term cellphone is used, it is in fact relating to smartphones and the advanced features that they exhibit over a standard cellphone.

According to the National Alliance on Mental Illness, depression and anxiety are the most common mental disorders reported in adults in the United States, with approximately 6.9% of the population and 18.1% of the population affected, respectively. The National Center for Health Statistics has discovered similar numbers, with an estimate of 8.1% of American adults suffering from depression in the past year (Smith,

2018). College students are greatly more affected by both of these disorders than the general adult population.

Depression, as defined by the American Psychiatric Association (2017), is a serious medical illness that has negative effects on how one feels, how they behave, and how they think. Depression also typically includes symptoms of sadness, appetite, or loss of interest in activities previously enjoyed. It is important to note that depression and grief and sadness are not the same thing. Depression can spawn from long periods of grief, but those in bereavement typically can still have positive emotions and energy and are not affected by a loss of self-esteem. Sadness falls into the same vein; it is a natural human emotion, and it does not become diagnosed as depression unless it is persistent and has continued for weeks (Parekh, 2017). Symptoms include, but are not limited to: feeling sad, loss of interest in activities once enjoyed, changes in appetite, trouble sleeping, feeling worthless, and thoughts of suicide (Parekh, 2017). There are also physical conditions that have symptoms that mimic depression, most notably thyroid problems, brain tumors, and vitamin deficiencies (Parekh, 2017). Depression affects a whopping 36.4% of college students, according to the American Psychological Association (Parekh, 2017). This is compared to around 7% of the overall adult population.

The American Psychiatric Association (2017) defines anxiety as a normal reaction to stress, such as worrying lightly over a future event. Anxiety disorders, however, are differ from healthy anxiety because they include excessive sensations of fear and worry (Parekh, 2017). Anxiety disorders typically take the shape of anticipation to a future concern or event and can inhibit an individual from functioning normally (Parekh, 2017).

Similar to depression, there is a clear difference between nervousness, worry, fear, and anxiety. Fear is more concerned with immediate threats and is critical to the fight or flight response (Parekh, 2017). While nervousness and worry are also focused on future events like anxiety, they are typically more short lived and are not as consuming. There are several types of anxiety disorders, including generalized anxiety disorder (GAD), panic disorder, social anxiety, and even phobias all fall under the umbrella of anxiety (Parekh, 2017). Phobias are the most common anxiety disorders, and they are followed by social anxiety disorder and GAD (Parekh, 2017). Like depression, anxiety is disproportionately represented in college students compared to the rest of the adult population. While around 18% of the adult population are affected by anxiety in a given year, the American Psychological Association has reported that 41.6% of college students struggle with at least one kind of anxiety disorder (APA, 2018).

The base emotions that make up--and can spawn--anxiety and depression are both natural and can be essential to human growth. Fear and sadness are two of the six basic human emotions that can be seen across all cultures on Earth (Burton, 2016). These basic emotions are the building block of more complicated mental states, such as depression and anxiety. In limited amounts, these emotions are healthy and even key to survival: fear, for example, can keep a person alive and alert in a dangerous or unknown situation (Burton, 2016). Sadness can help draw people together after a trauma and help make people more empathetic and compassionate (Lickerman, 2012). Unlike their more advanced counterparts, fear and sadness have clear benefits and do not linger and cause lasting illness. Depression and anxiety take center stage in this paper because of the heavy influence that they have on college students. While the number of afflicted

students is already very high, especially when compared to the rest of the adult population, there is evidence that the problem is getting worse. A survey sponsored by the American Psychological Association of college counseling center directors yielded the following results: 95% of directors believe the number of students with significant psychological problems is a growing concern for their campus, and 70% believe that the number of students with severe psychological problems on their campus has increased in the past year (APA, 2013). Other sources have found that, between 2009 and 2015, the number of students visiting counsel centers increased by about 30% on average (Reilly, 2018). This growing crisis, combined with the increasingly omniscient smartphones, has led to the speculation that these two variables are related.

Literature Review

The potential for study of the relationship between cellphone addiction and mental health, is, by nature, fairly new. The smartphone as society knows it was not even invented until 2007 when Apple released its first generation of the IPhone. Over the past decade, research has begun to emerge looking into potential relationships between smartphone usage and mental health.

Anxiety, the most common mental health issue in both college students and adults as a whole, has gained particular attention in past studies. There are two different kinds of anxiety revolving around the topic of cellphone addiction that have interested researchers. The first is known as the Fear Of Missing Out, or FOMO (Rosenfeld, 2017). FOMO is the drive to constantly check social media sites, as well as having a need to stay on top of everything that is happening in one's social circle (Rosenfeld, 2017). The important

factor in FOMO is the desire to be involved with the lives of others (Barkley, Karpinski, & Lepp, 2014). The need to be informed may seem trivial, but research has shown that it can carry a negative effect. A recent study looking at the relationship between cellphone use, academic performance, anxiety, and satisfaction with life discovered that high frequency cellphone users have higher anxiety, lower GPAs, and a lower rating of life satisfaction when compared to their peers who used cellphones less often (Barkley et al., 2014). The measure they used to measure life satisfaction was first described by Shin and Johnson (1978), which states that life satisfaction is a judgmental process wherein individuals assess their quality of life. Johnson's (1978) definition is not a one-size-fits-all; rather, each person build their own definition based on their own personal criteria. The study by Barkley et al. is not the only of its kind to find similar findings. A study done by Elhai et al. (2018) on the relationship between FOMO and several negative effects, including smartphone usage, found that FOMO was related to smartphone use in a social context, though the effect was small. This study also found that increased use of a smartphone, especially at excessive levels, can be detrimental to mental health (Elhai et. al., 2018).

Another study conducted by Claire Wolniewicz (2018) and her colleagues found that excessive smartphone use is associated with physical health symptoms, mental health problems including depression and anxiety, decreased productivity, and poor academic achievement. This study also found that Problematic Smartphone Use (PSU) was moderately correlated with FOMO, and was particularly related with social smartphone use (Wolniewicz et al., 2018). Most of the research on the topic of FOMO is more focused on how this type of anxiety relates to social media usage, but this research shows

that the fear of missing out can be sparked from using smartphones excessively. FOMO, which often starts as simple curiosity, can become a downward spiral of anxiety. Constantly seeing the best of other people's lives can lead to disappointment in one's own, which can usher in a period of depression and spiral back to the desire to check one's phone (Barkley et al., 2014). Whether FOMO is more associated with social media is irrelevant to this paper, but the phenomenon itself is coming under research and has been shown to detrimental to mental health.

The second type of anxiety that concerns smartphone addiction is more akin to social anxiety disorder. The primary focus for researchers with this branch of anxiety is when individuals use their phone as an escape from any kind of situation or social interaction. A study completed by researchers in China examined several hundred college students to study the relationships between cellphone addiction, self-esteem, and social anxiety. They found that individuals with low self-esteem usually have distorted cognitions and maladaptive emotion regulation, which resulted in higher social anxiety and being more sensitive to evaluations (You et al., 2019). These people have to use the mobile phone excessively to obtain reassurance in their social relationships (You et al., 2019). While this study primarily focused on self-esteem and interpersonal sensitivity, it did offer insights into how social anxiety relates to cellphone addiction. You et al. (2019) states that since mobile phones are so highly accessible, they become convenient for individuals seeking to escape reality. As a result, these individuals are more susceptible to excessive use of their cellphones (You et al., 2019). Smartphones, with all of their features, provide an excellent avenue of escape for individuals who struggle with social anxiety. Similar findings were discovered right at the start of the smartphone era. Survey

results from 2007, right when the smartphone craze truly picked up, looked at the cellphone usage of socially anxious and lonely individuals. This survey found that more anxious participants tended to use texting as a way to kill time or as a diversion to avoid an activity (Reid & Reid, 2007). Considering when these initial findings were discovered, it is likely that there have been increasing changes in the twelve years since this study was published.

While most of the research indicates that cellphone usage increases the likeliness or effects of social anxiety, there is research to support the idea that having a smartphone can actually combat social anxiety. A study comparing the usage of a smartphone app designed to challenge social anxiety, an internet self-help program, and a control group yielded interesting results. The groups using both the app and the internet program experienced significant decrease in anxiety; far more than that group that received neither of these aides (Boettcher et al., 2018). These groups were followed up to a year after the end of the trial period, and there were still small benefits to those who used both the app and the self-help program. The results indicated that using the app, in addition to a self-help program, could be beneficial in the long run for those who use the app rigorously (Boettcher et al., 2018). While these dedicated users may be able to receive some significant benefit out of using such an app or internet program, individuals who are not as serious may receive little to no benefit in the long run. This article states that there are many apps and programs for smartphones that are intended to combat mental illness, but most of them have not been tested scientifically (Boettcher et. al., 2018).

This is not the only study that has proposed either very minor consequences to cellphone addiction or even some benefits. A meta-analysis of 23 articles regarding

cellphone addiction and mental health only discovered correlational relationships, meaning that it is difficult to determine which scenario is the most accurate: is cellphone usage causing mental health symptoms, or if these same symptoms in fact cause the cellphone use (Hunley, 2017). Therefore, it is also difficult to pinpoint the basis for these mental health problems, because the cellphone may not be a problem at all. Hunley (2017) even states that, in some cases, the cellphones may even be a solution. Regardless, the same meta-analysis discovered that cellphone use does not guarantee worse mental health (Hunley, 2017). While there may be benefit to using a smartphone to combat certain mental illnesses, it may be too soon to state it as scientific fact.

The relationship between cellphone addiction and anxiety has been heavily scrutinized by researchers, but depression has not been examined as intensely. Research directly linking depression and cellphone addiction is currently few and far between, and the overall consensus on this link seems to be less clear than that of anxiety. One study looking at the role of depression, attachment styles, and cellphone addiction found significant positive correlations between individuals with depression and those with avoidant or ambivalent attachment styles, but they also found a significant negative correlation with individuals who are securely attached (Ghasempour & Mahmoodi-Aghdam, 2015). In the discussion of their article, they say that the results showed a significant and positive relationship between depression and cellphone addiction, and that depression can also help predict for addiction among college students (Ghasempour & Mahmoodi-Aghdam, 2015). They also argue that a possible explanation is that depression symptoms cause affected individuals to feel inferior and suffer from low self-esteem and have poor face-to-face social skills. Therefore, these symptoms cause depressed people to

seek alternative communication methods, such as cellphones and the internet, where communication is less stressful (Ghasempour & Mahmoodi-Aghdam, 2015). According to Elhai et al. (2018), however, there have been numerous studies comparing the relationship of depression and cell phone addiction that have found either small or inverse relationships. These somewhat inconsistent findings might explain the general lack of research trying to link depression directly with cellphone addiction. As Elhai et al. (2018) explain, these inconsistencies have resulted in more research focused on other psychopathology-related constructs that might help explain the relationships between depression and cellphone addiction. As a result, other constructs have instead been studied as mediators between depression and cellphone addiction, such as rumination, low self-control, mindfulness, and boredom (Elhai et al., 2018).

Cellphone addiction, on the other hand, is a documented, well researched, and growing problem in the Unites States. Cellphones have such an addictive quality that they were given an entry into the Diagnostics and Statistical Manual of Mental Disorders (DSM) 5th edition (Rosenfeld, 2017). Shambare et al. (2012) claim that cellphone use is one of, if not the, largest addiction of the 21st century. There is some research to back up this claim. One study has found that female college students spend an average 600 minutes on their cellphone every day, while male college students spend approximately 459 minutes per day (Roberts, Yaya, & Manolis, 2014). This study also found strong gender differences with cellphone use in that females use their phones primarily for socially-related motives while males have more utilitarian and/or entertainment motives (Roberts et al., 2014). Another interesting find is that texting, calling, and emailing are the most consuming activities in regard to cellphone use, which shows that they are still

being used primarily as communication devices (Roberts et al., 2014). The next most time consuming activity, however, is social media. These findings suggest that a good indicator of possible cellphone addiction is the amount of time a user spends on social media sites, such as Instagram, Facebook, and Twitter (Roberts et al., 2014). Despite this, Roberts et al. (2014) suggest that cellphone addiction is a "secondary addiction" and that cellphone use is ultimately an attempt to escape another, more significant problem, such as boredom, low self-esteem, relationship trouble, etc. This ties back into much of the research in congruence with similar to studies such as this one, where researchers are looking at additional psychological constructs that might be the closer to the heart of the cellphone addiction problem. Furthermore, this also suggests that cellphones themselves have little to do with the mental health crisis in America.

The growing issue of cellphone addiction is not limited to America. A meta-analysis completed by researchers from Spain report that 22.1% and 27.9% of adolescents and young people, respectively, were cellphone addicts (De-Sola Gutiérrez, Rodríguez de Fonseca, & Rubio, 2016). Out of these populations, they also found that only around 5% in each group exhibited dangerous or harmful behaviors. In contrast to this, a study done by Smetaniuk (2014) give an estimate of only 10 to 20% of college students exhibiting problematic cellphone usage. It is important to note that these results are now five years old, and cellphone technology has grown tremendously in that short period of time. As previous research illustrated in this paper shows, mental health problems in college students have also risen in this span of time.

There are several other interesting results in the study conducted by De-Sola Gutiérrez and his colleagues. Eastern cultures and nations, especially Korea, were found

to have much higher rates of cellphone addiction among young people than in the Americas (De-Sola Gutiérrez et al., 2016). This study, similar to the one conducted by Robert et al., found major gender differences between both the amounts of time spend on mobile devices and the primary functions used. The studies show that females have, overall, higher levels of both dependence and problematic use than males. Female cell phone use is related more to sociability and interpersonal relationships, whereas males use their phones in a more practical and instrumental way (De-Sola Gutiérrez et al., 2016). They concluded their analysis stating that they have shown the emerging problem of cellphone addiction, but there is a lack of criteria in this line of research that requires some caution (De-Sola Gutiérrez et al., 2016). This analysis also considered the possibility that the relationship between cellphone addiction and mental health is more complicated than some researchers believe in that it is difficult to determine what came first: the addiction or the mental illness.

Thesis Statement and Hypothesis

The purpose of this thesis is to find any correlations or links between cellphone addiction and mental health, focusing primarily on depression and anxiety. Mental health is a growing concern in America, and since the smartphone is a relatively new and very widespread technology, the ramifications of overuse warrant further investigation. In 2017, Rosenfeld stated that upwards of 72% of Americans owned a smartphone. Now, merely a year later, the Pew Research Center puts the percentage of smartphone ownership closer to 77%. If a negative link is found between cellphone addiction and mental health, it could be especially potent among millennials and younger generations

because they have grown up with this technology and have used cellphones for most of their lives.

The following hypothesis is made. It is predicted that students who are more addicted and/or dependent on their cellphones will show higher rates of anxiety and depression. It is important to note that the results of this study will come from correlation between these variables. Therefore, this study will indicate a relationship but not a causation.

Method

Participants

Students were recruited for this study from the MTSU Department of Psychology research pool. Approximately two hundred students took the psychology pretesting survey, which included a scale regarding cellphone addiction. From this pool, the students were split into quartiles depending on their responses on the cellphone addiction scale. The first quartile consisted of students who used their cellphones the least in relation to their peers, while the fourth quartile consisted of students who use their cellphones the most. These two quartiles were the target group for this study; the students in the second and third quartiles were not considered for further research.

The students who fell into the upper and lower quartiles were invited to partake in further research. A total of 26 students (18 women, 8 men) participated in the full study. Eighteen of these students were freshman, three were sophomores, three were juniors, and two were seniors.

Materials

    Survey: This study was administrated through a survey that the researcher compiled. It contained elements from three different scales that measured anxiety, depression, and cellphone addiction. It consisted of 56 items, including the scales, with demographic questions and other inquiries on primary cellphone usage and time spent on the devices. The average completion time was around 10 to 15 minutes, adhered to all APA guidelines, and was IRB approved (see Appendix A).

    Besides the main scales, there were a number of other questions intended to gather data on the primary use of cellphones and how many hours a day they were used. The first question the participants were asked inquired on the primary use of their cellphone. They were instructed to select one of the following: Social Media, Music, Internet, Email, Calling, Texting, or Other.

    The second major set of questions focused on the length of time that students partook in non-professional, non-athletic leisure activities. These activities were broken up into five broad categories that were all things that someone could use their phone to partake in. The categories were as such: Watching TV, Netflix, or Movies, Browsing Social Media, Reading, Playing Video Games, and Using a phone for any reason. In each of these main categories, the participants were instructed to select the length of time they thought was most accurate. They were given the following options: None, Less than one hour a day, 1-3 hours a day, 3-5 hours a day, 5-7 hours a day, and more than eight hours a day. The elements of the survey were presented in the following order.

    Nomophobia Questionnaire: The NMP-Q is a fairly new, 20-item test, with each item being scored on a 7-point response scale (1 = *strongly disagree,* 7 = *strongly agree*).

This scale measures Nomophobia, which is the fear of being without one's cellphone (Yildirim & Correia, 2015). Example questions include "If I could not check my smartphone for a while, I would feel a desire to check it" and "Running out of battery in my smartphone would scare me." The possible scores range from 20 to 140. A score of 20 means an absence of nomophobia, 21-59 signifies a mild case of nomophobia, 60-99 is a moderate level, and 100-140 is severe nomophobia (Yildirim & Correia, 2015).

GAD-7: The GAD-7 is a 7-item scale that measures generalized anxiety disorder. While it is primarily used to measure the severity of generalized anxiety disorder in an individual (e.g., "Trouble relaxing" and "Becoming easily annoyed or irritable"), it can also screen moderately well for panic disorder, social anxiety disorder, and post-traumatic stress disorder (GAD-7, n.d.). The GAD-7 score is calculated by assigning a value of a 0, 1, 2, or 3 to the response categories of "not at all," "several days," "more than half the days," and "nearly every day," for each question. This gives a range of scores from 0-21, with the increments of 5, 10, and 15, which represent mild, moderate, and severe anxiety, respectively (Jordan et. al., 2017).

Zung-Self-Rating Depression Scale: The Zung SDS is a 20-item scale that screens for depression in individuals. There are ten positively worded (e.g., "Morning is when I feel the best") and ten negatively worded (e.g., "I have trouble sleeping at night") statements. There are four possible responses to each question: "A little of the time," "Some of the time," "Good part of the time," and "Most of the time." The possible scores range from 20 to 80, 20-44 falls within the normal range, 45-59 is considered mildly depression, 60-69 is moderately depressed, and 70 and above being severely depressed (WHO, n.d.).

Procedure

      All potential participants initially completed the cellphone addiction measure during psychological pretesting. Data was collected during the Fall 2018 semester and the Spring 2019 semesters. After all the data from the pretesting surveys had been collected, the results from the cellphone addiction scale were analyzed to calculate the upper and lower quartiles. The fall semester yielded 63 potential participants, where 17 were males and 45 were female, and one potential participant declined to reveal their gender identity. The spring semester yielded an additional 21 potential participants, with six being males and 15 being females. In total, these 84 students were invited to participate in the full study. All of these students were invited by a cordial email to partake in this study. Each email gave a list of dates and times where the students could participate. If they were interested, they responded to this email and signed up for one of the slots.

      The participants then arrived at the designated rooms for this study and were asked to read and sign an informed consent form. This document gave a short description of the study and explained that there are no risks involved in taking the survey (see Appendix B). Any questions that the participants had regarding the study were answered prior to the handout of the survey.

      After the consent forms were signed and all questions answered, the participants completed the survey. When finished, they received a debriefing form that explained the purpose of the study in more detail, and also provided contact information for the MTSU counseling center. After that, the participants were thanked for their time and they were free to leave.

Descriptive Statistics

Figure 1: Main Cell Phone Usage
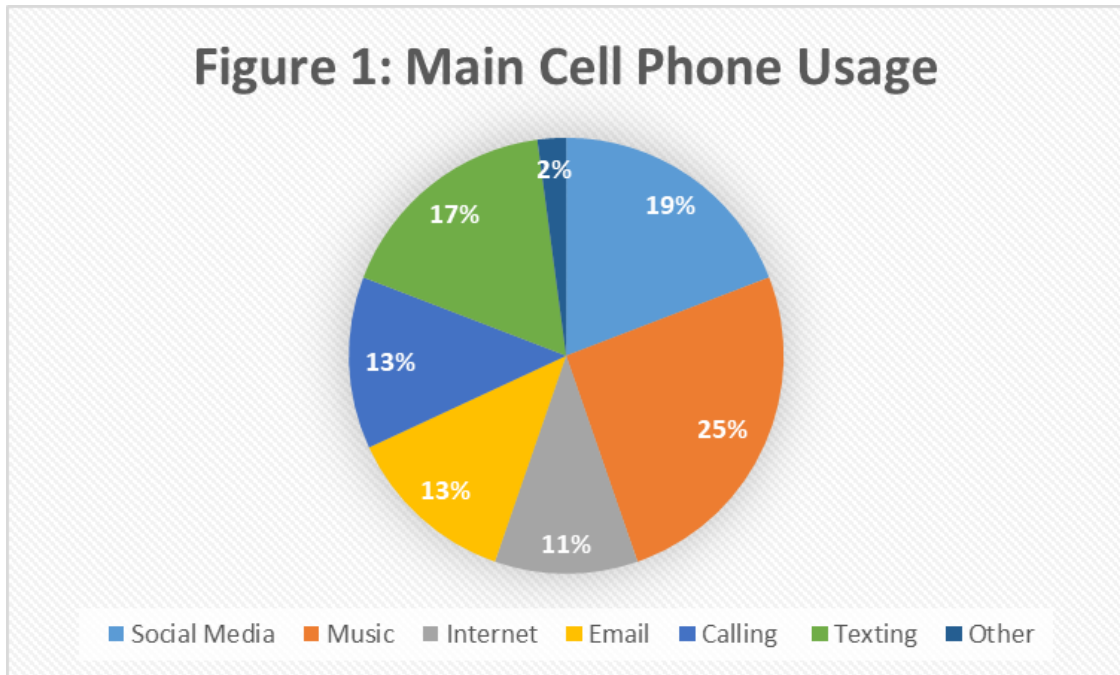
The first set of additional questions were intended to discern the primary

cellphone usage. Although the participants were instructed to select only one, several

selected two or more of the options. It is unsure whether they selected multiple options

because they simply could not choose a single one, or if the instructions on the survey

were not clear enough. Regardless, this a small, unintentional flaw that would be

corrected in the event of a repeat of this study. The most common reported usage was

music, with 12 out of the 26 participants giving music their vote. However, due to the

multiple votes provided by some participants, music only made up 25% of the total votes.

Social media came in second, with 9 participants giving it their vote, resulting in 19% of

the total votes. Texting came in third place with 17%, followed by email and calling,

which both had 13%. Using the internet came last at 11%, with only a single vote going

into the 'other' category.

Figure 2: Watching TV, Netflix, or Movies

Figure 3: Browsing Social Media
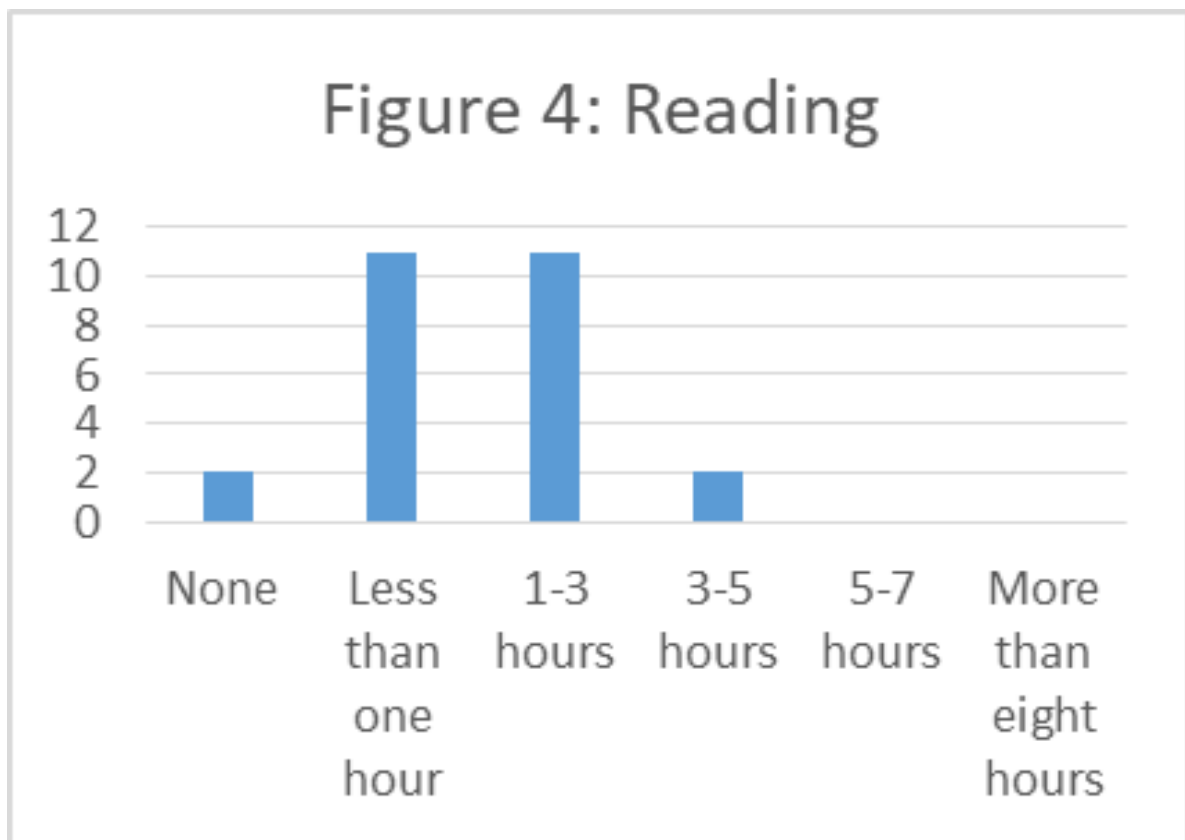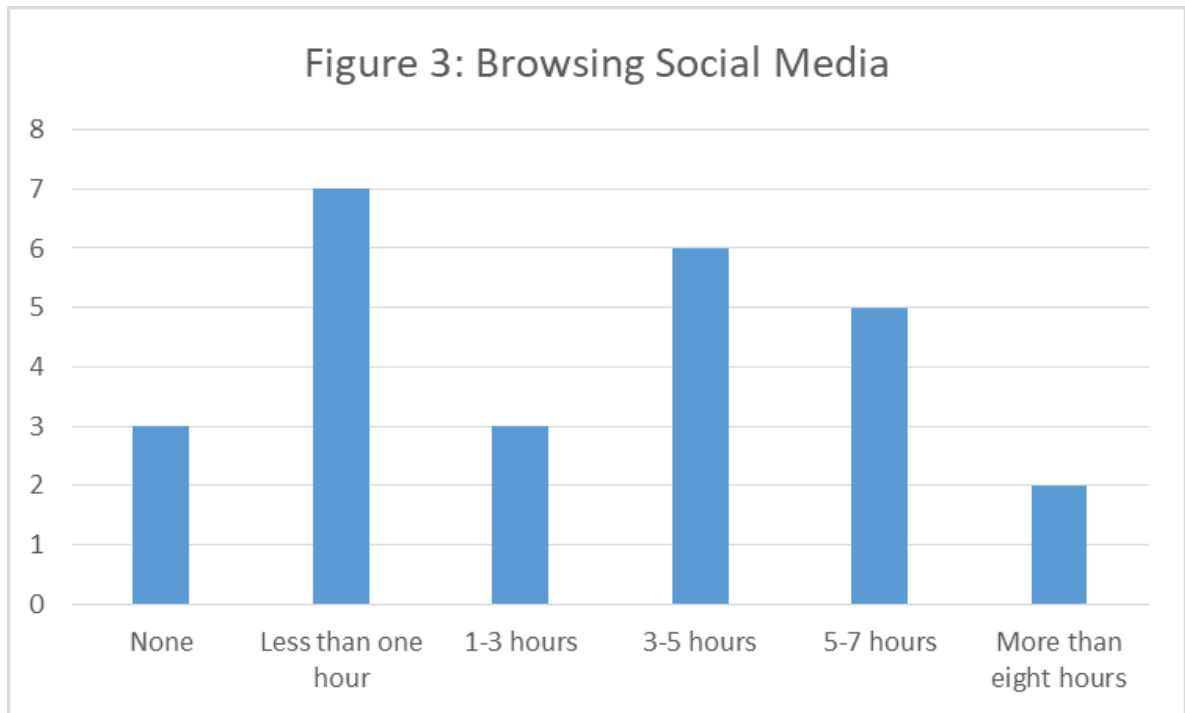

Figure 4: Reading
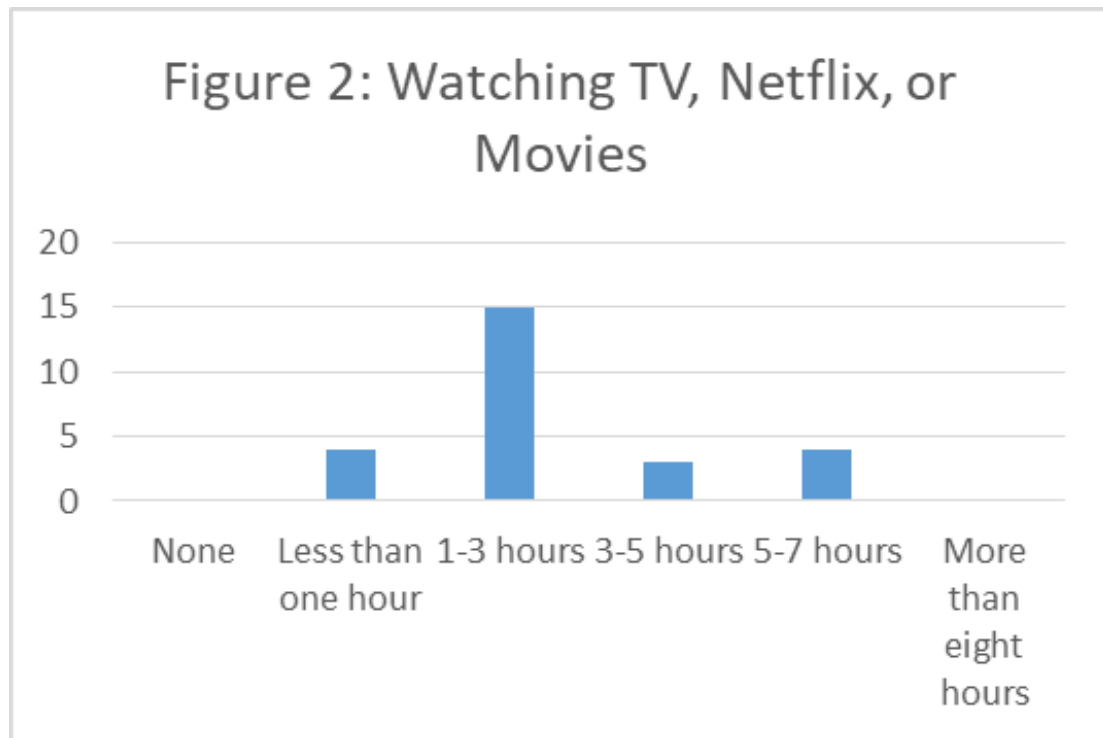
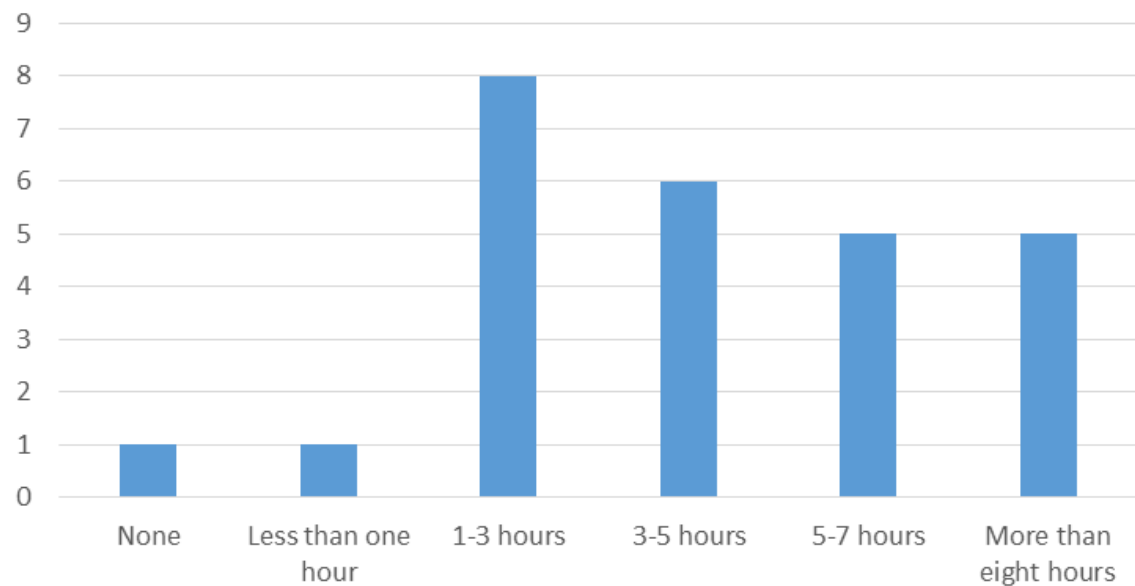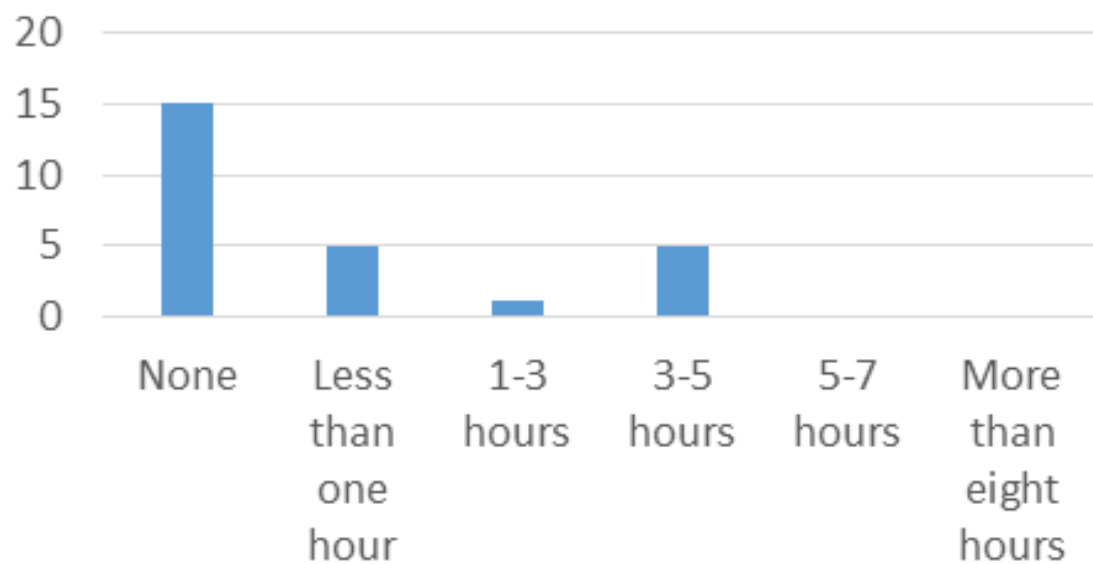Figure 5: Using Phone for any Reason

Figure 6: Playing Video Games

The second group of questions was interested in the length of time spend on certain activities. As can be seen in Figures 2-6, the daily length of time devoted to these leisurely activities varied greatly. None of the activities had a very bell curve structure to them, with the Watching TV, Netflix, or Movies (Fig. 2) category coming closest. The Reading (Fig. 4) category is also close to a normal curve, though it is skewed to the left considering the last two sub-categories, 5 to 7 hours and more than eight hours, respectively, had no responses. The Browsing Social Media (Fig. 3) category, with two humps, had a double curve of a distribution. The last two categories were both heavily skewed, with Using Phone for Any Reason (Fig. 5) being heavily skewed to the right while the Playing Video Games (Fig. 6) category was skewed heavily to the left.

Test of Hypothesis

The first test was an independent samples *t*-test to compare both measures of high and low depression and high and low measures of anxiety with cellphone addiction. There was not a significant difference in the scores for low levels of depression (*M* = 40.54, *SD* = 7.63) and high levels of depression (*M* = 40.92, *SD* = 11.54) conditions; *t*(24) = -.100, *p* = .921. There was also no significant difference in all cellphone addiction scores for low levels of anxiety (*M* = 6.31, *SD* = 4.84) and high levels of anxiety (*M* = 10, *SD* = 5.657) conditions; *t*(24) = -1.79, *p* = .086. All of these *t*-tests were run at the *p* = .05 significance level.

There was just enough change to cause a handful of participants to move out of the 'low' quartile of cell phone addiction, which effectively created three groups for the final analysis. This is the reason why an analysis of variance (ANOVA) test was required. A one-way ANOVA was conducted to determine whether depression scores differed

between the low, medium, and high cellphone addiction brackets. There was not a significant difference in depression between the different levels of cellphone addiction at the $p < .05$ level for the three conditions [$F(2, 23) = .037$, $p = .964$]. A one-way ANOVA was also run between anxiety and the three levels of cellphone addiction. There was not a significant difference in anxiety scores found at the $p < .05$ level for the three conditions [$F(2, 23) = 2.116$, $p = .143$].

After the t-tests and one-way ANOVAs were completed, several correlational tests between anxiety, depression, and cellphone addiction were run. A significant positive correlation was found between depression and anxiety among the participants of this study, $r(24) = .650$, $p < .01$. As expected, I found a significant positive correlation between participants with high cellphone addiction scores and their anxiety level, $r(24) = .459$, $p < .05$. In addition, a positive but fairly small correlation between participants with cellphone addiction and depression scores was found, $r(24) = .141$, $p < .05$. The correlational tests proved to be significant, but the t-tests and the one-way ANOVA were not. Thus support for my hypothesis was mixed.

A correlation was also calculated between the initial cellphone addiction test participants took during the pre-testing survey and the addiction scale results when the participants took the follow up survey. These results indicated a very strong positive correlation and found to be, $r(24) = 0.924$, $p < 0.01$, suggesting that cellphone addiction seems to be very stable over time.

Analysis of Data

The results of this study provide partial support for the hypothesis because the *t*-tests was found to be in significant. However, due to the fairly strong correlations, it is safe to assume that there are potential findings with this line of study. As much of the literature review shows, there is an association between depression, anxiety, and cellphone addiction (Barkley et al., 2014; Reid & Reid, 2007; Shambare et al., 2012). As the correlational tests show, and in parallel to other studies, (e.g., Reid & Reid, 2007; Roberts et al., 2014; You et al., 2019), there is a stronger link between anxiety and cellphone addiction than between depression and cellphone addiction.

Depression and anxiety were shown to be highly correlated in this study, and this is a finding that is common throughout the research literature (e.g., Parekh, 2017; Smith, 2018). If these two illnesses are commonly found in congruence with each other, then why did this study find more significant results with anxiety and cellphone addiction than depression? With a bit of understanding about each illness, I believe that these different results make some sense. Foremost, individuals suffering from anxiety are typically going to be faced with more stressors and worries than those with depression (Parekh, 2017). While there are many different kinds of anxiety, the common root is worry, whether that is about social encounters, test-taking, or simply life itself. Methods of escape can be very appealing to people with anxiety, and a cellphone can provide that escape. One device can offer books, movies, TV shows, social media, games, the entirety of the internet, and much more. Social media, in particular, in regard to FOMO, can be a huge draw. Even if individuals do not suffer from the more traditional views of anxiety,

the fear of missing out can bring them back to their phones time and time again, as research has shown (e.g., Barkley et al., 2014; Wolniewicz et al., 2018). This is not to say that those suffering from depression cannot be addicted to a cellphone or experience similar problems; rather, cellphone addiction is able to hit anxious individuals in two ways: a method of escape from anxiety provoking situations, and as an avenue to constantly stay informed. Anxiety is also the most common of all mental illnesses, both among college students and the general adult population (Smith, 2018). So, just by looking at the numbers, it makes sense that anxiety and cellphone addiction are more closely linked.

The correlation between anxiety and cellphone addiction that this study ran was both significant and strong, implying a possible relationship. However, *t*-tests did not find a significant difference between the different levels of cellphone addiction. As the results section shows, however, it almost met the significance mark. This is especially striking, given the low sample size. Anxiety was much closer to being significant than depression. A significant correlation was also found between depression and cellphone addiction, but it was much weaker than the relationship between anxiety and cellphone addiction. The *t*-tests, on the other hand, were not remotely close to being significant. The correlation suggests that there might be a relationship between depression and cellphone addiction, but it is not an easy one to find. As the literature review shows, other researchers have had trouble finding a definitive link between these two variables. Other studies (e.g., Ghasempour & Mahmoodi-Aghdam, 2015), have found similar correlations, but attachment styles played a large part on whether a depressed individual would be addicted to their cellphone. Elhai et al. (2018) in turn found small and even inverse

relationships, believing that the link between depression and cellphone addiction, by itself, is not very strong, and requires other psychological variables-such as attachment styles-to help explain the relationship. My opinion has developed into something similar: if future research wants to find a link between depression and cellphone addiction, then other variables need to be used as bridges to make predictors on any potential relationship.

Another test that this study ran was between the two different instances of the participants taking the cellphone addiction scale. Due to the length of time between taking the scales, there was some concern that the data gathered at the start of the semester would vary somewhat from the data gathered later on. I thought that there was enough time for habits to change or other instances to arise. A participant might lose a phone during this time, therefore altering the results drastically. Another possibility considered was a participant getting a newer phone. If they had been using an older or outdated model, and then received a new one during the time between the two scales, their addiction data would likely be disproportionally lower during the first scale than during the second. However, when each individuals' two separate responses were tested against each other, I found a very strong relationship, meaning that there was very little variance between the two separate completions of the scales. All in all, there was very little change, which shows that students' cellphone dependence is consistent over the time period used in this study.

When looking at the primary usage for cellphones, the results were initially surprising for two reasons: Primarily, even though music is a key component to smartphones, I always assumed that music was more of a secondary focus. Next, again

due to personal bias, social media had been expected to come out on top. As a student, it seems that most students use their phones to spend time on social media. However, it makes sense that these two key features would be used together, since many students around campus often have headphones of some kind on when using their phones. It was also interesting to see that calling, the most direct and personable method of communication on a cellphone, had only 13% of the total votes. These results seem to indicate that these more direct and personable methods of communication, such as calling, texting, and email, are being replaced by more indirect ways of maintaining communication, namely social media.

The lengths of usage questions also yielded some interesting results. The Watching TV, Netflix, or Movies category was not very surprising simply because it had a fairly normative distribution, with the most common length being one to three hours and tapering off towards the extremes. The Reading category, also being fairly normal, was also not very interesting, however it was disappointing to me to see that some individuals do not make any time to read at all during the day. The Playing Video Games category was only a little surprising. Nearly three fifths of the participants reported not playing any games at all, which seemed a little high, while another fifth reported playing for less than an hour. This was interesting because of the amount of research that has been pumped into answering the question on whether or not video games are making people violent. They also can be highly controversial and receive lots of media attention. However, out of 26 participants, 20 of them reported playing less than an hour a day, if any at all. It is important to keep in mind that there were far more female participants in this study than males, and it is often stereotyped that females play fewer video games

than males. If the gender numbers were reversed, the amount of reported time playing video games might have been higher.

The last two categories are where things became more interesting. Initially, there was the Browsing Social Media category, which has a distribution curve with two humps. This split distribution suggests that half the participants fell into a healthier length of time, while the other half fell into an arguably unhealthy amount of time. Half of the participants reported spending three or fewer hours on social media, while the other half reported spending at least three hours, with two even stating that they regularly spend over eight hours on social media. This means that some students spend a third of their total day, around half of the hours spent awake, on social media. Multitasking was not taken into account on this survey, but even while multitasking eight hours of commitment, even if it is partial, is a huge amount to devote on a regular basis. Five other participants reported spending five to seven hours on social media, while another six spend three to five. These numbers are drastic, though they are somewhat balanced out by the students who spend much smaller amounts of time on social media. Three participants even reported that they do not use social media at all on most days. These results seem to divide students into two distinct schools of thought, and it is interesting that there is a degree of equal polarization in social media usage among college students.

The final category, Using Phone for Any Reason, is surprising simply because of how high the numbers got. Only two participants reported using their phones for an hour or less on a daily basis; the rest spend at least an hour, with more than half the students using their phones for three hours or more. Ten out of 26 participants reported using their phones for at least five hours, with half of these students using them for eight or more.

Like the amount of time spent on social media, these numbers are much higher than expected. Again, multitasking may offer some answer, such as students who use their phone four hours a day, but for three hours they are simply listening to music. Regardless, these are huge amounts of time that students are pouring into their phones. This springs the question; how much time is too much? Is this a trend that is becoming more common throughout the population as a whole, or is it mostly isolated to college students? How far reaching, numerous, or long lasting are the consequences of cellphone use, if any? Can using a phone for eight or more hours a day bring about any benefits? These are all questions that could and should be answer by further research.

Limitations of this Study

There are limitations to this study. First and foremost is the general lack of participants. Only 26 students completed the survey, and this small number has made it difficult to test my main hypothesis. The goal was to recruit at least twice that number, but there is only so much that can be done to draw the interest of undergraduates to partake in research. One redeeming factor, even though the numbers were low, is the students were all recruited from the extreme ends of the spectrum. Thus, data are more focused and are less influenced by results that fall in the middle of the cellphone addiction spectrum. On that same note, there was also a balance between the upper and lower quartiles for the final study. There was a possibility that one group would be disproportionate to the other, but that ended up not being the case. Out of the 26 participants, 12 of them remained in the 'high' quartile, 11 remained in the 'low' quartile, with the remaining 3 individuals'' scores being bumped up just enough to create a group

in the middle. The small sample size was a limitation for this study, but the responses received were polarized and assisted in making the data more focused.

Another limitation was the disproportion between male and female participants. Participants who identified as female outnumbered those who identified as male by almost a 3 to 1 ratio, with 18 of the participants being female and the remaining 8 being male. As the literature review shows, there are many studies who have looked at cellphone behavior differences between the genders with strong indications that females are more adversely affected by cellphone addiction. This relationship was something that this study originally intended to look at, but given the small numbers of participants overall, and the small number of males, I decided that it would not be prudent to draw any conclusions from this sample.

There is a third, albeit smaller, limitation that is worth mentioning. All of the data are self-reported, meaning that the validity of this study depends on the honesty of the participants. Of course, this is a limitation that almost all studies on college students share, since other alternatives (e.g., observing students and their behaviors; having participants tested by trained psychologists) are beyond the scope of this study. In order to counter this limitation, this study used scales that are valid and tested, but this is a limitation worth mentioning all the same.

Avenues for Future Research

Despite the drawbacks of this study, there is great potential for future and expanded research on this topic. I believe that, with some corrections, a repeat of this study would find additional significant results. If a repeat were to occur, a greater effort would be placed upon gathering a larger number of participants as well as attempting to

have a balance between male and female participants. This would allow such a study an opportunity to analyze the relationships between the different genders and cellphone addiction. However, selecting participants just because they fall within a certain gender would not be random and would thus be a poor representation of the population. Therefore, by increasing the number of participants in general, there would be enough to yield significant findings as well as providing insight into any potential gender differences.

There is a research alternative that is worth discussing. Upon a repeat of this study, in an effort to gain more participants, the method of recruitment could change. This study drew students from the psychology research pool and only recruited those that fell within the upper or lower quartiles for cellphone addiction. These students were invited to partake in this study via email. Only around 25% of these students replied, with the majority either not being interested or the invitation was lost in their inboxes. In an effort to counteract that, a repeat of this study could use the SONA system solely for recruitment. The primary reason why this alternative was not use for this study was because half of all responders would not be able to be used since they would fall within the middle two quartiles. One advantage of using the pretesting pool was that potential participants were effectively already screen by taking the pretesting survey, ensuring that a separate screening process would not have to take place. As this study has shown, the disadvantage to this is a smaller recruitment pool. If a repeat used the SONA system, half of the participants would have to be screened out. However, if using SONA allows the study to gather enough students, then overall numbers could make up for the fact that half will not be considered for the final results. I am unsure whether this alternative

recruitment method would be more successful, but I believe that it would be warrant a try in the event that this study is repeated.

Besides a direct repeat of this study, there are other avenues of future research. One possibility would look at a link between mental health and social media usage among college students. One of the key components in cellphone addiction research is the Fear of Missing Out, or FOMO. This is often linked to cellphones via social media; the phone, by itself, typically cannot generate anxiety towards events outside of an individual's life. However, since smartphones have access to the internet, and since every social media outlet has an easily downloadable app, these two main elements are often used in congruence with one another. As the literature review shows, there are several studies interested in the impact that FOMO can have in the lives of individuals, especially young people. The question then rises: which is truly causing the negative effect on college students? Is it the cellphones as a whole, or merely the social media usage that cellphones give a constant connection to? Social media could be the primary culprit for the disproportionate amount of college students who are afflicted from some kinds of mental illness, and the cellphone is merely a device that allows this to happen. Both cellphone addiction and social media usage may have equal parts to play. As results from the APA (2018) have shown, college students are more afflicted by mental health issues than the general adult population. The Pew research center has also shown that, as of 2018, 95% of young adults own a smartphone, making 18 to 29-year-olds the largest demographic in regards to ownership. Another study completed last year showed that young adults aged 18-24 use social media significantly more than any other age group

(Smith & Anderson, 2018). All of these factors combined explain why these avenues of research could be both enlightening and fascinating.

A second possibility would be to compare cellphone addiction among adults who are not in college and current college students. As previously discussed, college students are experiencing mental illness at a rate much higher compared to the rest of the adult population. Providing that cellphones play a part in this, it is highly unlikely that they make up all of this difference. College can be a difficult time for many people, considering that most college students are facing new challenges, increased loads in school and maybe work, as well as any other young adult problem contrived. This turbulent time likely has many components that combine to cause these high rates of depression and anxiety. A future study could collect data from both groups of adults and compare the effects of cellphone addiction. It would be interesting to see how much of the variance in each group can be attributed to cellphone addiction. It might be found that cellphone addiction is a growing problem for all age groups, not just college students.

In a similar note, it would also be interesting to compare the primary uses of cellphones between college students and the rest of the adult population. As this study has shown, college students primarily use their phones for listening to music and for browsing social media, while other methods of communication, such as calling, texting/instant messaging, and emailing are not as preferred. These results may or not be the same as the rest of the adult population, and may shed some light into potential causes of mental illness. Social media, as previously discussed, is also being looked at as a contender for the mental health crisis among college students. If college students and the rest of the adult population vary greatly in either the preferred usage of their phones or in

the length of time they spend browsing social media, then it may open the door for future scrutiny. The overall time spent on the leisurely activities described in this study could also provide some insight as well. However, if this research path was to be pursued, it would be important to remember that leisure patterns between college students and the rest of the adult population are likely highly different, making it difficult to compare habits between these two groups.

In conclusion, this study found strong correlations linking anxiety and cellphone addiction. While correlation does not equal causation, these findings are significant enough to warrant future study. This paper also helped to highlight and emphasize the growing mental health crisis among college students. Though this paper did not find a direct link between these variables, it has been shown that other research has been able to. These findings suggest that some modern technology may be playing a part in the rise of mental health issues, and that the number of issues is likely going to continue to rise. Additional research paths have been suggested as well. This study has shown that MTSU may be facing the same troubles that universities around both the country and the world are facing. For the sake of college students and young adults everywhere, it is vital that more research is put into this topic.

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IRB
INSTITUTIONAL REVIEW BOARD
Office of Research Compliance,
010A Sam Ingram Building,
2269 Middle Tennessee Blvd
Murfreesboro, TN 37129

MIDDLE TENNESSEE STATE UNIVERSITY

IRBN001 - EXPEDITED PROTOCOL APPROVAL NOTICE

Friday, August 03, 2018

Principal Investigator	**Jonathan Elam** (Student)
Faculty Advisor	Corey Teague
Co-Investigators	NONE
Investigator Email(s)	*jwe2q@mtmail.mtsu.edu; corey.teague@mtsu.edu*
Department/Affiliation	Psychology

Protocol Title	***Cell phone addiction and mental health***
Protocol ID	**18-2269**

Dear Investigator(s),

The above identified research proposal has been reviewed by the MTSU Institutional Review Board (IRB) through the **EXPEDITED** mechanism under 45 CFR 46.110 and 21 CFR 56.110 within the category *(7) Research on individual or group characteristics or behavior*. A summary of the IRB action and other particulars in regard to this protocol application is tabulated below:

IRB Action	APPROVED for ONE YEAR		
Date of Expiration	**8/30/2019**	Date of Approval	8/4/18
Sample Size	100 (ONE HUNDRED)		
Participant Pool	**General Adults (18 years and older) - MTSU Students**		
Exceptions	Identifiable information and basic demographics are permitted to plan and execute the research.		

Restrictions	1. **Mandatory signed informed consent - the PI must provide a copy of the approved informed consent template.** . 2. **Any identifiable information must be destroyed and links between the analyzed data and individual subjects must be erased.** 3. **Mandatory implementation of the inclusion/exclusion criteria.**
Comments	NONE

This protocol can be continued for up to THREE years (**8/30/2021**) by obtaining a continuation approval prior to **8/30/2019**. Refer to the following schedule to plan your annual project reports and be aware that you may not receive a separate reminder to complete your continuing reviews.   Failure in obtaining an approval for continuation will automatically result in cancellation of this protocol. Moreover, the completion of this study MUST be notified to the Office of Compliance by filing a final report in order to close-out the protocol.

IRBN001   Version 1.3   Revision Date 03.06.2016 Institutional Review Board Office of Compliance   Middle Tennessee State University
Continuing Review Schedule:
Apply for the protocol's continuing review by the deadline indicated below and please be aware
that **REMINDERS WILL NOT BE SENT.**

Reporting Period	Requisition Dea dline	IRB Comments
First year report	7/31/2019	NOT COMPLETED
Second year report	7/31/2020	NOT COMPLETED
Final report	7/20/2021	NOT COMPLETED

Post-approval Protocol Amendments:
Only two procedural amendment requests will be entertained per year. *In addition, the researchers can request amendments during continuing review. This amendment restriction does not apply to minor changes such as language usage and addition/removal of research personnel.*

Date	Amendment(s)	IRB Comments
NONE	NONE.	NONE

The investigator(s) indicated in this notification should read and abide by all of the post-approval conditions imposed with this approval. Refer to the post-approval guidelines posted in the MTSU IRB's website. Any unanticipated harms to participants or adverse events must be reported to the Office of Compliance at (615) 494-8918 within 48 hours of the incident. Amendments to this protocol must be approved by the IRB. Inclusion of new researchers must also be approved by the Office of Compliance before they begin to work on the project.

All of the research-related records, which include signed consent forms, investigator information and other documents related to the study, must be retained by the PI or the faculty advisor (if the PI is a student) at the secure location mentioned in the protocol application. The data storage must be maintained for at least three (3) years after study completion. Subsequently, the researcher may destroy the data in a manner that maintains confidentiality and anonymity. IRB reserves the right to modify, change or cancel the terms of this letter without prior notice. Be advised that IRB also reserves the right to inspect or audit your records if needed.

Sincerely,

Institutional Review Board
Middle Tennessee State University

Quick Links:
Click here for a detailed list of the post-approval responsibilities.
More information on expedited procedures can be found here.
IRBN001 – Expedited Protocol Approval Notice   Page 2 of

Informed Consent

I am asking you to participate in a research study titled "Cellphone Usage and Mental Health". I will describe this study to you and answer any of your questions.

This study is being led by Jonathan Elam, an undergraduate student in the Behavior and Health Sciences department. The **Faculty Advisor for this study is** Dr. Tom Brinthaupt of the MTSU psychology department.

What the study is about

The purpose of this research is to….

      Try and discover if there is a positive relationship between cell phone addiction and mental health among college students, primarily anxiety and depression.

What we will ask you to do

I will ask you to….

      Take a single survey that will include three scales: a depression scale, an anxiety scale, and a cell phone addiction scale. It should take no longer than thirty minutes to complete the survey.

Risks and discomforts

I do not anticipate any risks from participating in this research.

Benefits

There are no benefits.

Information about this study may benefit other people by giving us a better understanding of the causes of mental health problems in American college students. We hope to learn if cellphones are contributing to the growing mental health problem in society.

Compensation for participation

Participants will receive one (1) participation point upon completion of this survey.

Privacy/Confidentiality/Data Security

Participants' privacy will be protected by having all results and data be stored securely and will not be shared with anyone. No one will have access to the participants' personal information aside from the primary researcher themselves, and all personal data will be destroyed upon the completion of this study.

Data Sharing

Data from this study will not be shared beyond the investigators of this study.

Taking part is voluntary

Participation of this study is completely voluntary. Any participant can back out at any time for any reason, both before and during the completion of this survey.

If you have questions

The main researcher conducting this study is Jonathan Elam, an undergraduate student at Middle Tennessee State University. Please ask any questions you have now. If you have questions later, you may contact Jonathan Elam at jwe2q@mtmail.mtsu.edu or at (865)805-5830. If you have any questions or concerns regarding your rights as a subject in this study, you may contact the Institutional Review Board (IRB) for Human Participants at 607-255-5138 or access their website at http://www.irb.cornell.edu. You may also report your concerns or complaints anonymously through Ethicspoint online at www.hotline.cornell.edu or by calling toll free at 1-866-293-3077. Ethicspoint is an independent organization that serves as a liaison between the University and the person bringing the complaint so that anonymity can be ensured.

Statement of Consent
I have read the above information, and have received answers to any questions I asked. I consent to take part in the study.

Your Signature_____ Date_____

Your Name (printed)_____

Signature of person obtaining consent_____ Date__

Printed name of person obtaining consent_____