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The relationship between cell phone use, academic performance, anxiety, and Satisfaction with Life in college students

Andrew Lepp *, Jacob E. Barkley, Aryn C. Karpinski

Kent State University, College of Education, Health and Human Services, Kent, OH 44242-000, USA

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ABSTRACT

While functional differences between today's cell phones and traditional computers are becoming less clear, one difference remains plain – cell phones are almost always on-hand and allow users to connect with an array of services and networks at almost any time and any place. The Pew Center's Internet and American Life Project suggests that college students are the most rapid adopters of cell phone technology and research is emerging which suggests high frequency cell phone use may be influencing their health and behavior. Thus, we investigated the relationships between total cell phone use ($N = 496$) and texting ($N = 490$) on Satisfaction with Life (SWL) in a large sample of college students. It was hypothesized that the relationship would be mediated by Academic Performance (GPA) and anxiety. Two separate path models indicated that the cell phone use and texting models had good overall fit. Cell phone use/texting was negatively related to GPA and positively related to anxiety; in turn, GPA was positively related to SWL while anxiety was negatively related to SWL. These findings add to the debate about student cell phone use, and how increased use may negatively impact academic performance, mental health, and subjective well-being or happiness.

1. Introduction

Distinctions between today's cellular phones (henceforth cell phones) and traditional notions of the computer are becoming less and less clear. For example, in 2011, the 8th US Circuit Court of Appeals ruled that smart phones as well as ordinary cell phones (those used only to make calls and send text messages) are, from a legal standpoint, computers (United States v. Kramer, 2011). In terms of functionality, cell phones complete many of the same tasks as an Internet connected computer. As such, today's cell phones allow users to call, text, e-mail, video conference, microblog, interact on social-networks, surf the Internet, watch and share videos and pictures, play video games, and utilize a tremendous array of software driven applications. In contrast to traditional notions of the computer, the mobile nature of the cell phone allows these services to be accessed almost anywhere and at almost any time. Considering that cell phones and their growing suite of applications are typically within arm's reach of nearly everyone, it is worth considering what influence they may have on users' beliefs, attitudes, behaviors and behavioral outcomes. It may be that cell phone use (CPUse) has implications for human behavior which extend beyond the realm of communication.

For example, a recent study by our group (Lepp, Barkley, Sanders, Rebold, & Gates, 2013) found that CPUse was negatively related to an objective measure of physical fitness (VO2peak) among a sample of typical college students. In other words, high cell phone users were less physically fit than low cell phone users. Interview data collected as part of the study explained the negative relationship by suggesting that CPUse disrupts physical activity behavior, causing high frequency users to be less physically active and more sedentary in comparison to low frequency users. Unpublished interview data collected during the same study also suggested that CPUse may disrupt college students' academic achievement and contribute to anxiety. Specifically, when participants were asked to provide details about their CPUse, several indicated that it occurred during class time or while studying. For example, one participant stated "I usually go on my phone if I am bored sitting there in class. Or during homework I will take little Twitter breaks." Likewise, when asked to explain their experience of CPUse, some indicated that CPUse is associated with feelings of anxiety. For example, another participant stated:

> The social network sometimes just makes me feel a little bit tied to my phone. It makes me feel like I have another obligation in my life that I have to stick to. Sometimes the cell phone just makes me feel like it is a whole new world of obligations that I have because anybody can get a hold of me at any time by just thinking about me. You know, if my mom wanted to give me a call right now, and just talk for a second, she could. And if I did

* Corresponding author. Tel.: +1 (330) 672 0218; fax: +1 (330) 672 4106.
E-mail addresses: alepp1@kent.edu (A. Lepp), jbarkle1@kent.edu (J.E. Barkley), akarpins@kent.edu (A.C. Karpinski).

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not call her back by the end of the day, she would get worried. It creates a bit of anxiety and it is kind of annoying sometimes.

Closely inspecting the data revealed that such responses were more common among high frequency cell phone users than low frequency cell phone users. Considering this, the purpose of this study was to investigate these potential relationships further using objective or validated measures. Of particular interest were the following relationships: CPUse and academic performance; CPUse and anxiety; and CPUse and Satisfaction with Life as mediated by academic performance and anxiety.

1.1. Cell phone use, academic performance, and anxiety

Research investigating CPUse and academic performance is limited and methods vary substantially from study to study. Nevertheless, results suggest a relationship exists. Jacobsen and Forste (2011) identified a negative relationship between the use of a variety of electronic media including cell phones (calling and texting) and academic performance (self-reported GPA) among first year university students in the United States. Using data collected from a sample of Taiwanese adolescents, Yen et al. (2009) found an association between CPUse (calling and texting) and participants' self-assessment of whether or not they had allowed CPUse to interfere with "important social, *academic*, or recreational activities" during the previous year (p. 866). Hong, Chiu, and Hong (2012) found daily CPUse (calling and texting) to be correlated with a self-reported measure of academic difficulty among a sample of female, Taiwanese university students. Finally, Sánchez-Martínez and Otero (2009), using a sample of Spanish high school students, found a relationship between "intensive" CPUse and school failure. School failure was operationalized as having repeated the previous year's grade level or failing four or more courses during the previous academic year. Although these studies utilized a variety of self-reported measures, academic performance was consistently and negatively associated with CPUse (calling and texting).

Several researchers have pointed to multi-tasking as an explanation for the negative relationship identified between CPUse and academic performance (Jacobsen & Forste, 2011; Junco & Cotton, 2011, 2012; Rosen, Carrier, & Cheever, 2013; Wood et al., 2012). Jacobsen and Forste (2011) reported that over two-thirds of the university students in their study used electronic media (including cell phones) while in class, studying, or doing homework. Likewise, Sánchez-Martínez and Otero (2009) found that although CPUse was typically prohibited in the classroom, half of the students in their sample reported bringing the device to school and keeping it on during class. In two studies specifically targeting multi-tasking and academic performance, Junco and Cotton examined large samples of college students and found that sending text messages and checking Facebook while studying or doing homework was common behavior. Furthermore, this behavior interfered with schoolwork (2011) and was negatively related to overall college GPA (2012). Wood et al. (2012) measured the influence of multitasking with an array of digital technologies (texting, e-mail, Facebook, MSN messaging) on real-time learning. Participants were randomly assigned to various conditions (multi-tasking with one of the four technologies or no multitasking) while participating in classroom learning activities. After the learning activities were complete, a 15-item multiple choice test was used to assess learning. Results showed that multi-tasking with any of the technologies examined had a negative impact on learning. Most recently, Rosen, Carrier et al. (2013) observed the study behaviors of a sample of middle school, high school, and university students and found participants typically became distracted by media such as Facebook and texting in less than 6 min after initiating a studying session. Furthermore, measurements of daily Facebook use and daily texting behavior predicted off-task behavior during study periods. Notably, all of the media related technologies associated with increases in multi-tasking and decreases in academic performance are now commonly accessed with a single, Internet-connected cell phone.

Like the research investigating CPUse and academic performance, research investigating CPUse and anxiety is limited. Furthermore, measures of anxiety vary from study to study. Nevertheless, there is evidence of a positive relationship between CPUse and anxiety, particularly among individuals identified as problematic cell phone users (Beranuy, Oberst, Carbonell, & Chamarro, 2009; Bianchi & Phillips, 2005; Ha, Chin, Park, Ryu, & Yu, 2008; Jenaro, Flores, Gómez-Vela, González-Gil, & Caballo, 2007; Lu et al., 2011). Problematic cell phone use has been described as an addiction-like behavior leading individuals to use the cell phone compulsively (Takao, Takahashi, & Kitamura, 2009). However, it is not clear whether the relationship between CPUse and anxiety exists independent of problematic behavior. For example, Hong et al. (2012) found a positive correlation between daily CPUse (calls and texts) and anxiety, but further investigation suggested that the relationship was mediated by cell phone addiction. Taken as a whole, these studies identify a positive relationship between problematic CPUse and anxiety. Moreover, these studies suggest a need to expand our understanding of this relationship beyond problematic users. As Merlo (2008) suggests, even typical cell phone users may experience some level of anxiety as a result of perceived obligation to remain constantly connected with others. In support of this idea, Rosen, Carrier et al. (2013), and Rosen, Whaling, Rab, Carrier, and Cheever (2013)investigated anxiety related to technology use among a large sample of teens, young adults and adults. Their results show that not being able to connect with technology, particularly Facebook, text messages and cell phone calls, as frequently as desired was associated with feelings of anxiety. Furthermore, technology use and technology related anxiety was predictive of mood and personality disorders.

Increasingly, a diversity of media-related technologies are accessible through the modern cell phone. Thus, when exploring the behavioral impacts of CPUse there is a need to consider other cell phone uses such as Facebook, surfing the Internet, and playing video games. Research has explored many of these activities in relation to academic performance and anxiety independent of CPUse. In many ways, the findings are similar to what has been described above for calling and texting. For example, video game playing has been associated with lower GPAs (Jackson, von Eye, Fitzgerald, Witt, & Zhao, 2011; Jackson, von Eye, Witt, Zhao, & Fitzgerald, 2011). High levels of Internet use have been associated with anxiety (Beranuy et al., 2009; Jenaro et al., 2007) and low levels of Internet use have been associated with improved academic performance (Chen & Peng, 2008). However, there is research to suggest that it is not the amount of time that a student spends online but rather what a student does online which affects these variables (Chen & Tzeng, 2010). Chen and Tzeng found that female high Internet users who engage in information seeking and chatting had better academic performance than low users. On the other hand, the same group of female high users felt more depressed than low users. Likewise, heavy Internet users who focused on information seeking, chatting and video games had lower levels of academic performance and felt more depressed than low users.

When considering specific Internet-based activities, social networking (e.g., Facebook, MySpace, and Twitter) has become extremely popular in recent years, and several studies have identified a negative relationship between social-networking site (SNS) use and academic performance (e.g.: Rosen, Carrier et al., 2013; Stollak, Vandenberg, Burklund, & Weiss, 2011). Kirschner and Karpinski (2010) demonstrated that Facebook users have lower GPAs and spend fewer hours per week studying than non-users. Likewise,