

I CAN'T USE MY CELL PHONE?: CELL PHONE ADDICTION, RESTRICTIVE
SOCIAL ENVIRONMENTS AND HEALTH OF COLLEGE STUDENTS

THESIS

Presented to the Graduate Council of
Texas State University-San Marcos
In Partial Fulfillment
Of the Requirements

for the Degree

Master of ARTS

by

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San Marcos, Texas
August 2013

I CAN'T USE MY CELL PHONE?: CELL PHONE ADDICTION, RESTRICTIVE
SOCIAL ENVIRONMENTS AND HEALTH OF COLLEGE STUDENTS

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ACKNOWLEDGEMENTS

I would like to begin by expressing sincere gratitude for Dr. Osborne. His proficiency as a professor is undeniable, offering a boundless transmission of knowledge, the provision of balance, and the instilment of courage on the path to success. He has always believed in me and my abilities, and never held back from articulating it in times of need. His philanthropic influence has indefinitely contributed to my growth as an individual, and words may not fully express how thankful I am to have been on the receiving end. Although our collaboration on this project has concluded, I hope future opportunities for us to be creative and keep up on life's fun events remain on the horizon. You were my professor, my thesis Chair, and my mentor for many years. Through all of it, you are someone I am extremely privileged to call my friend.

I would like to extend appreciation to my committee members, Dr. Etherton and Dr. Sierra. It required a tough team to shift into high gear in order to keep up with my aspirations to reach that summer finish line. Dr. Etherton, you have been there through it all; idea development, progress along the way, lengthy periods of inactivity, and those interesting bumps in the road – thank you so much for your unyielding support. Dr. Sierra, you so graciously offered your assistance when it was needed most. You ventured into uncharted territory to impart statistical expertise that was of immeasurable value to the completion of this project. Thanks again for your timely reinforcement and benevolence.

I also would like to thank others who have significantly contributed to the creation and conclusion of this project. Dr. Turner, you provided me with unique knowledge of survey coding and design with regard to web hosting. Thank you for helping me launch the thesis survey in such a way that it was easily accessed by participants and the data collection was most non-abrasive in nature. Dr. Nagurney, I would like to thank you for allowing me the opportunity to shine as a Graduate Instructional Assistant in your methods courses, and for the fun we had during the early stages of thesis development. Dr. Raffeld, thank you for being so kind in explaining various intricacies of SPSS – much more than we had time for in the advanced statistics course. In addition, your smile and great conversation were always something to look forward to.

A special thanks to Dr. Romano. I cannot even begin to tell you how valuable your time and knowledge have been to the fast-paced completion of this project. You were persistent with reminding me to keep on task and provide you with progress updates – oddly enough, it worked wonders. You put forth much needed encouragement backed with 20 plus years of watching me grow up. When I was in dire need, you took time out of your prior engagements to lend me the most incredible statistics resource I have ever had the pleasure to read. Seriously, that book aided in the comprehension and execution of the statistical analyses in record breaking time. Thank you for your lasting friendship, your admirable dedication as a professor, and your kindness in sharing your wealth of knowledge with those of us who are still running to catch up.

I would like to thank my family for their unwavering support, in every form, throughout the many years of education. This gratitude would not be complete without

recognizing strength beyond the miles. The entire Stewart family, especially my Grandfather, and Uncle David – I believe you both have been my biggest supporters. You were always there to cheer me on and held out hope even in times where I had none. I love you and hope to see you all very soon. My love and thanks also extend to the entire Hamner family. Grandpa, I wish more than anything my academic journey could have ended long before your journey did in this life. I think about you every day, and will forever share your legacy through memories of your presence. Mom and Dad, I do not know where I would be without all the assistance you have been able to provide all these years. You put a roof over my head, food on the table, and endless amounts of love in my heart every day of this educational voyage. There have been tough times, but there have been far more great times. Through the laughter and the tears, we made life ours and have quite a unique story to tell. My eternal love and thanks to you both. Donnie, you have shown me the power of perseverance and have taught me so much about communication dynamic through our ever evolving sibling relations. As this door closes, another one will open, but this time we can both share the rewards of success. And let us not forget about the shenanigans – I love you, brother. Cassie, you have been a pivotal force in our family, both then and now. You are proof, from your presence and experience that life works in enigmatic ways. I am fortunate to have such a wonderful sister-in-law, and our bond is sure to stand the test of time. Asher, this past year watching you grow has been amazing. I love you more than words can articulate, and am so excited to see what your future holds.

Finally, I would like to give a warm thanks to my delightful friends. Tara and Jamie, you ladies have been my rock – a text a day certainly did help to keep the thesis

stress at bay. Jamie, your compassion for life is such an inspiration. You have guided me through quite a bit of tunnels I thought would never end, and the sunshine on the other side has never felt better. Tara, we have had more ups and downs in this life than most elevators. The best part is, we had each other through them all and were able to laugh it up along the way. Susan, we “shared the road to Masters” together. As always, you cruised 90 mph and disappeared into the sunset of success while I stalled out in your exhaust. However, you always knew that I was not far behind – thanks for leaving a light on for me. Kristi, you have been a breath of fresh air amidst the cloud of smog. Your gentle nature, acceptance, and positive outlook on just about everything never cease to amaze me. Thanks for motivating me to become better person in all aspects of life. Justen, your presence has become one of the most unexpected and wonderful contributions I have had the chance to experience. You have facilitated the opportunity for me to discover inner strengths, expand horizons, and embrace each moment for what it is worth – thank you. There are many other friends who hold a special place in my heart, which have in fact assisted in keeping me grounded throughout graduate school. Both old and new, you know who you are and I promise not to waste opportunities to tell you how unique and important you really are. No acknowledgement would be complete without a sincere thanks to my incredible neighbors. You have been there in numerous ways for our family, shown us such generosity over the years, and have become great friends. Our conversations about the day-to-day aspects of life, as well as the ones where we express concern for each other are things I will always cherish. To all of my friends, thank you for everything you do and have so selflessly given.

This manuscript was submitted on June 21, 2013

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ABSTRACT

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This study investigated group differences in levels of cell phone addiction, frequency of Internet use on the device, and restrictive classroom and employment settings against levels of anxiety and depression. Participants ($n = 195$) completed a demographic and environmental questionnaire, the Mobile Phone Addiction Scale (MPAS), as well as both the anxiety and depression subscales of the Mental Health Inventory (MHI). Results found levels of restrictive social environments and cell phone addiction influence the level of anxiety and depression experienced by individuals. No support was found for frequency of Internet use as an influencing factor for levels of anxiety or depression. However, significant group differences in Internet use groups on

low, moderate or high cell phone addiction scores suggests high rates of Internet use on a cell phone is related to higher levels of cell phone addiction.

CHAPTER I

INTRODUCTION

Over the past decade, usage of the Internet has become a revolutionary method of communication. Undergoing rapid change with continuous development of new Internet programs throughout this time (e.g., Facebook, Twitter, YouTube, etc.), researchers have struggled to explain the various ways in which Internet usage may enhance or hinder the psychological and social well-being of regular users (Kim & Haridakis, 2009). Although some researchers have examined the positive psychosocial aspects of using the Internet, a thorough review of the literature shows a considerable amount of attention has been paid to the negative effects of persistent Internet use. Various labels have been used to describe the essentially parallel Internet using behaviors, such as pathological Internet use (Davis, 2001; Morahan-Martin & Schumacher, 2000), compulsive Internet use (Van den Eijnden, Meerkerk, Vermulst, Spijkerman, & Engels, 2008), Internet dependency (Scherer, 1997), problematic Internet use (Caplan, 2002), and Internet addiction (Young, 1996). Despite the disagreement in terminology among these researchers, there is a general consensus regarding the implied harm associated with excessive Internet use. Recently, Internet technology has advanced well beyond the much researched areas of personal computer-mediated communication. For instance, the Pew Internet and American Life Project reported an estimated 56% of Americans currently access the Internet wirelessly through portable devices such as laptops, gaming consoles, portable

music players, and cell phones (Horrigan, 2009). Furthermore, wireless Internet use is particularly high among young adults ranging from 18 to 29 years of age, as 81% percent of the cohort reported utilizing this type of modern technology (Lenhart, Purcell, Smith, & Zickuhr, 2010). The increasingly mobile aspect of Internet accessibility, in addition to the volume of literature focused on the negative behaviors associated with excessive Internet use, has encouraged a new and growing area of research – cell phone behavior as it relates to Internet use.

Since making their debut, cell phones have become an ever-present part of daily life in the United States. The Pew Internet and American Life Project reported a steady increase in the number of adolescents between 12 and 17 years of age owning cell phones, from 45% in 2004, to an astounding 71% in 2008 (Lenhart, 2009). By year end in 2009, approximately 93% of young adults between the ages of 18 and 29 reported cell phone ownership (Lenhart et al., 2010). The functionality of modern mobile devices is likely a factor regarding existing popularity of the cell phone. Initially, cell phones were simply a device used for making outgoing and receiving incoming voice calls. Currently, technological advancements have transformed cell phones into multifaceted communication portals equipped with e-mail capabilities, digital cameras, Internet access and web browsing, GPS navigation, portable music players, Short Message Service (SMS) texting, television viewing options, and software applications for various functions, similar to that of a personal computer (Beal, 2010; Siegel, 2008). The cell phone, as a result of Internet capabilities, has been implicated as a catalyst for problematic Internet-related behaviors such as cyber bullying, excessive emailing, problematic gambling, overuse of text messaging, as well as problematic sexual behavior

and sexting (Campbell, 2005; Kamibeppu & Sugiura, 2005; McBride, & Derevensky, 2009; Perry & Lee, 2007; Weiss, & Samenow, 2010).

Perhaps the most debatable aspect of both Internet and cell phone use is whether individuals are capable of becoming dependent or “addicted” to these mediums of communication. Although some argue that the term addiction should remain reserved for dependence on ingested substances (Blaszczynski, 2006), the progressive trend in associated literature suggests addiction terminology should be expanded to encompass a variety of non-substance-related dependencies (Lemon, 2002; Orford, 2001). The term “addiction,” as it would apply to excessive use of information-technologies, does not appear in the *Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition-Text Revision* (DSM-IV-TR; American Psychiatric Association, 2000). Because of this, the problematic behaviors have been characterized as such through comparisons made against diagnostic criteria for substance dependence and pathological gambling (Jenaro, Flores, Gómez-Vela, González-Gil, & Caballo, 2007; Perry & Lee, 2007; Scherer, 1997; Young, 1996; Young, 1998).

For the purpose of the current investigation, the term “addiction” will be utilized when referring to problematic cell phone use behaviors akin to impulse-control disorders criteria located in the DSM-IV-TR. However, preferred terminology of respected researchers will be used when discussing their studies. The use of addiction terminology is not intended to imply that the concept is perceived as being more appropriate than alternate terms – it is however a means of acknowledging the belief in current literature that certain behaviors are pathological in nature. Beyond terminology, negative aspects of excessive cell phone use are well documented (Bianchi & Phillips, 2005; Ha et al., 2008;

Leung, 2008). However, further research is necessary to better understand this behavior, and identify psychological processes underlying patterns of problematic use.

Problem Statement

With the greater part of literature focused on problematic Internet usage, or Internet addiction as a rather stationary medium (i.e., personal computers), there is a need to expand research on cell phone usage specifically since it has the new-found ability to be intertwined with Internet use of similar magnitude. Advancements in technology have facilitated a market for modern mobile devices to now be readily equipped with full Internet capabilities. It is necessary to explore which Internet-related functions on cell phones are being utilized among a college population, as excessive use of these communication mediums may result in addictive behavior. Furthermore, there is a need to investigate perceived cell phone addiction as it relates to individual health in terms of anxiety and depression that may occur as a result of usage behavior. Finally, existing literature has yet to investigate the potential impact a restrictive environment might have on individuals with a perceived cell phone addiction.

Purpose and Significance of the Study

The purpose of this study is to explore group differences between individuals with self-reported cell phone addiction coupled with mobile Internet usage and restrictive environments, and how these factors may impact the health of those utilizing this medium of communication. Little is known about cell phone functions requiring Internet usage specifically in terms of how the chosen functions relate to perceived addiction to the device. This study aims to address this, as well as expand the scope of research investigating perceived cell phone addiction and psychological measures of anxiety and

depression in a college population. Furthermore, this study aims to address any potential impact the environment has on the well-being of individuals that report having an addiction to their cell phone. Specifically, this study intends to address whether those scoring high on cell phone addiction will also score high on anxiety when coupled with environments in which cell phone usage is highly restricted, or even prohibited.

This study will also present awareness regarding self-reported cell phone addiction and depression. Depression has been linked to Internet usage via stationary computers (Kraut et al., 1998). It has further been suggested that individuals suffering from depression are more likely to form addictions to the Internet (Young & Rogers, 1998). However, little is known about whether the same principle can be applied to Internet use on cell phones. The current study aims to expand this “addiction” notion to include cell phone usage, especially since cell phones are commonly used to access the Internet. This study may also facilitate future research on mobile devices and their impact on the mental health and social lives of those who frequently use them exclusively for Internet access, with specific focus on situations in which usage of that device is restricted or even prohibited.

Overview of Methodology

Students from a university were recruited by the researcher from one of their regularly scheduled undergraduate courses. Individuals were initially presented with summary of the research and an alternate task, as well as an email address where the researcher could be contacted. Those choosing to participate in this research were asked to complete an online survey containing background questions on demographics and academic and/or employment environments, as well as the Mobile Phone Addiction Scale

to assess perceived cell phone addiction (MPAS; Leung, 2008), and the depression and anxiety subscales of the Mental Health Inventory (MHI; Veit & Ware, 1983).

Research Questions and Hypotheses

This study investigates whether individuals with Internet access on their cell phone also consider themselves to have a self-reported addiction to using this medium of communication, and whether that level of addiction influences levels of anxiety and depression. In addition, this study aims to investigate whether restrictive social environments (i.e., college courses in which cell phone use is prohibited, and/or employment settings with such restrictions) are related to increased levels of anxiety when coupled with self-reported cell phone addiction and frequency of internet use on the device.

H_a1: It is hypothesized that restrictive social environments (i.e., academic and employment settings where use of a cell phone is severely restricted or even prohibited), frequency of Internet use on the cell phone, and self-reported addiction to the device will act together to influence anxiety levels. In other words, cell phone use specifically to access the Internet, perceived addiction to the device, and environments in which that cell phone usage is restricted, are expected to yield significant group differences with respect to the dependent measure of anxiety.

H_a 2: It is also hypothesized that there will be a statistically significant group differences in cell phone addiction levels for individuals who frequently access the Internet on their cell phone.

H_a 3: Finally, it is hypothesized that there will be no statistically significant interaction between restrictive classroom and employment environments, Internet use on

the cell phone, and self-reported addiction to the device, with respect to levels of depression. This is in contrast to previous studies on Internet addiction (i.e., the old “chained to one’s computer” view), which have linked depression to Internet usage on personal computers (Kraut et al., 1998; Young & Rogers, 1998). The reasoning behind this hypothesis is the new-found mobility in being able to have Internet capabilities while on-the-go, no longer having to isolate oneself for use. Perhaps the freedom to utilize the Internet from a mobile device, without being bound by time or location, allows the user to feel positive about their connectivity, despite admitting excessive use.

Limitations

Due to the nature of this investigation, the current research is not without limitations. First, this study employed self-report instruments as a method for data collection. As such, it is possible the participants may have reported biased information. Second, the survey questions may have lacked an adequate amount of context for the participants, which potentially may have allowed for inaccurate responses in some instances. Third, the current study was comprised of a convenience sample from a local university, and may not provide an accurate representation of the general population, or college students from other geographical locations. Finally, the current research utilized a correlational design, making the investigation unable to allow for causal inferences to be established.

Definition of Key Terms

Several key terms will appear throughout this thesis. These key terms are pertinent to the thesis investigation and are defined as follows:

1. Psychosocial factors: A combination of mental health and social conditions in an individual's life.
2. Cell phone: A multifaceted, wireless, transportable device used for telecommunications, and more recently, Internet connectivity including web browsing, email, text messaging, and social media involvement (Beal, 2010).
3. Internet: An interconnected system of electronic communication which facilitates the instantaneous linking of technological devices, networks, and facilities worldwide.
4. Internet addiction: An inability to manage Internet usage, leading to a variety of impairments in psychological, social and/or occupational environments (Young & Rogers, 1998).
5. Restrictive environment: Any environment in which a person is unable to, or is prohibited from engaging in a desired behavior.

Thesis Organization

The current chapter provides a brief introduction into the impact of Internet use and its more recent coupling with cell phones, a problem statement for this thesis project, the purpose and significance of this study, an overview of methodology, the research questions being posed and related hypotheses for this study, as well as investigative limitations, and definitions of key terms utilized throughout this thesis. Chapter II elaborates on the literature and issues related to Internet and cell phone addiction. Methodology for the study is presented in Chapter III, which includes the employed research design, participant selection, the procedure for data collection, and the research instruments utilized. Chapter IV presents the results for this study. Finally, Chapter V

provides a general discussion of the results, limitations, suggestions for future research, and overall conclusions.

CHAPTER II

REVIEW OF LITERATURE

Addiction Terminology

The current investigation builds on previous research indicating some individuals become addicted to the Internet in a manner similar to that of individuals developing addictions to alcohol, drugs, and gambling (Beard & Wolf, 2001; Griffiths, 1996, 2000; Widyanto & Griffiths, 2007; Young, 1998). As a variety of mobile devices are now equipped with Internet capabilities (Horriagan, 2009), the current study intends to evaluate Internet use on mobile phones and the impact of problematic mobile phone usage, which has been referred to in recent literature as cell phone addiction (Carbonell, Guardiola, Beranuy, & Bellés, 2009). In contrast to the implied addiction component in definitions for substance dependence, the concept of behavioral addiction has remained relatively elusive (Shaffer, 1997). Perhaps the reason for this is an absence of the term “addiction” within the categorical system of the current DSM-IV-TR (APA, 2000) and previous version (DSM-IV; APA, 1994). Despite the nonexistence of “addiction” in the DSM, the word continues to be used in contemporary literature, demanding further discussion in order to clarify use of the term for this investigation.

While many argue addiction terminology should be utilized only when referring to physiological dependence on ingested substances (e.g., Akers, 1991; Blaszczynski, 2006; Rachlin, 1990), other researchers have suggested addiction is an appropriate

expression to describe or explain various problematic behaviors such as pathological video gaming (Keepers, 1990), uncontrollable sexual activity (Goodman, 1993), excessive exercise (Freimuth, Moniz, & Kim, 2011), pathological gambling (Hoffman, 2011), and compulsive eating (Fortuna, 2012; Lesieur & Blume, 1993). As such, it is important to explore the diagnostic criteria often utilized by researchers when proposing the concept of behavioral dependency, or addiction.

Of the current diagnostic criteria in the DSM-IV-TR, substance dependence is considered to be the closest to what has been traditionally labeled as addiction (Walters, 1996). Substance dependence is manifested by any three or more of the following seven criteria, which occur at any time within a 12-month period: tolerance, withdrawal, unintended increase in the amount and time frame of use, unsuccessful attempts to control or decrease use, a preoccupation with activities used to obtain the substance, diminished interest in recreational, social or occupational activities as a result of substance use, and continued use of the substance despite awareness of physical or psychological consequences associated with such use (APA, 2000). If the substance dependence criterion were to be utilized to define addiction, above listed behaviors (i.e., uncontrollable sexual activity, compulsive eating, and pathological gambling) could also be classified as addictions, as the object of dependency is not explicitly specified (Walters, 1996). Because of this, it is also important to compare the diagnostic criteria for substance dependence against criteria established for pathological gambling, otherwise considered by some to be a behavioral addiction (Marks, 1990; Potenza, Fiellin, Heninger, Rounsaville, & Mazure, 2002).

The DSM-IV-TR criterion for pathological gambling is classified within the impulse-control disorder category, and is manifested when five of more of the following conditions are met: a preoccupation with gambling, an increased need for gambling in order to reach the preferred level of excitement (e.g., tolerance), unsuccessful attempts to control, reduce, or discontinue gambling, the experience of irritability or restlessness when attempting to reduce gambling (e.g., withdrawal), the use of gambling to relieve undesired moods or escape problems, seeking out additional gambling in attempt to regain losses, the extent of gambling involvement is concealed from others, illegal acts are employed in order to finance gambling, an occupation, education, or relationship is jeopardized or risked as a result of gambling, and others are depended upon to assist in relieving financial burden caused by gambling (APA, 2000). This criteria has been utilized by researchers to identify behaviors considered to be addictive, particularly Internet abuse (Young, 1996) and problematic cell phone use (Bianchi & Philips, 2005), as both are central to the present investigation.

Beyond the argument of whether non-substance related dependencies should be included, and regardless of overlap between substance dependence and pathological gambling diagnoses, the concept of addiction is generally agreed to consist of the following three elements: an urge or compulsion to engage in an activity, an inability to decrease or control that activity, and a commitment to continuing the activity despite being aware of adverse consequences associated with it (Goodman, 1990; Holden, 2000; Shaffer, Hall, & Vander Bilt, 2000). Relevant to the current research is the proposed concept of technologically-based addictions. Specified as a component of behavioral addiction, Griffiths (1996) defined technological addictions as those which are non-

substance related and involve interactions between a human being and machine. This category of addiction is suggested to include television, computer games, virtual reality, and Internet use (Griffiths, 1996). For purposes of the current investigation, and similar to the definition proposed by Walters (1996), addiction is operationally defined as behaviors which an individual repeatedly fails to resist despite significant psychological or social consequences.

Internet Use

It has become difficult to separate the good from the bad when discussing psychosocial aspects of Internet use. This difficulty is best referred to as an “Internet paradox,” in that the Internet provides a wealth of information and communication opportunities, but it has also been associated with significant social and psychological declines, such as impaired family communication, reduced size of social circles, and increased levels of depression (Kraut et al., 1998). In other words, the good appears to come with the bad – at least it can. Campbell, Cumming and Hughes (2006) suggested Internet environments are capable of counteracting negative consequences by providing chat functions to reduce social fearfulness, an uncritical place to communicate, and a means for some individuals to manage social phobias. College students perceived Internet use as having a positive impact on their lives as it assisted in assignment completion, research opportunities, and communication with friends and family. Despite the positive perception however, it should be noted that 13% of regular Internet users in this study also reported having a dependency on the Internet, as specified by tailored criteria similar to that established in the DSM for substance dependence (Sherer, 1997). As Sherer (1997) illustrates, it is possible that the positive effects of reducing social fearfulness and

enhancing communication can, in the long run, be offset— at least for some users - by the negative consequences of developing dependency.

Internet Addiction

Perhaps the most investigated aspect of the Internet over the last decade is deciphering when frequent or excessive use becomes an addiction. Kandell (1998) has defined Internet addiction as “psychological dependence on the Internet, regardless of the type of activity once logged on” (p.12). Young (1999) suggested Internet addiction is similar to diagnostic criteria for pathological gambling. A Diagnostic Questionnaire (DQ) structured from the pathological gambling criteria in the DSM (DSM-IV; APA, 1994) was created by Young (1998) as a screening tool for Internet addiction. The DQ required respondents to answer “yes” or “no” to items assessing (1) a preoccupation with the Internet, (2) a need for increasing Internet usage to achieve desired satisfaction, (3) unsuccessful attempts to cut back on, control, or stop Internet use, (4) depressed, moody, restless, or irritable feelings experienced when trying to reduce Internet use, (5) use of the Internet for longer time periods than originally intended, (6) the jeopardizing of or risking a loss of an occupation, education, or relationship as a result of Internet use, (7) attempts to conceal the extent of Internet use from others, and (8) use of the Internet as a way of relieving negative feelings (e.g., anxiety, depression, helplessness, guilt) or escaping personal problems (Young, 1998). While there currently is no definitive diagnosis for Internet addiction (Suler, 2004), many labels have been used in literature to describe behaviors analogous to Internet addiction including pathological Internet use (Davis, 2001; Morahan-Martin & Schumacher, 2000), compulsive Internet use (Van den Eijnden

et al., 2008), Internet dependency (Scherer, 1997), and problematic Internet use (Caplan, 2002).

Despite some of the positive consequences outlined above (e.g., Campbell, Cumming and Hughes, 2006), research examining the Internet continues to focus on negative outcomes that result from problematic Internet usage. Time spent online has been suggested to act as a mechanism for social displacement, such that the more time one spends on the Internet, the less time one is able to spend with their family members, friends, or coworkers (Nie, Hillygus, & Erbring, 2002). This type of isolation is commonly reported as a by-product of stationary computer-mediated communication, and when coupled with frequent or compulsive Internet use, it has been linked to negative psychosocial consequences such as depression (Chen & Peng, 2008; Kraut et al., 1998).

Individuals who perceive themselves to be excessive Internet users also report experiencing more physical illness (Chen & Peng, 2008), and social inhibition (Lacovelli & Valenti, 2009) than their average Internet-using counterparts. As the Internet has continued to expand communication and learning capabilities, so has the tendency for more individuals to develop dependencies or addictions to this technological medium (Young, 1998). Excessive Internet use has been documented to significantly impair educational, occupational, and domestic responsibilities, as well as disrupt personal relationships and create financial burdens (Griffiths, 2000; Young 1998). With regard to usage preferences, online socializing has been suggested to contribute to the development of problematic Internet using behaviors (Caplan, 2003). As the Internet can now be accessed readily from a variety of mobile devices (Horrigan, 2009), and online communication via cell phone technology has been suggested to impact the mental and

physical health of adolescents (Kamibeppu & Sugiura, 2005), further review is needed to describe patterns of problematic or “addictive” cell phone use.

Cell Phone Use

In a 2012 report, the U.S. Central Intelligence Agency (CIA) estimated there are 279 million cell phone users nationwide (CIA, 2012). According to research statistics from the Pew Internet & American Life Project, that number represents 88% of the population, and 55% of those individuals use online features on their cell phones. In addition, 45% of young adults aged 18-29 who access the Internet on their cell phone reported utilizing the phone for the majority of their Internet browsing behavior, as opposed to a laptop or personal computer (Smith, 2012). Use of the cell phone has become a ubiquitous part of everyday life, and for some individuals, has created a sense of feeling lost when the device is not present (Aoki & Downes, 2003).

Psychological benefits associated with the utility of the cell phone may contribute to the increasing popularity of the device among young adults. An analysis of college students’ attitudes toward cell phones revealed key contributors to usage importance including the following: a sense of personal safety (e.g., having the ability to call someone in the event of a vehicular breakdown, or feeling secure when out late at night), information access, social interaction (i.e., keeping in touch with friends, or eliminating boredom), ease of parental contact, and reliance, or a means by which to keep in touch with and be up-to-date with the world (Aoki & Downes, 2003). Cell phones can act as an extension of personal identity, such that some users individualize their devices with designer phone covers, chosen ring tones, and unique screen displays (Srivastava, 2005). Benefits of cell phone use also expand beyond youth interest and into public service,

becoming increasingly evident in the healthcare industry. For instance, voice-reminders and text-messages have been found to increase medication adherence, reduce stress levels, decrease the amount of missed appointments, improve patient education, and increase the overall quality of care experienced between patient and provider (Santosh, Boren, & Balas, 2009). In addition to these positive perceptions and multifunctional benefits of modern day cell phone use, negative outcomes have also been observed.

The cell phone has evolved into a multifunctional device now equipped with Internet capabilities, and as a result, has been associated with problematic behaviors including cyber bullying, problematic gambling, excessive text messaging, as well as inappropriate sexual communications and sexting (Campbell, 2005; McBride & Derevensky, 2009; Perry & Lee, 2007; Weiss & Samenow, 2010). The cell phone can also act as a distraction to others. For example, Campbell and Russo (2003) reported use of a cell phone in environments such as grocery stores, restaurants, movie theaters, and classrooms to be particularly disturbing to some individuals. In addition, the cognitive performance of students was found to be impacted when device ringers are heard in a classroom environment (Shelton, Elliott, Lynn, & Exner, 2009). Further issues relating cell phones to academic environments include using the device to cheat on exams (Meer, 2004), and inappropriately utilizing device cameras in restrooms or locker rooms to exploit classmates in a humiliating fashion (Shaw, 2011). Mobile devices have posed significant problems on roadways as well. According to the National Highway Traffic Safety Administration (2010), cell phones were the main distraction in 18% of traffic-related fatalities reported in 2009.

The rate of cell phone use is particularly pertinent to problematic outcomes. Kamibeppu and Sugiura (2005) found cell phone users experienced a sense of insecurity and disrupted sleep patterns due to continuous e-mail exchanges, as 54% of their respondents indicated sending or receiving more than 10 messages per day. This frequency of cell phone use has been linked to negative effects such as anxiety, depressive symptoms, stress, low self-esteem, sleep disturbances, and somatic complaints (Ha et al., 2008; Jenaro, Flores, Gómez-Vela, González-Gil, & Caballo, 2007; Thomée, Härenstam, & Hagberg, 2011). This raises the question as to whether cell phone users perceive themselves as having an addiction to the device when such negative outcomes are experienced.

Cell Phone Addiction

Consequences of problematic cell phone use or addiction have received far less attention in empirical research than those associated with Internet addiction (Carbonell, Guardiola, Beranuy, & Bellés, 2009). Much like Internet addiction, the latest version of the DSM does not have a diagnosis specified for pathological cell phone use. As modern technology currently allows for the Internet to be accessed readily on cell phones, this new standard of connectivity is beginning to be implied as a strong contributing factor in the psychosocial well-being and health impact experienced by adolescents who over-utilize it (Kamibeppu & Sugiura, 2005). In some instances, cell phone use is continued despite awareness of potentially problematic outcomes (Bianchi & Phillips, 2005). In an effort to clarify problematic patterns of behavior, excessive use with an absence of harmful outcomes has been argued to differ from addiction in that some individuals might excessively engage in a behavior without becoming addicted (Charlton &

Danforth, 2004). However, it is also argued that negative psychological outcomes, such as those associated with withdrawal, are indicative of an addiction despite the amount of time one engages in a particular behavior (Charlton & Danforth, 2004). Considering this distinction, the current investigation intends to examine the existence of perceived cell phone addiction using a measure which includes items to assess withdrawal (MPAS; Leung, 2008).

Conceptual Framework

As excessive cell phone use has been conceptualized as an addiction comparable to substance dependence (Chóliz, 2010), the standard utilized for establishing dependence or addiction is considered support for the current investigation. For example, the essential attribute common in both dependence and behavioral addiction is the repeated use of a substance or repeated behavior capable of resulting in tolerance, withdrawal, or an inability to control substance use or engaging in the behavior (Potenza, 2006). Bianchi and Phillips (2005) created a 27-item Mobile Phone Problem use Scale (MPPUS) to encompass a range of these issues relating to technological and behavioral addictions. Later research extracted 17-items from the MPPUS in order to establish a suitable scale for mobile phone addiction (MPAS; Leung, 2008). Eight of those items are structured from DSM criteria for pathological gambling, and in previous research, had been modified to form a measure for Internet addiction (Young, 1998). As such, the abbreviated 17-item measure will be utilized in the current investigation to assess perceived cell phone addiction, especially as it relates to the use of Internet functions on cell phones.

Individuals with behavioral addictions are likely to experience the previously mentioned symptoms such as tolerance, withdrawal, cravings, and an inability to control the behavior (Potenza, 2006). Therefore, individuals perceiving an addiction to their cell phone are expected to report experiencing withdrawal symptoms, or negative psychological consequences (e.g., anxiety), from inability to engage in the desired amount of cell phone usage behavior. In 2010, an estimated 40% of full-time college students and 73% of part-time college students between the ages of 16 and 24 held employment outside of coursework (National Center for Education Statistics, 2012). Because both classroom and employment environments tend to restrict the use of cell phones, addicted college students who are also a part of environments which limit or prohibit cell phone use, are expected to experience different levels of anxiety than those with lower restrictions and low addiction levels in this investigation.

Finally, depression has been linked to Internet addiction through the use of personal computers (Ha et al., 2007; Kraut et al., 1998; Young & Rogers, 1998). Recent research has also linked depression to the development of problematic cell phone use (Yen et al., 2009). However, an extensive review of the literature failed to link depression to perceived cell phone addiction in a U.S. population. It is unknown whether mobile connectivity of the Internet via cell phone technology will impact depression in a manner similar to the previously noted studies examining Internet addiction on computers. In addition, there does not appear to be any literature specifically addressing restrictive environments (i.e., locations where cell phone use is limited or prohibited) in relation to perceived cell phone addiction. The current investigation is thought to pioneer this aspect

of cell phone use in a U.S. college population and facilitate subsequent research on the topic regardless of the outcome.

CHAPTER III

METHODOLOGY

Design

The present investigation utilized a non-experimental design to explore group differences between self-reported cell phone addiction levels and mental health constructs (i.e., anxiety and depression), when coupled with restrictive environments (i.e., college courses and/or employment settings in which cell phone use is prohibited) and frequency of Internet use. Preliminary bivariate correlations were run on the independent variables to examine potential relationships with the dependent measures. The independent variables consisted of (a) restrictive classroom environment, (b) restrictive work environment, (c) and frequency of Internet access on the cell phone as measured by the environmental questionnaire, in addition to (d) perceived cell phone addiction as measured by the MPAS. The dependent variables were (a) anxiety and (b) depression as measured by the MHI subscales. One-way between-subjects analysis of variance (ANOVA) tests were then employed to examine individual group differences for the independent variables against the dependent measures. Finally, factorial between-subjects ANOVA tests were run to investigate potential interactions and influence of group differences on all independent variables against the dependent measures.

Participants

Participants consisted of 197 students, 158 (80.2%) females and 37 (18.8%) males

enrolled in undergraduate psychology courses at Texas State University-San Marcos. Of the total participants, 46 (23.4%) were freshmen, 55 (27.9%) were sophomores, 48 (24.4%) were juniors, 43 (21.8%) were seniors, and 3 (1.5%) reported a graduate classification. Two students (1.0%) were unaccounted for as their gender and classification were not specified on the survey. The participants ranged in age from 17 to 50 years ($M = 20.86$, $SD = 3.70$). Participation in this study was voluntary, however those which chose to participate received compensation in the form of extra credit from their course instructors. Participants interested in participating contacted the researcher via email, where instructions on how to participate were given. Participants were not aware of the study hypotheses prior to voluntary completion of the survey.

Procedure

The researcher worked with a professor in order to create an online survey with an accessible hotlink for this investigation. Instructors in the Psychology Department at Texas State University-San Marcos were contacted by the researcher in an effort to seek approval for administering the survey link to their students via email. Once approval to do so was granted, the researcher went to the instructors' courses and gave an announcement at the beginning of a designated class period. Potential participants were informed of an opportunity to earn extra credit by either participating in research or by completing an alternate task that had been established by the researcher. A sheet of paper containing a brief summary of the research and the alternate task, as well as an email address where the researcher could be contacted was made available to the students in these courses. Students were informed at the time that if they chose to participate, anonymity of their responses was guaranteed because no one, not even the researcher

would be able to link survey responses with the Texas State Net ID numbers provided for extra credit purposes.

Individuals who chose to email the researcher received a reply email containing a link to the survey for this study as well as an alternative method to participation. The email was created by the researcher and specifically stated that completion of either of the two offered activities would earn the student extra credit points. The alternative participation required the student to read an article attachment in the email pertaining to excessive cell phone use (Ha et al., 2008), and submit a brief written summary to their course instructor in exchange for extra credit. Those that chose to participate in the study followed the link, which directed the students to a webpage containing the consent form. A statement was provided at the bottom of the consent form explaining that by continuing on to the survey, the student was providing his or her consent to participate in this study. The student was then directed to a subsequent webpage where instructions for filling out or exiting the survey were provided. Students were prompted to enter their Texas State Net ID number when exiting or at completion of the survey in order to receive extra credit.

Measures

The data were collected using a three-section self-report questionnaire to assess demographics, environmental cell phone restriction, frequency of Internet use, cell phone addiction, and mental health measures of depression and anxiety.

Demographics and Environment. The first section asked participants to report demographic information including gender, age, academic classification, and number of classes the student was enrolled in. This section also addressed the amount of cell phone

restriction placed upon the participant while in class, at work, or both. In addition, participants were asked two questions to assess whether Internet access was available on their cell phone, and the primary use of their cell phone (i.e., talking, texting, emailing, web-browsing, or social networking). The question about Internet use frequency asked participants to choose from the following response options: no Internet access, never, sometimes, often, or always. Questions about the classroom environment asked participants to report the number of classes being taken that had a cell phone policy in the course syllabus, the number of classes being taken that prohibited cell phone use of any kind, whether or not any of the students' instructors had to tell them or other students to discontinue cell phone use while in class, and how often the cell phone was able to be used in class. Questions about work environment asked participants to report if they were employed, whether or not their employer had a policy regarding cell phone use while at work, whether or not the students' employer had to tell them or other employees to stop using their cell phone at work, and how often the cell phone was able to be used while working (see Appendix A). The eight questions about environment were created by the researcher in order to gauge the amount of cell phone restriction placed upon the participants in social environments, particularly those most common to the college population. Higher scores on the eight environmental assessment questions indicated more restrictions on cell phone use for the participants.

Cell Phone Addiction. The second section of the survey asked participants to complete a modified version of the Mobile Phone Addiction Scale (MPAS), a self-report measure designed to assess the incidence of behavioral and cognitive symptoms of problematic cell phone usage, and the extent to which negative outcomes in an

individual's life may result (Leung, 2008). The MPAS was originally adapted from the twenty-seven-item Mobile Phone Problem Use Scale (MPPUS) developed by Bianchi & Phillips (2005). A Cronbach's alpha of .93 was reported for the MPPUS, which demonstrates high internal consistency between items, thus suggesting it is an appropriate and reliable measure of problematic mobile phone use. The MPAS only utilized seventeen items from the MPPUS, which also contained eight adapted items from the DSM-IV designed to assess pathological gambling. The eight revised DSM-IV items were also used by Young (1998) in the establishment of a questionnaire to measure Internet addiction. This further solidifies the rationale for utilizing the MPAS, as it encompasses diagnostic criteria for problematic impulse-control which is implied as a component of behavioral addiction. Participants were asked to rate their agreement with each item on the MPAS using a 5-point Likert scale, ranging from 1 "*Not at all*", to 5 "*Always*". For this investigation, the items were changed to read "*cell phone*" as opposed to "*mobile phone*" in an effort to formulate a measure that was more fitting to the modern terminology prevalent among a college population (see Appendix). Reliability for the scale was demonstrated by a Cronbach's alpha of .90 (Leung, 2008).

Psychosocial Factors. The third section of the survey asked participants to complete an abbreviated version of the Mental Health Inventory (MHI), comprised of the depression and anxiety subscales. Viet and Ware (1983) reported the internal reliabilities for these MHI subscales to be .86 and .90, respectively. Phrasing of the inventory items was modeled after that utilized by the Queensland Transcultural Mental Health Centre (2003). The psychological distress constructs of depression and anxiety in the abbreviated MHI utilized in this study were assessed using fifteen items. The depression

subscale consisted of five items which measure the degree to which an individual has experienced depressive symptoms within the past month (e.g., “*During the past month, how much of the time have you been in low or very low spirits?*”). The anxiety subscale consisted of ten items which measure the degree to which an individual has experienced symptoms of anxiety within the past month (e.g., “*How often did you become nervous or jumpy when faced with excitement or unexpected situations during the past month?*”). Participants were asked to rate their responses on a six-point Likert scale with various endpoints ranging from 1 (e.g., “*never, none of the time, not at all bothered by this*”) to 6 (e.g., “*always, all of the time, extremely so, to the point I could not take care of things*”). Higher scores on the MHI are indicative of greater mental health disturbance for the individual.

CHAPTER IV

RESULTS

Participants

The investigation consisted of 197 participants. Two individuals (1.0%) did not specify age, gender, or classification. One participant (.5%) was also unaccounted for with respect to number of classes and employment status. The sample was relatively young ($M = 20.86$, $SD = 3.70$). The majority of participants were female, 80.2% ($n = 158$), and 18.8% ($n = 37$) were male. Forty-six (23.4%) individuals were freshmen, 55 (27.9%) were sophomores, 48 (24.4%) were juniors, 43 (21.8%) were seniors, and 3 (1.5%) were graduate students. Of the participants, 56.9% were enrolled in five or more classes, 33% in four, and 9.6% in three or less. Employed individuals represented 58.4% of the sample. Frequency and nature of cell phone use for the sample is located in Table 1.

Preliminary Measures

Reliability. Measures were assessed to determine scale reliabilities prior to data analyses. The reliability of both MHI subscales was examined. The anxiety subscale consisted of 10 items ($\alpha = .91$), and the depression subscale consisted of 5 items ($\alpha = .85$). Both subscales yielded good reliability, respectively. Reliability of the MPAS was also examined. The scale consisted of 17 items ($\alpha = .90$), and yielded good reliability.

The alpha coefficient was consistent with that found by Leung (2008). Scale reliability was unable to be obtained for the environmental assessment as items were examined individually in relation to the criterion measures.

Table 1

Frequencies of Cell Phone Use for the Sample

Variable	N (%)	Variable	N (%)
<i>Use In Class</i>		<i>Internet Access</i>	
Never	27 (13.8%)	No Access	35 (17.9%)
Sometimes	102 (52.0%)	Never	4 (2.1%)
Often	41 (20.9%)	Sometimes	32 (16.4%)
Always	26 (13.3%)	Often	70 (35.9%)
		Always	54 (27.7%)
<i>Use At Work</i>		<i>Function</i>	
Never	69 (38.1%)	Talking	12 (6.2%)
Sometimes	62 (34.3%)	Texting	156 (80.0%)
Often	30 (16.6%)	Emailing	2 (1.0%)
Always	20 (11.0%)	Web-Browsing	6 (3.1%)
		Social	19 (9.7%)
		Networking	

Variable Relationships. Variables of interest in the current investigation were assessed for potential relationships prior to hypothesis testing. For variables of interest in research hypothesis 1, individual bivariate analyses were performed to evaluate the relationship between the dependent MHI anxiety measure and each of the independent variables; classroom restriction, employment restriction, Internet use, and MPAS scores. The analyses failed to yield statistically significant correlations between variables at the $p < .05$ level, with the exception of MPAS scores (see Table 2). A significant correlation was found between MPAS scores and anxiety, which was expected as five items on the scale specifically characterize symptoms of anxiety (Leung, 2008).

Table 2

Pearson Correlation Matrix for Independent Variables and Anxiety Scores

	1	2	3	4
1. Class Restriction	-.051	--	--	--
2. Work Restriction	--	.005	--	--
3. Internet use	--	--	.036	--
4. MPAS Scores	--	--	--	.330**

**Correlation is significant at the 0.01 level (2-tailed)

For variables of interest in research hypothesis 2, a bivariate analysis was performed to evaluate the relationship between the independent variable of Internet use frequency, and the dependent MPAS measure. Frequency of Internet use was positively correlated with MPAS scores (.234; $p < .01$), which indicates a positive relationship between the regularity of Internet use on the cell phone and an individual's level of cell phone addiction (see Table 3). This suggests a higher rate of Internet use on cell phones is associated with increased levels of addiction experienced by the user.

Table 3

Pearson Correlation Matrix for Frequency of Internet Use and MPAS Scores

	1	2
1. Internet Use	--	.234**
2. MPAS Score	.234**	--

**Correlation is significant at the 0.01 level (2-tailed)

For variables of interest in research hypothesis 3, individual bivariate analyses were performed to evaluate the relationship between the dependent MHI depression measure and each of the independent variables; classroom restriction, employment restriction, Internet use, and cell phone addiction. The analyses failed to yield statistically significant correlations between variables at the $p < .05$ level, again with the exception of

MPAS scores (see Table 4). A significant correlation was found between MPAS scores and depression, which was expected as three items on the scale specifically characterize symptoms of depression (Leung, 2008).

Table 4

Pearson Correlation Matrix for Independent Variables and Depression Scores

	1	2	3	4
1. Class Restriction	-.019	--	--	--
2. Work Restriction	--	-.023	--	--
3. Internet use	--	--	.055	--
4. MPAS Scores	--	--	--	.347**

**Correlation is significant at the 0.01 level (2-tailed)

Variable Grouping. In order to examine differences in means for each of the independent variables against the dependent measures in hypotheses 1 and 3, it was first necessary to create groups. Participant responses for each variable were by separated into three categories; low, moderate, or high, with respect to the amount of environmental restriction, Internet use, and self-reported addiction experienced by the individual. Restrictive environment responses were separated into groups as follows: high = never able to use the cell phone in class or at work, moderate = sometimes, and low = often and always. Internet use responses were separated into groups as follows: high = always and often use the Internet on the cell phone, moderate = sometimes, and low = no Internet access or never. A histogram for Internet use groups revealed an abnormal distribution. To correct this, the low and moderate groups were combined, thus reflecting two groups which are comparatively more equivalent than the previous three. Raw Internet use responses were utilized for group comparison against the MPAS measure as a whole for testing hypothesis 2. Scores on the MPAS ranged from the lowest possible score of 17 to a high score of 77 (out of a possible 85), and were categorized into groups as follows;

low = scores ranging from 17 to 38, moderate = 39 to 47, and high = 48 to 77, with approximately 33% of the sample represented by each group.

Hypothesis Testing

H_a1. Restrictive social environments (i.e., classroom and employment settings), Internet use on the cell phone, and self-reported addiction to the device will interact to influence anxiety levels.

Prior to executing a factorial model, multiple one-way between-subjects analysis of variance (ANOVA) tests were performed in order to compare mean group scores for each of the independent variables against the dependent anxiety measure. Individual Levene tests for homogeneity of variance revealed no violations of assumed group equality for the variables being investigated. ANOVA assessments yielded no statistically significant group mean differences for restricted class users $F(2,191) = .522, p = .577$, restricted work users $F(2,176) = .137, p = .872$, or frequency of Internet use $F(2,191) = .042, p = .837$, with regard to anxiety scores. However, the ANOVA test conducted on MPAS scores found statistically significant group mean differences for reported levels of anxiety $F(2,191) = 11.409, p < .01$. Multiple pairwise comparisons were conducted using the Tukey HSD post hoc analysis. Results from the test revealed the low MPAS group ($M = 28.84$), or those who were categorized as having little or no cell phone addiction characteristics, had significantly lower mean anxiety than the moderate ($M = 26.76$) or high ($M = 27.93$) cell phone addiction groups.

A non-experimental 3x3x2x3 factorial ANOVA was performed to examine potential interactions between environmental restrictions, self-reported cell phone addiction (in which Internet components are utilized), and the anxiety measure.

Preliminary data screening was performed to examine potential violations of ANOVA assumptions. The Levene's test indicated a significant violation $F(47, 131) = 1.627, p = .017$; however, no additional data alterations were applied. The factorial ANOVA test yielded a statistically significant main effect for the cell phone addiction group $F(2, 179) = 3.536, p = .032$ ($\eta^2 = .05$). The main effect for MPAS scores suggests there are significant differences in anxiety scores with regard to individuals in the high ($M = 28.128$), moderate ($M = 26.236$), or low ($M = 22.051$) cell phone addiction groups. A significant interaction was also found between class restriction, work restriction, and cell phone addiction $F(7, 179) = 2.231, p = .036$ ($\eta^2 = .10$). The interaction for MPAS scores and class restrictions on anxiety can be seen in Figure 1. The interaction for MPAS scores and work restrictions on anxiety can be seen in Figure 2. This interaction suggests individuals with high class and work restrictions belonging to the high cell phone addiction group had significantly higher anxiety scores than individuals with moderate or low cell phone addiction scores. This finding partially supports the current hypothesis in that a significant interaction was discovered, though it would appear frequency of Internet use was not significant to the interaction equation for anxiety levels $F(3, 179) = 1.236, p = .299$.

H_a 2. There will be a statistically significant group difference in MPAS scores for individuals who frequently access the Internet on their cell phone.

A one-way between-subjects ANOVA was performed in order to compare mean scores on the MPAS (17 = not at all, 85 = Always) for participants who were categorized into one of five groups with regard to frequency of Internet usage on their cell phone: Group 1 = no Internet access; Group 2 = never; Group 3 = sometimes; Group 4 = often;

Group 5 = always. A histogram was examined for MPAS scores prior to analysis in order to ensure an approximate normal score distribution and the absence of extreme outliers. In addition, homogeneity of variance was examined using the Levene test, revealing no significant violation of assumed equality across groups: $F(4, 188) = .945, p = .439$.

The ANOVA comparing group means for the MPAS was statistically significant, $F(4, 188) = 2.88, p < .05$, thus supporting the hypothesis. The results have a corresponding effect size of $\eta^2 = .06$, which indicates only 6% of the variance in MPAS scores was predicted by the frequency of Internet use on cell phones. Means and standard deviations for the five Internet use groups are shown in Table 5.

Table 5

Means and Standard Deviations of MPAS scores for Internet Use Groups

Internet Use	N	Mean	Standard Deviation
<i>No Internet Access</i>	35	38.71	11.45
<i>Never</i>	4	38.00	7.16
<i>Sometimes</i>	32	42.59	10.37
<i>Often</i>	70	43.66	11.15
<i>Always</i>	52	46.94	13.21

Multiple pairwise comparisons were conducted using the Tukey HDS post hoc test. Results from the test revealed Group 5 ($M = 46.94$), those who always utilize Internet on their cell phones, reported significantly higher MPAS scores than Group 1 ($M = 38.71$), or those having no Internet access ($p = .012$). This suggests frequent or perhaps even excessive use of the Internet on a cell phone is a contributing factor to having an addiction to the device. Group 3 ($M = 42.59$), was approximately intermediate to Group 1 and Group 5, however no significant mean differences were found when compared to Groups 2 and 4.

H_a 3. There will be no statistically significant interaction between restrictive classroom and employment environments, Internet use on the cell phone, and self-reported addiction to the device, and depression levels.

Prior to executing a factorial model, multiple one-way between-subjects ANOVA tests were performed in order to compare mean group scores for each of the independent variables against the dependent depression measure. Individual Levene tests for homogeneity of variance revealed no violations of assumed group equality for the variables being investigated. ANOVA assessments yielded no statistically significant group mean differences for restricted class users $F(2,191) = .179, p = .836$, restricted work users $F(2,176) = .190, p = .827$, or frequency of Internet use $F(2,191) = .001, p = .972$, with regard to depression scores. However, the ANOVA test conducted on MPAS scores found statistically significant group mean differences for reported levels of depression $F(2,191) = 13.422, p < .01$. Multiple pairwise comparisons were conducted using the Tukey HSD post hoc analysis. Results from the test revealed the low MPAS group ($M = 8.54$), or those having little or no cell phone addiction characteristics, had significantly lower mean depression than the moderate ($M = 11.02$) or high ($M = 11.60$) cell phone addiction groups.

A non-experimental 3x3x2x3 factorial ANOVA was performed to examine potential interactions between environmental restrictions, self-reported cell phone addiction, Internet use on the cell phone, and the depression measure. Preliminary data screening was performed to examine potential violations of ANOVA assumptions. The Levene's test indicated no significant homogeneity of variance violations. The factorial ANOVA test yielded a statistically significant main effect for the cell phone addiction

group $F(2, 179) = 7.626, p = .001 (\eta^2 = .09)$, and a significant interaction between class restriction, work restriction, and cell phone addiction $F(7, 179) = 3.112, p = .005 (\eta^2 = .13)$. Specifically, individuals with moderate MPAS scores and high class restrictions (see Figure 3), and those with high MPAS scores and high work restrictions (see Figure 4) reported more depression symptoms than the comparison groups. Support for the current hypothesis is not substantiated as significant interaction between variables was discovered. However, a lack of statistically significant group differences in Internet use means for levels of depression in this model should be noted. This finding suggests Internet use on the cell phone is not an influencing factor in depression levels for users.

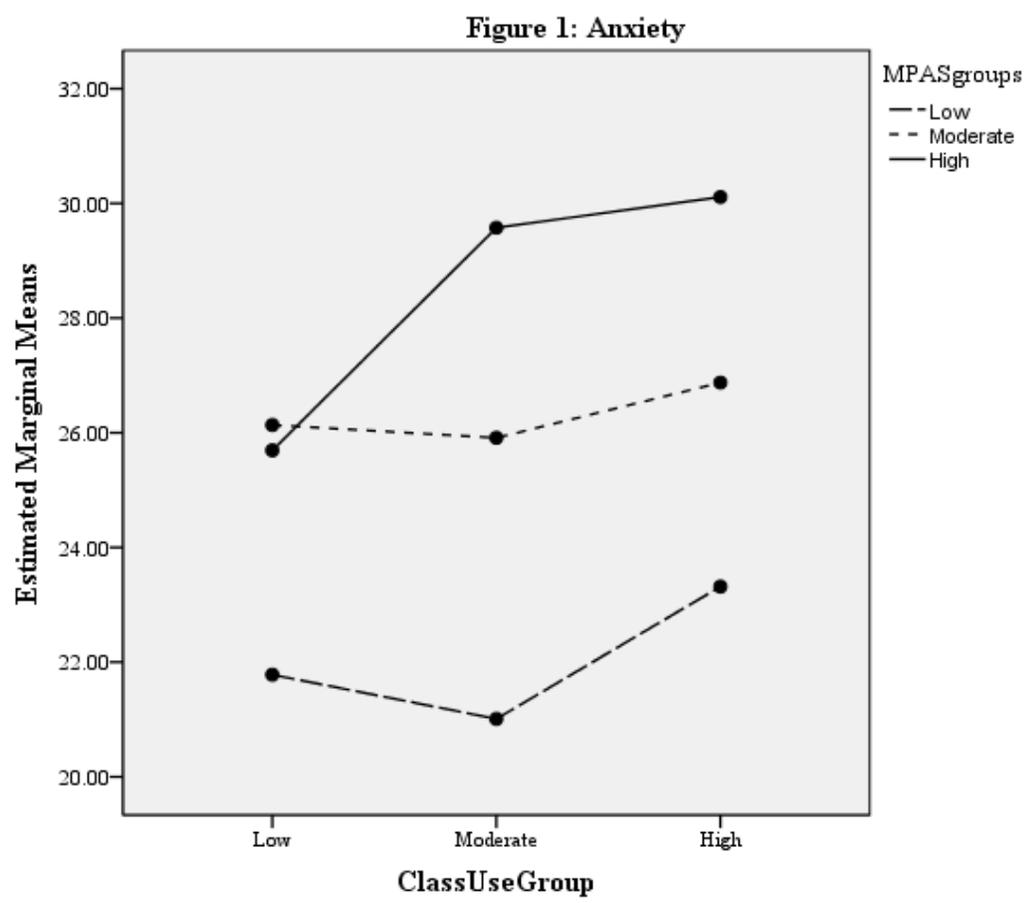


Figure 1. Class Restriction, MPAS Scores, and Anxiety. This figure demonstrates the significant main effect for cell phone addiction scores on anxiety based on environmental restriction. Individuals who scored high on the MPAS and resported high class restrictions experienced more anxiety than individuals with low MPAS scores and less class restrictions.

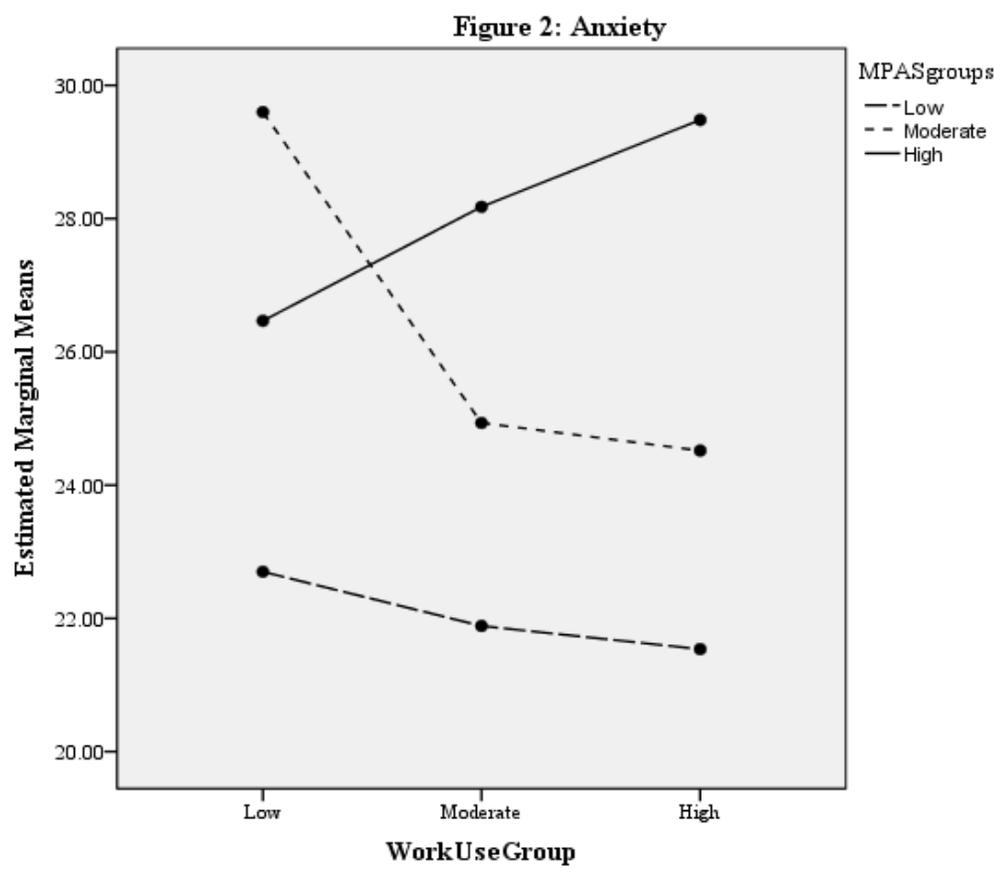


Figure 2. Work Restriction, MPAS Scores, and Anxiety. This figure demonstrates the significant main effect for cell phone addiction scores on anxiety based on environmental restriction. Individuals who scored high on the MPAS and reported high work restrictions experienced more anxiety than individuals with low MPAS scores and less work restrictions.

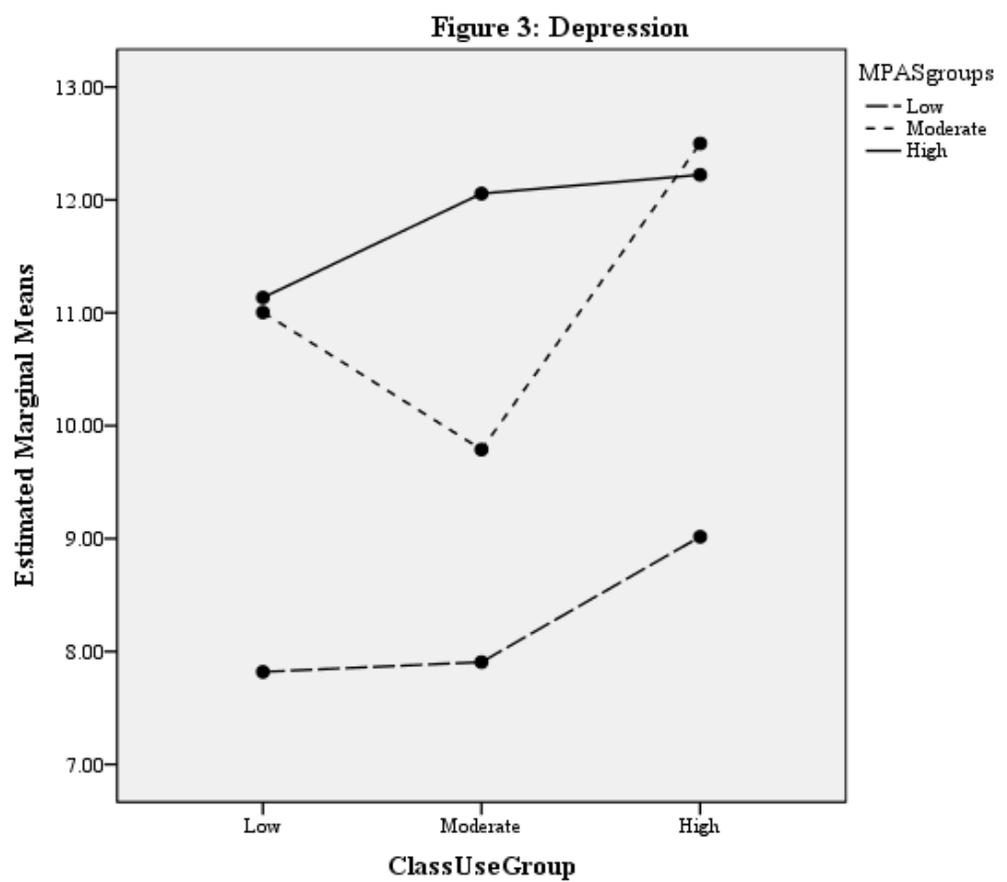


Figure 3. Class Restriction, MPAS Scores, and Depression. This figure demonstrates the significant main effect for cell phone addiction scores on depression based on environmental restriction. Individuals who scored moderate on the MPAS and reported high class restrictions experienced more depression than individuals with low MPAS scores and less class restrictions.

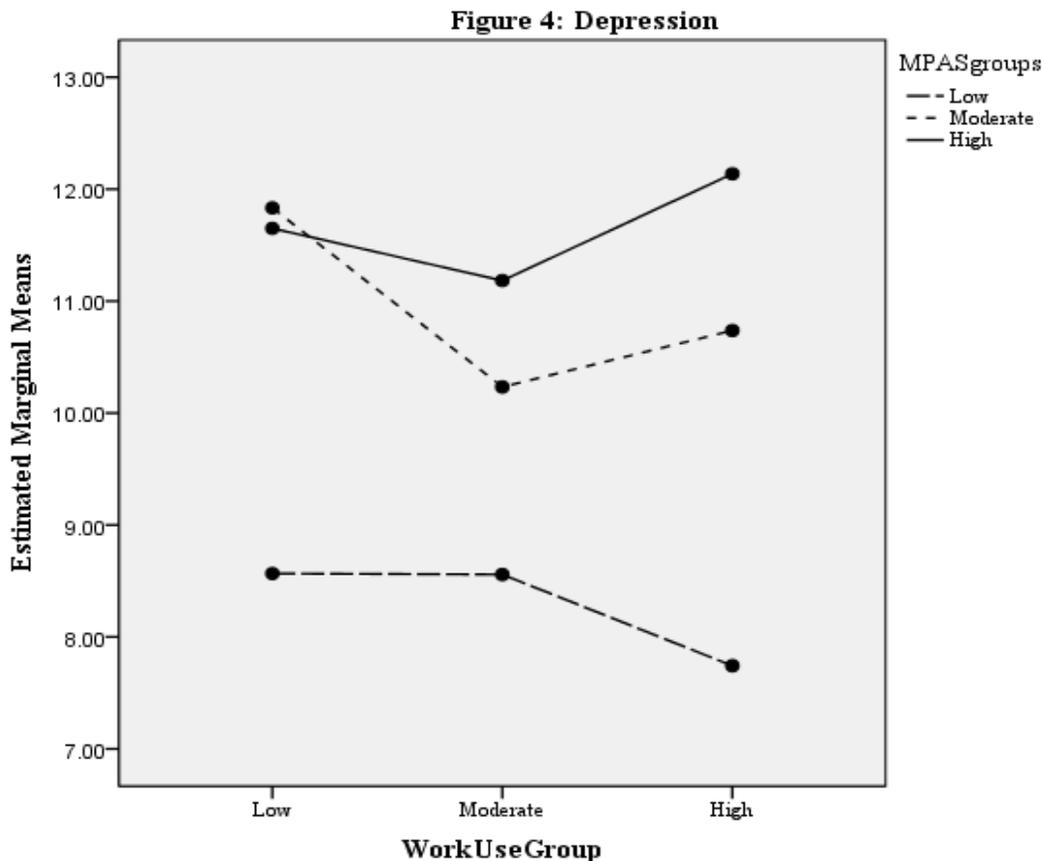


Figure 3. Work Restriction, MPAS Scores, and Depression. This figure demonstrates the significant main effect for cell phone addiction scores on depression based on environmental restriction. Individuals who scored high on the MPAS and reported high work restrictions experienced more depression than individuals with moderate or low MPAS scores and less work restrictions.

CHAPTER V

DISCUSSION

The popularity of mobile devices has increased dramatically over the last decade. Bianchi & Phillips (2008) found young individuals in particular are more susceptible to frequent and sometimes problematic use of cell phones than older individuals. Wireless Internet use is also particularly high among individuals between the ages of 18 to 29 years (Lenhart et al., 2010). Although research has begun to make connections between the mobility of problematic Internet use on cell phones (Weiss & Samenow, 2010), the current investigation is distinctive in that it is the first to explicitly address Internet use on the cell phone as a predictor of cell phone addiction. In addition, there currently are no restrictive environment measures available to the research community. Therefore, a measure was created for this study in an effort to facilitate further discussion about how a restrictive construct might apply to cell phone dependencies. Awareness of outcomes which may be consequential to limiting conditions associated with such problematic behavior is still in its infancy and relatively unexplored. As such, it is difficult to contrast considerable aspects of this research with existing literature.

The purpose of the present study was to discover whether a combination of factors related to cell phone use could impact health outcomes for college students. Significant findings were not demonstrated for hypothesis 1 in stating frequency of Internet use and the aggregated variables (i.e., restrictive environments, and cell phone

addiction) would influence anxiety measures. However that should not be taken to imply health consequences do not exist when frequent or even excessively used Internet functions on mobile devices are severely restricted or prohibited. Instead, it should be interpreted as a measurement concern by which the construct was unfit for the model employed in the current investigation. Additional efforts to include the frequency of Internet access on cell phones should utilize a more comprehensive ordinal measure to assess the variable. Perhaps the use of an Internet addiction scale (see Young, 1998) in conjunction with a frequency assessment might provide further insight as to whether individuals are actually utilizing the Internet on their cell phone to excess, as opposed to merely reporting “always” in order to classify an extent of the behavior.

Results for hypothesis 1 did however yield a statistically significant interaction between class restriction, work restriction, and cell phone addiction. This interaction accounted for 10% of the variance in anxiety scores for participants across groups. These results suggest individuals with high class and work restrictions, also belonging to the high cell phone addiction group, had significantly higher anxiety scores than individuals with moderate or low cell phone addiction scores. This finding is paramount in that it proposes the idea of having to abstain from an addiction, in this case, excessive cell phone use, may in fact impact the health of individuals. This concept can be related to existing literature which argues behavioral addictions are established in much the same way as physiological addictions, such that one continues the substance or behavior in an attempt to avoid negative outcomes associated with restraint (Becker & Murphy, 1988; Goodman, 1990; Potenza, 2006; Young, 1998). That being said, it is reasonable to infer anxiety levels in this investigation may have been influenced by the inability to appease

addiction behavior in environments restricting use of the cell phone. This outcome would be consistent with withdrawal symptoms experienced in chemical addictions (Watkins, Koob, & Markou, 2000), which are also suggested to exist as a component of behavioral addictions (Potenza, 2006). Findings from this study highlight the need for further investigation as cell phone addiction in particular appears to have been a catalyst for negative outcomes.

Although the results are intriguing, it is possible that anxiety responses could be an inaccurate reflection of those actually experienced by the participants as a result of environmental restrictions influencing cell phone use. For instance, the MHI asked “*How often did you become nervous or jumpy when faced with excitement or unexpected situations during the past month?*” This question may have elicited a different response had it read, “*When unable to use your cell phone, how often do you become nervous or jumpy?*” As such, a tailored question would eliminate an associated time frame for the participant to reflect upon, and directly address cell phone use in the individual’s response. It should be noted that the inclusion of a tailored measure would not necessarily yield higher levels of anxiety. It could however provide a more reliable response set. The only approach to accurately address whether individuals experience real-time anxiety as a result of environmental restriction would be to incorporate a physiological measure in conjunction with a method for controlled cell phone abstinence. Doing so would require alterations to the study’s design, hypotheses, and perhaps variables of interest. Another option for obtaining a more accurate measure of anxiety for the current investigation would have been to also utilize a more extensive measure such as the State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970). The A-Trait Scale from this measure

assesses whether an individual has an anxiety disposition, which in addition to suggested tailoring of the MHI subscale, would have perhaps helped to identify whether or not participants were generally anxious or actually experiencing anxiety in relation to environmental restraints and cell phone addiction. It is imperative for future investigations to address these methodological concerns prior to making further inferences.

Hypothesis 2, which anticipated significant group differences in MPAS scores for individuals who frequently access the Internet on their cell phones, was formulated on the notion that the Internet helps to expand communication and learning capabilities. It is speculated that these multifaceted benefits have contributed to a rise in Internet dependencies (Young, 1998). Due to the capabilities of readily accessible Internet via mobile devices (Horrihan, 2009), associations with problematic behaviors related to such use are being discovered (Campbell, 2005; Kamibeppu & Sugiura, 2005; McBride & Derevensky, 2009; Perry & Lee, 2007; Weiss & Samenow, 2010).

Results from hypothesis 2 found individuals who always utilize Internet on their cell phones reported having significantly higher cell phone addiction scores than those having no Internet access on the device. This suggests frequent or perhaps even excessive use of the Internet on a cell phone may contribute to whether an individual develops an addiction to the device. In other words, excessive internet use might be a mechanism or catalyst by which an individual perceives having a cell phone addiction. This could easily become a circular issue, similar to questions that could be raised about Internet use on personal computers. For example, if an individual is addicted to Internet use behavior, does that also imply an underlying addiction to computers, as they are a means through

which the Internet is accessed? Questions of this sort may facilitate further dialogue about individual characteristics which make some more prone than others to fall victims to excessive cell phone use strictly because of Internet accessibility. With regard to Internet-related utility of the cell phone, young individuals have a propensity to text more than their older counterparts (Bianchi & Phillips, 2005). Eighty percent of the sample in the current investigation reported texting as the most utilized cell phone function. These findings are in line with those of Ha et al. (2008), which found both average and excessive cell phone users prefer text messaging over voice calls. Although previous studies have associated problematic cell phone use with personality traits such as impulsivity, extraversion, the need for social approval, and neuroticism (Billieux, Van der Linden, d'Acremont, Ceschi, & Zermatten, 2007; Ezoe, Toda, Yoshimura, Naritomi, Den, & Morimoto, 2009; Takao, Takahashi, & Kitamura, 2009), research has yet to measure such traits against the behavior as a function of Internet use on the device. Results from the current study highlight the importance for future research to include Internet usage patterns as a component of modern cell phone addiction.

Prior to testing hypothesis 3, a preliminary correlation on individual variables found significant group differences between levels of cell phone addiction and the amount of participant reported depression. Specifically, groups with low cell phone addiction exhibited lower levels of depression than did those in the moderate or high groups. This finding is not surprising given the breadth of existing research linking higher levels of addiction to various substances and behaviors with higher levels of depression (Chen & Peng, 2008; Kraut et al., 1998; Miller, Klamen, Hoffmann, & Flaherty, 1996; Young & Rogers, 1998). However, the main effect for MPAS groups and the depression

measure is questionable as a significant bivariate correlation was found between these measures. This may have resulted from a situation in which individuals belonging to the high cell phone addiction group happened to respond with “often” or “always” on the three MPAS items specifically addressing depressive symptoms. This situation should be rectified for future research through the use of a more extensive depression measure, as opposed to the employed MHI subscale containing five items, of which only four were counted per scoring instruction (see Appendix C).

Hypothesis 3 revealed a statistically significant interaction between class restriction, work restriction, and cell phone addiction. Specifically, individuals with moderate cell phone addiction, highly restricted class use, and highly restricted work use appeared to exhibit more depression symptoms than comparison groups. The results suggest the combination of these factors influence depression for college students, perhaps because they are unable to utilize their cell phone at school or work. It is possible that individuals resort to excessive cell phone use because of depressive symptoms. On the other hand, it is also possible that individuals might experience depressive symptoms as a result of their excessive cell phone use. For example, the Internet is capable of counteracting negative consequences (e.g., diminished communications, depression; Campbell, Cumming, & Hughes, 2006), and those with depression are suggested to be more likely to develop an addiction to the Internet in an effort to alleviate depressive symptoms (Young & Rogers, 1998). Furthermore, Internet addiction can significantly impair educational, occupational, and domestic responsibilities, personal relationships and financial stability (Griffiths, 2000; Young 1998). It would be logical to suggest these impairments could equally lead to depression, thus creating a circular pattern. However,

unlike the existence of literature examining depression-related influence and outcomes for Internet addiction (Campbell, Cumming, & Hughes, 2006; Chen & Peng, 2008; Kraut et al., 1998), the construct of cell phone addiction has yet to be examined empirically for causal relations to depression. With regard to the current investigation, it was theorized that depression levels would only be higher, and likely persist beyond environmental restrictions, when the individual spends a significant amount of time being restricted from utilizing the device they are addicted to. For instance, a student might have five or six classes to attend in addition to working 40-hour per week. If those environments prohibit the use of personal communication devices, keeping up with social lives on what little spare time is available could disrupt personal relations and perhaps lead to isolation or even depression.

Although the findings from the current study do not support the research hypothesis in terms of both Internet use as an aggregate variable, and an absence of significant group differences in depression levels, support is found by previous research linking excessive cell phone users to increased depressive symptoms, as compared to average users (Ha et al., 2008; Kamibeppu & Sugiura, 2005). However, it should be noted that results obtained from Ha et al. (2008) were derived from a researcher-created Excessive Cellular Phone Use Survey (ECPUS), for which no reliability or validity estimates were presented. In addition, a thorough review of the literature failed to yield other investigations which may have employed that particular measure. This further exemplifies the need for additional research to include depression as either a predictor or criterion variable to facilitate further understanding of this relationship.

Although no support was found, it was hypothesized that there would be no statistically significant interaction between restrictive environments, Internet use on the cell phone, and self-reported addiction to the device, with respect to depression levels. This theory is in contrast to research linking depression to Internet usage on personal computers (Kraut et al., 1998; Young & Rogers, 1998). The reasoning behind this hypothesis was based on flexibility of Internet now being accessible while on-the-go, no longer having to isolate oneself at home, in a computer lab, or in an office for connectivity. It was anticipated that a youthful college population would have positive thoughts about their connectivity, despite levels of self-reported addiction. Recent research has linked depression to the development of problematic cell phone use (Yen et al., 2009), but again, it is unknown if a similar relationship between the two variables exists when such use is examined as a predictor of depression. Results from the current study imply that possibility, but must be interpreted with caution based upon aforementioned methodological concerns. In addition, cell phone addiction is relatively unexplored in American populations, thus necessitating further investigation of the potential for negative health outcomes associated with it. The current investigation is thought to add to a growing body of literature and help to facilitate additional inquiry.

Limitations

Due to the nature of the current research, the investigation was not without limitations. First and foremost, this study employed self-report measures for data collection. As such, there was potential for common method biases to have been a factor in the information reported. Survey responses might have been skewed by social desirability bias, which could have resulted from a belief that survey responses were

somehow linked to identification numbers provided for extra credit purposes. Participants consequently might have responded favorably to reduce the likelihood of the researcher passing judgment on their true feelings (Fisher, 1993). A remedy for this would be to assure anonymity is guaranteed in the investigation (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003), or structure questions as indirect measures of evaluation so participants can respond from another perspective rather than targeting their own behavior (Fisher, 1993). It would also be unreasonable to assume the current investigation was exempt from response-set bias. This type of bias could have occurred in one of two ways in the current investigation: through the use of response-selection polarities of “never” and “always,” resulting in less extreme responses from participants to avoid strong commitments in either direction (Tourangeau, Rips, & Rasinski, 2000), and through acquiescent response selection resulting in the tendency to agree or express likelihood on successive questions of the measured behavior despite consideration for the question content (Ware, 1978). Issues with item polarity can be addressed through altering the scales endpoints on predictor and criterion measures, but doing so might pose a threat to the scales validity or reliability and should be exercised with caution (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Successive response agreement can be controlled for using temporal separation (e.g., utilizing a distraction task between measures to provide time gaps between response sets), or proximal separation through altering the type of response option from one measure to another (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). Finally, some individuals may have been motivated to participate merely for extra credit purposes rather than fulfilling an obligation to assist departmental research. As such, responses could have been compromised by consistency motif, or the

tendency for participants to answer consistently in one direction or another without consideration for accuracy (Podsakoff & Organ, 1986). Particularly given the general nature of MHI items, this could have been controlled for through targeting discrete events in questioning.

As previously mentioned, survey questions in the current investigation may have lacked adequate context for participants. Because of this, results must be interpreted cautiously as accurate representations of psychosocial constructs may not be reflected as a result of the selected measures. For example, The MHI asked participants to reflect on specific mood states over the past month, as opposed to more recent events in an individual's life, or a specific circumstance directly related to mobile device usage. In such cases, it may have been possible for participants to respond based on an instance or instances within that time frame, which may or may not have been remotely related to the use of their cell phone. Merely asking the participants to answer general questions about mental states they have experienced within the last month could have easily elicited a response related to family issues, exam scheduling, employment stressors, a car accident, etc. It may have been unreasonable to assume responses would be related to mobile device usage strictly because the participants had completed the cell phone addiction measure moments before answering the MHI questions. This poses a significant threat to the assumed validity of response accuracy.

The current investigation was also the first to utilize the MPAS for investigating cell phone addiction in an American sample, which presents yet another concern for validity. Leung (2008) created the MPAS to assess cell phone addiction symptoms for adolescents in Hong Kong. There was no mention as to whether the scale underwent

translation between languages prior to being utilized. The MPAS is an adapted version of the MPPUS, a twenty-seven-item scale developed by Bianchi & Phillips (2005). The MPAS only utilized seventeen items from the MPPUS. However, eight of these items are adapted from those initially designed to assess the impulse-control disorder, pathological gambling in the DSM-IV. The same eight items were also modified by Young (1998) and were used to measure Internet addiction, thus providing a rationale for utilizing the MPAS as a measure of cell phone addiction in conjunction with Internet use in the current study. The reliability of the scale was high for the current sample (.90), which was consistent with that previously established (Leung, 2008). This suggests the scale is a valid instrument across cultural boundaries. Conversely, as this assessment has not been utilized beyond development and the current investigation, there remains a need to further explore psychometric properties for the MPAS using American populations.

Due to time constraints, another limitation for the current study is evident as participants were comprised of a convenience sample from a local university. Additionally, the sample consisted entirely of psychology students. Although the age range of and environmental surroundings of participants were of particular interest, college students from other disciplines or even geographical locations would provide a much more accurate representation of those among the general population.

The current research utilized a non-experimental design, making the investigation unable to allow for causal inferences to be established. While establishing connections and interactions between variables or constructs provides a valuable platform for future investigations to work from, empirical research on cell phone addiction would benefit

from experimental designs which attempt to separate and further differentiate precise influencing factors.

Finally, the sample size for the current investigation was of relatively robust ($n = 195$). However, it should be noted that the population was heavily skewed with respect to gender. The sample was comprised of 158 females (80.2%), and only 37 males (18.8%) from undergraduate psychology courses, thus limiting investigative gender comparisons. Although these percentages are in line with the growing trend for women to represent approximately 74% of the work force in psychology (Willyard, 2011), the results from the current investigation should be interpreted cautiously as the ratio is insufficient for making generalizations to an entire college population with regard to cell phone or Internet use behaviors. As such, gender was not examined as a possible influencing variable for cell phone addiction or health outcomes in the current research. Although not found to be consistent with predicting problematic or addictive cell phone use, gender has been shown to predict general cell phone usage patterns, thus warranting further consideration (Bianchi & Phillips, 2005; Toda, Monden, Kubo, & Morimoto, 2006).

Suggestions for Future Research

Initially, the current research aimed to examine cell phone policies for participants' classes, which would have verified whether or not they existed and inquire about how stringent these policies were. Although participants were asked if a policy existed, the item was later deemed unfit for the investigation. Simply asking respondents whether a policy existed did not address enforcement procedures, which might be much more effective in assessing the level of restriction experienced in environments having strict enforcement strategies. Perhaps future research could address cell phone policies in

a college atmosphere and among employment settings to investigate how these rules might influence behavior or outcomes based on level of enforcement.

In addition, there currently is no measure in the research community to address restrictive environments. This construct is of particular importance when considering behavioral addictions and withdrawal outcomes when the behavior is not able to be acted upon. The employed measure utilized for the current investigation was created for the purpose of assessing environments which restrict or prohibit cell phone use. However, the items for this measure presented a number of practical concerns. First and foremost, the items were vulnerable to individual interpretation. For example, participants were asked “*How often are you able to use your cell phone while in class?*” This might have been understood as how often the participant actually uses their phone, as opposed to use in relation to policy guidelines about how often cell phones are permitted for use in the classroom. These are two very different perceptions between a truly restrictive environment and one which simply has a policy that is not adhered to or enforced. Knowing whether a policy exists, whether it is enforced, and whether it is adhered to, are important factors. Perhaps more important is whether or not behavior is changed as a result of that policy – only then can that environment be considered truly restrictive. Another concern with the measurement in the current study was the item construction. Due to combinations of continuous versus discrete response options, items were unable to be utilized as an entire measure. It is necessary to consider these methodological issues for future research in establishing a proper scale to assess levels of restrictive cell phone use as a construct, which can be utilized across environments of various sorts.

Conclusion

The findings from the current investigation found levels of restrictive social environments and self-reported cell phone addiction influence the level of anxiety and depression experienced by individuals. This study was unable to find support for frequency of Internet use as an influencing factor for levels of anxiety or depression. However, findings supporting differences in Internet use groups on low, moderate or high cell phone addiction scores suggests high rates of Internet use on a cell phone is related to higher levels of cell phone addiction. Given the prevalence and multifaceted functionality of cell phones, further understanding of cell phone addiction and its related impact to the physiological and psychological wellbeing of those affected is crucial.

APPENDIX A

Demographics and Environment Assessment

Directions: Please answer each of the following questions as honestly as possible and to the best of your ability. Any information obtained will be kept confidential.

1. What is your gender?

_____ Male _____ Female

2. How old are you?

_____ Years

3. What is your current classification?

_____ Freshman

_____ Sophomore

_____ Junior

_____ Senior

_____ Graduate Student

4. How many classes are you currently enrolled in?

_____ 1

_____ 2

_____ 3

_____ 4

_____ 5 or more

5. How many of these classes have a policy regarding cell phone use in the course syllabus?

_____ 0

_____ 1

_____ 2

_____ 3

_____ 4

_____ 5 or more

6. How many of your classes prohibit any kind of cell phone use?
- 0
 - 1
 - 2
 - 3
 - 4
 - 5 or more
7. Have any of your current professors had to tell you or other students to discontinue cell phone use while in class?
- Yes No
8. How often are you able to use your cell phone while in class?
- Never
 - Sometimes
 - Often
 - Always
9. Does you have Internet access on your cell phone?
- Yes No
10. What function do you use most on your cell phone?
- Talking
 - Texting
 - Emailing
 - Web-browsing
 - Social Networking (e.g., Facebook, Twitter)
11. Are you currently employed?
- Yes No
- Note:** If no, please skip the following questions about employment.
12. Does your employer have a policy regarding cell phone use while working?
- Yes No
13. Have you or other employees ever been told to stop using your cell phone at work?
- Yes No

14. How often are you able to use your cell phone while at work?

- Never
- Sometimes
- Often
- Always

15. You have used your mobile phone to make yourself feel better when you were feeling down

Not at all

Occasionally

Rarely

Always

16. You find yourself occupied on your mobile phone when you should be doing other things, and it causes a problem

Not at all

Occasionally

Rarely

Always

17. Your productivity has decreased as a direct result of the time you spend on the mobile phone

Not at all

Occasionally

Rarely

Always

APPENDIX C

Mental Health Inventory (MHI)

Directions: Please read each of the following questions and then indicate which statement best describes how things have been for you in the past month. Please answer as honestly as possible. There are no right or wrong answers.

1. How often did you become nervous or jumpy when faced with excitement or unexpected situations during the past month?

<input type="radio"/> Always	<input type="radio"/> Sometimes
<input type="radio"/> Very Often	<input type="radio"/> Almost Never
<input type="radio"/> Fairly Often	<input type="radio"/> Never

2. Did you feel depressed during the past month?

<input type="radio"/> Yes, to the point that I did not care about anything for days at a time
<input type="radio"/> Yes, very depressed every day
<input type="radio"/> Yes, quite depressed several times
<input type="radio"/> Yes, a little depressed now and then
<input type="radio"/> No, never felt depressed at all

3. How much time, during the past month, have you been a very nervous person?

<input type="radio"/> All of the time	<input type="radio"/> Some of the time
<input type="radio"/> Most of the time	<input type="radio"/> A little of the time
<input type="radio"/> A good bit of the time	<input type="radio"/> None of the time

4. During the past month, how much of the time have you felt tense or “high Strung”?

<input type="radio"/> All of the time	<input type="radio"/> Some of the time
<input type="radio"/> Most of the time	<input type="radio"/> A little of the time
<input type="radio"/> A good bit of the time	<input type="radio"/> None of the time

5. During the past month, how often did your hands shake when you tried to do something?
- | | |
|------------------------------------|------------------------------------|
| <input type="radio"/> Always | <input type="radio"/> Sometimes |
| <input type="radio"/> Very Often | <input type="radio"/> Almost Never |
| <input type="radio"/> Fairly Often | <input type="radio"/> Never |
6. How much time, during the past month, have you felt downhearted and blue?
- | | |
|--|--|
| <input type="radio"/> All of the time | <input type="radio"/> Some of the time |
| <input type="radio"/> Most of the time | <input type="radio"/> A little of the time |
| <input type="radio"/> A good bit of the time | <input type="radio"/> None of the time |
7. How much time, during the past month, were you able to relax without difficulty?
- | | |
|--|--|
| <input type="radio"/> All of the time | <input type="radio"/> Some of the time |
| <input type="radio"/> Most of the time | <input type="radio"/> A little of the time |
| <input type="radio"/> A good bit of the time | <input type="radio"/> None of the time |
8. How much of the time have you been bothered by nervousness, or your “nerves”, during the past month?
- Extremely so, to the point where I could not take care of things
 - Very much bothered
 - Bothered quite a bit by nerves
 - Bothered some, enough to notice
 - Bothered just a little by nerves
 - Not bothered at all by this
9. During the past month, how much of the time have you felt restless, fidgety, or impatient?
- | | |
|--|--|
| <input type="radio"/> All of the time | <input type="radio"/> Some of the time |
| <input type="radio"/> Most of the time | <input type="radio"/> A little of the time |
| <input type="radio"/> A good bit of the time | <input type="radio"/> None of the time |

15. During the past month, have you been anxious or worried?

- Yes, extremely to the point of being sick or almost sick
- Yes, very much so
- Yes, quite a bit
- Yes, some, enough to bother me
- Yes, a little bit
- No, not at all

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