PHYSIOLOGICAL AND PSYCHOLOGICAL CONSEQUENCES

OF FORCED MOBILE PHONE

ABSTENTION

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by

Duncan M. Dickson, B.A.

San Marcos, Texas
August 2012

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Committee Members Approved:

_____
Natalie Ceballos, Chair

_____
Ty Schepis

_____
Alex Nagurney

Approved:

_____
J. Michael Willoughby
Dean of the Graduate College

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ABSTRACT

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SUPERVISING PROFESSOR: NATALIE CEBALLOS, PH.D.

This study investigated problematic mobile phone use in a sample of 50

undergraduate students. The experiment utilized a new paradigm for examining this

phenomenon, in which participants were exposed to a quasi-deceptive provocation task

involving forced mobile phone abstention. Physiological and psychological response

(blood pressure and pulse rate; and self-reported anxiety, respectively) were measured

pre- and post-manipulation. Correlations between these measures and participants'

responses to the Mobile Phone Problematic Use Scale and Mobile Phone Dependence

Questionnaire were also examined. The most intriguing finding was that the extent of increase in anxiety over the course of the manipulation was significantly, positively correlated with MPPUS scores ($r(48) = .41$; $p = .003$), suggesting that the manipulation selectively increased anxiety among individuals who were prone to mobile phone dependence. Changes in physiological indices were non-significant.

CHAPTER I

INTRODUCTION

Since being introduced to consumers in the United States, mobile phones have

become a ubiquitous part of American life. As the mobile phone penetration rate

increases, so does connectivity amongst mobile phone users, with the constant evolution

of mobile phone technology continuing to redefine what connectivity means. Initially,

mobile phones were only capable of allowing the user to make and receive phone calls.

At present, mobile phone technology has progressed to the point at which the smart

phone serves as a multimedia portal connecting users to each other and a variety of

digital resources via email, Short Message Service (SMS) texting, internet accessibility,

and online streaming. Advances in hardware allow for mobile phones to function as a

multipurpose device that serves as a phone, navigational device, portable music player

and library, gaming system, still camera, video camera, mobile payment device, and

portable computer all in one. Furthermore, the rapidly expanding body of independently

developed programs and applications available for use on mobile phones expands their

functionality as a utility device.

The resultant effects of increased mobile phone connectivity have not all been

positive. Problematic mobile phone usage has increasingly become a topic of interest

with research being conducted on the links between patterns of mobile phone use and a

multitude of factors including: health compromising behaviors, personality, parental

rearing attitudes, sedentary behavior, and psychopathology amongst others (Leena, Tomi,

& Arja, 2005; Ha, Chin, Park, Ryu, & Yu, 2008; Toda et al., 2008; Ezoe, Toda,

Yoshimura, Naritomi, Den, & Morimoto, 2009; Yen et al., 2010;). As Internet connected

mobile phones become more prevalent, the role of the mobile phone as a facilitator for

internet-related problematic behavior becomes increasingly evident. As a facilitator of

both internet-related aberrant behavior and mobile phone unique problems, the mobile

phone has been implicated in variety of maladaptive patterns of use pertaining to:

sexting; gambling; video gaming; sexual preoccupation; excessive emailing and texting;

risky driving; cyber-bullying; the creation and dissemination of child pornography; and

black mail (Bianchi & Phillips, 2005; Campbell, 2005; Nix, 2009; Young, 2009; Weiss &

Samenow, 2010).

Despite the fact (or perhaps directly because of it) that there is no diagnostic label

in the *Diagnostic and Statistical Manual of Mental Disorders-Fourth Edition-Text*

Revision (DSM-IV-TR) for excessive mobile phone use deemed problematic, there is no

dearth of research in the extant literature ascribing labels like "mobile phone

dependence" and "mobile phone addiction" to such problems (Toda et al., 2008; Choliz,

2010). In the interim between the publication of the DSM-IV-TR in 2000 and the yet to

be published DSM-V, exponential advances in mobile phone technology and increased

penetration have occurred. Simultaneously, patterns of mobile phone behavior closely

analogous to substance dependence have been identified and studied in a variety of

populations (Bianchi & Phillips, 2005; Lu et al., 2001; Ha et al., 2008; Ezoe et al., 2009;

Takao, Takahashi, & Kitamura, 2009). The existence of problematic patterns of mobile

phone use is well supported, but there appears to be no consensus regarding what constitutes problematic mobile phone use or how it should be labeled. In order to better understand this phenomenon, research is needed to delineate normal from abnormal patterns of usage, and identify the psychological and physiological processes underlying the behavior.

CHAPTER II

LITERATURE REVIEW

Current explanations of problematic mobile phone (MP) usage are varied and, at times, contradictory. Numerous studies have been performed in an effort to identify the specific psychological correlates implicated in problematic MP use. Some have found that extraversion is related to higher levels of MP dependence, with the MP serving as a facilitator for initiating social interactions (Bianchi & Phillips, 2005; Ezoe et al., 2009). Low self-esteem has also been identified as a predictor of problematic MP usage (Bianchi & Phillips, 2005; Ha et al., 2008). Further studies have shown links between problematic MP use and high self- monitoring (extraversion and other-directedness), high social approval motivation, low levels of loneliness, lack of perseverance on challenging or dull tasks, and impulsive urgency (Billieux, van der Linden, D'acremont, Ceschi, & Zermatten, 2006; Takao et al., 2009). Additionally, some studies have indicated that individuals with high levels of anxiety or neuroticism are likely to engage in problematic MP use (Ha et al., 2008; Ezoe et al., 2009), while others have asserted that there is no link between anxiety and problematic MP usage (Bianchi & Phillips, 2005; Billieux et al., 2006;). Attempts have also been made at predicting problematic MP use through examining perceived parental rearing attitudes and social identity theory (Cassidy, 2008; Toda et al., 2008)

Gender has not been shown to be a reliable predictor of problematic mobile phone use, although it can predict various patterns of usage (Bianchi & Phillips, 2005; Toda, Monden, Kubo, & Morimoto, 2006). Age, however, has been shown to be a reliable predictor of problematic MP use, with younger individuals being more likely than older individuals to engage in problematic MP use (Bianchi & Phillips, 2005). Health compromising practices are also positively correlated with problematic MP usage (Leena, et al., 2005; Toda et al.; 2006, Ezoe et al., 2009). Billieux et al. (2006) approached the topic of assessing problematic MP usage directly and asked participants to rate their level of MP dependence on a scale from one to ten. Ratings were fairly high (mean = 5.63), indicating that most individuals perceived themselves as being moderately dependent on their mobiles (Billieux et. al., 2006).

At present, no specific diagnostic label exists in the psychiatric nomenclature for problematic MP use; neither the *International Statistical Classification of Diseases and Related Health Problems* (ICD-10) nor the DSM IV-TR address the issue. In the absence of an officially sanctioned term for the phenomenon, research on the topic suffers from a lack of cohesion. Ezoe et al. (2009) labeled problematic MP use *mobile phone dependence*, defining it as "excessive use and an intermittent craving to use a mobile phone" (p. 232). Justification for labeling it thusly hinges on their assertion that *mobile phone dependence* is essentially an analogue of substance dependence in that individuals' patterns of use often meet substance dependence criteria in behavioral (excessive use), physical (tolerance and withdrawal), and psychological (craving) domains. Unfortunately, this assertion is made without referencing any studies on problematic mobile phone use and without explaining how pathological MP use is differentiated from

normal levels. While Ezoe et al.'s (2009) reasoning behind conceptualizing problematic

MP use as an analogue of substance dependence is made clear, the absence of any

empirical support to justify the tenets of the argument calls into question the

appropriateness of the term.

Other authors have stopped short of ascribing concrete labels to patterns of

problematic MP use, opting instead to compare such patterns to behavioral addictions

(Bianchi & Phillips, 2005; Billieux et al., 2006; Ha et al., 2008). Unfortunately,

behavioral addiction is not a diagnostic category found within the DSM-IV-TR. As such,

the reader is often left to question what exactly is meant by the term *behavioral*

addiction. In their investigation of problematic MP use, Bianchi & Phillips' (2005)

described the concept of behavioral addiction as being a useful starting point for

examining MP use, regardless of whether or not behavioral addictions could be

considered proper "addictions". The 27-item MPPUS created by Bianchi & Phillips

covers a variety of domains pertinent to substance dependence including: tolerance,

craving, withdrawal, adverse consequences, and functional impairment.

If problematic MP use is to be conceptualized as being similar to substance

dependence or addiction, then the investigation of the issue should utilize methodology

common to the empirical study of either field. A central feature of both addiction and

dependence is repeated self-exposure to the substance or behavior in question that can

result in tolerance, withdrawal, or compulsive, uncontrolled use of the substance or

performance of the behavior (American Psychiatric Association, 2000; Potenza, 2006).

The theory of cue-reactivity explains the uncontrolled use of a substance or performance

of a behavior (both in the case of relapse after a period of abstinence, and in the case of

use or performance during a binge) as a classically trained response to cues related to the substance or behavior (Drummond, 2000). Cue-reactivity is not merely confined to consumption of the associated substance or performance of a behavior, but extends to psychological and physiological responses as well. Cue-reactivity of a psychological nature (or symbolic-expressive, in Drummond's (2000) terms) has been found in post-cue exposure increases in subjective craving and anxiety amongst substance dependent individuals (Swift & Stout, 1992; Sinha, Fuse, Aubin, & O'Malley, 2000). Additionally, physiological response to substance and behavioral cues is well documented in substance dependent and behaviorally addicted individuals (Aidman & Woollard, 2003; Chiamulera, 2005; Moodie & Finnigan, 2005; Erblich, Bovbjerg, & Sloan, 2011). In order to investigate the phenomenon of problematic MP use via a methodology common to both studies of substance dependence and behavioral addiction, the current study examines problematic MP use as it applies to the cue-reactivity paradigm. Cue-reactivity is assessed with behavioral, psychological, and physiological measures via scores on the MPPUS & MPDQ; and in changes in post-manipulation anxiety; and post-manipulation SBP, DBP, and pulse, respectively.

Purpose

MP addiction is currently not a recognized disorder in the DSM IV-TR, and as such, there is a paucity of research on the topic of problematic MP use. Most of the limited studies that have been conducted on the topic have been conducted in Japan and Europe, and most have been specifically confined to female participants. Little attention has been given to the topic of problematic MP use in the United States, and no research

has been conducted on the physiological responses associated with problematic MP use in the United States or elsewhere.

An extensive search of the peer-reviewed literature found that all existing research on the topic followed a common approach: reliance on self-report questionnaires to gather data on mobile phone dependence and problematic usage (Bianchi & Phillips, 2005; Toda et al., 2006; Ha et al., 2008; Takao et al., 2009). No studies in the extant literature have attempted to investigate problematic MP usage utilizing an experimental manipulation.

This study presents a new paradigm for the investigation of problematic MP use. Building on the methodology of previous research, self-report measures of problematic MP use remained essential to this study, but an experimental manipulation was also employed. In a pre/post manipulation, within subjects design, each participant was exposed to a quasi-deceptive provocation task with physiological measures (SBP, DBP, and pulse) and self-reported anxiety measured before and after the task condition.

Whether problematic MP use is best described as addiction or dependence is not the focus of this study. However, if problematic MP users can be identified via physiological and psychological responses to forced MP abstention, the findings of this study could be useful in future research on MP craving responses, MP dependence, and in uncovering the scope and severity of the problem.

CHAPTER III

HYPOTHESES

Two questions in the proposed research address the impact of forced mobile phone abstention on the physiological and psychological processes of individuals with short message service (SMS) text messaging enabled mobile phones. The first question is whether forced MP abstention will elicit a physiological and psychological response. Hypothesis 1: it is hypothesized that participants' blood pressure and heart rate will increase significantly from baseline to task and that their anxiety levels will show a similar pattern of increase, resulting in a main effect of forced MP abstention. The second question is whether scores obtained on the MPDQ and MPPUS correlate with physiological and psychological responses to forced MP abstention. Hypothesis 2: it is predicted that a larger change in physiological and psychological measures (post-manipulation minus pre-manipulation levels) will be associated with higher scores on the MPDQ and MPPUS.

CHAPTER IV

RESEARCH DESIGN AND METHODS

Rationale

The present study is an exploration of problematic mobile phone usage as it applies to the cue-reactivity paradigm. Cue-reactivity is a well-validated phenomenon that appears in the scientific literature pertaining to both substance addiction and substance dependence. Addressing problematic mobile phone usage as it applies to a paradigm commonly accepted in both fields of study allows problematic mobile phone usage to remain the focal point of the study, rather than expending energy engaging in the semantic debate over whether addiction or dependence is the most appropriate term for the issue.

Given that substance related stimuli serve as cues that produce significant effects in substance dependent individuals, it stands to reason that if problematic mobile phone use constitutes dependence, then mobile phone related cues should yield significant effects in mobile phone dependent individuals. Assessing the extent to which problematic mobile phone use applies to the cue-reactivity model requires an investigation of the symbolic-expressive, physiological, and behavioral effects elicited by mobile phone related cues. The current study fulfills these requirements by examining the relationship between problematic mobile phone use and pre/post manipulation changes in anxiety,

blood pressure, and heart rate resulting from exposure to exteroceptive, mobile phone related cues.

Investigating the existence of physiological and/or psychological responses to forced mobile phone abstention is the primary focus of the current study. The secondary focus is on evaluating the utility of self-reported problematic mobile phone usage as a predictor of psychological and physiological arousal in response to mobile-phone related cues.

Participants

Participants in this study were recruited from various undergraduate psychology courses at the Texas State University-San Marcos campus. In return for their participation, students were compensated with extra credit in the classes from which they were recruited. Participation was open to all students who were between the ages of 18 and 50, had no history of high blood pressure, and were in possession of a working, Short Message Service enabled mobile phone with an unlimited text and calling plan.

Measures

State-Trait Anxiety Inventory (Spielberger, Gorsuch, & Lushene, 1970) is composed of two, twenty item self-report measures that assess state (the State-Trait Anxiety Inventory A-State scale (SSAI)) and trait anxiety (the State-Trait Anxiety Inventory A-Trait scale (STAI)). The A-State scale and the A-Trait scale both ask the participant to indicate the extent to which an identical set of anxiety related statements (for example: "I feel calm"; "I am relaxed") applies to how they feel. They differ in that the A-State scale assesses anxiety at a particular point in time, whereas the A-Trait scale assesses the frequency with which an individual experiences anxiety-related symptoms

on a general basis. Both the A-State scale and the A-Trait scale have demonstrated high

internal consistency with K-R(20) coefficients ranging from .83 to .94 and .86 to 92

respectively (Gaudry, Vagg, & Spielberger, 1975).

Mobile Phone Problem Use Scale (MPPUS; Bianchi & Phillips, 2005) is a 27-

item self-report scale that contains items relating to mobile phone related tolerance,

withdrawal, escapism, and negative life consequences (for example: "My friends and

family complain about my use of the mobile phone."). Due to lack of availability of the

original semantic anchors, a five-point Likert scale was utilized to score the MPPUS with

responses ranging from "*Not true at all"*, to "*Extremely True*". Scores on the MPPUS

range from 27 to 135, with higher scores indicating greater levels of dependence. Bianchi

& Phillips (2005) demonstrated the construct validity of the MPPUS by showing that it

correlated with other measures of mobile phone problem use, namely: self-reported MP

use per week ($r = 0.45$, $p < 0.01$), number of individuals called on a regular basis ($r =$

0.42, $p < 0.01$), and the average monthly MP bill ($r = 0.43$, $p < 0.01$). Construct validity

of the MPPUS as a measure of addiction has also been demonstrated by its relationship

with the *MMPI-2 Addiction Potential Scale* ($r = 0.34$, $p < 0.01$) and the *Short Message*

Service Problem Use Diagnostic Questionnaire ($r (76) = 0.741$, $p < 0.001$). Bianchi &

Phillips' (2005) analysis of the internal consistency of the MPPUS yielded a Cronbach's

alpha of 0.93, from which it can be implied that the measure is reliable and has high

internal consistency between items.

Mobile Phone Dependence Questionnaire (MPDQ; Toda, Monden, Kubo,

Morimoto, 2004) is a 20-item self-report survey that assesses the frequency of occurrence

of behaviors associated with mobile phone dependence (for example: "I don't really want

to go places where mobile phone signals are weak."). On a four-point scale ranging from

Always to *Hardly Ever*, participants indicate the general frequency with which they

perform certain mobile phone related behaviors. Scores range from zero to sixty, with

higher scores indicating greater levels of dependence. High internal consistency has been

found in adult populations ($\alpha = 0.86$) (Toda et al., 2004; Ezoe et al., 2009). As a measure

of dependence, evidence of construct validity for the MPDQ comes from the positive

correlation found between the MPDQ and two domains of the *Neuroticism-Extroversion-*

Openness-Five Factor Inventory (NEO-FFI): extroversion ($r = 0.328$, $p < 0.001$) and

neuroticism ($r = 0.190$, $p < 0.005$). These two domains are implicated in dependence, and

thus the positive correlations between scores on the NEO-FFI and the MPDQ indicate

that the MPDQ has criterion validity (Ezoe et al., 2009).

Beck Depression Inventory-II (BDI-II; Beck, 2006) is a twenty-one item self-

report measure for assessing the severity of depression in adults and adolescents. On each

item, participants are asked to select the statement that best describes the way they have

been feeling during the previous two weeks (for example: "I feel the same about myself

as ever", "I have lost confidence in myself", "I am disappointed in myself", or "I dislike

myself."). Internal consistency for the measure is high ($\alpha = 0.91$), and the BDI-II has

been found to be an appropriate screen for depression within a variety of populations

(Beck, 2006).

Family History of Alcohol and Drug Use Questionnaire (Ceballos, 2006) assesses

familial history of problematic alcohol & drug use. Participants are given a pedigree chart

and asked to indicate whether each of their family members have never used alcohol or

drugs, socially used alcohol or drugs, or have had a problem with alcohol or drugs.

Omron BP785 10 Series Upper Arm Monitor (BP785) is a digital blood pressure monitor that operates using the oscillometric method. Through this method, blood flow through the brachial artery is measured and converted into a digital blood pressure reading. Oscillometric measurements have been shown to be as reliable as other forms of blood pressure measurement, with White & Anwar (2001) finding no significant differences in the accuracy of an oscillometric Omron blood pressure monitor when compared to results obtained with an aneroid sphygmomanometer.

Data Collection

Professors who agreed to allow recruitment from their classes presented a sign-up sheet to their students during class. Convenience sampling was utilized within these classes to enroll any and all interested students fitting the inclusion criteria for the study.

Data collection occurred in a laboratory setting inside the psychology building. There, each student who arrived with the intention of participating was given a consent form enumerating his or her rights as a participant and outlining the basic format of the study. After verifying that the participant met the inclusion criteria for the study and obtaining consent, the participant was instructed to dial a phone number linked to a Skype digital phone account. Having the participant dial the experiment's Skype account served two purposes: 1) it gave the experimenter contact information necessary for the experimental manipulation and 2) it provided a means by which to text debriefing information to the participant.

After the participant's call connected with the Skype account, the experimenter instructed him or her to hang up. The experimenter then instructed the participant to bring along any possessions and enter the lab where the study was being conducted. The layout

of the testing environment was as follows: two rectangular desks were present in the room. The first was situated against the wall in the middle of the room. A standard desk chair was behind the desk, so that the participant sat in the middle of the desk facing the wall. The BP785 was situated on the corner of the table, to the participant's left. A pen and a purple folder containing the survey packet were placed in the center of the participant's desk. The second desk was situated at a ninety-degree angle to the first. A chair for the experimenter was situated between the desk and the wall. This set-up allowed the experimenter to operate the BP785 and a laptop situated in the center of the desk while keeping the screen entirely out of view of the participant. A small, plastic rectangular bin was situated on the left side of the experimenter's desk.

In the lab, the participant was asked to take a seat. Once seated, the blood pressure cuff was applied and a test reading was performed in order to ensure that the cuff was adjusted properly and the BP785 was operating correctly. After confirming that the BP785 was functioning properly, the participant was instructed to open the folder in front of him or her and begin filling out the surveys. As the participant opened the folder, the experimenter started a timer and the baseline period commenced.

The survey packet contained the following questionnaires in the order listed: the *State-Trait Anxiety Inventory, A-State scale* (SSAI; Spielberger et al., 1970), the *Mobile Phone Problem Use Scale* (MPPUS; Bianchi & Phillips, 2005)*, a demographic questionnaire, the *Mobile Phone Dependence Questionnaire* (MPDQ; Toda et al., 2004), the *State-Trait Anxiety Inventory, A-Trait scale* (STAI; Spielberger et al., 1970), the *Beck Depression Inventory-II* (BDI-II; Beck, 2006), the *Family History of Alcohol and Drug Use Questionnaire* (See Ceballos, 2006), and another copy of the *SSAI*.

The baseline and task conditions occurred back to back, spanning a fifteen-minute timeline. The baseline condition comprised the first six minutes of the experiment and was followed immediately by the task condition, which lasted for the remaining nine minutes. Blood pressure and heart rate were measured three times during the baseline period: at the one-minute mark, at the three-minute mark, and at the five-minute mark. The average of these readings was taken and used as the participant's baseline condition values for systolic blood pressure (SBP), diastolic blood pressure (DBP), and pulse. Blood pressure and heart rate were taken five times during the task condition: at the seven-minute mark, and every two minutes thereafter. The mean of these readings was reported as the participant's SBP, DBP and pulse values for the task condition. Difference scores between baseline values and task values will be calculated separately for both blood pressure and heart rate.

The participant was allowed to maintain possession of his or her MP and to utilize it throughout the baseline condition. At the six-minute mark, the baseline condition ended and the task condition began. The experimenter then picked up the rectangular bin from the desk and extended it to within reach of the participant. The participant was then asked to place his or her MP in the bin. If the MP was not already turned on with the ringer activated, the participant was asked to do so before placing it in the bin. The experimenter then placed the plastic bin upon the desk, effectively obscuring the participant's view of his or her mobile phone.

During the task condition, the experimenter used Skype to send two SMS messages to the participant's MP. The first SMS message was sent to the participant's phone at the eight-minute mark, and the second was sent at the twelve-minute mark. The

experimenter also made two calls to the participant's MP in a similar fashion. The first call was made at the ten-minute mark, and the second will be made at the fourteen-minute mark. The timing of the calls and texts was spaced so that blood pressure (BP) readings were taken thirty seconds after the conclusion of each call and forty-five seconds of the receipt of each text. If either a call or SMS message sent to the participant's MP failed to result in activating the ring tone, further calls and texts were made until an audible response was elicited from the MP. Any participant who asked to check his or her phone was asked to wait until the end of the experiment.

If the participant completed the survey packet before the fifteen-minute mark, the experimenter asked him or her to keep quiet and remain still until the task condition was completed and all BP readings were taken. If the participant had not completed the survey packet at end of the task condition, the experimenter waited for him or her to finish. The experimenter then removed the blood pressure cuff from the participant's arm and returned his or her MP. The participant was then asked to join the experimenter at the experimenter's desk to witness the deletion of his or her phone number from the Skype account. After the deletion of his or her personal information, the participant was informed that a delayed debriefing would be occurring. He or she was then given instructions as to how and where they could receive a full debriefing and the results of the study upon its completion. Finally, the participant was be thanked for his or her cooperation and dismissed.

Table 1

Demographics and Trait Characteristics

Age	18-33, Mean = 21.6 , Std. Deviation = 2.9
Gender	15 Male (30%), 34 Female (68%)
Ethnicity	36 Caucasian (72%), 10 African American (10%), 3 Asian (6%), 3 Native American (6%)
Trait Anxiety	Mean = 35.204, Std. Deviation = 9.77
BDI Scores	Mean = 10.46, Std. Deviation = 6.668

Table 2

General Outline of the Laboratory Testing Session.

Time	Task(s)	Duration
0:00	SSAI	1-2 minutes
1:00	BPR1, MPPUS, MPDQ	3-5 minutes
3:00	BPR2	
5:00	BPR3	
6:00	Manipulation*, STAI, BDI	5-10 minutes
7:00	BPR4	
8:00	Manipulation**	
9:00	BPR5	
10:00	Manipulation***	
11:00	BPR6	
12:00	Manipulation**, FHADUQ	3-4 minutes
13:00	BPR7	
14:00	Manipulation***, SSAI	
15:00	BPR8, Debriefing	5-10 minutes

*Phone Surrendered; **Text; ***Call; State-Trait Anxiety Inventory A-State Scale
(SSAI), Blood Pressure Reading (BPR), Mobile Phone Problem Usage Scale (MPPUS),
Mobile Phone Dependence Questionnaire (MPDQ), State-Trait Anxiety Inventory A-Trait
Scale (STAI), Beck Depression Inventory-II (BDI), Family History of Alcohol and Drug
Use Questionnaire (FHADUQ)*

Data Analysis

To examine manipulation-related changes in cardiovascular and psychological indicators of anxiety/stress, separate (time: pre- vs. post-manipulation) x 2 (gender: male vs. female) repeated measures ANOVAs were used for each dependent variable: systolic and diastolic blood pressure, pulse rate and self-reported anxiety. Pearson correlations were used to examine the potential relationship between these dependent variables and measures of mobile phone dependence (e.g., the MPPUS and MPDQ).

CHAPTER V

RESULTS

Demographics

Demographic characteristics of ethnicity and age were analyzed using Chi-Square analysis and t-tests, respectively, with gender as a grouping variable. Frequency Males and females were well matched on demographics and did not differ on distribution of race/ethnicity; the majority of participants were Caucasian. Males and females did not differ significantly with respect to age; the average age of participants was 21.6 years (S.D. = 2.9).

Cardiovascular Measures

To address hypothesis 1, cardiovascular measures of SBP, DBP and pulse rate (bpm) at baseline and after the manipulation were examined using separate repeated measures ANOVAs with gender as the between-subjects factor and time as the within-subjects factor. SBP did not change significantly over time; however, males had a higher SBP overall compared to females ($F(1,47)=12.88$; $p=.001$). No significant changes were noted over time or between genders for DBP or pulse rate.

To address hypothesis 2, Pearson correlations between mobile phone dependence measures and cardiovascular variables were non-significant when the correlations were examined in the entire participant sample. Similarly, no significant relationships were noted when males and females were examined separately.

Self-Reported Anxiety

To address hypothesis 1, SSAI scores at baseline and after the manipulation were examined using repeated measures ANOVA with gender as the between-subjects factor and time as the within-subjects factor. Anxiety did not change significantly over time, and effects of gender and the time x gender interaction were also non-significant.

To address hypothesis 2, a significant correlation was noted between MPPUS scores and anxiety at time 2 ($r(48) = .35$; $p = .01$), but not at baseline ($r(48) = .11$; $p = .43$), suggesting that the manipulation selectively increased anxiety among individuals who were prone to mobile phone dependence. Furthermore, in the absence of a significant correlation between MPPUS scores and baseline anxiety, the significant correlation found between MPPUS scores and SSAI change scores ($r(48) = .41$; $p = .003$) shows that changes in post-manipulation anxiety were not due to pre-existing anxiety issues. Individuals who were more addicted to their mobile phones were more likely to experience higher anxiety after the manipulation.

Problematic MP Use and Depression

The relationships between depression and problematic MP use measures (MPPUS and MPDQ) were examined via Pearson correlations. A significant correlation was found between scores on the BDI-II and the MPPUS ($r(49) = .33$; $p = .019$) but not between the BDI-II and scores on the MPDQ. Individuals with higher scores on the BDI-II were more likely to endorse higher scores on the MPPUS.
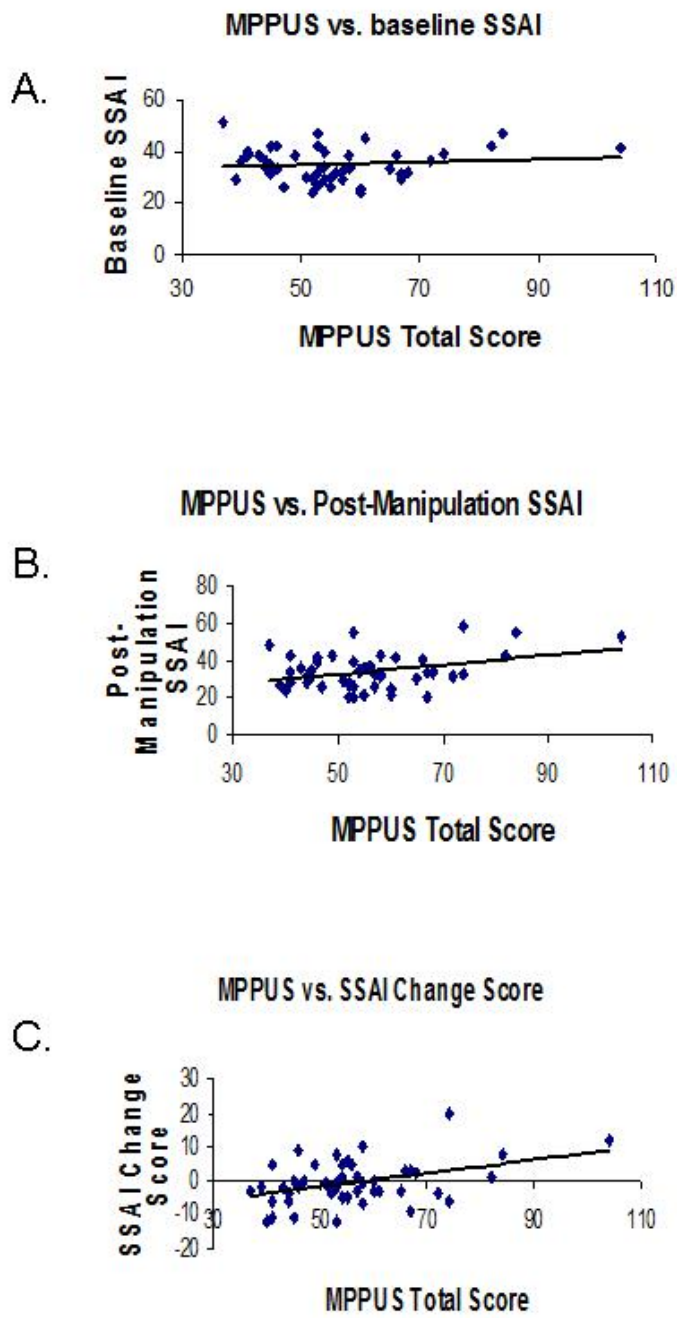
Figure 1

Correlations between MPPUS and SSAI

CHAPTER VI

DISCUSSION

This study is unique in that it represents the first time in which the phenomenon of problematic mobile phone use has been studied via an experimental manipulation. While the relationship between problematic MP use and relatively stable traits like impulsivity, trait anxiety, and self-esteem have been examined in the past, no research has attempted to move beyond examining the utility of stable characteristics as predictors of problematic mobile phone use. This study expands on previous research methodology in that it not only analyzes potential predictors of problematic MP use; it assesses cue-reactivity amongst problematic users in terms of the physiological and psychological responses to MP abstention during cue exposure. Approaching problematic MP use as it applies to the cue-reactivity paradigm via the experimental investigation of testable hypotheses allows for a more developed discussion of whether or not problematic MP use can be conceptualized as dependence or addiction.

Hypothesis 1, that forced mobile phone abstention would increase anxiety, was not substantiated for cardiovascular measures or self-reported anxiety in terms of the expected within-subjects effects of time. However, as illustrated in Figure 2 (part C), individuals endorsing the highest scores on the measure of problematic use were also those that experienced the greatest increases in post-manipulation anxiety. Following Drummond's (2000) paradigm, the changes observed in post-manipulation anxiety in this

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experiment evidence cue-reactivity that is symbolic-expressive, or psychological, in nature. This marks the first time in the literature that cue-reactivity has been documented in problematic mobile phone users.

Studies of cue-reactivity in opioid, cocaine, and alcohol dependent individuals have found significant positive correlations between self-reported anxiety and craving (Swift & Stout, 1992; Sinha, Fuse, Aubin, & O'Malley, 2000; Chiang, Scheutz, & Soyka, 2005; Tavares, Zilberman, Hodgins, & el-Guebaly, 2005). However, findings among social or occasional users of addictive substances have been less reliable. The consistent finding of significant positive correlations between craving and anxiety in studies of substance dependent individuals seems to point to a common mechanism between substance dependence and mobile phone dependence. If this is true, then the observed changes in post-manipulation anxiety may serve as an indirect indicator of increased craving. Further investigation of craving in response to MP-related cue exposure could potentially yield further evidence of cue-reactivity amongst problematic MP users. While several items in the MPPUS relate to craving, future research of this type could benefit from the inclusion of a craving specific measure.

The lack of significant findings regarding the relationship between scores on the MPPUS and physiological outcome measures should not be interpreted to mean that no physiological consequence occurs in response to forced mobile phone abstention. Rather, it should be understood as fairly substantial evidence that the means by which this study attempted to measure physiological response failed within this paradigm. Future attempts to analyze physiological response to MP related cue exposure should be made using instruments that take continuous measurements. Additionally, other means by which to

measure physiological arousal should be taken advantage of. Investigating cue-responsivity to MP related cues via electroencephalography or measurement of galvanic skin response could reveal findings that were undetected by the static blood measure monitor utilized in this study.

This study is the first to administer either the MPDQ or the MPPUS to an American sample. Analysis of the results revealed that there was a strong positive correlation between scores on the MPPUS and the scores on the MPDQ (r = .709, n = 50 , p = .01), contributing evidence of construct validity for both measures. Bianchi & Phillips (2009) developed and validated the MPPUS in English for use in an Australian sample, and it has since been translated and validated for use with Japanese speaking samples (Takao et al., 2009). The discovery of significant positive relationships between MPPUS scores and both BDI-II scores and post-manipulation anxiety, provide evidence of convergent validity for the MPPUS as a measure of problematic mobile phone use in American samples.

In contrast, the MPDQ was developed and validated for use with Japanese speaking samples, and while translated into English, has not been validated for use with English speaking samples. While positively related to scores on the MPPUS, the lack of significant relationships between the MPDQ and any other measures in the study appears to indicate that the MPDQ may not be an appropriate instrument for use with an American sample. The lack of significant findings between scores on the MPDQ and other outcome/predictor variables, in spite of a significant positive correlation to MPPUS scores, may reflect a lack of sensitivity in differentiating excess use from problematic or pathological use. This may in part be due to issues arising from the cultural specificity of

the instrument. Further investigation of the psychometric properties of the MPDQ is necessitated, but the results of this study indicate that any decision to use the MPDQ with an American sample should be carefully evaluated.

The results of this study are in line with existing literature that failed to find gender to be a predictor of scores on the MPPUS and the MPDQ (Bianchi & Phillips, 2005; Toda et al., 2006). While Bianchi & Phillips (2005) also found age to be a predictor of problematic MP use, males and females did not differ on age in the current study; thus, this variable was not examined as a covariate (Bianchi & Phillips, 2005).

The current study is not the first to have examined the relationship between depression as measured by the BDI-II and problematic MP use; it is, however, the first to look at that relationship using the MPPUS. Of the two studies in the literature that examined the relationship between BDI-II scores and problematic MP use, Ha et al. (2008) reported significant findings, whereas Billieux et al. (2007) did not. The discovery of a significant relationship between MPPUS and BDI-II scores in the current study supports Ha et al.'s (2008) findings, highlighting the importance of continuing to include measures of depression in studies of problematic MP use.

More research is needed to determine the nature of the relationship between depression and problematic MP use. While severity of depression was directly related to the intensity of problematic use, the correlational methodology utilized in this study does not allow for an examination of the temporal relationship between the two. Future research should address this issue to assess whether depression precedes problematic mobile phone use or vice versa, and whether a causal relationship exists between the two.

Limitations

The results of the present study are intriguing; however, a number of issues remain to be addressed in future research.

Sample Composition. Recruiting from undergraduate psychology courses via convenience sampling failed to yield sufficient numbers of high-use mobile phone participants. It was hypothesized that reactivity in this subset of individuals would be more pronounced than in those with average or below average scores on the MPPUS and MPDQ. Unfortunately, due to the small number of participants within each category, the relationship between levels of self-reported mobile phone dependence and physiological response could not be analyzed as intended.

Technical Limitations. Over the course of data collection, modification of protocol was necessitated due to technical difficulties encountered with the BP785. On multiple occasions, error messages were encountered when blood pressure readings were taken. In these instances the blood-pressure cuff was removed and reapplied with a blood-pressure reading taken immediately following reapplication. In all cases, reapplication corrected the error and yielded a blood pressure reading. One participant's data could not be included in this study due to an inability to acquire a BP reading.

Errors generally occurred during the task condition after several readings had been successfully taken. It is believed that the number of consecutive measurements taken per participant exceeded the number for which the blood pressure monitor was designed, leading to a loosening of the arm cuff and resulting in the aforementioned errors. Additionally, as indicated in the Blood Pressure Monitor manual, interference from the usage of cellular phones in close proximity to the machine may have contributed

to the operational failures. Whatever the cause of the errors, their presence indicates that the accuracy of the physiological data collected in this study is questionable.

Methodology. For the study at hand, the procedure for physiological data collection may not have adequately captured subjective reactivity to mobile phone abstention. When the study was being designed, it was thought that abstention from mobile phone use would yield a sustained physiological response that would persist throughout the entirety of the task condition. During the task condition, measurements were taken, on average, thirty seconds after each phone call was received, and forty-five seconds after each text. The results may have differed had measurements been taken while the participant's MP was ringing. In future research, the use of a continuous blood-pressure monitoring system could provide a more accurate assessment of physiological response.

Deception. The experimental manipulation employed in this study requires alteration to increase external validity. While the true nature of the study was never explicitly conveyed to the participants, active deception was not utilized. The experimenters' frequent interaction with both the Skype interface and the blood-pressure monitor was readily apparent to the participants, and was often sufficient to make the premise known. Additionally, the presence of two mobile phone related questionnaires in a packet containing only eight surveys might have been sufficient to betray the purpose of the experiment, especially considering that the possession of a mobile phone was one of the inclusion criteria for the experiment.

Several participants made comments confirming that they were aware of the manipulation during the experiment. It is possible that awareness of the experimenter's

role in the incoming calls and SMS messages during the experiment decreased reactivity. Since no efforts were made to ascertain how many participants remained naïve, the ecological validity of the results is called into question.

Suggestions for Future Research

Attempts at investigating the relationship between forced mobile phone abstention and psychological and physiological reactivity would benefit from a more convincing deception. Splitting the experiment into two stages could be helpful in crafting such a deception. In the first stage, a questionnaire packet could be administered to participants containing a single mobile phone use assessment instrument alongside several unrelated surveys. Recruitment for this initial stage would occur in the classes with the highest number of students enrolled, allowing for expedited recruitment and processing of a larger number of participants. From this sample, those participants who scored highest in mobile phone usage could be recruited for stage two of the experiment.

In stage two, active deception would be utilized. Participants would be told that they were taking part in a study pertaining to an unrelated topic. The naïve participants would then be attached to a continuous blood pressure monitor and given a neutral distraction task. While he or she performed the distraction task, and after an appropriate baseline reading had been taken, an unseen confederate would call and message the participant's phone. These changes in methodology would aid in keeping the manipulation covert while also allowing the experiment to target addicted populations instead of relying on a convenience sample of mostly social users.

Conclusion

The methodology utilized in this study failed to uncover a relationship between self-reported problematic MP use and cardiovascular response. However, the findings supporting the relationship between problematic MP use and self-reported, post-manipulation anxiety suggest that the design is an effective paradigm for assessing the relationship between self-reported anxiety and mobile-phone dependence within a laboratory setting via a quasi-deceptive provocation. Further refinements of this new paradigm may yield a more sensitive screen for problematic MP use and the underlying psychological and physiological correlates.

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APPENDIX A: STATE-TRAIT ANXIETY INVENTORY (A-STATE SCALE)

SELF-EVALUATION FORM
SSAI

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate HOW YOU FEEL RIGHT NOW AT THIS MOMENT. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer that seems to describe your present feelings best.

	Not at all	Somewhat	Moderately so	Very much so
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. I feel pleasant	1	2	3	4

APPENDIX B: STATE-TRAIT ANXIETY INVENTORY (A-TRAIT SCALE)

SELF-EVALUATION FORM
STAI

Directions: A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate HOW YOU GENERALLY FEEL. There are no right or wrong answers. Do not spend too much time on any one statement, but give the answer that seems to describe your present feelings best.

	Not at all	Somewhat	Moderately so	Very much so
1. I feel calm	1	2	3	4
2. I feel secure	1	2	3	4
3. I am tense	1	2	3	4
4. I feel strained	1	2	3	4
5. I feel at ease	1	2	3	4
6. I feel upset	1	2	3	4
7. I am presently worrying over possible misfortunes	1	2	3	4
8. I feel satisfied	1	2	3	4
9. I feel frightened	1	2	3	4
10. I feel comfortable	1	2	3	4
11. I feel self-confident	1	2	3	4
12. I feel nervous	1	2	3	4
13. I am jittery	1	2	3	4
14. I feel indecisive	1	2	3	4
15. I am relaxed	1	2	3	4
16. I feel content	1	2	3	4
17. I am worried	1	2	3	4
18. I feel confused	1	2	3	4
19. I feel steady	1	2	3	4
20. I feel pleasant	1	2	3	4

APPENDIX C: MOBILE PHONE PROBLEM USE SCALE

Please read the following statements and rate how much each item pertains to you. You should only circle one response for each statement.

If you feel that the statement is extremely true, circle 'A'.
If you feel that the statement is very true, circle 'B'.
If you feel that the statement is true, circle 'C'.
If you feel that the statement is somewhat true, circle 'D'.
If you feel that the statement is not true at all, circle 'E'.

	Extremely true	Very true	True	Somewhat true	Not True at all
1. I can never spend enough time on my mobile phone.	A	B	C	D	E
2. I have used my mobile phone to make myself feel better when I was feeling down.	A	B	C	D	E
3. I find myself occupied on my mobile phone when I should be doing other things, and it causes problems.	A	B	C	D	E
4. All my friends own a mobile phone.	A	B	C	D	E
5. I have tried to hide from others how much time I spend on my mobile phone	A	B	C	D	E
6. I lose sleep due to time I spend on my mobile phone	A	B	C	D	E
7. I have received mobile phone bills I could not afford to pay.	A	B	C	D	E
8. When out of range for some time, I become preoccupied with the thought of missing a call.	A	B	C	D	E
9. Sometimes, when I am on the mobile phone and doing other things, I get carried away with the conversation and I don't pay attention to what I am doing.	A	B	C	D	E
10. The time I spend on the mobile phone has increased over the last 12 months.	A	B	C	D	E
11. I have used my mobile phone to talk to others when I was feeling isolated.	A	B	C	D	E
12. I have attempted to spend less time on my mobile phone but am unable to.	A	B	C	D	E
13. I find it difficult to switch off my mobile phone.	A	B	C	D	E
14. I feel anxious if I have not checked for messages or switched on my mobile phone for some time.	A	B	C	D	E

	Extremely true	Very true	True	Somewhat true	Not True at all
15. I have frequent dreams about the mobile phone.	A	B	C	D	E
16. My friends and family complain about my use of the mobile phone.	A	B	C	D	E
17. If I didn't have a mobile phone, my friends would find it hard to get in touch with me.	A	B	C	D	E
18. My productivity has decreased as a direct result of the time I spend on the mobile phone.	A	B	C	D	E
19. I have aches and pains that are associated with my mobile phone use.	A	B	C	D	E
20. I find myself engaged on the mobile phone for longer periods of time than intended.	A	B	C	D	E
21. There are times when I would rather use the mobile phone than deal with other more pressing issues.	A	B	C	D	E
22. I am often late for appointments because I'm engaged on the mobile phone when I shouldn't be.	A	B	C	D	E
23. I become irritable if I have to switch off my mobile phone for meetings, dinner engagements, or the movies.	A	B	C	D	E
24. I have been told that I spend too much time on my mobile phone.	A	B	C	D	E
25. More than once I have been in trouble because my mobile phone has gone off during a meetings, lecture, or in a theatre.	A	B	C	D	E
26. My friends don't like it when my mobile phone is switched off.	A	B	C	D	E
27. I feel lost without my mobile phone.	A	B	C	D	E

APPENDIX D : MOBILE PHONE DEPENDENCE QUESTIONNAIRE

Please read the following statements and rate how much each item pertains to you. You should only mark one response for each statement.
If you feel that the statement always pertains to you, mark 'A'.
If you feel that the statement often pertains to you, mark 'B'.
If you feel that the statement sometimes pertains to you, mark 'C'.
If you feel that the statement hardly ever pertains to you, mark 'D'.

	Always	Often	Sometimes	Hardly Ever
1. I give my mobile phone more priority than clothes and food.	A	B	C	D
2. I feel unsettled when I forget to take my mobile phone with me.	A	B	C	D
3. I would rather lose my wallet or purse than my mobile phone.	A	B	C	D
4. I recharge my mobile phone battery every day.	A	B	C	D
5. I don't really want to go to places where mobile phone signals are weak.	A	B	C	D
6. When I am riding on a bus or in similar situations, I tend to handle my mobile phone.	A	B	C	D
7. Even when riding on a bus, I make and receive calls.	A	B	C	D
8. I use my phone when I am in the company of one or two other people.	A	B	C	D
9. I make mobile phone calls late at night.	A	B	C	D
10. I talk on my mobile phone for more than one hour a day.	A	B	C	D
11. I find it hard to keep company with people who don't have mobile phones.	A	B	C	D
12. Without thinking, I check my phone for email or voice mail even when it hasn't rung.	A	B	C	D
13. I send emails or texts when I am at work or in class.	A	B	C	D
14. I send ten or more emails a day.	A	B	C	D
15. I am pleased when I receive an email or text.	A	B	C	D

16. I send emails with little content that have no practical purpose.	A	B	C	D
17. I use a lot of pictographs and/or emoticons in my email.	A	B	C	D
18. I always reply to phone email.	A	B	C	D
19. I send lots of long email messages.	A	B	C	D
20. I express my true feelings better by email or text than by voice mail.	A	B	C	D
21. Is your cellular phone a smart phone?	Yes		No	

APPENDIX E: BECK DEPRESSION INVENTORY-II

Instructions: Choose **ONE** statement in each group that **BEST** describes the way you have been feeling during the **LAST TWO WEEKS**, including today. Circle the number beside the statement you have picked. If several statements seem to apply equally well, circle the highest number for that group. If none of the items seem to apply, circle 0. Be sure not to choose more than one statement for any group, including Item 16 (Changes in Sleeping Pattern) or Item 18 (Changes in Appetite).

1. Sadness
0 I do not feel sad.
1 I feel sad much of the time.
2 I am sad all the time.
3 I am so sad or unhappy I can't stand it.

2. Pessimism
0 I am not discouraged about my future.
1 I feel more discouraged about my future than I used to be.
2 I do not expect things to work out for me.
3 I feel my future is hopeless and will only get worse.

3. Past Failure
0 I do not feel like a failure.
1 I have failed more than I should have.
2 As I look back, I see a lot of failures.
3 I feel I am a total failure as a person.

4. Loss of Pleasure
0 I get as much pleasure as I ever did from the things I enjoy.
1 I don't enjoy things as much as I used to.
2 I get very little pleasure from the things I used to enjoy.
3 I can't get any pleasure from the things I used to enjoy.

5. Guilty Feelings
0 I don't feel particularly guilty.
1 I feel guilty over many things I have done or should have done.
2 I feel quite guilty most of the time.
3 I feel guilty all of the time.

6. Punishment Feelings
0 I don't feel I am being punished.
1 I feel I may be punished.
2 I expect to be punished.
3 I feel I am being punished.

7. Self-Dislike
0 I feel the same about myself as ever.
1 I have lost confidence in myself.
2 I am disappointed in myself.
3 I dislike myself.

8. Self-Criticalness
0 I don't criticize or blame myself more than usual.
1 I am more critical of myself than I used to be.
2 I criticize myself for all of my faults.
3 I blame myself for everything bad that happens.

9. Suicidal Thoughts or Wishes
0 I don't have any thoughts of killing myself.
1 I have thoughts of killing myself, but I would not carry them out.
2 I would like to kill myself.
3 I would kill myself if I had the chance.

10. Crying
0 I don't cry anymore than I used to.
1 I cry more than I used to.
2 I cry over every little thing.
3 I feel like crying, but I can't.

11. Agitation
0 I am no more restless or wound up than usual.
1 I feel more restless or wound up than usual.
2 I am so restless or agitated that it's hard to stay still.
3 I am so restless or agitated that I have to keep moving or doing something.

12. Loss Of Interest
0 I have not lost interest in other people or activities.
1 I am less interested in other people or things than before.
2 I have lost most of my interest in other people or things.
3 It's hard to get interested in anything.

13. Indecisiveness
0 I make decisions about as well as ever.
1 I find it more difficult to make decisions than usual.
2 I have greater difficulty in making decisions than I used to.
3 I have trouble making any decisions.

14. Worthlessness
0 I do not feel I am worthless.
1 I don't consider myself as worthwhile or useful as I used to.
2 I feel more worthless as compared to other people.
3 I feel utterly worthless.

15. Loss of Energy
0 I have as much energy as ever.
1 I have less energy than I used to have.
2 I don't have enough energy to do very much.
3 I don't have enough energy to do anything.

16. Changes in Sleeping Pattern
0 I have not experienced any change in my sleeping pattern.
1a I sleep somewhat more than usual.
1b I sleep somewhat less than usual.
2a I sleep a lot more than usual.
2b I sleep a lot less than usual.
3a I sleep most of the day.
3b I wake 1-2 hours early and can't get back to sleep.

17. Irritability
0 I am no more irritable than usual.
1 I am more irritable than usual.
2 I am much more irritable than usual.
3 I am irritable all the time.

18. Changes in Appetite
0 I have not experienced any change in my appetite.
1a My appetite is somewhat less than usual.
1b My appetite is somewhat greater than usual.
2a My appetite is much less than before.
2b My appetite is much greater than usual.
3a I have no appetite at all.
3b I crave food all the time.

19. Concentration Difficulty
0 I can concentrate as well as ever.
1 I can't concentrate as well as usual.
2 It's hard to keep my mind on anything for very long.
3 I find I can't concentrate on anything.

20. Tiredness or Fatigue
0 I am no more tired or fatigued than usual.
1 I get more tired or fatigued more easily than usual.
2 I am too tired or fatigued to do a lot of the things I used to do.
3 I am too tired or fatigued to do most of the things I used to do.

21. Loss of Interest in Sex
0 I have not noticed any recent change in my interest in sex.
1 I am less interested in sex than I used to be.
2 I am much less interested in sex now.
3 I have lost interest in sex completely.

REFERENCES

Aidman, E., & Woollard, S. (2003). The influence of self-reported exercise addiction on

acute emotional and physiological responses to brief exercise deprivation.

Psychology of Sport and Exercise, *4*, 225-236.

American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental*

Disorders (eth ed., text rev.). Arlington, VA: Author.

Beck, A. (2006). Beck Depression Inventory-II. Harcourt.

Bianchi, A., & Phillips, J. G. (2005). Psychological predictors of problem mobile phone

use. *CyberPsychology & Behavior*, *8*(1), 39-51.

Billieux, J., van der Linden, M., D'Acremont, M., Ceschi, G., & Zermatten, A. (2006)

Does impulsivity relate to perceived dependence on and actual use of the mobile

phone?. *Applied Cognitive Psychology*, *21*, 527-537.

Campbell, A. (2005). Cyber bullying: An old problem in a new guise?. *Australian*

Journal of Guidance and Counseling, *15*(1), 68-76.

Cassidy, S. (2006). Using social identity to explore the link between a decline in

adolescent smoking and in increase in mobile phone use. *Health Education*,

106(3), 238-250.

Ceballos, N. (2006). Tobacco use, alcohol dependence, and cognitive performance.

Journal of General Psychology, *133*, 375-388.

Chiamulera, C. (2005). Cue reactivity in nicotine and tobacco dependence: a "multiple-action" model of nicotine as a primary reinforcement and as an enhancer of the effects of smoking-associated stimuli. *Brain Research Reviews*, *48*, 74-97.

Chiang, S., Scheutz, C., & Soyka, M. (2005). Effects of cue exposure on the subjective perception of alcohol dependents with different types of cue reactivity. *Journal of Neural Transmission*, *112*, 1275-1278.

Choliz, M. (2010). Mobile phone addiction: A point of issue. *Addiction*, *105*, 373-375.

Drummond, C. (2000). What does cue-reactivity have to offer clinical research?. *Addiction*, *95*(2), 129-144.

Erblich, J., Bovbjerg, D., & Sloan, R. (2011). Exposure to smoking cues: Cardiovascular and autonomic effects. *Addictive Behaviors*, *36*, 737-742.

Ezoe, S., Toda, M., Yoshimura, K., Naritomi, A., Den, R., & Morimoto, K. (2009). Relationships of personality and lifestyle with mobile phone dependence among female nursing students. *Social Behavior and Personality*, *37*(2). 231-238.

Gaudry, E., Vagg, P., & Spielberger, C. (1975). Validation of the State-Trait distinction in anxiety research. *Multivariate Behavioral Research*, *10*, 331-34.

Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. C. (2006). The International Personality Item Pool and the future of public-domain personality measures. *Journal of Research in Personality*, *40*, 84-96.

Ha, J. H., Chin, B., Park, D., Ryu, S., & Yu, J. (2008). Characteristics of excessive cellular phone use in Korean adolescents. *CyberPsychology & Behavior*, *11*(6), 783-784.

Hietanen, M., Hamalainen, A. M., & Husman, T. (2002). Hypersensitivity symptoms associated with exposure to cellular telephones: no causal link. *Bioelectromagnetics*, *23*, 264-270.

Koivisto, M., Haarala, C., Krause, C. M., Revonsuo, A., Laine, M., & Hämäläinen, H. (2001). GSM phone signal does not produce subjective symptoms. *Bioelectromagnetics*, *22*, 512-516.

Leena, K., Tomi, L., & Arja, R. (2005). Intensity of mobile phone use and health compromising behaviours – how is information and communication technology connected to health-related lifestyle in adolescence?. *Journal of Adolescence*, *28*, 35-47.

Lu, X., Watanabe, J., Liu, Q., Uji, M., Shono, M., & Kitamura, T. (2011). Internet and mobile phone text-messaging dependency: Factor structure and correlation with dysphoric mood among Japanese adults. *Computers in Human Behavior*, *27*(5), 1702-1709.

Moodie, C., & Finnigan, F. (2005). A comparison of the autonomic arousal of frequent, infrequent and non-gamblers while playing fruit machines. *Society for the Study of Addiction*, *100*, 51-59.

Nix, J. (2008). Unwholesome activities in a wholesome place: Utah teens creating pornography and the establishment of prosecutorial guidelines. *Journal of Law and Family Studies*, *11*(1), 183-192.

Oftedal, G., Straume, A., Johnsson, A., & Stovner, L. J. (2007). Mobile phone headache: a double blind, sham-controlled provocation study. *Cephalagia*, *27*, 447-455.

Rubin, G. J., Hahn, G., Everitt, B. S., Cleare, A. J., & Wessely S. (2006). Are some people sensitive to mobile phone signals? Within participants double blind randomized provocation study. *BMJ*, *332*, 886-889.

Rutland, J. B., Sheets, T., & Young, T. (2007). Development of a scale to measure problem use of short message service: The SMS Problem Use Diagnostic Questionnaire. *CyberPsychology & Behavior*, *10*(6), 841-843.

Sinha, R., Fuse, T., Aubin, L., & O'Malley, S. (2000). Psychological stress, drug related cues and cocaine craving. *Psychopharmacology*, *152*, 140-148.

Spielberger, C., Gorsuch, R., & Lushene, R. (1970). *Test Manual for the State-Trait Anxiety Inventory*. Palo Alto, CA: Consulting Psychologists Press.

Swift, R., & Stout, R. (1992). The relationship between craving, anxiety, and other symptoms in opioid withdrawal. *Journal of Substance Abuse*, *4*(1), 19-26.

Takao, M., Takahashi, S., & Kitamura, M. (2009). Addictive personality and problematic mobile phone use. *CyberPsychology & Behavior*, *12*(5), 501-507.

Tavares, H., Zilberman, M., Hodgins, D., & el-Guebaly, N. (2005). Comparison of craving between pathological gamblers and alcoholics. *Alcoholism: Clinical and Experimental Research*, *29*(8), 1427-1431.

Toda, M., Ezoe, S., Nishi, A., Mukai, T., Goto, M., & Morimoto, K. (2008). Mobile phone dependence of female students and perceived parental rearing attitudes. *Social Behavior and Personality*, *36*(6). 765-770.

Toda, M., Monden, K., Kubo, K., & Morimoto, K. (2004). Cellular phone dependence tendency of female university students. *Japanese Journal of Hygiene, 59*, 383-386.

Toda, M., Monden, K., Kubo, K., & Morimoto, K. (2006). Mobile phone dependence and health-related lifestyle of university students. *Social Behavior and Personality*, *34*(10), 1277-1284.

Weiss, R., & Samenow, C. (2010). Editorial: Smart phones, social networking, sexting and problematic sexual behaviors – A call for research. *Sexual Addiction & Compulsivity*, *17*, 241-246.

White, W., & Anwar, Y. (2001). Evaluation of the overall efficacy of the Omron office digital blood pressure HEM-907 monitor in adults. *Blood Pressure Monitoring*, *6*(2), 107-110.

Yen, C., Hsiao, R., Ko, C., Yen, J., Huang, C., Liu, S., & Wang, S. (2010). The relationships between body mass index and television viewing, internet use and cellular phone use: The moderating effects of socio-demographic characteristics and exercise. *International Journal of Eating Disorders*, *43*(6), 565-571.

Young, K. (2009). Internet addiction: Diagnosis and treatment considerations. *Journal of Contemporary Psychotherapy*, *39*, 241-246.

VITA

Duncan Martin Dickson was born and raised in Corpus Christi, TX. After completing high school, he attended Texas A&M University-Corpus Christi, where he received the degree of Bachelor of Arts in 2007. After several years working with adolescents with development disabilities and psychiatric disorders, he resumed his educational career and entered the Graduate College of Texas State. There he studied in the Master of Arts in health Psychology program. In partial fulfillment of the requirements of that program, he completed an internship as a psychometrician at a residential treatment facility while simultaneously preparing his thesis.

Permanent Address: 102 Frederick Rd

                                     Fredericksburg, TX 78624

This thesis was typed by Duncan Martin Dickson.