### A Dissertation entitled

Examining Recreational Phone Use Among College Students and its effect on Health and Academic Performance

by

John A Matkovic

Submitted to the Graduate Faculty as partial fulfillment of the requirements for the

Doctor of Philosophy Degree in Health Education

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The University of Toledo December, 2022

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**Introduction**: College students are spending approximately a third of their day on their cell phones (Penglee et al., 2019). Students' excessive use of phones is distracting, detrimental to students' grades, and can negatively impact students' mental health (Glassman et al., 2021; Lepp et al., 2014; Smetaniuk, 2014). There is a lack of research regarding the prevalence of phone use among students, how perceptions affect phone use, and what types of messaging may influence phone behaviors.

**Purpose**: This alternative, or manuscript dissertation, includes two distinct studies. Study one is a quantitative study which examined the prevalence of phone use, addictive phone tendencies, the effects that perception (social norms) have on phone use, and whether phone in the classroom use is predictive of poor grades. Study two was an experimental, message manipulation where participants were exposed to one of several preventive messages. This study utilized a quantitative design (with qualitative elements) to assess which message was most effective in influencing willingness to change behaviors, and whether the Precaution Adoption Process Model (PAPM) and the Elaboration Likelihood Model (ELM) may be useful in influencing modifying college students' phone behavior. **Methods:** (Study 1) An online survey was distributed via Prolific with 40 survey items to measure the prevalence of phone use in class and while studying, perceptions of use among peers (including injunctive and descriptive norms), and to measure addictive phone behaviors (n=500). (Study 2) Using the same participant pool as study 1, an online survey was utilized to conduct an experimental message manipulation to determine which message type was most effective in influencing participants' willingness to change phone-use behaviors. Inclusion criteria for both studies was the same: current undergraduate students who own a smartphone.

**Results:** (Study 1) Participants reported using their phones at high levels, averaging more than five hours each day. The more participants believed college students were using their phones, the more they used their own phones. Additionally, the more screen time participants had, the more they procrastinated. (Study 2) While there was not a main effect on message type on willingness to reduce ROAM, there was a main effect of message type on how certain participants were that they could change. Those who viewed the high relevance statement, and the gain-frame message were more certain they could change their phone behavior. Five main themes emerged from the qualitative analysis of the message feedback which included: 1) Supporting/Relevant, 2) More Information Wanted, 3) Not Persuasive, 4) Defensiveness, and 5) Introspection.

**Conclusions:** Based on the results of the first study, student perceptions regarding the prevalence of phone use are associated with their phone behaviors. Therefore, social norms messages may be a promising approach for researchers and practitioners to use in designing interventions to address excessive and inappropriate phone use. Additionally,

participants frequently checked their phones in class, when studying, and averaged more than five hours of screen time on their phone daily. Although this high usage did not appear to impact their grades, it was associated with increased self-reported procrastination and anxiety levels. Regarding the second study, defensiveness concerning participants' phone usage emerged as a major theme, and a possible barrier to behavior change. While no main effect emerged identifying the best message to increase willingness to change, participants who viewed the gain-framed message were more certain that they could change their behavior. Further, participants who were more anxious and procrastinated more, were less likely to report an increase in their willingness to modify their phone behaviors. While these two studies provide insights into student phone behaviors, additional research is needed to understand why students are so unwilling to change their behaviors and to develop health education materials regarding phone use.

#### Acknowledgments

I want to first thank each of my committee members; without their support, expertise, and recommendations I would not have made it through my dissertation. Thank you to Dr. Glassman for acting as my chair and for helping me work through the additional challenges of our sudden virtual shift in the past two years. I also want to give a special thank you to the rest of my committee: Dr. Amialchuk, Dr. Geers, Dr. McKenzie, and Dr. Na. I would also like to thank Dr. Dake for taking a chance on me and inviting me to apply to the Health Education program over four years ago.

I also cannot forget to thank my family and friends for their unending support. For my friends, thank you for your excited text messages when I found out I was accepted into a PhD program and thank you for the continued excitement as I've neared the end of my studies. Thank you to my family as well, who have always been supportive of my efforts to continue my education, even when it meant a change in my career trajectory. Their support and value in my happiness first and foremost helped when I needed to make difficult decisions, and I strive show others the same level of support. Lastly, thank you to Kelly for going on this journey with me, during all the great days, late nights, conference trips, and all of your help with statistics. I don't know how I would have made it through this process without a loving partner so supportive and excited to discuss science, and health, and research day in and day out.

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### List of Abbreviations

ANOVA.....Analysis of Variance

COVID-19.....Coronavirus Disease of 2019

ELM.....Elaboration Likelihood Model

GPA.....Grade Point Average

IRB.....Institutional Review Board

PAPM.....Precaution Adoption Process Model

ROAM......Recreational Off-Task Academic Mobil Phone use

SPSS.....Statistical Packages for Social Sciences

US.....United States

### List of Symbols

 $(\mathbb{R})$ Registered Trademark $X^2$ Chi-square $R^2$ Standardized Coefficient=Equals>Greater than<</td>Greater than<</td>Less thanpp-valuenSample Size $\eta^2$ Partial eta squareSEStandard errorBBeta%US Dollars

### **Chapter 1**

# Prevalence and Perceptions of Phone Use Among College Students

### Introduction

The first chapter of this alternative dissertation (two studies) includes the introduction to the topic and a description of the problems associated with recreational phone use in class among college students. Recreational phone use is any phone use in class that is not explicitly for class purposes. This may include texting, browsing the internet, playing games, shopping or going on social media. More specifically, the following issues are examined: prevalence estimates of phone use among college students in the United States (U.S.), the academic impact of phones, the public health impact of phone use, and how health communication may address this problem. This chapter concludes with the purpose of the studies, research questions, definition of terms, research questions, and topics under investigation.

**Prevalence of Phone Use Among College Students in The U.S.** Smartphone use has become commonplace in society, with college students being among the highest users of phones. Penglee et al., (2019) report college students spend as many as eight hours or more each day on their phones. Researchers have identified various consequences associated with phones and high phone usage. For example, college students' use of phones in class or while they study inhibits learning for many students (Lepp et al., 2015; McCoy, 2016). Indeed, college students use their phones and other digital devices over 100 times a day on average for non-academic activities and report that they are regularly distracted by their phone use (Glassman et al., 2021; McCoy, 2016). -Phone use among college students may increase the risk for various health issues and poorer academic outcomes. If students struggle academically, it could potentially lead to them failing classes or leaving college.

**Benefits of a College Degree**. Completing a college degree provides several benefits to would-be college graduates. The first, and perhaps most desirable\_advantage to earning a college degree, is the opportunity for higher earning potential. According to Chen (2017), individuals with a bachelor's degree make on average 40% more in weekly pay compared to those with a high school diploma. Elsewhere, the median earnings of individuals with a college degree are estimated to be \$21,000 more per year than those with just a high school degree (Baum et al., 2013). Additionally, unemployment rates are much higher on average for those with a high school diploma compared to those with a bachelor's degree; in some instances, unemployment rates are as much as seven percent lower for those without a college degree (Baum et al., 2013; Chen, 2017). Further, college graduates are likely to earn on average one million dollars more in their lifetime than those with a high school diploma (UAB, 2020).

Higher education levels are also associated with better health outcomes and better overall health (Eide & Showalter, 2011). For instance, college-educated individuals are significantly less likely to smoke, be obese later in life, or have children who are obese (Baum et al., 2013). In addition to these positive health outcomes, college-educated adults are also more likely to have employer-based health insurance and lower overall healthcare costs than those without a college degree (Baum et al., 2013). Finally, individuals with only a high school diploma are three times as likely to end up in poverty

than individuals with a college degree (Baum et al., 2013). There are many ways poverty can negatively affect health, mental health, and stress—thereby demonstrating the importance of earning a degree and the protective implications for health.

# Estimates of Current College Graduation Rates and College Retention Rates.

Given the variety of health and economic benefits that accompany obtaining a college degree, it is important to examine the college graduation rates in the United States. According to data from the National Center for Education Statistics (2020), the six-year graduation rate for incoming college students (in 2012) was 62 percent. However, the rate varies considerably by institution. Nationally, at universities with open admission, only about a third of students graduate with a bachelor's degree within six years (NCES, 2020). For universities with low admission rates, the graduation rates are much higher (NCES, 2020). The vast differences in college graduation rates highlight the need to address these disparities. Retention rates are important because they provide a window into overall student success from year to year.

Phone Use and Academic Performance. Excessive phone use constitutes a challenge to learning for educators and college students. A variety of studies show that phone use has been associated with poor educational outcomes (Duncan et al., 2012; Felisoni & Godoi, 2018; Lepp et al., 2014a). Indeed, Felisoni and Godoi (2018) found that as phone use among students increased, academic performance decreased. Perhaps unsurprisingly the most damaging effect was seen when students used their phones while in class (Felisoni & Godoi, 2018). Moreover, students who use their phones the least reported the best academic outcomes, and conversely, those who used their phones the most reported the worst grades (Duncan et al., 2012; Lepp et al., 2015a). To further

complicate things, students are aware using their phones too much is a bad habit but still perform the behavior (Lepp et al., 2015a).

**College Phone Use and Mental Health.** Research indicates that high-level or 'excessive' use of phones can also negatively impact mental health. This is concerning because large numbers of college students are already suffering from anxiety, stress, and depression (Beiter et al., 2015). Smetaniuk (2014) describes excessive technology use as any usage involving passive (passive browsing) or active behaviors (actively engaging or posting on social media) that can lead to addictive tendencies. Further, excessive internet use, texting, and general phone use have all been linked to depression in students (Sapacz & Clark, 2016; Smetaniuk, 2014). Additionally, Bianchi and Phillips (2005) postulate that individuals with lower self-esteem and self-confidence overly utilize social media to feel better about themselves. Ironically, using social media is considered a mal-adaptive coping technique and often results in people feeling worse about themselves (Smetaniuk, 2014). Such behaviors and reliance on phones as coping mechanisms could lead to an unhealthy cycle of high phone use leading to poor mental health outcomes, which inevitably leads to more phone use.

Mental Health: Addictive Phone Use. Phone use is likely addictive. For example, Roberts and colleagues (2014 & 2015) report that college students use their phones in a compulsive manner despite the consequences. They found the amount of time college students spend on specific activities (e.g., time spent online, time spent on social media sites, and time spent gaming) was associated with addictive cell-phone behaviors (Roberts et al., 2014). Further, Sapacz & Clark (2016) found that college students

reported increased anxiety when their access to their phones was limited; this effect was highest when they could see their phones but not use them.

Excessive phone use can also negatively impact socialization patterns. People dealing with depression are more likely to engage in *passive phone use*, which negatively impacts their social interaction and, in turn, their mental health (Elhai et al., 2017). Moreover, Elhai and colleagues (2017a) describe passive phone use as phone use that lacks any active participation, such as commenting, posting, or liking posts on social media. Studies show that students spend the most time trying to stay connected with others (Roberts et al., 2014, Smetaniuk et al., 2014). When one can't stay connected, this social isolation, exacerbated by passive phone use, may compromise their academic achievement and satisfaction (Irani et al., 2014; Jorgenson et al., 2018; Sultan et al., 2020; Wayment & Walters, 2016).

Further complicating matters, excessive phone use can also harm sleep quality (Amra et al., 2017; Rosen et al., 2016; White et al., 2010). Students are more likely to wake up throughout the night when they exhibit addictive tendencies (Rosen et al., 2016). Students who interrupt their sleep with their phone use invariably report poor sleep quality and are more likely to perform poorly on tests (Ahrberg et al., 2012, Rosen et al., 2016).<sup>27</sup> Improving college students' self-control may help address late-night phone use, thereby improving sleep, and, in turn, academic performance (White et al., 2010).

Phone Use and Physical Health. Excessive phone use can also profoundly impact physical health. Like other types of screen use, high levels of phone use are associated with decreased physical activity (Lepp et al., 2015; Lepp & Barkley, 2019, Lepp et al., 2013). This connection is essential because lower levels of physical activity

are associated with chronic diseases such as diabetes, anxiety, and depression (Larson et al., 2015; Lee and Kim, 2019). Regular, daily use of phones has also been linked to increased feelings of fatigue, poor posture, and musculoskeletal issues (Benden et al., 2021, Neupane et al., 2017, Park et al., 2015). For example, research reveals that chronic neck pain (known as "text neck") is tied to frequent phone use (Neupane et al., 2017, Park et al., 2015). However, there are other concerns beyond just text neck. Any repetitive movement has the potential to result in pain or strain. For example, frequent texting and tapping of thumbs on modern smart phones is associated with musculoskeletal disorders of the thumbs (SMS thumb) and forearms (Gustafsson et al., 2018; Shah & Sheth, 2018). While text neck and SMS thumb may cause short-term pain and discomfort, premature arthritis and disability constitute serious medical issues.

Influencing Behavior Change / Elaboration Likelihood Model. The multitude of risks associated with excessive phone use warrants intervention, particularly with college students. Behavior change can be challenging to achieve; however, researchers and practitioners have successfully utilized the Elaboration Likelihood Model (ELM) to modify behavior through health communication messages. The ELM, developed by Petty and Cacioppo (1986), is a theory used to help researchers and practitioners better understand how people interpret messages and ways to make them more persuasive. Not everyone has the desire or capability to understand all the information presented in every message that individuals may encounter. Therefore, according to the tenants of the ELM<sub>a</sub> people process messages based on where they fall on a continuum of processing; central or peripheral processing (Petty & Cacioppo, 1986). Depending on where an individual is on this continuum may help determine how they assess information. The central route of persuasion involves the individual processing the message based on the information presented (i.e., thorough cognitive assessment). Conversely, with the peripheral processing route, a 'cue' or image is used to persuade the individual to make a simple inference about the merit of the message (Petty & Cacioppo, 1986). In sum, a key aspect of the ELM is the idea of elaboration — the degree to which or how intently the individual may consider the information presented in a message (Petty & Cacioppo, 1986).

Researchers have previously used the ELM to try to influence individual attitudes towards specific messages while also addressing the social influences that affect decision making (Chang et al., 2015)., Li (2013) showed the impact a message has could be improved when individuals know and believe the benefits that come with changing behavior(s). Trust in messages can be increased (through either processing route) when the source of the information or message is considered credible by the audience (Zhou et al., 2016). Creating messages using a combination of text and graphics or images has yielded stronger responses to pro-environmental messaging than text alone (Lazard & Atkinson, 2015). Researchers have used the ELM with college populations to address risky behaviors such as *binge* drinking (Glassman et al., 2018; Kitchen et al., 2014). Given that the ELM has been used successfully with college populations, the choice to use the ELM may be a natural fit for addressing college student behaviors with modern media (Kitchen et al., 2014). Because the ELM involves persuasive messaging and communications, as well as segmented persuasion routes, the ELM represents an applicable theory to use with health communication campaigns.

**Precaution Adoption Process Model**. Another behavior change model that has proven useful is the Precaution Adoption Process Model (PAPM). The PAPM was developed to examine how individuals react when they encounter a health threat by using seven distinct stages to explain whether an individual is willing to change a behavior (Janis & Mann, 1977; Weinstein et al., 2008). For example, individuals who encounter information on Radon may indicate they hadn't thought much about testing for Radon. Researchers have used the PAPM to address behaviors that are in response to such threats; the PAPM has been used to better understand how people react to disasters, the threat of radon, and the threat of Human Papillomavirus (HPV) (Crane et al., 2012; Glik et al., 2014; Barnard et al., 2017). The PAPM has value because this model allows for the possibility of relapses, or that an individual may decide not to act at all (Weinstein et al., 2008). Understanding the stage individuals are at can allow health practitioners to identify barriers and better tailor messages. Phone use may be a logical behavior to address using the PAPM because it can be an academic and health hazard, one that many people are unaware of.

**Health Communication.** Health communication is another method researchers and practitioners can use to modify behavior change. The driving force behind health communication is the belief that health outcomes can be improved by providing motivating health-related information to the public (Schiavo, 2014). This health information may be presented to individuals, groups, or even organizations to drive changes that will improve health (Thompson & Harrington, 2022). Posters, pamphlets, press releases, and even face-to-face health education are all common methods used in health communication campaigns (Bensley & Brookins-Fisher, 2019; Schiavo, 2014;

Thompson & Harrington, 2022). Additionally, health communication techniques are not only used to influence behaviors but to create empowering environments in which health messaging will be more readily accepted (Schiavo, 2014; Parvata et al., 2011). Given the multitude of methods available, health communication has been extensively used to promote change for a variety of behaviors.

Conducting formative research, a hallmark of health communication, aids the interventionist in better understanding the barriers, benefits, desired outcome, as well as what to focus on regarding promotion (Case et al., 2017; Parvata et al., 2011). For as long as health practitioners have been encouraging healthy behaviors, health communication has been a practical approach to influencing and changing behaviors. For example, researchers successfully used health communication to address e-cigarette use, exercise habits, healthier eating, and drinking alcohol, among many others (Case et al., 2017; Glassman et al., 2013; Parvanta et al., 2010; Snyder, 2007). It is this broad utility that researchers and practitioners find useful when designing interventions.

Health Communication and College Student Behaviors. Health communication campaigns have been used to promote a variety of health behaviors among college students. In previous studies, researchers were able to utilize health communication techniques to improve stress management and prevent alcohol and substance abuse among college students (Chiauzzi et al., 2008; Kazemi et al., 2017). Peterson et al., (2010) also demonstrated that a health campaign can influence nutrition choices for college students when eating in campus dining halls. Thompson et al., (2013) showed how social marketing, a communication technique under the umbrella of health communication, increased student confidence in risk-reduction methods for drinking

alcohol. Similarly, health campaigns have been effective in reducing the frequency of alcohol consumption among college students (Glassman et al., 2018).

**Social norms.** A dearth of research exists addressing phone use among college students pertaining to their academic outcomes. However, for an inherently social behavior like phone use, a theoretical approach that utilizes this social aspect may be helpful. The social norms theory, or social norms approach, is another theory that has been used to influence or modify behavior among college students (Perkins & Berkowitz, 1986). Group behaviors, specifically behaviors that occur in a social context, can have a strong influence on individual behavior and actions. When this social context influences behavior, it may be known as a social norm (McDonald & Crandall, 2015). Behaviors may become a 'social norm' when that behavior becomes what is expected in certain social situations (McDonald & Crandall, 2015). Norms can help define the attitudes and personality of a group; the pressure to conform and remain relevant in a group setting is a powerful driving force of behavior-(McDonald & Crandall, 2015). As Manski (2000) explains, however, it can be challenging to identify how these interactions occur, and whether behavior change is a result of this social context. Expectations also play a role in social norm-related behavior; when individuals are unsure about performing a behavior, they may look to others to see what behaviors are performed and what results from said behaviors (Manski, 2000).

The social norms approach has utility in a variety of situations. Social norms have been used to address college student drinking, healthy eating among students, sexual assault prevention, eating disorders, and tobacco use among other behaviors (Perkins & Berkowitz, 1986; Berkowitz, 2002; Crosby et al., 2018; Perkins & Berkowitz, 1986;

Rageliene & Gronhoj, 2020). There has been some research utilizing norms to examine phone use. For example, researchers have used a norms approach to look at phone use of employees in the workplace, as well as using norms to predict phone-based distracted driving (Carter et al., 2014; Ragsdale & Cooper, 2016). However, there is a lack of research involving using social norms to adjust phone use behaviors of college students *in class, or while studying*. Because phone use is inherently a social behavior, a social norms approach may have utility in influencing more positive phone behaviors among college students in class.

### **Purpose of This Study**

**Study One.** The purpose of study one is to determine the prevalence of phone use during class and while studying among college students and learn about the implications of this behavior on academic performance. Further, participants' perceptions of their peers' phone use will be examined to assess the relationship between perceptions and behavior. Additionally, this study may provide insight into whether phone use predicts anxiety, depression, and other health issues like text neck. Finally, Results from this study may indicate if interventions are warranted such as social norms marketing campaign to correct misperceptions or a program to address phone/grade/anxiety among college students.

**Study Two.** The purpose of study two is to assess students' perceptions of the effectiveness of several health communication messages designed to reduce recreational phone use among college students in class. Using the Precaution Adoption Process Model (PAPM) and the Elaboration Likelihood Model (ELM) will provide insights into college students' readiness to change their behavior and the elaboration they experience,

respectively, when viewing the tailor-made prevention messages. Finally, an evaluation of the overall appeal and utility of the prevention messages will afford practitioners and researchers with intervention strategies and materials.

### **Definition of Terms**

- ROAM (Recreational Off-Task Academic Mobil Phone use): Smartphone use in class or while studying that is not related to academic purposes.
- Smartphone addiction: repeated use of a phone despite any negative consequences that may be associated with repeated and continual use (Roberts et al. 2014).
- Excessive phone use: passive or active use of technology in a manner that further reinforces use that can lead to addictive behaviors (Smetaniuk, 2014).
- Elaboration Likelihood Model (ELM): model that researchers use to describe how persuasive information is processed by individuals through central and peripheral processing. This model deals with how individuals respond and react to messages and message content (Simons-Morton et al., 2012).
- Elaboration: the amount of effort needed for an individual to understand, process, evaluate, and decide to accept or reject a given message (Yocco, 2014).
- Central Route Processing: an aspect of the ELM that involves the detailed examination of information. The central route requires the observer of the information to already have motivation and ability to review and/or accept the message (Simons-Morton et al., 2012).
- Peripheral Route Processing: an alternate processing route whereby individuals quickly interpret information. The peripheral route is passive, when compared to

the central route, and uses external cues that do not require direct or active knowledge of the issue conveyed in the message (Simons-Morton et al., 2012).

- Precaution Adoption Process Model (PAPM): model with seven stages of change and is used when there is an issue that may require specific and deliberate planning to prevent or minimize harm from a behavior(s) (Simons-Morton et al., 2012).
- Recreational phone use: operationalized by the authors of this study, as any phone use (during class or while studying) that is not strictly used for coursework or academic purposes. This may include texting, shopping, gambling, gaming, using social media, or watching videos online.
- Health communication: Method of influencing the health of individuals, groups, or organizations using, including but not limited to, messages, posters, or direct health education (Bensley & Brookins-Fisher, 2019; Schiavo, 2014; Thompson & Harrington, 2022).

### **Research Questions (Study One)**

The research questions for study one include:

**RQ 1:** What are the prevalence and perceived prevalence of ROAM-ing among college students?

• [RQ 1 Analysis: descriptive statistics]

**RQ 2:** Do perceived norms regarding ROAM-ing predict self-reported phone use in class and while studying?

Does this vary by demographics (gender, race, GPA)?

• [RQ 2 Analysis: descriptive statistics]

**RQ 3**: Is there a relationship between the belief that cell phones can negatively impact college students and college student thoughts on reducing cell phone use?

### • [RQ 3 Analysis: Correlation]

**RQ 4**: Is ROAM a predictor of poor academic performance?

• [RQ 4 Analysis: Multiple Linear Regression]

RQ 5: Is ROAM-ing a predictor of nervousness, procrastination, and/or anxiety?

• [RQ 5 Analysis: Multiple Linear Regression]

**RQ 6**: To what extent do students exhibit addictive tendencies towards their phones while in class?

• [RQ 6: Descriptive Statistics]

### **Research Questions (Study Two)**

• RQ 1: Is there a main effect of message type or ELM processing type on students' certainty that they can change their behaviors, as measured by the certainty item?

### o [RQ 1 Analysis plan: 2x5 between subjects ANOVA

RQ 2: Is there a main effect of message type or ELM processing type on willingness to modify (decrease) phone usage as measured by the PAPM stages of change?

- o Which preventive message is most successful?
- o [RQ 2 Analysis plan: 2x5 Between subjects ANOVA]

- RQ3: Do college students find the messages appealing, believable, creative, persuasive, interesting, understandable, applicable to students, and discouraging of **ROAM**?
  - o Which message(s) do students find most appealing, believable, etc.?

#### **o** [**RQ 3** Analysis plan: descriptive statistics]

- RQ 4: What were the themes that emerged from students' comments regarding the messages?
  - o What specifically did students like about the messages?
  - o What specifically did students dislike about the messages?
  - o [RQ 4 Analysis plan: qualitative analysis]
- RQ5: Are message type and elaboration state predictive of willingness to change?
  - o [RQ5 Analysis plan: multiple regression]

### Delimitations

**Study One**. Participants will be recruited from a nationally representative sample (via survey platform Prolific) to complete an online survey. Participants in study one will be delimited to current undergraduate college students in the United States, ages 18-24. Participants will not be delimited based on race, ethnicity or gender.

**Study Two.** As with study one, study two will be delimited to participants who are current undergraduate college students in the United States, ages 18 to 24. Participants will not be delimited based on race, ethnicity, or gender.

### Limitations

**Study One**. With any type of research limitations exist, and this study is no exception. First, participants were recruited via the software platform Prolific/Qualtrics. This recruitment method could result in selection bias concerning those who actively seek out research opportunities. For example, survey participants are slightly younger, with higher education, and include more women than the general population (Prolific n.d.). Recall bias constitutes another limitation as participants may not be able to accurately remember how often or how much they use their phones. Social desirability represents a concern because participants are asked sensitive questions about their mental health including nervousness, procrastination, and anxiety, which they may be unwilling to acknowledge even with the anonymity highlighted within the informed consent procedures.

**Study Two.** In study two, several noteworthy limitations exist. While a national sample was used participants were limited to those with knowledge and access to the Prolific recruitment platform; therefore, the results should be interpreted with caution. As in study one, because there are questions about personal behavior, participants may provide socially desirable responses. Also, the exposure to the prevention messages may be too brief to determine to assess the efficacy of these messages. In other words, the participants' exposure to the dose or the frequency of the message(s) was not assessed, nor the long-term outcomes.

### **Chapter Summary**

Included in this chapter is a description of the problems that are often associated with excessive recreational phone use among college students. In brief, excessive phone use among college students is associated with sedentary behaviors, increased stress, anxiety, depression, and poor academic outcomes. This chapter also details how the ELM and health communication may be utilized to influence behavior change. Finally, the chapter concludes with the purpose of the study, research questions, terms, as well as the delimitations and limitations of each study.

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#### Chapter Two

## **Prevalence and Perceptions of Phone Use Among College Students**

Chapter two of this dissertation follows the author guidelines for the journal, *Computers in Human Behavior*. This chapter includes an abstract, introduction, procedures, data collection and analysis, results, discussion, acknowledgments, and a funding statement. This study was approved by the University of Toledo Institutional Review Board.

The purpose of study one was to learn about the experiences and motivations of undergraduate college students' cell phone usage during class and while studying. Data were collected from college students to better understand their reasons for using their phones while in class or studying. Additionally, the relationships between phone use and perceptions of phone use among their peers, anxiety, nervousness, and academic procrastination were examined. Answering these questions may assist researchers and practitioners in designing interventions to reduce this obsessive and oftentimes distracting behavior. More specifically, the results from this study will provide information that can be used to design prevention messages.

#### Abstract

**Introduction**: Phone use by college students in the classroom and while studying compromises academic performance. There are also potential mental and physical health ramifications for engaging in this behavior. The purpose of this study was to understand the influence social norms have on phone use among college students and to examine the relationship between phone use, anxiety, nervousness, and procrastination. Additionally, the Precaution Adoption Process Model (PAPM) was used to determine students' readiness to change their phone behavior.

**Methods:** A cross-sectional survey was used to collect data from a national sample of college students (n=500) in the United States. Descriptive statistics were calculated to determine the prevalence of phone use in class and while studying. Multiple linear regressions were conducted to determine whether phone use predicts anxiety, poor academic performance, and if social norms (i.e., perceived prevalence of phone use) help to explain phone use in class and while studying.

**Results:** Participants responded to using their phone an average of 317 minutes (about 5 and a half hours) each day, with some reporting their daily screen time as high as 670 minutes (about 11 hours). Grade point average (GPA) did not appear to be affected by the

high phone use; although, excessive phone use was associated with increased procrastination and anxiety. Additionally, participants perceptions of their peers' phone use predicted self-reported phone use. The greater the perceived phone use, the higher the self-reported phone usage. Lastly, approximately 40% of participants reported using their phone in a manner that meets the threshold for addictive use.

**Discussion:** Results from this study have implications that impact college students' health, wellness, and academics. Participants reported high rates of phone use in the class and while studying. Because perceived phone use was predictive of actual phone use a social norms marketing intervention shows promise in addressing this behavior. Further, students' anxiety levels, procrastination habits, and addictive tendencies should be considered when developing interventions to mitigate excessive and inappropriate phone use.

#### Introduction

Smartphone use among college students constitutes an emerging health concern as well as an academic hazard. Excessive phone use is associated with various problems, including distracting college students from learning, physical health issues from repetitive movements, and intensifying already-present mental health problems (Elhai et al., 2017a; Felisoni & Godoi, 2018; Glassman et al., 2018). Regarding academics specifically, phone use\_in class and while studying compromises academic performance, negatively impacts graduation rates, and hinders future successes, such as admission to graduate school (Bjornsen & Archer, 2015). Academic success is critical because graduating from college affords individuals the benefit of not just an advanced degree but higher lifetime earnings, a better chance of finding gainful employment, and overall

improved financial stability (Baum et al.m 2013; Chen, 2017; UAB, 2020). Moreover, research indicates that college graduates have better health outcomes on average, report higher quality health, and have healthier children (Baum et al., 2013; Edie and Showalter, 2011). Thus, the need to design and implement interventions to address this compulsive behavior is evident.

Problematic cell phone use stems from the addictive tendencies people exhibit with the typical student using their phone over 100 times each day (McCoy, 2016; Smetaniuk, 2014). As with other addictive habits, the greater the exposure, in this case, the amount of time spent on the phone, the more problematic the behavior becomes (Roberts et al., 2014). Similarly, a dose-response effect between grades and phone use exists, the more an individual uses their phone, the more likely their grades will suffer (Duncan et al., 2012; Felisoni & Godoi, 2018; Lepp et al., 2014a). For example, Felisoni & Godoi (2018) found students who routinely use their phones in class had worse grades than individuals who showed more self-restraint (Duncan et al., 2012; Lepp et al., 2015a). Lepp et al. (2015a) note that students realize that using their phones in class is counterproductive yet are unable or unwilling to modify their behavior.

A variety of neurobiological and psychosocial factors may help explain students' problematic phone use and their inability to self-regulate their behaviors (Elhai et al., 2016; Roberts et al., 2014; Smetaniuk, 2014). Social activities such as checking text messages, using social media, shopping, gambling, dating—via the phone—trigger a powerful dopamine reward response (Vessiere & Stendel, 2018). Further, excessive phone use among students may be harmful not only to their academics but to their relationships and job performance as well (Elhai et al., 2017) However, unlike many

other addictive behaviors, the ramifications of the behavior may be too subtle for the average person to attribute to their phone. In other words, many people may be unaware of the negative impact their phone is having on their lives, let alone academics.

For example, many people underestimate the potential mental health issues excessive phone use may cause or more likely exacerbate. More specifically, anxiety, depression, and compromised self-worth are all associated with excessive phone use (Sapacz & Clark, 2016; Smetaniuk, 2014). While individuals may subconsciously use their phones as a means of relieving stress, research indicates phones may have the opposite effect. For instance, when people use their phones to cope with stress, anxiety, or depression, their interactions with social media can result in deleterious effects, impacting their mental health (Bianchi and Phillips, 2005; Smetaniuk, 2014). Through this mechanism, an individual could become involved in a maladaptive cycle whereby their main coping behavior, using their phone, makes them feel worse. College students, many of whom are already highly stressed with academics and work, are particularly susceptible to this unhealthy cycle (Beiter et al. 2015).

While much remains unknown about peoples' obsessive motivations for using their phones, evidence suggests that social norms may be useful in explaining this behavior. According to Social Norms Theory, a social norm is a behavior or belief within a social group that is viewed as acceptable (McDonald & Crandall, 2015). Social norms influence people because of the desire to perform expected behaviors, alter, or reduce socially undesirable behaviors within a group (McDonald & Crandall, 2015). Social norms can sway how individuals act; therefore, by correcting misperceptions, related behaviors can be modified as well (McDonald & Crandall, 2015). As Manski (2000)

suggests, individuals perform behaviors based on what they observe in their peer groups and what they perceive as socially appropriate or common. For example, if people believe most of their peers use their phones extensively, it may affect their own use because they may believe excessive phone use is acceptable, even in class.

Although the social norms theory has not yet been used to address phone behaviors in academic environments, the theory has been used to modify behavior within college populations for a variety of behaviors. Indeed, social norms theory gained notoriety when it was successfully used to reduce high-risk drinking among college students (Perkins & Berkowitz, 1986). In addition to reducing high-risk alcohol use, social norms interventions have been used to address habitual behaviors like cigarette smoking and hookah use --(Heinz et al., 2013). Additionally, Glynn and colleagues (2009) found that students are more likely to vote if they believe their peers are likely to vote, and peer perceptions can predict intentions to vote. The desire for students to stay socially connected through their phones suggests social norms are a promising approach to address problematic phone use among students. For instance, researchers have used social norms to reduce phone use in other settings and situations, like texting and driving or inappropriate phone use at work (Carter et al., 2014; Ragsdale & Cooper, 2016).

Little research has been conducted to assess the levels at which college students use their phones in class and while studying. Much is unknown regarding the role social norms have in influencing phone behaviors. The purpose of this study was to examine how social norms influence college students' phone use. By learning about students' perceptions regarding whether phone use during academic activities is acceptable and common, researchers may be able to design interventions to address this compulsive

behavior. Further, the relationship between phone use, anxiety, stress, and procrastination will be explored so researchers and practitioners can work to improve the consequences associated with this behavior. The challenges of higher education have a profound impact on students' overall mental health. The goal of this research is to identify ways to help students earn better grades and graduate from college while being mindful of their health.

#### 2. Methods

## 2.1 Procedures.

Researchers employed a cross-sectional research design to determine the prevalence of phone use in class and while studying, and to assess the extent to which social norms impact this behavior among college students. Further, data were collected to examine the relationship between phone use and anxiety, depression, and procrastination. The survey instrument was sent to prospective participants via Prolific's online messaging system. Before completing the survey, participants were asked to read the informed consent for the study and agree to participate in this research study. All methods and

procedures in this study were approved through the University of (redacted) Social, Behavioral, and Educational Institutional Review Board (IRB).

## **2.2 Participants**

A sample size power analysis was performed using G\*Power and indicated approximately 400 participants were necessary for the desired statistical tests with an effect size of 0.2294 (Faul et al., 2007, Hull, 2012). In total, 500 participants were recruited to ensure sufficient analytical power. Participants were identified and recruited in 2022 through convenience sampling on the Prolific recruitment platform based on the study inclusion criteria. Individuals met the inclusion criteria if they were current undergraduate students, living in the U.S. The Prolific platform was chosen for participant recruitment because its users are often younger, educated, and smartphone users (Prolific, n.d.). The Prolific platform identified individuals based on these criteria and generated a sample pool that were notified the survey was available. Each participant was monetarily compensated (at a rate of \$8.60 per hour according to Prolific guidelines) in exchange for their time and participation in this study. The survey took participants approximately seven to ten minutes to complete. Participants were (55.8%) women, (39.6%) men, and (3.8%) non-binary. Study participants were between the ages of 18-40 (M=24.75, SD=6.15). Additionally, participants were (64.6%) White, (10.6%) Black, (17.2%) Asian/Asian-American, and (14.4%) identified as Hispanic/Latin American.

### **2.3 Measures**

**Smartphone Use Per Hour.** Participants were asked to indicate how many times they check their phone in an hour while studying, and in class. Participants responded by entering the number of times they check their phone in 1 hour (from 0 to 999) to ensure all data variation is collected (Appendix I).

*Beliefs about academic performance.* Researchers used eight items to assess which activities negatively affect their grades using a 5-point Likert scale. The response options for these questions ranged from 1 = Strongly Disagree to 5 = Strongly Agree. The items included questions about diet, substance abuse and use, physical activity, phone use, and sleep.

*Addictive phone use*. Addictive phone tendencies of students were measured using the *addiction scale* adapted from the Smartphone Addiction Proneness Scale for Youth (Kim et al., 2014), which includes ten items using a 5-point Likert scale. The addictive scale contains items assessing distractions, and motivations for using the phones in and out of class.

*Social norms*. Social norms were assessed using four sliding scale items ranging from zero to 100 percent. More specifically, norms were measured by asking participants to determine the percentage of college students who used their phones for recreational activities in class, and while studying. Additionally, participants were asked whether they recommended using their phones less in class, and while studying. The response options for these items were on a five-point scale ranging from 1 =Strongly Disagree to 5 =Strongly Agree.

*Phone use and academic performance*. Phone use and academic procrastination were assessed using two sliding-scale items that measured occurrences ranging from\_zero to 30 days. These two items were used to assess the number of days in the past month participants felt anxious, and how many days they procrastinated because of their phones.

*Willingness to change*. Participants' willingness to modify their phone use behavior was assessed using a single-item measure utilizing the stages of the PAPM. This measure ranged from 1 ='I never thought of reducing my phone use in class,' 2 = 'I have thought about reducing my phone use, but not seriously, 3 = 'I have thought seriously about reducing my phone use, but I have not thought about it recently, 4 = I have thought about reducing my phone use, but I decided not to reduce my phone use, 5 = 'I have thought about reducing my phone use, and I believe I can reduce my phone use in the future, 6 = 'I have thought about reducing my phone use and I have a plan to do it', to 7 ='I have already taken steps to reduce my phone use.'

*Anxiety.* Participants' anxiety was measured by a survey item asking participants to indicate how many days in the past 30 days they felt anxious.

### 2.4 Data Analysis

The data collected from Qualtrics were exported SPSS version twenty-seven (IBM Corp., 2020). Descriptive statistics were used to describe the sample population, prevalence of phone use in the classroom and while studying in the past 30 days, and daily average screen time. Further, perceived norms of phone use while in class and studying were collected ANOVA tests were calculated to determine differences in demographic characteristics and willingness to modify phone usage. Spearman's

correlations were performed to examine the relationship between beliefs about willingness to change, cell phone use, perception of use among all college students, student procrastination, and anxiety. Finally, multiple linear regressions were conducted to identify whether social norms predict cell phone use, and if cell phone use is a predictor of procrastination, and anxiety.

### Results

#### 2.1 Demographics/Descriptive Findings

A total of 500 participants were recruited via Prolific and completed an online survey. Table 2.1 shows over half of participants were women (55.8%), nearly 40 percent were men (39.6%), 3.8% identified as non-binary, and 0.8% identifying as another gender. Participants' age had a mean of 24.5 (*SD* 5.7). Participants were 64.4% White, 17.2% Asian/Asian-American, 14.5% Hispanic or Latin American, 10.5% Black, 1.6% Arab or Arab American, and 0.6% Native Hawaiian or Pacific Islander. Further, 16.8% of participants also identified their ethnicity as Hispanic or Latino. For Greek life participants were involved in college athletics. Participants' grade point averages had a mean of 3.53 (*SD* = .421). Most reported GPA were above 3.50 (57.2%), 33.6% reported a GPA from 3.00 to 3.50, and 9.2% reported a GPA below 3.00.

# Table 2.1

Summarv	of D	emographic	Charact	eristics.
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	Study Sample rates
Grade Point Average (GPA)	
A (3.67-4.0)	48.5% (240)
B (2.70-3.66)	47.3% (234)
C (1.70-2.69)	4% (8)
D (0.70-1.60)	0.2% (1)
F (0.00-0.69)	0.0% (0)
Age in Years	
18	2.6% (13)
19	9.9% (49)
20	15.4% (76)
21	13.3% (66)
22	8.3% (41)
23	7.3% (36)
24	6.3% (31)
25	5.9% (29)
26	4.4% (22)
27	2.8% (14)
Race	
White	64.4% (319)
Asian or Asian American	17.2% (85)
Hispanic or Latin American	14.5% (72)
Black or African American	10.5% (52)
American Indian or Alaska native	1.6% (8)
Arab or Arab American	1.4% (7)
2 or more races	0.8% (4)
Native Hawaiian or Pacific Islander	0.6% (3)
Ethnicity	
Hispanic or Latino	16.8% (83)
Non-Hispanic or Latino	82.8% (410)
Greek Status	
Member of Sorority/Fraternity	8.5% (42)
Non-member	91.3% (452)
Member of a collegiate sports team?	
Yes	5.9% (29)

*Note:* N=500

Participants were tasked with identifying what percentage of their peers used their phones when in class and while studying, as well as the percentage of other students that recommend using their phone less. Participants were asked to estimate the percentage of students who they believed used their phones both in class (M= 70.1%, SD = 21.5%) and while studying (M= 79.8%, SD = 19.2%). However, participants had lower perceptions for the percentage of students they believed would recommend using their phone less in class (M = 46.7%, SD = 28.9%) and while studying (M = 48.8%, SD = 31.2%).

Participants also reported how often they checked their own phones when in class and while studying. Participants reported checking their phone an average of 3.988 times (*SD* = 4.42) in an hour when in class. Likewise, participants reported they checked their phones an average of 6.58 times in an hour (SD = 5.99) when studying. Data were collected to measure average daily screen time (in hours and minutes) from participants' phones. Participant screen time ranged from 0 to 670 minutes with an average daily screen time of approximately five and half hours (M=317.46, SD=137.99). A full description of participant screen times may be found in Figure 1.



Figure 2-1. Participant Daily Average Screen Time.



**Figure 2-2.** *The self-reported number of times participants typically check their phones during a 1-hour timeframe when in class.* 



**Figure 2-3.** *The self-reported number of times participants typically check their phones during a 1-hour timeframe while studying.* 

#### 2.2 Beliefs about Phone Use and Willingness to Change

Spearman's bivariate correlational analysis was performed to identify relationships between beliefs about phone use and self-reported willingness to reduce phone use in the classroom. Correlations were assessed according to guidelines by Cohen (1988), with small correlations being between .10 to .29, medium between .30 and .49, and large correlations being .50 and above. First, results indicate there is a significant negative correlation between the belief that *most college students think it's ok for students to use their phones in class* and willingness to change phone behaviors ( $r_s = -$ .119, p = .010). There was also a significant negative correlation between the belief that *grades are NOT affected by phone* use and willingness to change their behavior ( $r_s = -$ .287, p = <.001). Positive correlations between phone beliefs and willingness also existed. The belief that *unhealthy eating habits* ( $r_s = .123$ , p = .007) and *binge drinking* ( $r_s = .136$ , p = .003) can negatively impact their grades was positively correlated with participants' willingness to change their phone behaviors. Additionally, the beliefs *using your phone recreationally in class* ( $r_s = .278$ , p = <.001), *using your phone recreationally while studying* ( $r_s = .173$ , p = <.001), *and not getting enough sleep* ( $r_s = .135$ , p = .003) can negatively affect their grades were each positively correlated with willingness to modify phone behavior.

# Table 2.2

Means, Standard Deviations, and Spearman's Correlation Matrix for Norms, Beliefs, and Willingness to Change.																
	M	SD	1	2	3	4	5	6	7	8	9	10	11	12	13	14
1. Social norms about phone use in class.	3.73	.961														
2. Social norms about phone use and grades.	2.68	1.095	.25**													
3. Social norms about phone use and anxiety.	3.58	1.017	.28**	.26**												
4. Social norms about multi-tasking in class.	4.17	.890	.30**	.07	.32**											
5. Social Norms and rudeness in class.	2.78	1.00	39**	05	26**	24**										
6. Social norms and checking phones in class.	3.80	1.090	.25**	06	.05	.20**	19**									
7. Beliefs about unhealthy eating	3.90	.854	.05	10*	.02	.09*	.00	.11*								
8. Beliefs about binge drinking	4.61	.643	.08	08	.06	.19**	11*	.15**	.32**							
9. Beliefs about using marijuana/ cannabis	3.78	1.043	.04	14**	03	.07	.02	.09*	.15**	.27**						
10. Beliefs about physical activity	3.64	.992	.05	11*	04	.06	.04	.20**	.48**	.14**	.27**					

11. Beliefs about caffeinated	3.41	1.093	02	04	08	.08	.02	.08	.36**	.11*	.34**	.47**				
12. Beliefs about using phones in class	3.77	0.938	15**	44**	11*	.06	.09*	.04	.23**	.15**	.27**	.23**	.26**			
13. Beliefs about using phones while studying	3.77	0.987	09*	33**	12*	.03	.07	.09	.16**	.14**	.27**	.25**	.26**	.68**		
14. Beliefs about sleep	4.68	.607	.06	14**	.04	.29**	08	.12**	.31**	.46**	.16**	.28**	.18**	.25**	.28**	
15. Willingness to change. (PAPM)	3.26	1.804	12**	29**	07	.05	.14**	.08	.12**	.14**	.03	.06	.05	.28**	.17**	.14**

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

\*. Correlation is significant at the 0.05 level (2-tailed).

#### 2.3 Effect of Perceptions on Self-Reported Phone Use

To predict self-reported phone use in class, perceptions of college student phone use in class, perceptions of college student phone use while studying, perceptions of students who recommend against phone use in class, perceptions of students who recommend against phone use when studying, and perceptions of use among students who get 'A' grades predictors were grouped into a multiple regression model. Analyses indicate perceptions of peers' phone use (in class) predicted self-reported phone use in class, p<.001, B=.288, SE=.013. Additionally, participants who believed that 'A' students had higher phone usage in class were more likely to report higher phone usage in class, p=.003, B=.131, SE=.249, compared to participants who believed 'A' students used their phones less. Regression estimates are reported in Table 2.4.

## Table 2.3

	Unstandardized Coefficients		Standardized Coefficients		
-		Std.			
	В	Error	Beta	t	Sig.
(Constant)	-10.592	4.760		-2.225	0.027
What percentage of college students do you think use their phone while in class?	.061	.013	.288	4.813	<.001
What percentage of college students do you think use their phone while studying?	038	.014	161	-2.736	.006
What percentage of college students do you think recommend NOT using their phone while studying?	016	.011	101	-1.397	.163

Multiple Regression Model of Predictors of Self-Reported Phone Use in Class.

What percentage of college students do you think recommend NOT using their phone while in class?	.013	.010	.093	1.303	.193
Which do you think most accurately reflects how much time each group spends on their phones within a one-hour period in class? - Students who get all A's.	.734	.249	.131	2.955	.003

a. Dependent Variable: How many times do you typically look at your phone in a one-hour period while in class?

To predict daily average screen time, perceptions of college student phone use in class, perceptions of college student phone use while studying, perceptions of students who recommend against phone use, and perceptions of use among students who get 'A' grades predictors were grouped into a multiple regression model. Regression estimates are reported in Table 2.5. Perceptions of phone use while in class predicted daily average screen time, p=.029, B=.133, SE=.399.

## Table 2.4

Multipl	e Reg	gression	Model	of	Pred	lictors a	of Dai	ly A	Average ,	Screen	Time.
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	Unstandardized Coefficients		Standardized Coefficients			
-	D	Std.	D (		<u>a</u> .	
(Constant)	<u>В</u> 78.397	164.726	Beta	t .476	634	
What percentage of college students do you think use their phone while in class?	.875	.399	.133	2.194	.029	
What percentage of college students do you think use their phone while studying?	199	.426	028	468	.640	
What percentage of college students do you think recommend NOT using their	103	.233	022	444	.658	

phone while in class?					
Which most accurately reflects how much time each group spends on their phones within a one-hour period in class? - Students who get all A's.	10.793	8.726	.060	1.237	.217

a. Dependent Variable: Self-reported daily average screen time.

## 2.4 ROAM and Academic Performance

Self-reported phone use while in class, while studying, and self-reported daily average screen time were all examined as potential predictors of GPA in a multiple regression model; although, none of the variables were predictive of GPA. While selfreported ROAM use did not significantly predict GPA, post-hoc analysis showed selfreported procrastination predicted low GPA, p=.011,  $R^2=.013$ .

## 2.5 Phone Use, Anxiety, and Procrastination

Participant responses were examined to identify the best predictors of student self-reported anxiety and self-reported procrastination. The strongest significant predictor of procrastination was daily average screen time, p < .001, B = .206, SE = .003. The strongest predictor of anxiety was self-reported grade point average (GPA), p = .045 (B = .116, SE = 1.056). The multiple regression models for procrastination and anxiety may be seen below in Table 2.5 and Table 2.6.

# Table 2.5

# Multiple Linear Regression Model of Variables Predicting Self-Reported

## Procrastination.

	Unstandardized Coefficients		Standardized Coefficients		
Model	В	Std. Error	Beta	t	Sig.
(Constant)	6.492	10.212		.636	.525
How many times do you typically look at your phone in a one-hour period while in class?	.037	.122	.018	.302	.763
How many times do you typically look at your phone in a one-hour period while studying?	.164	.086	.113	1.901	.058
Daily Average Screen time	.014	.003	.206	4.401	<.001
Which do you think most accurately reflects how much time each group spends on their phones within a one-hour period in class? - Students who get all A's.	237	.555	020	428	.669
What percentage of college students do you think use their phone while in class?	029	.026	068	-1.123	.262
What percentage of college students do you think use their phone while studying?	.046	.029	.096	1.597	.111

a. Dependent Variable: In the past 30 days, please estimate how many days you procrastinated with your schoolwork because of your phone.

## Table 2.6

	Unstandardized Coefficients		Standardized Coefficients		
Model	В	Std. Error	Beta	t	Sig.
(Constant)	37.519	11.869		3.161	.002
How many times do you typically look at your phone in a one-hour period while in class?	.213	.129	.100	1.654	.099
How many times do you typically look at your phone in a one-hour period while studying?	041	.091	027	449	.654
Daily Screen Time Average	.004	.003	.056	1.181	.238
Which do you think most accurately reflects how much time each group spends on their phones within a one-hour period in class? - Students who get all A's.	-1.438	.592	116	-2.429	.016
What percentage of college students do you think use their phone while in class?	002	.029	004	057	.955
What percentage of college students do you think use their phone while studying?	.071	.032	.143	2.192	.029
What is your GPA? (Note: if you are in your first year, you may estimate your GPA)	-2.623	1.056	116	-2.484	.013
What percentage of college students do you think recommend NOT using their phone while in class?	.001	.025	.004	.055	.956
What percentage of college students do you think recommend NOT using their phone while studying?	.058	.024	.193	2.478	.014

Multiple Linear Regression Model to Predict Self-Reported Anxiety.

a. Dependent Variable: In the past 30 days, about how many days were you anxious because of school related activities (e.g., class assignments, exams, etc.)?

## 2.6 Phone use and addictive tendencies

Participant responses to an 8-item, 5-point Likert-type scale were examined to

identify whether they met the threshold for addictive phone tendencies (Kim et al., 2014).

Items were coded from one to five, based on how much participants agreed or disagreed with each item. Participants who met or exceeded the threshold of 27 (by agreeing or disagreeing with statements) were identified as having addictive phone tendencies (Kim et al., 2014). The analyses revealed that more than 40 percent of participants (200) have addictive phone tendencies.

## 2.7. Post-Hoc Analysis

Mediational analyses were conducted to determine if self-reported daily average screen time on their phones predicted anxiety (self-reported as days of anxiety in the past month) because of procrastination (self-reported as days of procrastination due to phone use). Self-reported procrastination mediated the relationship between daily average screen time and anxiety. The mediation model may be found in Figure 2-2.



Indirect effect:  $\beta$  = .11, CI: .064, .155

*Figure 2-2.* The mediation model.

#### Discussion

Smartphone use among college students is not harmless, despite the benign beliefs and perceptions that many students may hold (McCoy, 2016). Indeed, excessive phone use may compromise academic performance and exacerbate an array of health issues (Elhai et al., 2017a; Glassman et al., 2018). The aims of this study were to assess how often students use their phones and determine whether social norms effect phone behaviors. Additionally, we examined what effects, if any, phone use has on academics and anxiety. Potential addictive phone tendencies were also explored among participants.

Prior research indicates college students use their phones at levels, in some instances, upwards of eight hours a day (McCoy, 2016). Similar trends were found in the current study with students using their phone (i.e., screen time) an average of five and a half hours a day, with some participants on their phones 10 or more hours a day (2.7%). Further, participants reported checking their phone an average of four times in class, and over seven times when studying, during a one-hour period, respectively. This level of phone use can have harmful, and unexpected effects on students' academics (Chen & Yan, 2016, Lin et al., 2015). While some students may believe that multitasking is innocuous, they often underestimate the repercussions of their behavior and its impact on learning (Chen & Yan, 2016, Lin et al., 2015).

To better understand how beliefs about phones can affect student success, correlations between participant phone beliefs, norms, and participant willingness to modify their phone behavior were examined. The results revealed a significant, negative, albeit low association, between believing that most students use their phones in class, that phone use does not harm academics, and a lack of willingness to change phone behaviors. These results highlight a potential avenue for health education — by teaching students about the addictive tendencies of phones and the risks associated with distractions in the classroom, interventions may improve student willingness to use their phones less in class and while studying.

Additionally, participant responses revealed noteworthy insights about student perceptions of phone use. Participants overwhelmingly believed that most students use their phones in class and when studying. This perception is consistent with behavior; whereby students use their phones at very high levels (McCoy, 2016, Smetaniuk, 2014). However, participants also believed that about 50% of students recommend not using their phones in class. This mismatch of behaviors and attitudes toward phone use presents an opportunity for implementing social norms marketing campaigns. Specifically designing messages stating something like: Most college students recommend not using their phone use in the classroom or while studying.

It has been established that a relationship exists between high phone usage and lower grades among college students (Elhai et al., 2017a, Lepp & Barkley, 2019, Lepp et al., 2014). Although self-reported phone use among participants was not associated with GPA, procrastination tied with phone use, predicted GPA. This finding suggests that phone use in specific situations (i.e., procrastinating from doing schoolwork) may negatively impact student academics. Thus, when students use their phones to cope with stress, they may be unknowingly increasing their anxiety, thereby potentially harming their academic performance in the process.

To further examine the associations between phone use, procrastination, and anxiety multiple linear regression models were tested to identify the best predictors of anxiety, and procrastination. A multiple linear regression model tested self-reported phone use in class, self-reported phone use while studying, daily average screen time, perceptions of phone use in class, perceptions of phone use while studying, and beliefs about phone use among 'A' students as predictors of procrastination. The results revealed that daily average screen time was the best predictor of procrastination among participants. Further, another multiple linear regression model tested self-reported phone use in class, self-reported phone use while studying, daily average screen time, perceptions of phone use in class, perceptions of phone use while studying, and beliefs about phone use among 'A' students, GPA, injunctive norms in class, and injunctive norms while studying as potential predictors of anxiety among participants. Consistent with other research that shows students worry immensely about their grades, GPA was identified as the strongest predictor of anxiety (Smetaniuk, 2014). In addition, mediational analyses confirmed that procrastination significantly mediated the relationship between screen time and anxiety. While not a primary objective of this study, this model presents a potentially important starting point for future research. Researchers should further examine screen time and procrastination among students to identify the directionality of the effect, to better understand the relationship between screentime, procrastination, and anxiety.

The results from this study indicate that two-fifths of college students meet the criteria for addictive phone use (Lee et al., 2014). However, students and individuals in general used their phone more often during the COVID-19 pandemic, thus people may be

continuing to use their phones at elevated levels (David & Roberts, 2021; Ratan et al., 2021). Addictive phone tendencies present additional challenges and barriers to reducing phone use in the class and while studying. With such a substantial proportion of participants exhibiting addictive phone tendencies, there is a profound need to address excessive phone use from both a health and academic perspective.

## Limitations

This study has several noteworthy limitations which should be considered when interpreting the findings. First, data in this study were self-reported, using the Prolific platform to recruit participants. Thus, participants may not be representative of the overall college student population, particularly as it relates to reported GPA. For example, students that are willing to volunteer for research studies may be more mindful of their grades and may perform better academically compared to those who do not participate in research. Further, given that participants overwhelmingly reported high GPA, the ability to draw conclusions about the effects of phone use on academics is limited. Additionally, anxiety and procrastination were measured with a single item for each construct; participants were asked to identify how often they procrastinated or felt anxious in the past 30 days. This could be limiting because it relies on the participant's own idea of procrastination or anxiety, instead of utilizing a standardized measure for anxiety or procrastination. While this study may generate some insights into why students use their phones, it is cross-sectional; therefore, causal implications cannot be made. Longitudinal studies are needed to determine if causal links can be identified and to pinpoint the exact effect of perceptions upon student phone use, whether in class or studying.

#### **Implications and Recommendations**

This study provided information about college students' phone use, perceptions of phone use, and the related implications concerning academics and health. The results indicate that students' beliefs may be an influencing factor in their phone use. To address excessive and inappropriate phone use, universities could implement comprehensive health communication campaigns directed at modifying this seemingly intractable behavior. More specifically, student affairs personnel could create social norms messages and disseminate them during orientation and first year experience courses. These messages could then be further reinforced by in-class instructors before and during class. By highlighting the connection phones have to procrastination, these messages may influence students to use their phones in less deleterious ways.

Future studies may be conducted to further explore the effect social norms and perceptions have on phone behaviors. While there are clear implications for the effects phone use can have on procrastination and anxiety, the effect of social norms and perceptions on students' phone behavior is less obvious. Understanding this influence will allow researchers to better identify not only why students use their phones, but why they use them so much. Researchers should also examine harm reduction techniques associated with phone use — allowing students to use their phones in ways that are important to them while minimizing risk and negative outcomes.

### Conclusions

Researchers and practitioners can use the findings from this study to develop behavioral interventions. Implementing social norms campaign to address this behavior is a promising strategy, as there is a mismatch in perceptions regarding the high rates of phone use and recommendations from peers to use their phones less. It may also be useful to use an ecological approach to mitigate excessive and inappropriate phone use by addressing individual level (beliefs), interpersonal level (perceptions of peers), community level (schools) factors (Cheney et al., 2017). Excessive phone use is a potential risk to student wellness (e.g., anxiety) and academics. Additional research is needed to further understand how to mitigate excessive and inappropriate phone use as addressing this behavior is fundamental to improving student mental health and retention.

Conflict of Interest Disclosure The authors report no conflict of interest. Funding The authors report no outside funding for this study.

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#### **Chapter Three**

# Using the Precaution Adoption Process Model to Evaluate Health Communication Messages Regarding College Phone Use

Chapter three of this dissertation follows the author guidelines for the journal, *Journal of American College Health*. This chapter contains an abstract, introduction, materials and procedures, data collection and analysis, results, discussion, acknowledgments, and a funding statement. The four preventive messages assessed for this study are included in Appendix II. This study was approved by the University of Toledo Institutional Review Board.

The purpose of study two was to assess students' perceptions of the effectiveness of several health communication messages designed to reduce recreational phone use among college students while in class or while studying. The Precaution Adoption Process Model (PAPM) and the Elaboration Likelihood Model (ELM) were used to assess college students' readiness to change their behavior and the elaboration they experience, respectively, when viewing prevention messages. An evaluation of the overall appeal and utility of the prevention messages was conducted using participants' quantitative survey responses and qualitative comments. This message evaluation will afford practitioners and researchers with intervention strategies and materials. Note: the methods and data used for this study are the same as the study detailed in chapter two.
#### Abstract

**Introduction**: Phone use among college students in the classroom and while studying is commonplace. Excessive phone behavior poses a risk to students' academics and their health. The purpose of this study was to test four different health communication messages aimed at reducing phone use and determine the efficacy and appeal of each message.

**Methods:** Researchers used a between-subjects cross-sectional design to assess the messages' persuasiveness, perceived effectiveness, and overall appeal. The Precaution Adoption Process Model (PAPM) was used to determine students' willingness to change their phone behavior by comparing their scores before and after exposure to the message manipulation. The Elaboration Likelihood Model (ELM) was used to develop two relevance statements to determine if elaboration state affects how participants respond to the messages. ANOVA tests were conducted to determine whether there was an effect based on message type and elaboration state, and multiple linear regressions were conducted to determine if message type is predictive of willingness to change. Qualitative responses regarding the messages were also examined for emerging themes.

**Results:** Five major themes emerged after examination of the qualitative responses: 1) Supportive/Relevant, 2) More Information Wanted, 3) Not Persuasive, 4) Defensiveness, and 5) Introspective. An interaction effect was seen between the high relevance statement and the social norms message; those who viewed this message and condition were more certain they could change. No main effect on participants' willingness to change was identified after the message manipulation. However, post-hoc analysis revealed that participants who viewed the high relevance statement and the gain-frame message were more willing to change behavior than their counterparts. Additionally, those who reported higher anxiety and procrastination were more likely to report a decrease in behavioral willingness to modify their phone use.

**Discussion:** Few participants reported a change in their behavioral willingness following message exposure. Although participants agreed they liked the messages, and generally rated them favorably, many participants responded defensively to the qualitative questions, which provides insights into their unwillingness to reduce their phone behavior in the classroom. Additional qualitative research in the form of interviews and focus groups may be necessary to further why students are so resistant to changing their phone behavior. The results of this study highlight the need for basic health education relating to phone use. Health education may also be needed to address the underlying beliefs and attitudes related to phone use, and the risks associated with phones. Universities and should also consider restricting phone use in the classroom if students are unwilling or unable to modify their behavior.

# Introduction

College students' propensity to excessively use their phone poses serious academic problems and may impact their overall wellbeing. Students use their phones to text, read email, shop, access social media, among other Internet-based activities, spending more than eight hours a day on their phones (Penglee et al., 2019). This level of phone use can have adverse effects, such as distracting students from learning, thereby negatively impacting their academic performance (Duncan et al., 2018, Glassman et al., 2022). With students checking their phones over 100 times a day, often in class and while studying, academic consequences will invariably occur (Felisoni & Godoi, 2018; McCoy, 2016). High phone use is a sincere concern because the more students use their phones in class, the more likely they will suffer academically (Felisoni & Godoi, 2018).

Excessive phone use among college students has ramifications that go beyond academics and can compromise student mental health as well. Indeed, students are more likely to feel depressed when they use their phones too often and experience increased anxiety (Lepp et al., 2014; Sapacz & Clark, 2016; Smetaniuk, 2014). Phone use becomes excessive when an individual routinely becomes distracted by their phone, has trouble regulating their screen time, and uses their phone to cope with problems (Domoff et al., 2019; Smetaniuk, 2014). This excessive use can give rise to addictive tendencies. Addictive phone behavior is characterized by continued use despite the negative impact on social relationships and school responsibilities (Domoff et al., 2019). Further, some students exhibit self-medicating behavior, using their phones to deal with their stress, reduce anxiety, or bolster their self-esteem (Bianchi & Phillips, 2005). Ironically, students are unaware that the very behavior they are using to cope with is exacerbating their mental health issues, thereby perpetuating an unhealthy cycle (Smetaniuk, 2014).

While changing behavior is already complex, specific populations, such as college students, pose unique challenges. Students must learn to manage their independence while living away from home while balancing work responsibilities and social obligations (Pedrelli et al., 2015; Ruberman, 2018). Many college students struggle to fulfill their academic duties because they have trouble transitioning into their unfamiliar environment (Dembo & Seli, 2004). This struggle to adapt manifests itself in a variety of ways depending on the student and circumstances. For example, in a perceived effort to "fit in", students use alcohol and marijuana more frequently when they enter college than in high school (Fromme et al., 2008). Another adjustment issue involves the rigors associated with higher education straining students' ability to cope, and in some instances, exacerbating an underlying mental health issue such as anxiety. College students may be particularly susceptible to adjustment issues because they are among those most likely to suffer from mental illness (Pedrelli et al., 2015; Ruberman, 2018). Students who have difficulty managing their stress and, as a result, academic responsibilities are more likely to engage in compulsive behaviors, including excessive phone use (Krumrei-Mancuso et al., 2013; Porcelli & Delgado, 2017). The campus environment and newfound independence that college students experience are unique barriers to modifying behavior among this population.

Theory-based health communication campaigns have been used to address a wide variety of unhealthy behaviors. For example, researchers and practitioners have used health communication to modify college behaviors including student physical activity, vaping use, eating habits, stress management, and substance abuse (Case et al., 2017; Chiauzzi et al., 2008; Glassman et al., 2013; Parvanta et al., 2010; Kazemi et al., 2017; Snyder, 2007). A common health communication theory used to design prevention messages is the Elaboration Likelihood Model (ELM). is a tool that health communication campaigns have successfully used to influence behaviors. Within the

ELM there are two routes of persuasion: a central route which uses direct information to persuade audiences, and a peripheral route utilizing other prompts like recognizable imagery or appealing visuals to convince people the message is valuable (Petty & Cacioppo, 1986). The ELM has been used by researchers to understand how individuals interact on social media and how to design persuasive messages, highlighting the ELM's potential use in influencing phone behaviors (Chang et al., 2015).

While health promotion specialists and others have used health communication interventions to address many behaviors, little research exists concerning modifying excessive phone use among college students. The purpose of this present study was to examine students' perceptions about the efficacy of prevention messages designed to reduce phone use in the classroom and while studying. The Elaboration Likelihood Model was used to determine message relevance among participants. Further, the Precaution Adoption Process Model (PAPM), a stage theory, was used to assess students' willingness to modify their behavior The PAPM includes seven stages to assess how individuals respond when presented with a threat or risk (Weinstein et al., 2008). By designing persuasive messages, the results of this study may help students achieve better grades and assist universities in improving their retention and graduation rates.

## Methods

## **2.1 Participants and Data Collection**

Between subjects, cross-sectional experimental design was used to examine the efficacy of different health communication messages in encouraging students to reduce

their phone usage. While unique measures and analyses were conducted for this study, the participants, and some variables, such as demographic items, prevalence of phone use in the class and while studying, and readiness to change, are from Matkovic et al., (in review). Researchers received approval for this study through the University of Toledo institutional review board. A power analysis was performed using G\*Power and the results indicate that 500 participants are necessary for sufficient analytical power (Faul et al., 2007).

## **2.2 Procedures**

The focus of this experimental study is preventive message manipulation and the effect this manipulation has on participant willingness to change phone behaviors. Each participant was randomly assigned to a central or peripheral route elaboration statement (based on the ELM) prior to being exposed to one of four different messages (an informational message, a gain frame message, a humor appeal, a social norms appeal, or a control statement. While study two has overlap of data from study one, distinct, a priori hypotheses and analyses were used for each study.

#### 2.3 Messages

*Informational/Multitasking message:* This message says "Did you know? The average college student is on their phone more than 8 hours a day. *Phones can multitask but brains can't. If you're on your phone in class, you can't pay attention.*"

*Social norms appeal*: This message says "Did you know? The average college student is on their phone more than 8 hours a day. *Most college students recommend using their phone less while in class.*"

*Gain frame*: This message says "Did you know? The average college student is on their phone more than 8 hours a day. *If you want to get an "A", your first step should be putting your phone down in class.*"

*Humor appeal*: This message says "Did you know? The average college student is on their phone more than 8 hours a day. *You might not master the latest TikTok trend in 8 hours, but it's plenty of time to study for that test.*"

*Control statement*: The statement the same phone image as the other messages and includes a statement that says, "Please click the arrow to continue the survey."

Note: each message includes the same image of a hand holding a smartphone.

## 2.4 Measures

*Change certainty*. Participant certainty in their ability to change their phone behaviors before and after viewing messages was assessed using a 1-item measure utilizing the stages of the PAPM. This measure ranged from 1 ='I never thought of reducing my phone use in class,' to 7 = 'I have already taken steps to reduce my phone use.'

*Relevance statements.* Researchers measured the effect of participant elaboration on the messages participants viewed by presenting two relevance situations: a high relevance and a low relevance statement. The high relevance statement directed participants to imagine they are in the process of preparing for exams is intended to induce a high elaboration state. The low relevance includes a much simpler version of the high relevance statement, without additional information to support its statement. Increasing elaboration of a message can increase the likelihood of successful behavior change or behavior uptake (Petty et al., 2009).

*Message manipulation*. Message manipulation was measured by randomly assigning participants to view one of two relevance statements followed by one of four different health communication messages (or a control message) encouraging students to reduce their phone use when studying or in class (see Appendix II). These messages include an informational appeal that explains the brain cannot multi-task, a gain-frame message, a social norms message, and a humor appeal (and a control message).

*Message efficacy.* After viewing the messages, participants were then asked a series of questions about the messages. Questions included whether students understood the messages, to what extent they found them interesting, creative, persuasive, believable, personally relevant, and if they discouraged phone use. The survey also included open-ended questions for participants to further describe what they thought about the messages. Lastly, participants were again asked to identify their willingness to change their study habits (as indicated in the *Change Certainty* measure).

#### 2.5 Data Analysis

After collection, data were then exported for cleaning and analysis via SPSS version twenty-seven (IBM Corp., 2020). Descriptive statistics were used to describe the sample demographics and prevalence of phone use in the classroom and while studying. Each message was examined using descriptive statistics to identify which message(s) participants found most interesting, believable, creative, relevant, applicable to students, and discouraging phone use. An ANOVA was conducted to determine whether exposure

to the messages increased participant willingness to change or modify their behaviors through the stages of the PAPM. Qualitative analyses were conducted to examine emerging themes from open-ended questions regarding the extent to which students found the messages effective. Multiple regressions were performed to determine whether message type and elaboration state are predictive of intention to change behaviors.

#### **3.5 Data Analysis**

After administering the survey, data were then exported for cleaning and analysis via SPSS version twenty-seven (IBM Corp., 2020). Descriptive statistics were used to describe the sample demographics and prevalence of phone use in the classroom and while studying. Each message was examined using descriptive statistics to identify which message(s) participants found most interesting, believable, creative, relevant, applicable to students, and discouraging phone use. An ANOVA was conducted to determine whether exposure to the messages increased participant willingness to change or modify their behaviors through the stages of the PAPM. To accomplish this, the dependent variable was the change score, calculated as the difference between the pre and post-test scores, and the messages and relevance conditions are the independent variables. Qualitative analyses were conducted to examine emerging themes from open-ended questions regarding the extent to which students found the messages effective. For qualitative analyses, researchers first reviewed all of the remarks for the question "Do you have comments you would like to share regarding the message and the grade you gave it?" Themes were subsequently identified and participant comments were coded as recommended by Cresswell (2012). Multiple regressions were performed to determine whether message type and elaboration state are predictive of willingness to change

behaviors. Additionally, post-hoc multinomial logistic regression was performed to predict potential barriers to change.

## Results

# 3.1 Demographics/Descriptive Findings

Study participants (N=500) were recruited via Prolific (an online research participant recruitment platform). Participants were 55.8% women, 39.6% as men, 3.8% identified as non-binary, and 0.8% identified as another gender or did not wish to identify their gender. Participants varied in age from 18 - 40 (M=24.5, SD = 5.7). Participants were 64.6% White, 17.2% Asian/Asian-American, 14.4% Hispanic/Latin American, and 10.6% of participants were Black. Full participant demographics may be found in Table 3.1.

## Table 3.1

Summary of Demographics Characteristics.

	Study Sample rates
Age in years	
	18 2.6% (13)
	19 9.9% (49)
	20 15.4% (76)
	21 13.3% (66)
	22 8.3% (41)
	23 7.3% (36)
	24 6.3% (31)
	25 5.9% (29)
	26 4.4% (22)
	27 2.8% (14)

Race

White	64.4% (319)
Asian or Asian American	17.2% (85)
Hispanic or Latin American	14.5% (72)
Black or African American	10.5% (52)
American Indian or Alaska native	1.6% (8)
Arab or Arab American	1.4% (7)
2 or more races	0.8% (4)
Native Hawaiian or Pacific Islander	0.6% (3)
Ethnicity Hispanic or Latino Non-Hispanic or Latino	16.8% (83) 82.8% (410)
Creal Status	
Member of Sorority/Fraternity Non-member	8.5% (42) 91.3% (452)
Member of a collegiste sports team?	
Vec	5 9% (29)
No	94.1%(20)
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# 3.2 Participant Willingness to Change Based On Message And Relevance

After conducting a 2x5 ANOVA, no main effects of message, relevance condition, or interaction between message and relevance emerged as statistically significant in changing behavioral willingness based on the PAPM (measured by difference between change score post and pre-message exposure). Of the 500 participants, 408 did not differ in their pre- and post- PAPM responses. This suggests the messages were not effective in changing participants' willingness to change. This explains why no main effects of either message condition or relevance condition, nor an interaction between the two occurred.

# Table 3.2

## Tests of Between-Subjects Effects between Message Type and Relevance Condition.

Source	Type III Sum of Squares	Df	Mean Square	F	Sig.
Corrected Model	20.229 <sup>a</sup>	9	2.248	.709	.706
Intercept	5470.668	1	5470.668	1711.810	<.001
Relevance condition	3.301	1	3.301	1.033	.310
Message	9.882	4	2.471	.773	.543
Relevance condition * Message	9.260	4	2.315	.724	.576
Error	1508.435	472	3.196		
Total	7136.00	482			
Corrected Total	1528.664	481			

Dependent Variable: Willingness to change (PAPM Post-exposure score)

a. R Squared = .013 (Adjusted R Squared = -.006) (Computed using alpha = .05)

However, participants with a change score > 0, or those who reported a forward progression along the PAPM were separated from those who reported no change, or who reported a negative change. A post-hoc exploratory 2x5 ANOVA was conducted examining only those who reported a positive change in willingness, to determine if either the relevance or message manipulation impacted these individuals. There was a significant difference in participant willingness to change phone behaviors based on relevance condition, p=.049, partial  $\eta^2$  = .080.

#### Table 3.3

# Tests of Between-Subjects Effects between Message Type and Relevance Condition.

С	Type III Sum	Dſ	Maria	, F	<b>C</b> '.	partial 2
Source	of Squares	DI	Mean Square	F	51g.	η-
Corrected Model	12.813 <sup>a</sup>	9	1.424	1.150	.348	.181
Intercept	832.009	1	832.009	672.255	<.001	.935
Relevance condition	5.048	1	5.048	4.079	.049	.080
Message	4.388	4	1.097	.886	.479	.070
Relevance condition * Message	2.897	4	.724	.585	.675	.047
Error	58.169	47	1.238			
Total	975.000	57				
Corrected Total	70.982	56				
a D Carranal 101 (Adia	atad D.Carrand (	24				

Dependent Variable: Willingness to change (PAPM Positive change score)

a. R Squared = .181 (Adjusted R Squared = .024)

# **3.3 Participant Certainty in Their Ability to Change Based on Message and Relevance**

A significant interaction effect was found between the high relevance condition and the gain-frame message. Thus, those who viewed the high-relevance statement and then viewed the message (i.e., *If you want to get an A, your first step should be putting your phone down in class*) were more 'certain' they could change their phone behavior (p=.018, partial  $\eta^2 = .024$ ) than those with low relevance. Further, there was a significant difference between the high relevance informational message and the high relevance gain-frame message, SE = .204, p = .023, Hedges G = .62. There was also a significant difference between the low relevance and high relevance conditions of the informational message, SE = .204, p = .043, Hedges G = .40. Lastly, there was a significant difference between low relevance and high relevance condition for the gain-frame message, SE = .205, p = .016, Hedges G = .51. The interaction effect between messages and relevance conditions can be seen in Figure 3-1. Additional post-hoc analyses can be found in Appendix VI.

# Table 3.4

Tests of Between-Subjects Effects between Message Type and Relevance Condition.

Dependent Variable. How certain are you and you can reduce your phone use in class.							
Source	Type III Sum of Squares	Df	Mean Square	F	Sig.	partial η2	
Corrected Model	14.262 <sup>a</sup>	9	1.585	1.629	.104	.029	
Intercept	7361.409	1	7361.409	7565.202	<.001	.939	
Relevance	0.652	1	.652	.670	.413	.001	
Message	2.486	4	.621	.639	.635	.005	
Relevance * Message	11.718	4	2.930	3.011	.018	.024	
Error	476.800	490	.973				
Total	7995.000	500					
Corrected Total	491.062	499					

Dependent Variable: How certain are you that you can reduce your phone use in class?

a. R Squared = .029 (Adjusted R Squared = .011)



*Figure 3-1.* Interaction between the informational and gain-frame messages by relevance conditions and the change in means of participant certainty scores.

## 3.4 Predicting Willingness to Change, Based on Relevance and Message Type.

In examining the results of participant willingness to change based on the stages of the PAPM, four-fifths of participants had no change. A linear regression was performed to determine if relevance or message type predicted willingness to change as indicated by stages in the PAPM. As a result, neither message type, relevance statement nor interaction between the two, were significant predictors of willingness to change.

## 3.5 Participant's Evaluation of Messages

Participants who viewed one of the four different messages regarding phone use in class were asked to evaluate how much they liked the message by assigning them with a letter grade from A to F (A being the best possible grade, and F being the worst). Participants who viewed the control message did not evaluate or grade their message. The messages included an informational message (i.e., *Research indicates students learn best when they focus on one thing rather than trying to multitask. Phone distractions inhibit learning*), a loss-frame message (i.e., *On TikTok a lot? Tick Tock...put your phone down before you ruin your grades*), a gain-frame message (i.e., *If you want to get an 'A' in class, your first step should be putting your phone down in class*), and a social norms message (i.e., *Most college students recommend using their phone less while in class*). Overall, the informational message received the highest percentage of A and B grades (79.8%) while the loss-framed message was the least popular (63.3% A and B grades). A chi-square test of independence was conducted between message type and assigned letter grade. There was not a statistically significant association between message type and letter grade,  $\chi^2(9) = 12.62$ , p = .180. The percentage of grades can be seen in Table 3.5 below.

#### Table 3.5

Letter Grades assigned to Messages by Participants.

Message type	Letter grade								
	А	В	С	D or below					
Informational	24.3%	55.5%	16.1%	4%					
Loss-frame	14.8%	48.5%	29.7%	6.9%					
Gain-frame	17.3%	47.9%	20.4%	9.1%					
Social norms	25.4%	45.5%	19.8%	8.9%					

Those who viewed messages were asked to evaluate (by responding to a 7-item Likert scale from strongly disagree to strongly agree) the extent to which they agreed that the message they viewed was interesting, creative, persuasive, believable, discouraging of phone use, and applicable to college students. Table 3.6 indicates that overall participants rated the messages favorably on the aforementioned criteria; most participants somewhat agreed, agreed, or strongly agreed that messages were interesting, persuasive, believable, discouraging of phone use, and applicable to students. The survey also included an attention check to help ensure participants were paying attention to all survey directions; 99% of participants said they either paid some attention (n=55) or a great deal of attention (n=440) to the messages.

## Table 3.6

	Message Type								
	Informational	Loss-Frame	Gain-Frame	Social Norms					
Interesting	71.7%	60%	51%	63%					
Creative	39%	55%	28%	33%					
Persuasive	60%	41%	44%	44%					
Believable	83%	82%	70%	81%					
Discouraging of phone use	91%	83%	91%	91%					
Applicable to students	94%	94%	93%	95%					

The Percentage of Participants who Somewhat Agreed, Agreed, or Strongly Agreed Messages were Interesting, Creative, Persuasive, Believable, Discouraging, and Applicable to Students.

## **3.6 Qualitative Themes**

Participants were also asked to provide a comment regarding the rationale for the grade they assigned to the message they assessed. Five themes emerged, including: 1) *Supportive/Relevant*, 2) *Not Persuasive*, 3) *More Information Wanted*, 4) *Defensiveness*, and 5) *Introspective. Supportive/Relevant* feedback included positive statements indicating the message was helpful or relevant to students. The *not persuasive* theme involved recommendations for enhancing the message or making it more convincing. Similarly, comments regarding the *more information wanted* theme were indicative of a recommendation for additional supporting material. The *defensiveness* theme included those comments which indicated the participants refused/reluctant to believe the message or refused/reluctant to change their behavior. The *defensiveness* theme also included comments where participants stated the message was 'out of touch', was 'cringe,' or

blamed students. Comments from the *introspective* theme described how the message caused participants to think about their own behavior.

## **Informational Message**

The two most common themes for this message were *not persuasive* (34%) and *supportive/relevant* (34%). Participants expressed they liked the message and appreciated its relevance to students. However, participants commonly stated they thought the message could be improved by providing more compelling information. Indeed, participant 40 (female, aged 20) described wanting the message to be more persuasive by stating, "*I didn't dislike nor like the message so I gave it a C. I gave it that grade because it's a generic message with more text than an interesting picture which I believe can really drive a message especially to college students who are more drawn to pictures than text."* 

## Loss-frame Message

The themes that emerged for the loss-framed message were *defensiveness* (46%), *supportive/relevant* (33%), *and not persuasive* (10%). This message also received more *defensiveness* comments than the other messages. Participant 107 (non-binary, aged 20) provided an example of this defensiveness in their feedback, "*It is dumbed down to talk to college students like they live for tik tok* [TikTok®]. *It makes me feel like the message is talking down to me*."

## Gain-frame Message

The most common themes that emerged from comments related to the gain-frame message were *defensiveness* (32%), *supportive/relevant* (29.6%), *not persuasive* (23.5%).

Participant 228 (female, aged 21) provided feedback that included praise while displaying phone defensiveness, "I liked this message since it gave a reason for college students to not use their phones as much since social media controls our lives but it was a generic excuse as to why we shouldn't use our phones and 8 hours sound like it's a lie."

### Social Norms Message

The most common themes for the social norms message were *supportive/relevant* (36%), *not persuasive* (21%), and *more information wanted* (13%). This message also received the most comments that fell into theme of *introspective* (6%). One example of an introspective comment from Participant 356 (male, aged 19) was, "*I*[*t*] *didn't full*[*y*] *change me in the way I think, but it did get me to think about what I'm doing a bit more.*"

#### **3.7 Exploratory Post-hoc Analyses**

Additional post-hoc exploratory analyses were conducted to further investigate the association between the messages and participants willingness to reduce their phone use in class. More specifically, a multinomial logistic regression was performed to identify a model for the relationship between the independent variables and the three outcome groups (negative change in willingness, no change, and those with a positive change). The fit of the logistic model was statistically significant ( $\chi^2$  (22) = 34.88, p=.040) and the model explained 12.1% (Nagelkerk  $R^2$ ) of the variance in participant willingness to change. The final model contained the following predictor variables: selfreported days of anxiety, self-reported days of procrastination, daily average screen time, beliefs about phone use in class, beliefs about phone use while studying, and beliefs about binge drinking. Of the six predictor variables, four were statistically significant:

days of anxiety, days of procrastination, daily average screen time, and belief about phone use in class (as shown in Table 3.7). Participants with higher anxiety were less likely (.215 times lower odds) to report a negative change in willingness (to modify their phone behavior), compared to a positive change. Additionally, those with higher reported procrastination (p=.019) were less likely (4.32 times lower odds) to report a negative change in willingness, compared to a positive change. Additionally, those who had a lower daily average screen time (p=.016) had .451 times higher odds to report no change in willingness (modify their phone behavior), compared to a positive change. Lastly, those who believed phone use in class was less likely to affect grades (p=.046) had .429 times higher odds to report no change in willingness, compared to a positive change.

								95% Confidence Interval for Odds Ratios	
Willingness to change		В	Std. Error	Wald	df	Sig.	Odds Ratios	Lower Bound	Upper Bound
Negative change	Intercept	-2.389	1.728	1.912	1	.167			
	Days of Anxiety	-1.539	.708	4.726	1	.030	.215	.054	.859
	Days of Procrastination	1.464	.623	5.522	1	.019	4.323	1.275	14.656
	Daily Average Screen Time	.172	.606	.080	1	.777	1.187	.362	3.895
	Belief: Phones don't affect grades	.185	.600	.095	1	.758	1.203	.371	3.903
	Belief: Phones in class	658	.706	.868	1	.351	.518	.130	2.067
	Belief: Phones/studying	.716	1.298	.304	1	.581	2.047	.161	26.073
	Low relevance condition	.459	.589	.607	1	.436	1.583	.499	5.025
	High relevance condition	0 <sup>b</sup>			0				

**Table 3.7**Multinomial Logistic Regression Model Predicting Behavioral Willingness.

	Informational Message	1.183	.984	1.445	1	.229	3.265	.474	22.477
	Loss-frame message	.513	1.012	.257	1	.612	1.670	.230	12.134
	Gain-frame message	416	1.116	.139	1	.710	.660	.074	5.886
	Social Norms message	.955	.974	.962	1	.327	2.600	.385	17.549
	Control	$0^{b}$			0				
No change	Intercept	1.955	.960	4.144	1	.042			
	Days of Anxiety	.132	.355	.137	1	.711	1.141	.569	2.288
	Days of Procrastination	.331	.361	.842	1	.359	1.393	.686	2.827
	Daily Avg Screen Time	797	.331	5.794	1	.016	.451	.236	.862
	Phones don't affect grades	508	.331	2.353	1	.125	.602	.315	1.151
	Belief: phones in class	846	.424	3.983	1	.046	.429	.187	.985
	Belief: Phones/studying	1.478	.811	3.323	1	.68	4.386	.895	21.501
	Low relevance condition	344	.324	1.121	1	.290	.709	.376	1.340
	High relevance condition	0 <sup>b</sup>			0				
	Informational Message	063	.517	.015	1	.903	.939	.341	2.584

Loss-fra	ne message	.018	.513	.001	1	.971	1.019	.373	2.785
Gain-fra:	ne message	096	.495	.038	1	.846	.908	.344	2.396
Social N	orms message	.027	.503	.003	1	.957	1.028	.384	2.754
Control		$0^{b}$			0				

a. The reference category is: Positive change.

b. This parameter is set to zero because it is redundant.

## **3.8 Discussion**

The rise and adoption of smartphones has made the phone an integral part of everyday life, including for the modern student. While phones present some positive academic opportunities, such as responding to questions electronically in real-time, they may also negatively impact students. Indeed, research suggests that students get distracted by their phones which compromises learning (Smetaniuk, 2014; Lepp et al., 2015). Thus, the purpose of the present study was to conduct an experimental message manipulation to identify if different preventive messages and relevance affects students' willingness to decrease their phone use behavior.

Overall, the message manipulation did not influence willingness to decrease phone use in the classroom; however, a subset of participants reported a positive change in willingness to modify their phone usage, thereby providing important insights. In this study, participants were exposed to one of two relevance statements. The low relevance statement briefly explained that people who put their phones down do better in school, whereas the high relevance statement explained in greater detail how 10 minutes of phone time could affect grades (Felisoni & Goldoi, 2018). Results suggest that those who viewed the high relevance statement, and the gain-frame message indicated they were more *certain* they could change. Relevance prompts, including students getting an 'A' appears to be a salient motivator for students and may be used to encourage students to use their phones less in class. While more research is necessary to examine how to encourage a receptive mindset in students, an approach that utilizes a highly relevant message may increase intervention efficacy. There are several explanations for why so few participants reported a change in behavioral willingness after viewing the messages. First, it is important to note, the present study took place during the COVID-19 pandemic. Most people, including students, reported using their phones more than they did prior to the pandemic (David & Roberts, 2021; Ratan et al., 2021) Moreover, students relied on their phones for social interaction when social distancing was required (David & Roberts, 2021). The added challenges associated with the pandemic may have influenced people to become increasingly dependent on their phones; consequently, participants may have been even more resistant to changing their phone behaviors.

To further understand participants' beliefs about the messages, participants evaluated each message by assigning a 'letter grade.' Messages overwhelmingly received either an 'A' grade or a 'B' grade from participants. The message receiving the highest proportion of 'A' and 'B' grades was the information message, and the loss-framed message received the lowest proportion. Participants also provided corresponding qualitative feedback regarding their assessment, and five main themes emerged: 1) *Supportive/Relevant*, 2) *More Information Wanted*, 3) *Not Persuasive*, 4) *Introspection*, and 5) *Defensiveness*. Overall, the qualitative data corroborated the quantitative findings.

The qualitative analyses corroborate the descriptive findings whereby the comments aligned with the letter grades students assigned to messages. Generally, the higher the grades assigned the more positive the comment. For example, the informational message received a high proportion of 'A' grades and received comments like "*I think this is a good way of telling college students how much they actually use* 

*their phone, and why they may be falling behind on their grades and studies.*" Likewise, the loss-frame message received lower letter grades from people and received more negative comments like "*Sound out of touch and corny, and chastising.*" Results from the qualitative feedback can be used to improve future messages. Messages targeted towards students should avoid language that could be seen as condescending and instead focus on positive messages that highlight the benefits of reducing phone use. It should be noted that students are likely to be defensive of their phone use. Additionally, participants indicated offense at the idea phone use negatively impacts grades. Thus, it is also possible that participants may have reported no change in willingness because they do not believe they need to change.

The results of the post-hoc multinomial logistic regression also indicate a reluctance to modify their phone behavior. For instance, participants who reported a negative change in behavioral willingness to modify their phone behavior reported a higher number of days where they procrastinated compared to those who reported a positive change. This finding suggests a cyclical relationship may exist where phone use is associated with anxiety and anxiety is linked to maladaptive phone use. Regardless of the directionality of this relationship, anxiety, and procrastination appear to be barriers to reducing phone use. Similar defensive mechanisms may also have affected participants who reported no change in their behavioral willingness to modify their phone use. Indeed, those with higher screen time and those who believed phone use didn't affect their grades were more likely to report no change, compared to participants who reported a positive change. Perhaps, students resist changing their behaviors because they don't

understand the risks associated with high phone usage, including poor academic performance. Therefore, it is possible that those who underestimate the risks associated with excessive phone use are less likely to consider change.

#### Limitations

While the present study has several strengths, there are also limitations that need to be considered when interpreting the results. Due to the research design used for this study, behavior change could not be assessed; therefore, future research should be conducted using a longitudinal design to assess the extent to which message(s) change behavior, and for how long. Further, due to a lack of variation regarding participant willingness to change, the ability to draw conclusions regarding the message manipulation was limited. For future studies, participants could be exposed to messages multiple times to improve the effect of the manipulation. Additionally, to minimize bias among the four experimental messages, the same basic image was used for each message frame. Images, and visual aesthetics, are a vital component of health communication campaigns. If the visuals were more aesthetically pleasing, it is possible that participants may have been more willing to reduce their phone use in class. The self-reported data collected for this study includes inherent limitations such as social desirability and recall bias. Participants may have provided favorable responses while evaluating messages or may have incorrectly reported their phone usage. Lastly, participants recruited via the Prolific platform may perform better academically than their counterparts and may not be representative of the average college student.

#### **Implications and Recommendations**

While limited research exists in the emerging area of cell phone use and academics, this exploratory study provides insights into designing health communication campaigns. First, the qualitative feedback from this study suggests that students understood and rated the preventive messages favorably. However, creating messages that result in a willingness to modify students' behavior remains a challenge. Combining highly relevant information with gain frame messaging may be an approach worth exploring, focusing on the positive aspects of behavior change, instead of highlighting the negatives. Conducting formative research using focus groups and conducting interviews may elicit additional insight necessary to design more effective messages. To holistically address this issue, researchers and practitioners should combine mass communication approaches with interpersonal strategies. For example, college campuses could utilize multiple media channels to disseminate messages like desktop screen savers, posters, while faculty discuss phone addiction and learning related issues in the classroom.

#### Conclusions

The results of the current study suggest phone use among students is complicated, and a behavior that may not be easy to influence. The current study can be used by researchers and practitioners to develop preventive messages directed at addressing student excessive and inappropriate phone use. The social norms message combined with high relevance yielded the most favorable results regarding participant certainty out of the four messages. The results of post-hoc exploratory analysis further emphasized that

students require a message to be relevant to them. By utilizing the results and qualitative feedback of this study, it may be possible to create social norm messages about phone use that are meaningful and relevant to students. This study also provides implications about potential barriers to changing phone behaviors, specifically defensiveness. Post-hoc analysis showed that anxiety, procrastination, screen time, and beliefs may also deter willingness to change. Knowing this, researchers can address these issues in parallel (interpersonal communication and education) along with preventive messages. Students are resistant to changing their phone behaviors, so unyielding, that schools may need to implement a policy prohibiting phones in the classroom. Phone use among students is a challenging issue to address, more research is needed to better understand these complexities.

Conflict of Interest Disclosure The authors report no conflict of interest. Funding The authors report no outside funding for this study.

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#### **IV.** Conclusions

Chapter four includes a summary of studies one and two and consists of the following content sections: Summary of the Studies, Failed to Reject Hypotheses, Rejected Hypotheses, Discussion, Recommendations, Synthesis of Articles, Future Research, and Summary.

#### **Summary of the Studies**

Article One. Smartphones are common in the college classroom. Phone use among college students is at high levels, and researchers continue to examine the root causes of this increased usage (Elhai et al., 2017, Smetaniuk, 2014, & Lepp et al., 2017a). However, there is still much to learn about what drives phone use among students, including whether social norms (perceptions of use among their peers) affect students' own use. Additionally, little research has been conducted examining how perceptions of use among specific referent groups affect screen time. Lastly, college students' addictive tendencies with their phones were assessed to determine how intractable this behavior may be in terms of initiating change (Kim et al. 2014).

The purpose of this study was to examine the prevalence of phone use among college students in class and while they study, and to explore the effects of the perceptions of phone use on students. A 40-item survey was used to collect data regarding phone use, perceptions, beliefs about phone use, and addictive tendencies. This study will help researchers and practitioners to better understand the extent to which

college students use their phones, and how future interventions may improve student

phone behaviors.

The research questions for this study were as follows:

1. What are the prevalence and perceived prevalence of ROAM-ing among college students?

2. Do perceived norms regarding ROAM-ing predict self-reported phone use in class and while studying?

Does this vary by demographics (gender, race, GPA)?

3. Is there a relationship between the belief that phones can negatively impact grades and willingness to reduce ROAM-ing?

4. Is ROAM-ing a predictor of poor academic performance?

5. Is ROAM-ing a predictor of nervousness, procrastination, and/or anxiety?

6. To what extent do students exhibit addictive tendencies towards their phones while in class?

Participants were college students living in the United States who owned

smartphones aged 18 to 47. Participants were recruited via Prolific, the research study recruitment platform on Prolific.co (Prolific). Study participants received monetary compensation as incentives for their time completing the survey. Five hundred participants were recruited in the summer of 2022.

Descriptive statistics were calculated to describe the sample population and to what extent participants exhibited addictive tendencies towards phones. Multiple linear regressions were run to determine whether ROAM predicts poor academic performance, whether perceived ROAM-ing predicts phone use, and identify the best predictor of procrastination and anxiety. Further, Spearman bivariate correlations were conducted to determine whether beliefs about phone use are associated with willingness to change behaviors.

A linear regression was performed to examine whether ROAM predicted GPA. While ROAM did not significantly predict GPA, phone use in class and studying approached significance. Multiple linear regressions were also performed to identify whether perceptions of phone use predicted self-use. Perceptions of phone use in class predicted self-reported use in class (p<.001, B=.288, SE=.013) and predicted daily average screen time (p=.029, B=.133, SE=.399). Linear regressions also showed that the belief that *A students* use their phones in class predicted self-reported phone use in class (p=.003, B=.131, SE=.249).

Associations were found between beliefs and willingness to change as measured by the PAPM. There were positive and negative correlations between phone beliefs and willingness to change. Willingness to change were weakly positively correlated with beliefs that the following negatively impact grades: unhealthy eating habits ( $r_s = .123$ , p= .007), binge drinking ( $r_s = .136$ , p = .003), recreational phone use in class ( $r_s = .278$ , p= <.001), recreational phone use while studying ( $r_s = .173$ , p = <.001), and not getting enough sleep ( $r_s = .135$ , p = .003). Conversely, there were weak negative correlations between willingness to change and the belief it is ok to use phones in class ( $r_s = .219$ , p= .010), and the belief that grades are NOT affected by phone use ( $r_s = .287$ , p = <.001).

The results from the multiple linear regressions revealed the best predictor of procrastination as daily average screen time, p < .001, B = .206, SE = .003. and the best

predictor of anxiety was grade point average (GPA), p=.045 B=-.116, SE=1.056. Although neither phone use in class nor while studying predicted GPA, self-reported procrastination predicted lower GPA, p=.011,  $R^2=.013$ . Further, a mediational model with each of these variables (daily average screen time, procrastination, GPA, and Anxiety) was found to be statistically significant.

Participants also answered an eight-item scale within the survey that measured addictive tendencies towards phone use based on the Smartphone Addiction Proneness Scale for Youth. Over forty percent of participants met the scale threshold for having addictive phone tendencies (Kim et al., 2014).

Article Two.\_Although research has been conducted to examine phone use among college students, little is known about the effectiveness of behavioral interventions for phone use in academic settings. As a result, little is known of the specific motivations behind student phone use in class. Prior studies indicate that excessive phone use is habitual and similar to alcohol and drugs — addictive (Sapacz et al., 2016). The Precaution Adoption Processing Model (PAPM) is a behavioral model used to examine habitual behaviors but has not been used in health messaging for phone use before (Crane et al., 2012, Glik et al., 2014, & Barnard et al., 2017). The Elaboration Likelihood Model is based on the idea that people process or evaluate information depending on their processing state (Petty & Cacioppo, 1986).

The purpose of this study was to examine whether the PAPM can be used to measure changes in willingness to change phone behaviors. A 40-item survey included an
experimental message manipulation where participants randomly viewed one of 2

relevance statements and one of 5 messages (4 preventive messages and one control). The

survey also asked participants to evaluate the messages quantitatively and qualitatively.

The research questions for this study were:

1: Is there a main effect or interaction of message type or ELM processing route on students' readiness to reduce ROAM-ing?

**2**: Is there a main effect or interaction of message type or ELM processing route on students' certainty to reduce ROAM-ing?

**3**: Are message type and elaboration state predictive of willingness to change? Which message was most effective in terms of mediating readiness to change?

**4**: Do college students find the messages appealing, believable, creative, persuasive, interesting, understandable, applicable to students, and discouraging of **ROAM-ing**?

Which message do students prefer?

5: What themes emerged from students' comments regarding the messages?

What specifically did students like/dislike about the messages?

Participants included current college students in the United States, who own a smartphone. Recruitment was conducted through the research study recruitment platform on Prolific.co (Prolific). Study participants received incentives in the form of monetary compensation at a rate of \$8.60/hour for their time. Five hundred participants were recruited in the summer of 2022.

Descriptive statistics were calculated to describe the sample population and the message evaluation responses. Participants evaluated messages by assigning them a letter grade (A-F) and indicating to what level they agreed that messages were interesting,

believable, creative, persuasive, understandable, applicable to students, and discouraging phone use.

Qualitative feedback was collected by asking students to explain why they assigned their message its respective grade and how much it would make them think of reducing their phone use. After analysis, emerging themes were categorized into five primary themes regarding the messages. Major emerging themes were organized into *Supportive/Relevant* (34%), *Defensiveness* (27.3%), *Not Persuasive* (23.1%), *More Information Wanted* (8.9%), and *Introspective* (2.9%).

The most common themes for the informational message were *not persuasive* and *supportive/relevant*. While participants stated they liked the message and found it relevant to students, they often expressed that the messages could be more persuasive by making the imagery stronger or by including additional information. For the loss-framed message, the themes of *defensiveness*, *supportive/relevant*, and *not persuasive* were the most common. The loss-framed message had the most comments from the *defensiveness* theme. The most common emerging themes for the gain-framed message were *supportive/relevant*, *not persuasive*, and *defensiveness*. The three most common themes for the social norms message were *supportive/relevant*, *not persuasive*, and *more information wanted*.

Descriptive statistics were also calculated to compare the grades that participants assigned to each message. A quarter (24.2%) of participants who viewed the informational message gave it an A, 55.5% gave it a B, 16.1% gave it a C, and 4% gave it

a D or below. For the loss-frame message, 14.8% gave it an A, 48.5% gave it a B, 29.7% gave it a C, and 6.9% gave it a D or worse. For the gain-frame message, 17.3% gave it an A, 47.9% gave it a B, 20.4% gave it a C, and 9.1% gave it a D or worse. Lastly, 25.7% of participants who viewed the social norms message gave it an A, 45.5% gave it a B, 19.8% gave it a C, and 8.9% Gave it a D or worse. The informational message and the social norms message received the highest proportion of positive responses.

For the message and relevance manipulation, no main effects based on message or relevance condition affected participant willingness to change. Of the 500 participants, 400 had no change in their intention to change their phone behavior. However, a main effect did emerge regarding how certain participants were that they could change. An interaction was found between the high relevance condition, and the social norms message. Participants who viewed the high relevance condition and the social norms message were more likely to state they were certain they could use their phone less compared to any other message/relevance combination.

An exploratory, post-hoc, multinomial logistic regression also revealed a significant model predicting whether participants would report a decrease in willingness to change, no difference in their willingness to change, and an increase in their willingness. Those who reported more anxiety and more procrastination were more likely to have a decrease in their willingness to change, and those who reported more screentime and believed phones didn't impact grades were more likely to report no change.

Failed to Reject Hypotheses

Article 1

Failed to reject H2.3: There will be no difference in self-reported phone use in class (times checked/hour) by class recommendations.

Failed to reject H2.4: There will be no difference in self-reported phone use while studying (times checked/hour) by studying recommendations.

Failed to reject H2.5: There will be no difference in self-reported phone use while studying (times checked/hour) by gender

Failed to reject H2.6: There will be no difference in self-reported phone use while studying (times checked/hour) by race

Failed to reject H2.7: There will be no difference in self-reported phone use while studying (times checked/hour) by GPA

Failed to reject H4.1: ROAM-ing is not a predictor of poor academic performance.

Article 2

Failed to reject H3.1: There is no main effect of message type or ELM route on students' readiness to reduce ROAM.

Failed to reject H5.1: Message type and elaboration state are not predictive of willingness to change.

**Rejected Hypotheses** 

Article 1

Rejected H2.1: There will be no difference in self-reported phone use in class (times checked/hour) by in-class norms.

Rejected H3.1: There is no relationship between the belief that phones can negatively impact grades and readiness to reduce ROAM-ing.

Rejected H5.1: ROAM-ing is not a predictor of procrastination, or anxiety.

#### Article 2

Rejected hypothesis H4.1: There is no main effect of message type or ELM route on students' certainty to reduce ROAM.

#### Discussion

Article 1.

This study had several aims: to examine the prevalence of phone use among college students, their beliefs about their phone behaviors, and to identify the effect perceptions have on self-phone use. The current study also aimed to determine whether phone use predicted poor grades and what, if anything, predicted anxiety and procrastination.

The results may explain how phones can increase anxiety among students. The results showed that self-reported screen time predicted procrastination. Procrastination, in turn, predicts self-reported GPA. Finally, consistent with previous studies, the best predictor of anxiety in the present study was GPA (Smetaniuk, 2014). A mediational

model containing each of these variables was also statistically significant. This 'pathway' may show how phones can affect procrastination, academic success, and could exacerbate someone's anxiety.

In separate studies, Smetaniuk (2014) and Lepp et al., (2014) highlight the difficulty in addressing phone behaviors due to the addictive nature of phones. In the current study, over a third (40%) of participants exhibited addictive phone tendencies based on a scale developed by Kim and colleagues (2015). Habitual use and addictive tendencies further illustrate the need to better understand how and why students use their phones. The addictive way students use their phones further illustrates the complexity of phone behaviors. Researchers and practitioners should be mindful of addictive tendencies when designing interventions to reduce phone use.

Neither phone use nor daily average screen time predicted GPA. However, this is likely due to the self-reported GPA of participants; most participants reported high grades, and there was little variation, overall. Despite this, daily average screen time approached significance as a predictor of GPA. Additional studies with greater variation among GPA may allow for more significant predictors to emerge. Even though it was not a significant predictor, screen time appeared to have a negative effect on GPA. This result is consistent with other research and further shows how phones can harm academics (Duncan et al., 2012; Felisoni & Godoi, 2018; Lepp et al., 2014a).

Phones are used in many ways that are inherently social, and the results showed perceptions of how students used their phones predicted use, highlighting how social

factors influence people and their phone behaviors. These findings are important because correcting misperceptions is a successful method in health communication, known as social norms marketing (Berkowitz, 2005). As a result, it may be helpful for researchers who specialize in health communication to utilize and evaluate social norm marketing interventions. Particularly, this current study shows a mismatch in behaviors and values; participants accurately believe most students use their phones in academic settings, but also recommend (~50%) using their phones less in the classroom.

Responses to questions related to phone beliefs shed light on why students may or may not be ready to change. Positive correlations were found between willingness to change and beliefs that the following negatively impact grades:

- Unhealthy eating habits ( $r_s = .123, p = .007$ )
- Binge drinking ( $r_s = .136, p = .003$ )
- Phone use in class ( $r_s = .278, p = <.001$ )
- Phone use while studying ( $r_s = .173$ , p = <.001)
- Not getting enough sleep ( $r_s = .135$ , p = .003)

Conversely, negative correlations were discovered between willingness to change and the belief it is ok to use phones in class ( $r_s = -.119$ , p = .010), and that grades aren't affected by phones ( $r_s = -.119$ , p = .010). These results could show that individuals who believe phones can impact their grades are more likely to be willing to change. Further, correlational results indicate that individuals who don't think phones can be harmful are less likely to want to change. This study indicates that perceptions, beliefs, and procrastination may influence how much individuals use their phones. Although phone use in academic settings may be inevitable, the results of this study shed light on how correcting beliefs, correcting misperceptions, and reducing anxiety may also help reduce phone use. Lastly, the results show there may be a potential pathway for how phone use can negatively impact students' grades and anxiety. By better understanding how phone use can impact grades and anxiety, more effective interventions can be implemented to improve student wellbeing.

### Article 2.

The aim of study two was to examine the results of an experimental message manipulation and identify the most effective message/relevance statement in influencing willingness to change phone behaviors, as delineated by the PAPM. Additionally, qualitative and quantitative feedback was collected and analyzed regarding each message to ultimately design a health communication campaign. Qualitative analysis of feedback revealed five main themes: 1) *Supportive/Relevant*, 2) *Introspective*, 3) *Not Persuasive*, 4) *More Information Wanted*, and 5) *Defensiveness*.

The results of the qualitative comments provided a valuable understanding of student perspectives. The feedback illustrates what students may think when encountering a new preventive message and what type of message they may be drawn towards or reject. For example, comments in the *supportive/relevant* theme reflected on what they liked about the message and when they found the message applicable to

students. Comments in the *introspective* theme described how the messages made participants think about their own actions. Feedback in the *not persuasive* and *more information wanted* themes expressed a desire for messages to be more convincing and include supporting data, respectively. Lastly, *defensiveness* comments described how participants were resistant to calls for reducing phone use.

Participants also gave each message a letter grade. Grades helped to quantify which messages were most well-liked among all the participants. Participants seemed to favor the informational message and the social norms message the most. The informational message provided concrete information, and participants seemed to appreciate that the message included a more in-depth explanation. Qualitative responses and themes also seemed to be consistent with their corresponding letter grades. For example, participants responded defensively to the loss-frame message, which was rated as the least favorable message. Participants who viewed the message stated they felt it placed the blame on students for poor grades. Participants also responded to this message (loss-frame message) by stating they refused to believe it or that it would not change their behaviors. While there were varying levels of defensiveness, participants reacted defensively to each of the messages.

The message manipulation did not work as intended because many participants did not change in their willingness to alter their phone behavior. There may be several reasons for this. People may not understand the risks that are associated with high levels of phone use in school. Individuals may also greatly underestimate how much they use their phones; some qualitative responses indicated that participants did not believe

students use their phones upwards of eight hours a day. Participants may also overestimate their ability to successfully multitask while using their phone. The low proportion participants who were willing to change may also have revealed that a longer amount of time is necessary between the message exposure and data collection. Finally, there may be a need for a viewer to see a message multiple times for it to impact their behaviors.

There is an alternative explanation for why participants did not change their willingness to modify their phone behavior. People greatly increased their phone use during the COVID-19 pandemic, when the data for this study were collected, and often relied on them to stay socially connected (David & Roberts, 2021, Ratan et al., 2021). It may be that participants utilized their phones even more during this time-period, making them more resistant to changing their phone use. The pandemic use may have also made them more defensive of their phones because they used them to stay in touch with close friends and family members (David & Roberts, 2021).

Although the message manipulation did not work as intended, results showed that those who read the high relevance statement and then viewed the gain-frame message significantly differed in how certain they were that they could change their phone use, compared to other messages. The high relevance statement said "Why this matters to you: using your phone in class can negatively impact your performance in college. In 2018, researchers found that every 10 minutes of phone use during class has a measurable effect on undergraduate college students' grades, and that every 100 minutes that college students use their phone decreases their academic ranking at their college by over 6%."

Students in a high elaboration state may be more willing to consider behavior change when the message is also highly relevant to them. This approach could be used in realworld settings by presenting facts explaining how phone use affects grades, and how changing behaviors can positively academic outcomes. By understanding the ramifications of excessive phone use, students may then be more willing to change.

Post-hoc analyses were also conducted. Participants who recorded a positive change in behavioral willingness (indicating they were more likely to change after the message manipulation) were analyzed separately from those who reported no change. After analysis, those who viewed the high-relevance statement, and the gain-frame message were most likely to report an increase in behavioral willingness to modify their phone behavior than participants exposed to the other messages or conditions. It is possible that participants' phone defensiveness is associated with belief that phones are detrimental to academics. As a result, participants may have found the gain-framed message more appealing than the loss-framed message because the game-framed message made students feel less defensive and, thereby, more receptive to the message. Similarly, college students respond better to gain-framed alcohol and drug prevention messages than loss framed messages because the receiver is less defensive (Quick & Bates, 2010).

In addition, the results from a multinomial logistic regression model further shed light on the defensiveness of participants. Participants who were more anxious and spent more time procrastinating were more likely to report a decrease in their willingness to change, compared to those who were less anxious or procrastinated less. Participants who reported higher screen time and did not believe phone use impacted grades were also

more likely to report no change in their willingness to alter their phone behaviors, when compared to those who had an increase. The results of this model suggest that screen time, beliefs, anxiety, and procrastination influence how likely someone is to change their behavior. Gaining a better understanding of how these factors affect phone use may help interventionists communicate more effectively with their target audience.

### Recommendations

The following recommendations result from the findings from the two studies.

- 1. School officials and health promotion experts should develop and conduct educational sessions to students about the risks of excessive phone use. Moreover, orientation speakers and in-class instructors could explain these risks directly to students.
- 2. Health communication campaigns regarding excessive phone use should ensure messaging is highly relevant to students and explain why this issue is important to them.
- 3. Health communication campaigns should utilize gain-frame messaging. The high level of defensiveness in this study suggests students do not believe using their phones is risky. When students perceive a low level of risk to be associated with a behavior (e.g., excessive drinking), a gain-frame message may appeal more to them than other frames (Quick & Bates, 2010).
- 4. Health communication campaigns on college campuses should utilize multiple channels to disseminate messages such as on posters, campus computer screen savers, social media accounts, in the school newspaper, etc.
- 5. Important referents (peers, family members, friends, and college faculty) should be used to endorse and help communicate the message(s).

## **Synthesis of Articles**

Phone use is associated with poor academic performance, stress, and anxiety

(Lepp et al., 2014a, Sapacz & Clark, 2016, Smetaniuk, 2014). The level at which students

use their phones is potentially damaging to their health and academic success. The quantitative results regarding participant phone beliefs and perceptions in Chapter Two, combined with the quantitative and qualitative results of Chapter Three, provide information for future behavioral interventions. The key findings from this study suggest perceptions of peer phone use influence behaviors. Further, screen time can predict procrastination, and procrastination can predict grades.

Additionally, students may respond more favorably to highly relevant messages when the message provides supporting information. Results indicate there may be a pathway from screen time to grades, if indirectly. Both studies also revealed the effect phones may have on anxiety, and the effect anxiety may have on phone use. These studies complement one another because study one shows there is a mismatch between perceptions of how many students use their phones when in class/studying, and how many students would recommend decreasing their phone use. Combined with the results of the social norms message in study two, results reveal that a social norms approach constitutes a promising approach to addressing this complex behavior with college students.

The results of this study also have implications for health education. Participants reported using their phone at high levels (an average of five and a half hours a day) and reported checking their phones regularly when in class and when studying. Such phone use can impact anxiety, procrastination, and can be potentially harmful to mental and physical health. If phone use is as common as the present studies suggest, students could face enormous harm to their health and academics. There is a need for delivering health

education to inform students on the risk related to excessive phone use. Finally, research is also needed to assess the effectiveness of health education interventions to address this complicated personal health issue.

### **Future Research**

Although evidence points to the risks associated with excessive phone use for college students, they may be unaware of the distractions phone use cause and how that impacts learning, let alone the addictive issues linked to phones. Little research has been conducted assessing the prevalence of phone use in college, and scant research exists examining what types of interventions might address excessive and inappropriate phone use in the classroom. There is also a need to conduct research formative qualitative research (focus groups and interviews) to understand what motivates students to use their phone in academic settings. Focus groups can help to discover the social dynamics of phone use, while interviews may allow more honest, individualized responses. Future research should also explore social norms marketing approaches to see if these influence behavior change, as these may be viewed as less authoritarian to students.

Researchers should also conduct health communication studies to test additional message approaches. To this end, researchers should explore alternate theoretical approaches to identify intentions to change or actual behavior change. In addition, more research is needed to understand what type of 'relevance' messages will lead to behavior change. Finally, results from future studies can help researchers better understand how

ingrained beliefs and current phone behaviors affect college students' willingness to change.

# Summary

This chapter provided an overview of the findings from both article one and article two. Details regarding rejected and failed-to-reject hypotheses are included. Summaries, discussions, and recommendations based on findings for both articles are included. Lastly, this chapter also describes a synthesis of articles.

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# **APPENDIX I**

# **COPY OF SURVEY**

What is your Prolific ID? Please note that this response should auto-fill with the correct ID

Directions: For the purposes of this survey, **phone (i.e., smartphone) use** is defined as any act that is not specifically for class or class activities, excluding emergencies (e.g., serious family issue). This type of phone use commonly referred to as "recreational phone" use in class or while studying may include: texting, social media use, emailing, gambling, games, shopping, etc.

How many times do you typically look at your phone in a one hour period **while in class?** 

(Please use numerical values only):

How many times do you typically look at your phone in a one hour period **while studying?** (Please use numerical values only):

What percentage of college students do you think use their phone while in class? (Please use numerical values only. Do not include % sign.) What percentage of college students do you think use use their phone while studying? (Please use numerical values only. Do not include % sign.) What percentage of college students do you think recommend NOT using their phone while in class? (Please use numerical values only. Do not include % sign.) What percentage of college students do you think recommend NOT using their phone while studying? (Please use numerical values only. Do not include % sign.)

Please indicate the level to which you agree or disagree with the following statements:

ee	agree	nor disagree	disagree	disagree	
0	0	0	0	0	The typical college student would disapprove of me using my phone in class.
0	0	$\bigcirc$	0	0	Most students at MY university would disapprove of me using my phone in class.
0	$\bigcirc$	0	$\bigcirc$	$\bigcirc$	My friends would disapprove of me using my phone in class.
0	$\bigcirc$	$\bigcirc$	0	$\bigcirc$	My parents would disapprove of me using my phone in class.
0	0	0	$\bigcirc$	0	My teachers would disapprove of me using my phone in class.
0			0	0	phone in class. Most students at MY university would disapprove of me using my phone in class. My friends would disapprove of me using my phone in class. My parents would disapprove of me using my phone in class. My teachers would disapprove of me using my phone in class.

Which do you think most accurately reflects how much time each group spends on their phones within a one-hour period **in class**?

	10 minutes or less	Between 11 and 20 minutes	Between 21 and 30 minutes	Between 31 and 40 minutes	Between 41 and 50 minutes	51 minutes or more
The typical college student.	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Other students at YOUR university.	0	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Your friends.	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Students who get all A's.	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

	Strongly disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Strongly agree
Most college students believe it is okay to use their phone in class.	0	0	0	0	0
Most college students' grades are <b>NOT</b> impacted by their phone use.	$\bigcirc$	0	0	$\bigcirc$	0
Most college students do <b>NOT</b> think using their phone in class increases their anxiety.	$\bigcirc$	0	$\bigcirc$	$\bigcirc$	0
Most college students think they can successfully multi-task and look at their phone while in class.	0	0	$\bigcirc$	0	0
Most college students think it is rude to use their phone in class.	$\bigcirc$	0	0	$\bigcirc$	0
Most college students can <b>NOT</b> go an entire class without checking their phone.	$\bigcirc$	0	$\bigcirc$	0	$\bigcirc$

Please indicate the level to which you agree or disagree with the following statements regarding college students' phone use.

To what extent do you agree or disagree that the following behaviors can negatively affect **college students'** grades:

	Strongly Disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
Unhealthy eating habits	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Binge drinking	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Using marijuana/cannabis	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Not getting enough physical activity	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Drinking too many caffeinated beverages	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Using your phone recreationally in class	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Using your phone recreationally while studying	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
Not getting enough sleep	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

To what extent do you agree or disagree with the following statements regarding <u>your</u> <u>own</u> phone use:

	Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree
I get restless in class when I am without my phone.	0	0	0	0	0
I have a hard time focusing in class, due to my phone.	0	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
l've tried reducing my phone use while in class.	0	$\bigcirc$	0	$\bigcirc$	0
My phone does not distract me from learning.	0	$\bigcirc$	0	$\bigcirc$	0
In class, I panic if I am without my phone.	0	$\bigcirc$	0	$\bigcirc$	0
When I am bored in class I check my phone.	0	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
If the subject matter is too difficult, I have an urge to check my phone.	0	$\bigcirc$	0	0	0
I want to be able to see my phone in class, even if I don't plan on using it.	0	$\bigcirc$	0	0	0
I check notifications on my phone during class.	0	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$

If the class subject matter is not relevant to me I check my phone during class.

Note: For the next two questions, if you are not taking summer classes, please think back to your most recent active semester.

 $\bigcirc$ 

 $\bigcirc$ 

 $\bigcirc$ 

 $\bigcirc$ 

 $\bigcirc$ 

In the past 30 days, about how many **days** were you anxious because of school related activities (e.g., class assignments, exams, etc.)? (Please use numerical values only.)

In the past 30 days, please estimate how many **days** you procrastinated with your school-work because of your phone. (Please use numerical values only.)

Please indicate which best represents your thoughts about reducing your own phone use while in class. (Pick one)

O I have never thought about reducing my phone use in class.

O I have thought about reducing my phone use, but not seriously.

○ I have thought seriously reducing my phone use, but I have not thought about it recently.

○ I have thought about reducing my phone use, but I decided not to reduce my phone use.

I have thought about reducing my phone use, and I believe I can reduce my phone use in the future.

○ I have decided to reduce my phone use and I have a plan to do so.

○ I have already taken steps to reduce my phone use.

\_\_\_\_\_

Reducing my phone use in class is good to do.

O Strongly disagree

Disagree

O Neither agree nor disagree

O Agree

O Strongly agree

Reducing my phone use in class would help my grades.

O Strongly disagree

O Disagree

O Neither agree nor disagree

O Agree

O Strongly agree

## Please read the following statement before continuing:

You want to finish college with good grades, don't you?

Using your phone in class can negatively impact your performance in college. In 2018, researchers found that every 10 minutes of phone use during class has a measurable effect on undergraduate college students' grades, and that every 100 minutes that college students use their phone decreases their academic ranking at their college by over 6%.

Felisoni, D. D., & Godoi, A. S. (2018). Cell phone usage and academic performance: An experiment. Computers & Education, 117, 175–187. https://doi.org/10.1016/j.compedu.2017.10.006

End of Block: High Relevance Statement

Start of Block: Low Relevance Statement

## Please read the following statement before continuing:

Before we go on...

Remember, studies show that people who put their phones down do better in school.

Felisoni, D. D., & Godoi, A. S. (2018). Cell phone usage and academic performance: An experiment. Computers & Education, 117, 175–187. https://doi.org/10.1016/j.compedu.2017.10.006

End of Block: Low Relevance Statement

**Directions:** We want to obtain your feedback on a message. Please look at the following message carefully and use the following criteria to evaluate it:

Is the message: Understandable Interesting Creative Persuasive Believable Applicable Likely to discourage phone use <u>during class</u> <u>After 10 seconds you will be able to continue with the survey.</u> You will then be asked to provide a letter grade (A-F) based on the message's overall effectiveness. Finally, we will ask you to write about what you liked or disliked in the comment box. Please be specific. Thank you! Please indicate which best represents your thoughts about reducing your own phone use while in class. (Pick one)

O I have never thought about reducing my phone use in class.

O I have thought about reducing my phone use, but not seriously.

I have thought seriously reducing my phone use, but I have not thought about it recently.

○ I have thought about reducing my phone use, but I decided not to reduce my phone use.

○ I have thought about reducing my phone use, and I believe I can reduce my phone use in the future.

○ I have decided to reduce my phone use and I have a plan to do so.

○ I have already taken steps to reduce my phone use.

-----

How certain are you that you can reduce your phone use while in class?

O Not certain at all

○ A little certain

O Unsure

Certain

O Very certain

Reducing my phone use in class is good to do.

O Strongly disagree

○ Disagree

O Neither agree nor disagree

○ Agree

O Strongly agree

Reducing my phone use in class would help my grades.

○ Strongly disagree

○ Disagree

O Neither agree nor disagree

○ Agree

O Strongly agree

.....
Overall, would this message influence you to use your phone less?

O Strongly disagree

○ Disagree

O Neither agree nor disagree

○ Agree

○ Strongly agree

What is your gender identity?

O Male

O Female

O Non-binary/Genderqueer

○ Transgender

O Prefer to specify \_\_\_\_\_

What is your race? (select all that apply)

American Indian or Alaska Native
Arab or Arab American
Asian or Asian American
Black or African American
Hispanic or Latin American
Native Hawaiian or Pacific Islander
White or European American
Additional race not listed

What is your ethnicity?

○ Hispanic/Latino

○ Non-Hispanic/Latino

.....

How old are you?

Are you a member of a social fraternity or sorority?	
◯ Yes	
○ No	
Are you a member of a collegiate athletic team?	
⊖ Yes	
○ No	
What is your GPA? (Note: if you are in your first year, you may estimate your GPA)	
Do you have any additional comments regarding the survey or the messages you wa o share with us?	ant
	_
	-

Please enter your daily average screen time for your phone. (This may be found in settings>Digital Wellness/Parental controls for Android phones and settings>Screen Time for iPhones)

(Please use numerical values only)

	Hours	Minutes
Daily Average Screen time		

As a final control measure, we would like you to tell us the degree to which you paid attention to the message about your phone use:

Please answer this question truthfully; it will not impact your ability to be compensated for this survey.

O Not at all

 $\bigcirc$  A little attention

O Neither a lot nor a little attention

○ Some attention

○ A great deal of attention

# Please grade this message

 $\bigcirc$  A ○ A-○ в+ Ов ○ в-○ C+  $\bigcirc c$ ○ c-○ D+  $\bigcirc$  d ○ **D**- $\bigcirc$  F

	Strongly disagree	Disagree	Somewhat disagree	Neither agree nor disagree	Somewhat agree	Agree	Strongly agree
l understood this message	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	0	$\bigcirc$	0
This message is interesting	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
I found the message to be creative	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$
I found the message to be persuasive	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
l believe this message	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
This message applies to college students	$\bigcirc$	$\bigcirc$	$\bigcirc$	$\bigcirc$	0	$\bigcirc$	$\bigcirc$
This message discourages phone use	0	$\bigcirc$	0	$\bigcirc$	0	0	0

Please evaluate the message and indicate to what extent you agree with the following:

Please explain your rationale for the grade you gave this message. In other words, in detail, describe why you liked or disliked this message.

How much did this message make you think about reducing your phone use in class?

# **APPENDIX II**

# **PREVENTIVE MESSAGES**







# **APPENDIX III**

# **INFORMED CONSENT**

# ADULT RESEARCH SUBJECT - INFORMED CONSENT FORM

# Responses to Messages

# Key Information:

- You are being invited to participate in a research study.
- The purpose of the study is to understand your responses to a message.
- This research will take place online. It will consist of reading some information and viewing a message and answering some questions about what you read.
- Overall, the study is expected to take approximately 8 minutes.
- There are minimal risks to participation in this study, including loss of confidentiality and feeling slight discomfort.
- Participation is voluntary and you can stop at any time.
- You will receive compensation if you complete at least 80% of the survey questions.

# Principal Investigator: Dr. Tavis Glassman, Professor (419) 530-2770

*Purpose:* You are invited to participate in the research project entitled, "Responses to Messages," which is being conducted at the University of Toledo under the direction of Dr. Tavis Glassman. The purpose of this study is to have people evaluate how individuals respond to viewing certain messages.

Description of Procedures: This research study will take place online. You will be asked to read some information and view a message and answer some questions about what you read. We will also ask you to indicate your health, age, sex, race and ethnicity. Participation in this study will take approximately 8 minutes. If you wish to discontinue your participation in this study at any time, you may do so.

Potential Risks: There are minimal risks to participation in this study, including the low risk of loss of confidentiality, and feelings of minor discomfort when thinking about anxiety. You may stop your participation at any time without penalty.

**Potential Benefits:** The only direct benefit to you if you participate in this research may be that you will learn about the research process. The field of health education may benefit from this research because this will help us to understand how individuals respond to preventive messages. You will be compensated according to your Prolific profile after successful completion of the study. Note: while you may skip any individual question, you must complete at least 80% of the items to receive compensation.

**Confidentiality:** The information that is collected from your participation in this research will not be used or distributed for future research The researchers will make every effort to prevent anyone who is not on the research team from knowing that you provided this information, or what that information is. Responses to surveys will not include names and will be presented to others only when combined with other responses. The collected data will be stored on a password protected computer and only the Principal Investigator and research personnel will have access to the data.

**Voluntary Participation:** The anonymous information collected from you may be used for future research purposes. As a reminder, your participation in this research is voluntary. Your refusal to participate in this study will involve no penalty or loss of benefits to which you are otherwise entitled and will not affect your relationship with The University of Toledo. In addition, you may discontinue participation at any time without any penalty or loss of benefits. If you choose not to complete the study, you will not be compensated. You may skip any questions that you may be uncomfortable answering.

**Contact Information:** If you have any questions at any time before, during or after your participation, you should contact a member of the research team, Dr. Tavis Glassman, (419) 530-2770 If you have questions beyond those answered by the research team or your rights as a research subject or research-related injuries, the Chairperson of the SBE Institutional Review Board may be contacted through the Human Research Protection Program on the main campus at (419) 530-6167.

# **CONSENT SECTION – Please read carefully**

You are making a decision whether or not to participate in this research study. By continuing and completing this study you indicate that you are at least 18 years of age, you have read the information provided above, you have had all your questions answered, and you have decided to take part in this research.

### **APPENDIX IV**

### **COMPUTERS IN HUMAN BEHAVIOR GUIDE FOR AUTHORS**

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#### **INTRODUCTION**

Computers in Human Behavior is a scholarly journal dedicated to examining the use of computers from a psychological perspective. Original theoretical works, research reports, literature reviews, software reviews, book reviews and announcements are published. The journal addresses both the use of computers in psychology, psychiatry and related disciplines as well as the psychological impact of computer use on individuals, groups and society. The former category includes articles exploring the use of computers for professional practice, training, research and theory development. The latter category includes articles dealing with the psychological effects of computers on phenomena such as human development, learning, cognition, personality, and social interactions. The journal addresses human interactions with computers, not computers per se. The computer is discussed only as a medium through which human behaviors are shaped and expressed. The primary message of most articles involves information about human behavior. Therefore, professionals with an interest in the psychological aspects of computer use, but with limited knowledge of computers, will find this journal of interest.

#### **Types of contributions**

Original theoretical works, research reports, literature reviews, software reviews, book reviews(by

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For transparency, we encourage authors to submit an author statement file outlining their individual contributions to the paper using the relevant CRediT roles: Conceptualization; Data curation;

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### **APPENDIX V**

### Journal of American College Health Author Guidelines

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## **APPENDIX VI**

# Post-Hoc Analyses for 3.3 Participant certainty in their ability to change based on message and relevance.

	Unstandardized Coefficients		Standardized Coefficients		
	В	Std. Error	Beta	t	Sig.
(Constant)	3.852	.134		28.694	.000
Relevance condition	086	.197	043	436	.663
Informational msg	.201	.209	.081	.961	.337
Loss-frame msg	.060	.187	.024	.323	.747
Gain-frame msg	085	.185	034	460	.645
Social norms msg	.243	.203	.099	1.199	.231
Rel*Informational	327	.283	108	-1.155	.248
Rel * Loss_frame	.037	.279	.011	.133	.894
Rel * Gain-frame	.582	.284	.156	2.052	.041
Rel * Social norms	230	.280	075	820	.412

Dependent variable: How certain are you that you can reduce your phone use in class?

#### Parameter estimates

					95% Co	nfidence			
					Interval		- Partial		
-		Std.		<i></i>	Lower	Upper	Eta	Noncent.	Observed
Parameter	В	Error	t	Sig.	Bound	Bound	Squared	Parameter	Power <sup>b</sup>
Intercept	3.766	0.144	26.173	0.000	3.483	4.049	0.583	26.173	1.000
Relevance	.086	.197	.436	.663	301	.473	.000	.436	.072
Informational msg	127	.191	661	.509	503	.250	.001	.661	.101
Loss-frame msg	.098	.207	.472	.637	309	.504	.000	.472	.076
Gain-frame msg	.497	.215	2.310	.021	.074	.920	.011	2.310	.635
Social norms msg	.014	.193	.071	.943	365	.393	.000	.071	.051
Control	0								
Relevance* Informational	.327	.283	1.155	.248	229	.884	.003	1.155	.211
Relevance* Loss-frame	037	.279	133	.894	586	.511	.000	.133	.052

Dependent Variable: How certain are you that you can reduce your phone use in class?

Relevance* Gain-frame	582	.284	-2.052	.041	-1.140	025	.009	2.052	.535
Relevance* Social norms	.230	.280	.820	.412	320	.780	.001	.820	.130

b. Computed using alpha = .05