Obsessive Compulsive Tendencies as Predictors of Dangerous Mobile Phone Usage

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ABSTRACT

Recent attention to dangerous mobile phone use (MPU) has drawn concerns on how we can reduce use in situations such as driving. The National Safety Council estimates 1.6 million, roughly 28%, of vehicle accidents a year are related to MPU while driving. Much of the research has investigated dangerous use through an addiction perspective; however, if the underlying motivation is more similar to obsessive compulsive checking then the resulting interventions may be different. We investigate the dangerous and compulsive MPU through the lens of obsessive compulsive checkers by examining responsibility and compulsive checking on dangerous MPU. We test and support our model with a PLS analysis of 432 respondents. Findings provide evidence of an emerging perspective of MPU as well as insights into the recent lack of success in legislation to reduce dangerous MPU while driving.

Keywords

Mobile phone, Technology Addiction, Compulsive Use, Obsessive Compulsive Disorder.

INTRODUCTION

The sight of a driver, speeding down the road with eyes fixated on their mobile phone and thumbs tapping out another e-mail or text, is all too common today. Many of us might even engage in such distractions, despite the widespread knowledge of the danger of doing so. Recent legislation in many countries have attempted to discourage dangerous and inappropriate mobile phone use by punishing anyone caught in the act; yet in many areas, mobile phone–related vehicle accidents actually have increased since the passage of such laws (Highway Loss Data Institute 2010). The National Safety Council (2010) estimates that roughly 28%, or 1.6 million, of vehicle accidents annually in the U.S. can be attributed to mobile phone use. Despite the apparent risks, users appear likely to continue to use their mobile phones in dangerous situations if they regard the information they could receive from such use as sufficiently important (Nelson, Atchley, and Little, 2009). For employers of professional drivers the impacts of dangerous mobile phone use is not only an individual issue but an organizational problem that must be detected and prevented as the organization may ultimately be held liable.

Previous research into excessive mobile phone use has primarily adopted an addiction or dependency perspective (Bianchi and Phillips, 2005; Leung, 2008; Takao, Takahashi, and Kitamura, 2009). It thus parallels research of excessive use in other information technology domains, such as Internet, instant messaging, online gambling, and online pornography (see Carbonell, Guardiola, Beranuy, and Bellés, 2009). Excessive and inappropriate technology use has typically been referred to as pathological use, problematic use, or addiction reflecting the uncontrolled use and negative outcomes typically associated with increased use. Despite evidence that technology addiction may influence some dangerous mobile phone use, it has typically only explained part of the phenomenon with R^2 values ranging from 10-27% (Beranuy et al. 2009; Leung 2008; Takao et al. 2009). While this is an important step in predicting inappropriate usage a complementary yet similar behavior that may explain some dangerous use may be more closely related to obsessive compulsive disorders (OCD). One of the fundamental differences between OCD and addiction is the underlying motivation of initiating the behavior. While addicts initially perform their behavior to achieve pleasure, compulsive checkers attempt to reduce anxiety and distress without any pleasurable outcomes (Miele et al. 1990). Based on these motivations, the behavioral interventions that aim to treat OCD and addictions are fundamentally different. Therefore, the possibility that some MPU is driven by compulsive checking behaviors rather than an addiction may suggest alternative legislative interventions and prevention tactics.

This study investigates the role of obsessive compulsive checking in influencing dangerous MPU. We theorize that as people encounter increasing pressures and responsibilities related to demanding careers, social obligations, or family ties, they may

exhibit increased levels of compulsive checking which reflects their attempt to manage their role responsibilities. We test and support our model in Figure 1 examining the compulsive checking that influences dangerous MPU with a PLS analysis of 432 respondents.
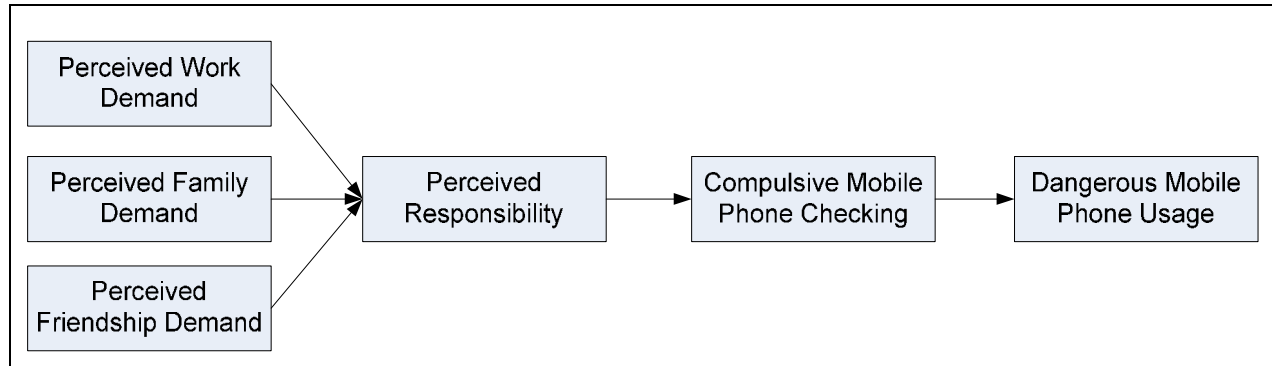

Figure 1. Conceptual Model.

THEORETICAL DEVELOPMENT

Compulsive Checking

People have become conditioned to the sound of a ringing mobile phone, to the extent that many people report hearing a ring even when nothing has sounded. Many people check their phones immediately upon receiving any notification, in the belief that the important information contained in the message cannot be ignored. Some users even become nervous and anxious if they cannot check their phones, such as during meetings, in class, or airplane trips. Additionally, perceptions of reaction and response times have changed due to the constant connection to our mobile phones (Spiegelman and Detsky, 2008); many people develop such a sense of dependence on their mobile phones that they experience increased levels of urgency and lack of perseverance (Billieux, Van der Linden, D'Acremont, Ceschi, and Zermatten, 2007). Such mobile dependence may be quite similar to OCD (Buck 2008) and the behaviors of these people mirror those of obsessive compulsive checkers who cannot perform their rituals.

A specific subset of OCD is compulsive checking which refers to the ritualistic behavior of repeatedly checking objects. The Diagnostic and Statistical Manual of Mental Disorders (DSM-IV-TR ; American Psychiatric Association, 2000 p.457) defines compulsions as "repetitive behaviors or mental acts the goal of which is to prevent or reduce anxiety or distress, ***not*** to provide pleasure or gratification," such that the aim is to prevent negative events or situations. While executing these behaviors is within a person's voluntary control, the underlying urges are not and may initiate the behavior despite any rational inclinations (Rachman 2002). We similarly define compulsive mobile phone checking as the ritualistic reflex to check for notifications or required actions on a user's mobile phone. Additionally over time, this type of behavior tends to become a conditioned response to external stimuli such as visual and auditory indicators (i.e., vibrations, alerts, and ringers).

A prominent driver of compulsive checking is found to be perceived responsibility (MacDonald and Davey, 2005; Salkovskis et al., 2000). Perceived responsibility refers to "the belief that one possesses the pivotal power to provoke or prevent negative crucial outcomes which may or may not be real" (Rhéaume, Ladouceur, and Freeston, 2000). Similarly, when people take on new demanding roles, such as starting a new career, increasing their family size, or performing social tasks, their perceptions about their level of responsibility might become inflated. The increased responsibility then may lead to compulsive behaviors to reduce stress and anxiety tied to their responsibilities. Recently technology has been seen to act as a significant coping mechanism for individuals facing a variety of psychological stress and daily problems (Meerkerk et al. 2010). As mobile phones have become the primary communication devices in many networks, we hypothesize that increased perceived responsibility will induce more compulsive mobile phone checking, as people attempt to minimize the potential for problems and negative outcomes and of their responsibilities.

H1: Perceived responsibility has a positive relationship with compulsive mobile phone checking.

Responsibility Antecedents

A few common areas of personal responsibility -- work, family, and social -- appear frequently in prior research. We adopt a perceptual view of responsibilities to complement our OCD foundations; that is, we anticipate that the levels of perceived responsibilities may or may not correspond to actual levels of demand. Therefore, we examine perceived work, family, and friendship demands, which refer to an individual's perceived demand levels within each domain and not actual demand levels (Boyar, Carr, Mosley, and Carson, 2007), as influences of perceived responsibilities.

Work Demand

Mobile phones have been indicated as potential causes for work-family conflicts (Turel, Serenko, and Bontis, 2011). Individuals can now be reached anywhere, at any time, and by anyone, both family and employers alike. This change in accessibility, especially in the employer-employee relationship, has altered perceptions of working hours among many organizations. Companies provide mobile phones to their employees to allow access to their work from various locations. Accordingly, employees increasingly are expected to work and respond during off-hours (Turel and Serenko, 2010). This is especially prevalent in individuals that are considered to be on "on call" for any instances of problems that may occur during their off time. These changes in the accessibility and expectations of employees may increase perceptions of work demands, as employees believe they need to respond instantly to fulfill their work responsibilities. Therefore, we hypothesize that increases in perceived work demand will have a positive relationship with perceived responsibilities.

H2a: There is a positive relationship between perceived work demand and perceived responsibility.

Family Demand

Technology developments, greater accessibility, and lower prices have encouraged the spread of mobile phones to consumers of all ages. Changes in family culture have begun to alter perceptions of appropriate levels of connectivity among family members. Children now carry mobile phones, provided by their parents, to stay connected to family members at all times. 98% of parents indicate that the primary reason their children have mobile phones is so that they could reach them at any time (Lenhart, Ling, Campbell, and Purcell, 2010). Individuals are now able to stay in contact with their children or spouse at all times which places individuals in a potential state of alertness to their devices. Turkle (2008) notes being psychologically tuned in to her mobile phone, as calls from her daughter prompt a certain ring. Parents potentially remain in a highly alert state, attentive to any notifications that may arrive on their mobile phones. Thus perceived family demand may increase with the seemingly greater need to remain attentive to family matters at all times. These perceptions are likely increase an individuals' responsibility as they feel obligated to be alert to their mobile phones in case their family attempts to contact them. We hypothesize that as perceptions of family demands increase there will be a positive relationship with perceived responsibilities.

H2b: There is a positive relationship between perceived family demand and perceived responsibility.

Friendship Demand

Digital natives, individuals that have grown up in the mobile generation with constant digital connectivity (Vodanovich, Sundaram, and Myers, 2010), the constant contact with their friends provides an environment that allows their entire social network to be a few thumb-flicks away at all times. With the introduction of smartphones and social network applications such as Facebook and Twitter the connection to our various social networks has become ubiquitous. As the prevalence and usage of mobile phones have increased, our expectations of our friends to respond nearly instantaneously have changed as we generally believe that their phone is with them at all times. This feeling of obligation within our social circles to respond quickly has placed social pressures to remain connected at all times. Therefore, as the perceived friendship demands increase there will be a positive relationship with perceived responsibilities and obligations to their social networks.

H2c: There is a positive relationship between perceived friendship demand and perceived responsibility

Dangerous Mobile Phone Use

While both technology addiction and compulsive use have many potential negative consequences such as reduced social well-being, depression, and loneliness, we focus on usage while driving, which is particularly important in light of the vast number of mobile phone–related accidents and fatalities as well as the failure of existing legislation[1] to reduce this type of use (Copeland 2010). Distracted driving has significant impacts on speed variability, time in lane (Crisler et al. 2008), time spent looking at the road (Hosking, Young, and Regan, 2007), and reaction times (Drews, Yazdani, Godfrey, Cooper, and Strayer, 2009) which ultimately place the driver and others in direct danger. We define dangerous MPU as ***any*** usage that creates potential for harm to the user or others as a result of the usage.

Drivers who carry mobile phones typically evaluate the dangerousness before deciding whether to answer or initiate a call which generally depends on the importance and urgency of the call or message (Nelson et al. 2009). If a situation appears dangerous and use would increase the potential for harm, rational people seemingly would not use their mobile phones. Much

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[1] We also note that the enforcement of these laws is a potential factor in these scenarios as well. We thank the reviewer for making this point.

of the dangerous MPU research assumes rational choice of usage; however, people who have developed compulsive checking behaviors instead may rely on the conditioned reflex, such that they use their mobile phone out of instinctual behavior without undertaking a typical cost–benefit analysis of the dangers of the usage situation. Compulsive checking involves continuously performed actions that demand little or no effort that can quickly become automatic reflexes. This type of repeated conditioning can then produce compulsive behaviors (Everitt and Robbins, 2005). Not only does the primary stimuli (i.e., direct mobile phone use) trigger affective responses that are trained through the conditioning, but over time, secondary stimuli (e.g., ringers, vibrations, alerts) potentially trigger the same responses (LaRose, Lin, and Eastin, 2003). Therefore, as people continually use their mobile phones for varying functions their tendencies to compulsively check their mobile phones may increase as well, due to their development of learned responses to primary and secondary stimuli. Therefore, the nature of a compulsive checker who is analyzing the dangerous scenario may instead initiate a reflex response to engage in dangerous use. We hypothesize that as individuals' levels of compulsive checking increase their usage in dangerous situations will increase due to their reflex usage circumvents the danger evaluation.

H3: Compulsive mobile phone checking has a positive relationship with dangerous mobile phone use.

METHOD

Participants

As our research questions revolve around societal issues and not organizational only focuses our sampling frame of participants for this study was adults who own a mobile phone and currently drive a motor vehicle. Participants were recruited through Amazon's Mechanical Turk, an online crowdsourcing market, with a large and diverse population of users from different age groups, genders, and locations. For inclusion into the study we required that all respondents currently own a mobile phone. We traced IP and e-mail addresses using survey software to control for and reduce the possibility of multiple responses. Four participants were dropped from the analysis for not owning a mobile phone providing 432 usable responses for the analysis. Participants were on average 28.26 (SD = 8.28) years old, 62% were men, 55% were single, had 3.86 (SD = 1.82) mobile phones within their immediate family, and 70% were currently employed. In addition, 55% had smartphones, of which 14% were employer provided mobile phones.

Measurement

All measurement scales were taken from previously validated research whenever possible. *Perceived work demand* (5 items), *perceived family demand* (4 items), and *perceived friendship demand* (4 items) were adapted from Boyar et al. (2007) to measure perceived demand aspects of the participants. To measure *perceived responsibility* we utilize the Responsibility Attitude Scale (Salkovskis et al. 2000) from the psychology literature which includes 26 generalized questions that relate to an individual's overarching feelings of responsibility in various situations. The RAS is summated for a composite score of overall responsibility (Steketee, Frost, and Cohen, 1998).

To develop measures of compulsive mobile phone checking and dangerous mobile phone use we followed recommended methods by Moore and Benbasat (1991) by reviewing previous literature for items and themes, pre-testing the items for face and content validity, and executing a pilot study for item reduction, reliability, and validity checks. To measure *compulsive mobile phone checking* (10 items) we adapted relevant items from the Cell Phone Attachment Scale (Alexander, Ward, and Braun, 2007) and generated additional items that focus on the compulsive behavioral action or response of mobile phone use. To measure *dangerous mobile phone use* (8 items) we developed a contextualized usage scale that focuses on the use of mobile phones while driving a vehicle. Formative items were developed that related to both the initiation and response to communications and applications on the mobile phone while engaged in driving. All constructs were measured on 7 point scales from "Strongly Disagree" to "Strongly Agree".

A series of controls were used to address issues that may influence the compulsive checking and usage of mobile phones. To control for potential comorbidity of pre-existing clinical OCD conditions we utilized the *general obsessive compulsive checking* clinical checking compulsions subscale of the Padua Inventory – Washington State University Revision (Burns, Keortge, Formea, and Sternberger, 1996). *Social desirability bias* (Reynolds 1982) was estimated to address the responses pertaining to dangerous and excessive mobile phone use. Additionally, we controlled for an individual's *general mobile phone usage* capturing the duration and number of text messages, e-mail messages, and calls. We further controlled for *age*, *gender*, *marital status*, *employment status*, *phone type*, *employer provided phones*, and the *number of mobile phones in the participant's immediate family*. Refer to Appendix 2 for a complete listing of the items.

RESULTS

We utilize partial least squares structural equation modeling with SmartPLS (Ringle, Wende, and Will, 2005) to evaluate all hypotheses and psychometrics within our analysis. To evaluate and estimate the measurement and structural models, we examined the construct reliabilities, convergent and discriminant validity, and the structural path coefficients with a recommended bootstrapped estimation of 1000 resamples (Chin 1998, 2010).

Convergent validity

To examine the convergent validity of all reflective constructs within the model, we examined both the factor loadings of the indicator items as well as the average variance explained (AVE) for each construct (Hair, Black, Babin, Anderson, and Tatham, 2006). All reflective indicator items loaded at a minimum of .64 on their respective constructs (see Table 1), indicating that they converge more on their primary construct than others (Gefen and Straub, 2005). Additionally, the AVE indicates convergent validity when the average variance explained for each construct is > 0.50 (Hair et al. 2006). All reflective constructs met both of these criteria and thus provide support for the convergent validity of our reflective constructs.

Measurement Items	Compulsive Mobile Checking	Clinical Complusive Checking	Family Demand	Work Demand	Friendship Demand
Compulsive Mobile Checking 1	**0.75**	0.34	0.25	0.28	0.34
Compulsive Mobile Checking 2	**0.76**	0.43	0.30	0.29	0.32
Compulsive Mobile Checking 3	**0.65**	0.32	0.28	0.30	0.15
Compulsive Mobile Checking 4	**0.72**	0.34	0.29	0.28	0.18
Compulsive Mobile Checking 5	**0.73**	0.35	0.26	0.29	0.24
Compulsive Mobile Checking 6	**0.73**	0.28	0.17	0.16	0.34
Compulsive Mobile Checking 7	**0.77**	0.33	0.25	0.29	0.25
Compulsive Mobile Checking 8	**0.76**	0.32	0.27	0.32	0.24
Compulsive Mobile Checking 9	**0.76**	0.31	0.28	0.30	0.25
Compulsive Mobile Checking 10	**0.79**	0.42	0.27	0.27	0.40
Clinical Complusive Checking 1	0.40	**0.77**	0.30	0.29	0.36
Clinical Complusive Checking 2	0.40	**0.82**	0.25	0.31	0.30
Clinical Complusive Checking 3	0.37	**0.83**	0.31	0.27	0.28
Clinical Complusive Checking 4	0.28	**0.78**	0.35	0.27	0.25
Clinical Complusive Checking 5	0.34	**0.74**	0.24	0.22	0.29
Clinical Complusive Checking 6	0.32	**0.76**	0.24	0.24	0.26
Clinical Complusive Checking 7	0.31	**0.64**	0.14	0.15	0.20
Clinical Complusive Checking 8	0.38	**0.67**	0.16	0.14	0.26
Family Demand 1	0.31	0.32	**0.82**	0.38	0.37
Family Demand 2	0.30	0.28	**0.90**	0.44	0.41
Family Demand 3	0.32	0.29	**0.89**	0.39	0.40
Family Demand 4	0.28	0.28	**0.86**	0.38	0.37
Work Demand 1	0.28	0.27	0.42	**0.84**	0.32
Work Demand 2	0.34	0.26	0.40	**0.89**	0.32
Work Demand 3	0.36	0.31	0.38	**0.89**	0.31
Work Demand 4	0.31	0.26	0.41	**0.87**	0.29
Work Demand 5	0.31	0.28	0.37	**0.83**	0.28
Friendship Demand 1	0.28	0.32	0.38	0.29	**0.83**
Friendship Demand 2	0.38	0.35	0.45	0.36	**0.91**
Friendship Demand 3	0.36	0.31	0.43	0.32	**0.89**
Friendship Demand 4	0.30	0.29	0.30	0.28	**0.87**

Table 1. Measurement Item Loadings

	Variables	Cronbachs Alpha	AVE	Mean	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Family Demand	0.89	0.76	5.28	1.22	**0.87**															
2	Friendship Demand	0.90	0.77	4.73	1.25	0.45***	**0.88**														
3	Work Demand	0.92	0.75	5.15	1.25	0.46***	0.36***	**0.86**													
4	Responsibility	NA	NA	123.39	20.37	0.42***	0.42***	0.42***	NA												
5	Compulsive MobileChecking	0.91	0.55	4.84	1.17	0.35***	0.38***	0.37***	0.44***	**0.74**											
6	Dangerous Usage	NA	NA	3.01	1.71	-0.05	0.15**	0.06	0.01	0.23***	NA										
7	Age	NA	NA	28.26	8.28	0.13**	-0.11*	0.09	-0.05	-0.17***	-0.14**	NA									
8	Employment Status	NA	NA	0.70	0.46	0.10*	0.08	0.33***	0.11*	0.07	0.06	0.19***	NA								
9	Gender	NA	NA	0.38	0.49	-0.01	-0.11*	-0.06	-0.05	-0.08	-0.21***	0.15***	-0.06	NA							
10	# Immediate Cells	NA	NA	3.86	1.82	-0.03	0.07	0.06	0.11*	0.24***	0.06	-0.13**	0.03	-0.04	NA						
11	Employer Provided	NA	NA	0.14	0.35	0.04	0.16**	0.07	0.13**	0.05	0.09	-0.06	0.12*	-0.07	0.02	NA					
12	Social Desirability	NA	NA	6.72	2.33	0.06	-0.10	0.03	-0.03	-0.24***	-0.19***	0.15**	0.02	0.09	-0.09	-0.04	NA				
13	Maritial Status	NA	NA	0.55	0.50	-0.22***	0.07	-0.12*	0.00	0.03	0.14**	-0.57***	-0.19***	-0.34***	0.15**	0.01	-0.12*	NA			
14	Phone Type	NA	NA	0.55	0.50	0.10*	0.14**	0.08	0.06	0.16***	0.07	0.02	0.04	0.05	0.07	0.14**	-0.11*	-0.04	NA		
15	General Usage	NA	NA	3.34	3.26	0.07	0.19***	0.14**	0.15**	0.32***	0.29***	-0.19***	-0.03	-0.10	0.19***	0.18***	-0.11*	0.15**	0.12*	NA	
16	Clinical Complusive Checking	0.89	0.57	4.72	1.12	0.34***	0.37***	0.32***	0.60***	0.47***	0.02	-0.12**	0.08	0.00	0.05	0.07	-0.14**	0.05	0.03	0.13**	**0.75**

Note: * p < 0.05, ** p <0.01, *** p < 0.001. Square root of the AVE on diagonal.

Table 2. Latent Variable Correlations.

Discriminant validity

To provide evidence of adequate discriminant validity of all the reflective constructs in the model, we examine the factor loadings and cross-loadings of each measurement item as well as conduct the Fornell-Larcker test (Fornell and Larcker, 1981). We examine the discriminant validity by comparing the square root of the AVE against the correlations of other constructs in the model. Discriminant validity is supported when the square root of the AVE is larger than any other off-diagonal correlations (Fornell and Larcker, 1981). As we show in Table 2, all reflective constructs within this model meet this criterion. As further evidence of discriminant validity, we examined the cross-loadings of each measurement item with all latent variable constructs within the model. All reflective items loaded highly on their respective construct, at a minimum of .64, with all other measurement items cross-loading at least .24 less than the primary loading exceeding the recommended 0.10 difference threshold for cross-loadings (Gefen and Straub, 2005). Thus we find consistent evidence of discriminant validity within our measurement items.

Reliability and Consistency

Scale reliability and consistency was examined by the Cronbach's alpha scores of each construct. Reliability measures of .70 and above are acceptable and present evidence of scale reliability (Nunnally and Bernstein, 1994). All reflective measurement scales provided a minimum Cronbach's alpha score of 0.89 indicating strong reliability of the scales (see Table 2).

Structural Model

The structural path model in Figure 2 was estimated with 1000 bootstrapping re-samples of the 432 responses to provide path estimates and significance levels (Chin 2010). PLS does not provide overall goodness-of-fit measures; rather, PLS models should be evaluated on the basis of their R^2 values and the direction and significance of the coefficients in relation to the hypotheses. The model explains 17% of the variance of dangerous mobile phone usage, 40% of the variance of compulsive mobile phone checking, and 46% of the variance of perceived responsibility. Consistent with previous OCD studies, we find that perceived responsibility has a positive relationship with compulsive mobile phone checking above and beyond a person's general levels of OCD, in support of H1. Perceived work, family and friendship demand also are significant indicators of perceived responsibilities in support of H2a, H2b, and H2c. Additionally, we find significant evidence of a positive relationship between compulsive mobile phone checking and dangerous mobile phone usage, in support of H3. Therefore, the structural model in Figure 2 indicates support for all hypothesized relationships.
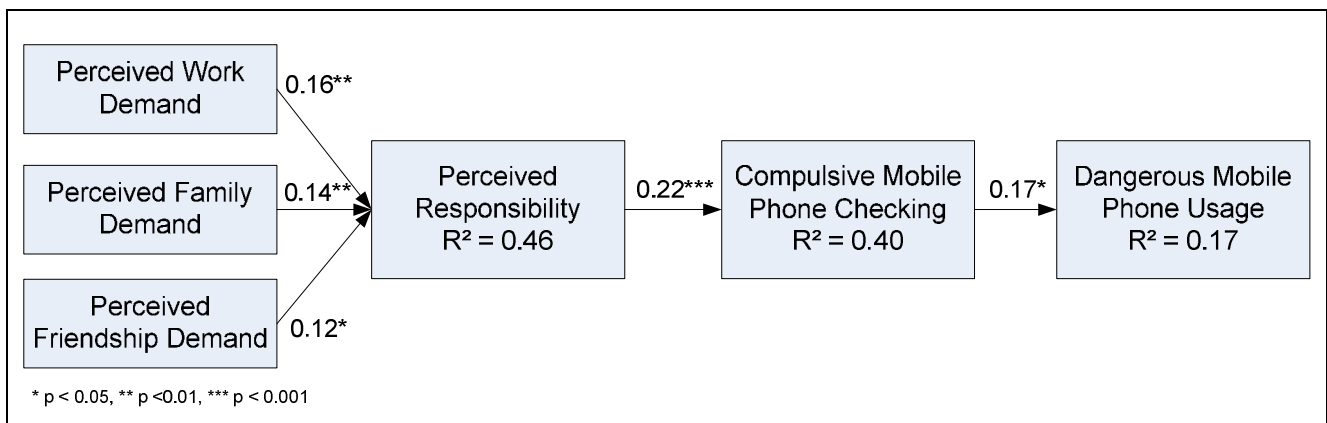

Figure 2. Structural Model Estimation

DISCUSSION

These results provide supporting evidence that the motivation underlying some dangerous mobile phone use is very similar to obsessive compulsive checking behaviors. Therefore, by considering OCD behaviors, we can further improve predictions of dangerous mobile phone use which may be initiated through reflexive actions via mobile phone stimuli and produce irrational usage behaviors despite high levels of risk.

The purpose of this study was to examine dangerous mobile phone use from a complementary perspective of obsessive compulsive checking. Evidence of compulsive checking behavior brings to light the notion that the underlying motivations of mobile phone use may not always be pleasure driven but rather a response to heightened stress and anxiety as people attempt to manage their role responsibilities. Inflated levels of responsibility drive such obsessive compulsive checking (Salkovskis et

al. 2000), and compulsive checking behaviors are initiated in an attempt to alleviate the stress and anxiety that the person experiences (Reeves, Reynolds, Coker, and Wilson, 2010). As mobile phones have become our primary means of communication within networks and provide constant access, their usage to cope with and manage responsibilities constitutes a crucial function of the device (Meerkerk et al. 2010). Mobile phones have become multi-function devices which allow for a variety of both hedonic and utilitarian uses. While the addiction perspective may explain some use, an examination of complementary perspectives such as OCD is required to examine the usage of functionalities that may not provide pleasure to the users. Additionally, as the potential interventions for treating addictions and OCD differ fundamentally on their focus of varying motivations, the identification of these underlying motivations are critical to the success of future interventions.

Theoretical Contributions

Previous research has primarily focused on the addiction perspective of excessive mobile phone use and overlooked the potential explanatory power of OCD behaviors (Bianchi and Phillips, 2005; Jenaro, Flores, Gómez-Vela, González-Gil, and Caballo, 2007; Leung, 2008). We offer evidence that perceived responsibility relates to the increased compulsive mobile phone checking that a person exhibits thereby supporting the idea that it may be stress and anxiety influencing usage instead of pleasure as indicated by some addiction motivations. Additionally, an OCD perspective indicates that reflexive actions through compulsive checking, rather than purely conscious goal motivated actions, may influence the potential use in dangerous situations such as driving a vehicle.

Practical Implications

The results of our study have important implications for the prediction and control of excessive and dangerous mobile phone use. Current legislative bans on usage while driving have not been highly effective in reducing use. The failure of recent bans on mobile phone use while driving (Copeland 2010) may be in part due to their assumptions of the underlying motivations of usage. For example, banning a person with compulsive checking behaviors from checking will likely not produce beneficial outcomes; the person's increased levels of anxiety and distress due to the ban may simply outweigh the potential costs associated with checking in dangerous situations. Individuals with OCD often recognize that their compulsions are irrational yet perform them anyway (Rachman 2002); a ban may do little to reduce the individual's intense need to mitigate distress, anxiety, and potential harm to others in their network. Thus, alternative interventions and treatments should be examined as a potential solution to usage driven by compulsive checking.

From a technological standpoint, creating multiple notifications and alerts that distinguish different types of communication (e.g., e-mail, texts, calls), networks (friends, work, family), and levels of importance (urgent, when convenient, unimportant) might reduce compulsive mobile phone checking by disrupting the reflexive stimuli that trigger the instant response (Skinner 1963). Current mobile phones typically produce a single type of vibration for all notifications, though it is possible to create different ring tones or alerts for different individuals many still simply rely on a singular alert. The ability to create notifications based on networks and message importance could be effective means of changing the stimuli produced by mobile phones and thus reducing the levels of compulsive checking which are triggered by the repeated stimuli.

Limitations and Future Research

While our investigation of dangerous MPU provides evidence of a complementary perspective on the motivations of usage there are some limitations. First, this study relies on self-reported usage data which may have underestimated the actual dangerous usage levels. However, after controlling for social desirability biases there are still significant results indicating the robustness of our findings. Second, our measure of dangerous MPU did not differentiate calls made with the phone versus those made with hands-free devices which future studies should attempt to capture. Third, while we control for employer provided phones in an attempt to capture the increased expectations of usage future research should examine specific job designs and requirements as well which may place employees on the road as a function of their job (i.e. professional drivers). Fourth, this sample consisted of a larger population of young males compared to the general population; however, our pilot studies with varying demographics produced a similar pattern of results indicating robustness. Future research should focus on gathering objective usage measures across time and within the specific contexts of interest. Fifth, prior research has indicated additional effects of a variety of personality traits such as impulsivity (Billieux et al. 2010, 2007) and neuroticism (Bianchi and Phillips 2005) that may influence an individual's usage. Therefore, future research should examine the potential of additionally personality traits to examine the robustness of our findings. As the functionality of the mobile phone has increased, an examination of the specific functions and features that are used may lead to a better indication of their motivations. Additionally, our current measurement scales examine demand levels and responsibility from a very general perspective, future research may try and contextualize the measures in closer relation to specific facets of an individual's life for more a detailed examination. Finally, researchers should examine both addiction and compulsive checking perspectives together to determine their influence in various contexts, outcomes, and the success of interventions.

CONCLUSION

By examining dangerous mobile phone use through the lens of obsessive compulsive checking, we find support for an emerging perspective. Our introduction of an alternative explanation provides further motivation to attain a deeper understanding of excessive and dangerous technology use to develop conclusions and potential interventions for the issue. The results of our study bring to light potential answers to the unsuccessful legislative bans on mobile phone use while driving (Copeland 2010; Highway Loss Data Institute 2010). Therefore, additional studies should examine the potential interventions that aim to reduce obsessive compulsive checkers' behaviors which may inform solutions to reduce excessive and dangerous mobile phone use in various dangerous scenarios.

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Appendix 1. Complete PLS Model Estimates

Variables	Perceived Responisibility	Compulsive Mobile Phone Checking	Dangerous Mobile Phone Usage
Age	0.00	-0.13*	-0.03
Employment Status	-0.01	0.03	0.08
Gender	-0.02	-0.07	-0.14*
# Immediate Cells	0.07*	0.15***	-0.05
Employer Provided	0.06	-0.07	0.02
Social Desirability	0.04	-0.15***	-0.12
Maritial Status	0.01	-0.14**	0.05
Phone Type	0.00	0.10*	0.01
General Usage		0.20***	0.22**
Clinical Complusive Checking	0.46***	0.27***	-0.12
Family Demand	0.14**		
Friendship Demand	0.12*		
Work Demand	0.16**		
Responsibility		0.22***	
Compulsive Mobile Checking			0.17*
R²	0.47	0.40	0.17

Note: * p < 0.05, ** p <0.01, *** p < 0.001. Controls in italics.

Appendix 2. Questionnaire Items

Construct		Items	Means	SD
Perceived Work Demand Boyar et al. (2007) *Reflective*	1	My job requires all of my attention.	5.30	1.48
	2	I feel like I have a lot of work demand.	4.96	1.41
	3	I feel like I have a lot to do at work.	5.19	1.42
	4	My work requires a lot from me.	5.28	1.43
	5	I am given a lot of work to do.	5.04	1.50
Perceived Family Demand Boyar et al. (2007) *Reflective*	1	I have to work hard on family-related activities.	5.12	1.46
	2	My family requires all of my attention.	5.31	1.41
	3	I feel like I have a lot of family demand.	5.12	1.41
	4	I have a lot of responsibility in my family.	5.57	1.36
Perceived Friendship Demand Boyar et al. (2007) *Reflective*	1	I have to work hard on friendship-related activities.	4.75	1.41
	2	My friendships require all of my attention.	4.69	1.41
	3	I feel like I have a lot of friendship demand.	4.68	1.46
	4	I have a lot of responsibility in my friendships.	4.82	1.43
Perceived Responsibility Salkovskis et al. (2000) *Summated*	1	I often feel responsible for things which go wrong.	4.77	1.38
	2	If I don't act when I can foresee danger, then I am to blame for any consequences if it happens.	4.79	1.33
	3	Thinking bad things is as bad as doing bad things.	4.96	1.37
	4	I worry a great deal about the effects of things which I do or don't do.	4.86	1.28
	5	To me, not acting to prevent disaster is as bad as making disaster happen.	5.03	1.27
	6	If I know that harm is possible, I should always try to prevent it however unlikely it seems.	5.25	1.26
	7	I often take responsibility for things which other people don't think are my fault.	4.68	1.41
	8	I am often close to causing harm.	3.65	1.63
	9	I must protect others from harm.	5.18	1.11
	10	I should never cause even the slightest harm to others.	5.16	1.31
	11	I will be condemned for my actions.	4.77	1.33
	12	If I can have even a slight influence on things going wrong, then I must act to prevent it.	5.16	1.26
	13	For me, even slight carelessness is inexcusable when it might affect other people.	5.00	1.32
	14	Even if harm is a very unlikely possibility, I should always try to prevent it at any cost.	5.08	1.33
	15	Many of my past actions have been intended to prevent harm to others.	4.86	1.33
	16	I have to make sure other people are protected from all of the consequences of things I do.	5.00	1.20
	17	If I cannot be certain I am blameless, I feel that I am to blame.	4.52	1.34
	18	If I take sufficient care then I can prevent any harmful accidents.	4.99	1.22
	19	I often think that bad things will happen if I am not careful enough.	4.91	1.40
	20	I am too likely to feeling responsible for things going wrong.	4.64	1.42
	21	I must always think through the consequences of even the smallest actions.	4.98	1.29
	22	Everything I do can cause serious problems.	3.60	1.66
	23	To me, not acting when disaster is a slight possibility is as bad as making that disaster happen.	4.50	1.40
	24	In all kinds of daily situations, my inactivity can cause as much harm as deliberate bad intentions.	4.27	1.42
	25	Once I think it is possible that I have caused harm, I can't forgive myself.	4.52	1.41
	26	Other people should not rely on my judgment.	4.26	1.49
	∑	Summated score of the responsibility attitude scale.	123.39	20.37

Appendix 2. Questionnaire Items (continued)

			Means	SD
Compulsive Mobile Phone Checking *Reflective Adapted from Alexander et al. (2007)*	1	I tend to check my phone for alerts even when I know that I have not received anything.	4.75	1.65
	2	I tend to check my cell phone as soon as I hear a cell phone alert.	5.21	1.32
	3	I tend to check for the missed messages on my cell phone frequently.	5.02	1.43
	4	I tend to check my phone first thing in the morning when I wake up.	5.08	1.49
	5	I tend to check my phone in the middle of the night.	4.23	1.85
	6	I tend to reach for my phone every time I hear a vibration noise.	4.95	1.55
	7	I tend to reach for my phone every time I hear a cell phone alert.	5.11	1.40
	8	I tend to check my phone for missed calls and/or messages as soon as I leave class.	5.08	1.46
	9	I have difficulty controlling the amount of time I spend on my cell phone.	4.34	1.82
	10	I find it difficult to control my cell phone use.	4.29	1.91
Dangerous Mobile Phone Usage *Formative*	1	I answer calls while driving.	3.23	1.88
	2	I answer emails while driving.	2.60	1.67
	3	I answer text messages while driving.	2.90	1.79
	4	I make calls while driving.	3.16	1.91
	5	I send emails while driving.	2.65	1.78
	6	I send text messages while driving.	2.88	1.84
	7	I browse the internet while driving.	2.64	1.80
	8	I check social networks applications while driving.	2.70	1.83

Controls		**Items**	**Means**	**SD**
Obsessive Compulsive Checking Burns et al. (1996) *Reflective*	1	I have to do things several times before I think they are properly done.	4.61	1.53
	2	I tend to keep on checking things more often than necessary.	4.68	1.36
	3	I check and recheck gas and water taps and light switches after turning them off.	4.64	1.60
	4	I keep checking forms, documents, checks, etc., in detail to make sure I have filled them in correctly.	5.04	1.40
	5	I keep on going back to see that matches, cigarettes, etc., are properly extinguished.	4.53	1.59
	6	I check letters carefully many times before posting them.	4.95	1.38
	7	Sometimes I am not sure I have done things which in fact I know I have done.	4.65	1.44
	8	When I read, I have the impression I have missed something important and must go back and reread the passage at least two or three times.	4.59	1.59
General Usage *Formative*	1	How many years have you owned a cell phone?	6.19	3.27
	2	How many hours a day do you spend talking on the phone?	2.84	3.12
	3	How many hours a day do you spend texting on the phone?	2.06	2.84
	4	How many hours a day do you spend emailing on the phone?	1.04	2.14
	5	How many calls do you receive a day?	17.74	18.44
	6	If you receive emails, how many do you receive a day?	9.95	17.86
	7	If you receive texts, how many do you receive a day?	36.76	58.81
# Immediate Cells	1	Number of mobile phones in the individual's immediate family.	3.86	1.82
Age	2	Age of individual.	28.26	8.28
Social Desirability	3	Summated score of the social desirability scale.	6.72	2.33
Maritial Status	4	Marital status of the individual (1 = Single, 0 = Other).	.55	.50
Gender	5	Dummy variable for gender of individual (1 = Female, 0 = Male).	.38	.49
Phone Type	6	Dummy variable for mobile phones that are smartphones (1 = Smartphone, 0 = Other)	.55	.50
Employment Status	7	Dummy variable for the employment status of the individual (1 = Employed, 0 = Unemployed)	.70	.46
Employer Provided	8	Dummy variable for employer provided mobile phones (1 = Yes, 0 = No)	.14	.35