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Smartphone Dependence: Relation To Text-Message Dependence, Personality, And Loneliness

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SMARTPHONE DEPENDENCE: RELATION TO TEXT-MESSAGE DEPENDENCE,
PERSONALITY, AND LONLINESS

By

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Bachelor of Science, University of North Dakota, 2015

A Thesis

Submitted to the Graduate Faculty

of the

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in partial fulfillment of the requirements

for the degree of

Master of Arts

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Alex J. Holte

This thesis, submitted by Alex J. Holte in partial fulfillment of the requirements for the Degree of Master of Arts from the University of North Dakota, has been read by the Faculty Advisory Committee under whom the work has been done and is hereby approved.



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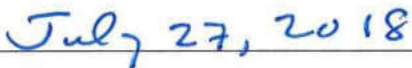
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This thesis is being submitted by the appointed advisory committee as having met all of the requirements of the School of Graduate Studies at the University of North Dakota and is hereby approved.



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Title Smartphone Dependence: Relation to Text Message Dependence,
 Personality, and Loneliness

Department Psychology

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Alex J. Holte

8/12/2018

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ABSTRACT

Given the ubiquity of smartphones, research has examined its impact on human behavior. Through prior studies have examined smartphones through the addiction framework, resulting in controversy of if habitual smartphone use is an addiction disorder, prior works have not examined the framework of how reliant someone is to their smartphone in their daily life. Additionally, prior works have not examined how smartphone dependence is related to texting dependence, state anxiety, trait anxiety, depression, neuroticism, extroversion, and loneliness. The literature has also not examined the method of communication that an individual prefers and how that relates to loneliness. We had 237 undergraduate students complete a multitude of measures related to the constructs listed above. All four subscales of smartphone dependence were significantly and positively correlated with their respective texting dependence subscale. Additionally, extroversion was significantly correlated with the excessive use subscale and neuroticism was significantly correlated with emotional reaction and relationship maintenance subscale. A majority of the smartphone dependence subscales were significantly correlated with measures of state/trait anxiety, depression and loneliness. Loneliness was not related to the quantity of phone calls or text messages made on the typical day, however loneliness was significantly higher in individuals who prefer asynchronous methods of communication. Numerous associations with psychopathology were made in this study and provide the literature with further support that as technology evolves over time, research must continue to evolve as

well, examining the very real negative effects associated with smartphone usage. Implications and suggestions for future studies are discussed.

CHAPTER 1

INTRODUCTION

Through the advancement of technology, smartphones impact the world we live in. The common phone no longer simply makes voice calls. Through these advancements, a seemingly endless amount of functions and capabilities are facilitated through smartphones. Within the typical day, the average person can find themselves waking up to their phone as their alarm, using the internet browser of their phone to find out when stores open/close, taking a photo with their phone's camera, as well as more recreational activities such as video games to pass the time. As a technological adaptation of the Swiss-Army-Knife, smartphones are multifaceted devices designed to make life easier.

Ubiquitous in society, 95% of Americans owned a mobile phone in 2016 (Pew Research Center, 2017). Given the prevalence of cellphones, researchers have evaluated the influence on human behavior. Mental health consequences of smartphones have been considered and the scientific literature has advocated the too much smartphone use is related to chronic stress, low emotional stability, depression (Augner & Hacker, 2012), low self-esteem, and social anxiety (Hong, Chui, & Huang, 2012). Moreover, college students are commonly termed as mobile phone "natives" as they have grown up with these technologies and have not lived in a world without them (Forgays, Hyman, & Schreiber, 2014). College students frequently check their phones while in lecture (Atchley and Warden, 2012; Deloitte, 2016) and negative associations to

academic performance has been documented (Rosen, Carrier, & Cheever, 2013). College students have shown to prefer asynchronous methods of communication such as texting (Harrison & Gilmore, 2012) and researchers have advocated they depend on texting in multiple life settings (Igarashi, Motoyoshi, Takai, and Yoshida, 2008). Though work has considered psychopathological concerns, more work is needed to further understand the everchanging dynamics of smartphones.

Literature Review

The following section provides a comprehensive review of prior works related to the current study in the following order. First the theoretical prospective of Uses and Gratification Theory in addition to the Compensatory Internet Use Theory will be presented. Next mobile phone dependence will be discussed. Aspects of mental health such as anxiety, depression and loneliness will be conferred. Personality will be mentioned next to outline the individual differences of smartphone use in individuals. Lastly, we will look at the aims of this study and consider gaps in the literature.

Theoretical Perspectives: Usages and Gratification Theory / Compensatory Internet Use Theory

Usage and Gratification Theory (UGT) describes the interaction of media choices of individuals to meet needs (Katz, Blumer, & Gurevitch, 1973). Prior work suggest five gratifications are provided through smartphone use: sociability (Leung & Wei, 2000), relaxation (Leung & Wei, 2000), instantaneous access (Ling, 2004), mobility (Leung & Wei, 2000), and status (Leung & Wei, 2000). Depending on the current need of an individual, a different

gratification may be sought. For example, if someone is bored, they may desire entertainment and choose to use a video application. An additional consideration for gratification needs is individual differences (Blumler, 1979). Such that UGT acknowledges the intrinsic factors of an individual (Joo & Sang, 2013). When examining texting behavior, two additional gratifications were found: coordination and escape (Leung, 2007). Coordination refers to the ability to schedule a time to communicate with another. Escape relates to texting as a mechanism to get away from a task. This theory can be applied to examine the method of communication that an individual chooses to use as prior works have applied the theory to uses of social media (Tonteri, Kosonen, Ellonen, & Tarkiainen, 2011) and text-messaging (Punyanunt-Carter, 2012; Wei & Wang, 2010) through analyzing the desire to fulfill psychological and social needs.

An expansion of UGT, Compensatory Internet Use Theory (CIUT) suggests negative emotions are assuaged through technology use and overuse (Kardefelt-Winther, 2014). This theory advocates that excessive technology use is a compensatory behavior intended to control negative emotions. Previous studies have found support for CIUT in Problematic Smartphone Behavior (Long et al., 2016; Wang, Wang, Gaskin, & Wang, 2015; Zhitomirsky-Geffet & Blau, 2016). This theory could be used to examine why individuals who score high in anxiety, depression or loneliness may be more dependent on using their smartphone and texting as CIUT advocates individuals with psychopathologic symptoms use technologies excessively.

Smartphone Dependence

Though researchers have tried conceptualizing overuse of smartphones as an addiction (Bian & Leung, 2015; Chóliz, 2010; Hong, Chiu, & Haung, 2012; Park & Lee, 2012; Walsh, White, & Young, 2010), an attempt to have it recognized as a behavioral addiction in the

Diagnostic and Statistical Manual of Mental Disorders (DSM-5) was not successful (Deb, 2015). One of the ongoing issues within the scientific community is that there is not a standard terminology for this type of behavior (Konok, Gigler, Bereczky, & Miklosi, 2016; Sansone & Sansone, 2013). Kruger and Djerf (2017) advocated that though smartphone use characterized by compulsion or excessive use may mirror addictive properties, it is more accurate to describe it as a psychological dependence. This dependence describes more of a reliance in lieu of a psychological addiction.

Furthermore, Igarashi et al, (2008) Self-Perception of Text-Message Dependence Scale (SPTMDS) outlined four aspects of dependence to texting: emotional reaction, excessive use, relationship maintenance, and psychological/behavioral symptoms. These four components of dependence were applied in Ferraro, Wunderlich, Wyrobek & Weivod (2014) paper in which they developed an iPod dependence measure through replacing the word “text messages” for “iPod.” As a result, they found that each of the texting dependence subscales correlated with the respective subscale of iPod dependence. Though text-message dependence and iPod dependence provides an understanding of how reliant an individual is to text others or play their iPod, currently there is not a scale measure that uses the same framework seen in the SPTMDS to describe smartphone dependence in general. These same aspects of dependence could be seen in a scale that measures how reliant someone is on their smartphone as the researchers have indicated they each relate to smartphone use.

Emotional Reaction

Prior research has examined the reaction invoked upon an occurrence in which one is unable to access or use their smartphone. Clayton, Lesner and Almond (2014) advocated that

smartphone users have an increase blood pressure and heart rate, anxiety, feelings of unpleasantness, and decreased cognitive ability when unable to answer their ringing phone. Additionally, Cheever, Rosen, Carrier and Chavez (2014) found participants have anxious feelings when either separated from their phone or told to turn it off. Similar results were found in Konok, Pogány, & Miklósi (2017) as separation from one's smartphone induced both behavioral and physiological anxiety. Similarly, Holte and Ferraro (2018) found participants formed emotional bonds to their cellphones based on how reliant they were to use the device to text others. Furthermore, Rosen, Carrier, Miller, Rokkum, and Ruiz (2016) found 81% of their participants kept their phone near them when they slept to ensure they do not miss a message. The findings of this study suggest that people want to limit distance between themselves and their smartphone to alleviate negative emotions expressed in the event they cannot use their phone. The desire to seek proximity of one's phone to assuage negative emotions could be related to Compensatory Internet Use Theory. Though individuals are not using their devices, the very nature of keeping it close to them enervates the negative emotions from being separated as documented in the literature (Cheever, Rosen, Carrier and Chavez, 2014; Clayton, Lesner, Almond, 2014; Konok, Pogány, & Miklósi, 2017).

Because of using one's phone to reduce negative emotions, it is common for individuals to check their phone often. Atchley and Warden (2012) suggested that young adults feel they continually need to check their phone for messages. Similarly, Oulasvirta, Rattenbury, Ma, and Raita (2012) suggested the average person checks their phone 34 times a day for messages. As it relates to the college student population, checking one's phone is much more pervasive as young adult smartphone users check their phones 82 times a day (Deloitte, 2016). McCoy (2013)

advocated that typical college students check their phone at least 10 times during the time they are in class each day. Frequent checking of one's phone seems to be one of the factors that describes dependence on one's smartphone which can be perplexing as most of the communication methods used within smartphones are asynchronous, and immediate responses are not needed.

Excessive Smartphone Use

Dependence on smartphone use has been predicted by excessive use (Billieux, Van der Linden, & Rochat, 2008; Hong, Chiu, & Huang, 2012). Excessive smartphone use has also been characterized as a predictor of addictive-like qualities and compulsive behavior (Augner & Hacker, 2012; Kwon, et al., 2013; Lee, Chang, Lin, & Cheng, 2014; Lin et al., 2015; van Deursen, Bolle, Hegner, & Kommers, 2015). Mok et al, (2014) explains these occurrences to individuals developing a tolerance to smartphone use and as a result need to spend a gradually larger amount of time to reach an optimal level of fulfillment. Hong, Chiu, and Huang (2012) suggested the increased dependence on smartphones is relating to the development of associated problems.

One of the associated problems of excessive smartphone use occurs when an individual interrupts a conversation they have with someone in person, to use their smartphone. This describes an important aspect of excessive use of texting. Most considerations of excessive use relate to the amount of time spent texting or amount of text messages; however, an additional consideration is the element of using one's phone in situations that previously weren't considered to be appropriate. For example, the concept of "phubbing" has been developed and refers to using one's smartphone instead of focusing on the social interaction in front of them

(Chotpitayasunondh & Douglas, 2016). Phubbing has shown to have negative effects on relationship satisfaction and self-reported feelings of wellbeing (Roberts & David, 2016). On a similar note, smartphone users have started using their phones in situations in which you would typically anticipate someone detaching from phone use. Participants in Harrison and Gilmore (2012) reported using their smartphone while speaking to someone in person, at a movie or sporting event they paid to see, at a religious service, and even while having sex. All things considered, smartphones have become persistent entities that not only are being used in large quantities of time but has encompassed a changing of norms that is related to negative effects with interpersonal relationships.

Relationship Maintenance

The literature has indicated that smartphone use is related to an improved sense of fulfillment and connection within close relationships (Coyne, Stockdale, Busby, Iverson, and Grant, 2011). College students have shown to feel inclined to texting in effort of maintaining relationships (Drouin & Landgraff, 2012; Forgays, Hyman, & Schreiber, 2014; Hall & Baym, 2011; Park, Lee, & Chung, 2016) and seek approval of friends (Igarashi et al, 2008). Young adults desire social relationships and have reservations regarding potential failure of face-to-face communication (Leary and Kowalski, 1995). The asynchronous affluences of smartphones remove the risk of face-to-face failure by promoting a technology they have more control over.

Smartphones engender the ability to communicate with others and maintain relationships regardless of proximity. Benefits of electronic communication in long distance relationships includes feelings of availability, self-disclosure, and emotional intimacy (Boneva, Kraut, & Frolich, 2001; Bruss & Hill, 2010; Cooper, & Sportoari, 1997). It appears smartphones have

ameliorated some limitations of long distance relationships through numerous methods of communication (texting, phone call, snapchat, video chat). For less distant relationships, Park, Lee, and Chung (2016) suggested that time spent texting was inversely related with relationship satisfaction. Perhaps relying on texting as a primary method of communication with a partner does not enhance one's relationship? Park et al (2016) however, found that the quantity of text messages was related to decreased loneliness and increased intimacy and relationship satisfaction. Additionally, Ramirez and Broneck (2009) advocated that digital communications in terms of assurance and positively is more frequently seen in dating relationships in comparison to family members, suggesting that smartphones are used to further promote the development of a social relationship. Taken together, there is a myriad of considerations involving interpersonal relationships and smartphones and individuals may be dependent on their smartphone to maintain and develop relationships.

Psychological/Behavioral Symptoms

An element of smartphone dependence incorporates psychological/behavioral symptoms related to motives for device use and associations with anxiety, depression and loneliness. Numerous associations of smartphone use and mental health have been made. Within this section, a detailed account of anxiety, depression, and loneliness will be provided.

Anxiety

Anxiety is a negative state characterized with somatic symptoms of tension and nervousness about future events (American Psychiatric Association, 2000; Barlow, Pincus, Heinrichs, & Choate, 2003). Anxiety impacts everyone. Though a moderate amount of anxiety is

beneficial (Yerkes & Dodson, 1908); higher levels of symptoms are related to memory impairment (Bulbena & Berrios, 1993), academic failure (Mazzone et al., 2007), increased risk of drug abuse (Liang, Chikritzhs, & Lenton, 2011), problematic drinking behaviors (Lewis and O'Neill, 2000), diminished quality of life (Olatunji, Cisler, & Tolin, 2007) and increased risk of having an eating disorder such as anorexia and bulimia nervosa (Kaye, Bulik, Thornton, Barbarich, & Masters, 2004). Though not comprehensive, this list articulates the notion that anxiety is related to negative life outcomes.

Psychopathology has previously been applied to technologies such as smartphones. For example, college students who spend more time on their phones score higher in anxiety (Demirci, Akgönül, and Akpınar, 2015). Researchers have also analyzed the role smartphone use plays in alleviating anxiety as Reid and Reid (2007) suggested anxious individuals use their phone to divert their attention from when they were bored, suggesting they want to distract or escape from the anxiety provoking thoughts or problems (Nehra, Kate, Grover, Khenra, & Basu, 2012). The multitude of functions ranging from entertainment (Youtube, Pokémon Go) to socializing (Facebook, Snapchat) provide individuals opportunities to escape current thoughts or issues. This rationale of escaping or distracting oneself from one's thoughts is the second most frequent reason college students use text messaging (Grellhesl & Punyanunt-Carter, 2012).

Depression

Depression is a mood disorder characterized by feeling worthless, unable to make decisions, and impaired physical functions such as changes in weight and/or appetite, disorganized sleep schedule, and significant lack of energy (American Psychiatric Association, 2000). At least 16.2 million adult Americans have a minimum of one major depressive episode

(MDE) each year (National Institute of Mental Health, 2017). Young adults have the highest prevalence of MDE, with 10.9% of all adults 18-25 having an occurrence each year (National Institute of Mental Health, 2017). Additionally, depression has been related to diminished work performance (Sanderson & Andrews, 2006) and morality nearly twice the rate of non-depressed people (Cuijpers & Smit, 2002).

Yen et al (2009) advocated that depression severity relates to more symptoms of problematic smartphone use in adolescents. This association among depression and excessive smartphone use was also seen in Smetaniuk (2014) study of undergraduate students. Furthermore, depression scores in Demirci, Akgönül, and Akpınar (2015) were higher in the group associated with higher smartphone use, in comparison to the low smartphone use group. Additionally, work by Ferraro et al. (2014) found significant correlations of text-message dependence and iPod dependence with depression in college students. Each of these studies highlight the nature in which depression in young adults is related to excessive smartphone use which is interesting given Elhai, Levine, Dvorak & Hall (2017) suggested that depression symptomology was inversely related to using smartphones for social reasons. Taken together, these findings provide further validation that smartphones are not just a device for communicating with others as depressed individuals tend to use their phones more frequently yet they do not use their phones as often for social purposes.

Through the perspectives of Usage and Gratification Theory (UGT) and Compensatory Internet Use Theory (CIUT), individuals may use their phones to escape depressive thoughts (Leung, 2007) and/or may use these technologies excessively to ameliorate these feelings (Kardefelt-Winther, 2014). The attempt to escape depression without addressing the issue

directly is within the classification of avoidance coping (Panova & Lleras, 2016) and has shown to be counterproductive in that these individuals experience more anxiety and depression symptoms in the future (Holahan, Moos, Holahan, Breena, & Schutte, 2005; Seiffge-Krenke & Klessinger, 2000).

Loneliness

Loneliness is occurrences of discontinuity between desired interpersonal relationship and the perceived current relationships of an individual (De Jong Gierveld & Van Tilburg, 2010; Heinrich & Gullone, 2006; Peplua & Perlman, 1982; Shiovitz-erza & Leitsch, 2010). This is consistent with Segrin and Burke's (2015) indication that being alone is not the same as being lonely. Evolutionary psychologists would suggest loneliness contributes to the survival of individuals as it reminds people the evolutionary advantages of having a close social circle (Cacioppo & Patrick, 2008). Loneliness has been shown to be the highest in young adults (Brage, Meredith, & Woodward, 1993; Cinga, 2018; Perlman, 1988; Ryan & Patterson, 1987). Loneliness is anticipated in college students as they leave home for the first time and lose contact with their previous network (Dill & Anderson, 1999).

Hawkley, Thisted, Masi, and Cacioppo (2010) advocated that loneliness has a distinct and opposing effect on psychological and physical health. Loneliness is associated with many adverse consequences such as depression (Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006), poor sleep quality (Cacioppo, Hawkley, Berntson, et al, 2002; Segrin & Burke, 2015), increase risk of mortality (Holt-Lunstad, Smith, Baker, Harris, & Stephenson, 2015; Steptoe, Shankar, Demakakos, & Wardle, 2013), poor health (Cacioppo, Hawkley, Crawford, et al, 2002; Hawkley & Cacioppo, 2003; Heffer, Nq, Suhr, et al, 2012; Segrin & Domschke, 2011), and

suicide (Stravynski & Boyer, 2001). Furthermore, the effects of loneliness are comparable to health implications such as having high blood pressure, obesity, smoking, and lack of exercise (House, Landis, & Umberson, 1988). Lonely individuals are also viewed more negatively in comparison to non-lonely counterparts (Tsai & Reis, 2009). Loneliness has also been related to boredom proneness (Skues, Williams, Oldmeadow, & Wise, 2016).

It could be anticipated that someone would use their smartphone to distract themselves from loneliness as Ye (2005) suggested that media is a common source for distracting someone from their distress. As a result, loneliness is related to mobile phone use (Park, 2005; Townsend, 2000) and problematic use of smartphone (Kim, 2017). On a similar note, in the early 2000's when smartphones were not as prevalent, Morahan-Martin and Schumacher (2003) indicated lonely people used the Internet and sent more emails in comparison to non-lonely individual and that lonely individuals would use the Internet when they were lonely. Caplan (2005) demonstrated that college students with loneliness had a preference of online social contact as they felt safer in contrast to face-to-face interactions. Fast forward to the smartphone era and similar results are being discovered as Kim (2017) advocated that individuals who are lonely depend on their smartphone in lieu of face-to-face communication. The asynchronous feature of computer mediated communication (CMC) is appealing to lonely individuals as they believe they have a better chance of success from it.

Researchers have discussed the effects of smartphones on interpersonal relationships. Przybelski and Weinstein (2012) suggested that the presence of a cellphone can have associations to lower feelings of closeness, conversation quality, and connection. Furthermore, the effects of different communication methods (text messaging, voice calls, applications etc.)

and how the method relates to loneliness and interpersonal relationships has been examined. Particularly, researchers have examined the differences of asynchronous communication methods where communication can be exchanged with variable delay and synchronous methods that do not have a delay. A recent nationwide survey of 20,000 Americans by Cigna, suggests that consistent in-person interaction is related to being less lonely (2018). Work by Holtzman, DeClerck, Turcotte, Lisi, and Woodworth (2017) expanded this finding, through suggesting individuals who receive emotional support through synchronous means of in-person conversation is linked to higher positive affect in comparison to support received from text message, a primary form of asynchronous communication. Furthermore, Wei and Lo (2006) found similar results as lonelier participants made less phone calls.

There appears to be a link between the authentic components of the method of communication. Specifically, methods that are synchronous may be more authentic as they replicate the real-world requirements of communicating with another. Synchronous methods are the closest replication of the in-person experience. Though asynchronous methods such as texting may be viewed as convenient (Dimmick, Feaster, & Ramirez, 2011; Leung, 2007; Phau & Teah, 2009) these conveniences may come at the cost of higher loneliness for individuals who prefer these methods.

Personality Traits

The Big Five Model of Personality outlines five personality traits used to explain behavior (John & Srivastava, 1999). Commonly abbreviated OCEAN, these traits are openness, conscientiousness, extroversion, agreeableness, and neuroticism (John & Srivastava, 1999). Individuals can be classified either scoring high or low on these concepts and the interaction

between the traits explains behavior. Extroversion and neuroticism have been studied as it relates to smartphone behavior and some of these findings are outlined in the forthcoming paragraphs.

Extroversion

Extroversion describes the preference to pursue social interaction (Watson & Clark, 1997). Extroverted individuals are often referred to as “outgoing”, “sociable”, and “adventurous.” (John & Srivastava, 1999). Extroverts are often regarded as popular (Jensen-Campbell et al, 2002) In comparison to their introverted counterparts, extroverts have a better likelihood of being happier, healthier, and living longer (Ozer & Benet-Martínez, 2006) Consistent with their gregarious tendencies, extroverts spend more time texting (Butt & Phillips, 2008; Ehrenberg, Juckes, White, & Walsh, 2008; Hong, Chiu, & Huang, 2012; Igarashi et al, 2008) than introverts. Furthermore, Igarashi et al (2008) suggested that extroversion is related to excessive text messaging subscale in the SPTMDS. Extroversion is also related with pathological alcohol use (Ruiz, Pincus, & Dickinson, 2003) suggesting that there is an element of extroversion related to excessive use of entities.

Neuroticism

Neuroticism is an indication of the emotional stability of an individual (McCrae & Costa, 1991). Neurotic individuals are anxious, restlessness, depressed, impulsive, and in some instances paranoid (Devaraja, Easley, & Crant, 2008; Ostendorf & Angleiter, 2004; Rammstedt & John, 2007). Criminal behavior, dissatisfaction of occupation, and poor family relations are associated with neurotic individuals (Ozer & Benet-Martínez, 2006). In terms of smartphone behaviors, neurotic individuals are more likely to send a sexually explicit photo (Devevi &

Weisskirch, 2013) and prefer to text someone in lieu of a phone call (Love & Kewley, 2003). As it relates to text messaging, neuroticism is associated with relationship maintenance behaviors and strong emotional reactions (Igarashi et al, 2008). Additionally, high levels of neuroticism are related to strong anxiety toward interpersonal communication (Leary, 1983).

Purpose of the Present Study

The purpose of the present study was to examine psychological effects of smartphone use on college students. Specifically, this study aimed to examine if smartphone dependence would be related to personality traits, depression, loneliness, texting dependence, and state/trait anxiety. Additionally, this study examines if loneliness associated with communication preference of an individual and if there is a relationship between frequency of texting/phone calls and loneliness.

Hypothesis One: Based on the relatedness of the constructs, it was expected that all four subscales of the texting dependence measure will be correlated with their respective subscale of smartphone dependence. Prior work by Ferraro et al, (2014) indicated that all four subscales of texting dependence was related to similar subscales for iPod dependence. Given the preference college students have with text messaging (Harrison and Gilmore, 2012) it is logical to assume that there will be a correlation between the texting subscales and smartphone subscales.

Hypothesis Two: Prior works have indicated extroversion is related to time spent on one's phone (Butt & Phillips, 2008; Ehrenberg, Juckes, White, & Walsh, 2008; Hong, Chiu, & Huang, 2012; Igarashi et al, 2008). For some extroverts, the smartphone engenders the ability for them to reach their optimum level of communication as they do not have to be in the same place with others to communicate. It is hypothesized that extroversion will be related to excessive

smartphone use subscale. The excessive use subscale of texting dependence has previously been linked to extroversion (Igarashi et al, 2008) and it was anticipated that this finding would also be related to excessive use subscale of smartphone dependence.

Hypothesis Three: It is hypothesized that neuroticism will correlate to the emotional reaction and relationship maintenance smartphone dependence subscales. Prior work by (Igarashi et al, 2008) indicates that texting dependence subscales of emotional reaction and relationship maintenance are related to neuroticism and similar findings are anticipated. We anticipate that neurotic individuals would rely on using their phone to maintain and obtain social relationships and as a result, would react strongly if they were unable to use their phone given this reliance to maintain social relationships.

Hypothesis Four: Prior work by Ferraro et al., (2014) suggested that all four subscales of iPod dependence were related to depression, state anxiety and trait anxiety. Using similar dimensions with smartphone dependence, we anticipate all four subscales to also have this association with these variables. Additionally, we anticipate loneliness will also correlate with each of these subscales.

Hypotheses Five: It is anticipated that loneliness will be related to the frequency of text messages and phone calls. Specifically, a negative correlation is expected for number of phone calls made and a positive correlation is anticipated in the number of text-messages sent. Wei and Lo (2006) previously found loneliness being related to a smaller quantity of phone calls made. Prior to the proliferation of smartphones in society, lonely individuals sent more emails in comparison to non-lonely as well as the state of loneliness often triggered the behavior of using the Internet to enervate their perceived lack of social connection (Morahan-Martin &

Schumacher, 2003). This hypothesis relates to the notion that lonely individuals prefer using their smartphones to communicate in lieu of face-to-face communication (Kim, 2017) which is discussed in hypothesis six.

Hypothesis Six: Given the conveniences allotted from asynchronous methods of communication (IE: ability to proof read, more time to think of response) it is anticipated that individuals who indicate they prefer asynchronous methods of communication (IE: text messaging or snapchat) will score higher in loneliness than individuals who prefer synchronous methods of communication (IE: voice call or video chat). Prior works have highlighted ambiguity in the findings of what type of psychological traits can account for choice method of communication. For example, Leung (2007) indicated individuals who have more face-to-face conversations also send more text-messages. However, prior work has argued these technologies may replace in person social interactions for some individuals (Nie, Hillygus, & Erbring, 2002). Perhaps analyzing the role of loneliness may provide more insight in the psychological traits that account for choice communication method?

CHAPTER 2

METHOD

Participants

Participants consisted of 274 undergraduate students enrolled in psychology courses at the University of North Dakota. Thirty-seven participants' data was excluded from data analysis due to failing to complete all measures. The adjusted total of 237 participants was primarily female (77.2%), identified as White (91.6%) and a majority was either Catholic (38 %) or Christian non-Catholic (36.3%). The average age was 18.94 (SD= 1.57, range 18-35). Participants averaged 7 hours of sleep each day (SD= 1.15, range 3-10) and were primarily first-year college students (59.5%). The average grade point average was 3.62 (SD= .37, range 2.50-4.00). All participants reported owning a smartphone, with a majority owning some variant of an iPhone (87.3%).

For those who indicated the quantity of their cell phone behaviors, participants averaged 63.26 text-messages per day (SD= 74.4, range 1.5-550), made an average of 2.74 phone calls per day (SD= 2.25, range 0-15) and used an average of 6.572 cell phone applications each day (SD= 3.31, range 0-25). A major of participants reported using their phone during class (66.2%), while at a sporting event (89.0%), and while watching television (92.0 %). Nearly half of the participants reported using their phone while having a meal with friends or family (45.6%). Additionally, few participants reported using their phone while driving (28.7%), at work (34.6%), and on a date (20.8%). Most participants indicated they prefer asynchronous

communication methods ($n= 166$) while using their smartphone, compared to synchronous ($n= 71$).

Materials

Demographics. Information including age, sex, class standing, religion/spiritual affiliation, race/ethnicity, and academic major were obtained with a demographic information questionnaire (Appendix A). Furthermore, participants self-reported responses regarding their perceived smartphone use.

Text-Message Dependence. The Self-Perceptions of Text Message Dependence Scale (SPTMDS; Igarashi et al, 2008; appendix C) was used. Text-message dependence characterizes a reliance on texting, in lieu of a behavioral addiction. Historically this scale has good construct validity in relation to items of emotional reaction ($\alpha = .81$), relationship maintenance ($\alpha = .78$), and excessive use ($\alpha = .85$; Igarashi et al., 2008). This measure consists of 20 questions and measures individual's reliance on texting as it relates to four dimensions: emotional reaction, excessive use, relationship maintenance and psychological/behavioral symptoms associated with cellphone use. With use of a Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) for the first three subscales and 1 (*not true at all*) to 5 (*extremely true*) for the psychological/behavioral symptoms subscale, participants rated the extent statements related to their texting behaviors. For our study, the SPTMDS had high internal reliability, $\alpha = .88$.

Smartphone Dependence. The Self-Perceptions of Smartphone Dependency Scale (SPSPDS; appendix B) was used to assess smartphone dependence. This scale was adapted from the SPTMDS, by replacing words pertinent to texting to words associated with smartphone use,

such as application use. This scale intended to measure dependence on smartphones, not just the specific feature of texting. The SPSPDS contains four subscales including emotional reaction, perceptions of excessive use, relationship maintenance, and psychological/behavioral symptoms. The first subscale entails questions pertaining to emotional reaction, a typical question would be “I feel anxious when I can’t use my smartphone.” The second subscale related to excessive smartphone use. A common question would be “I sometimes use my smartphone while engaging in a conversation with another person.” The third subscale contains questions regarding disruption of relationships and a representative question would be “Without my smartphone, I would not be able to connect with friends who use similar apps.” The first 3 subscales use a Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*) and participants used this scale to reflect the extent to which the statement provided reflects their behavior. Participants rated the extent to which items in the fourth subscale related to their behavior by using a Likert scale ranging from 1 (*not true at all*) to 5 (*extremely true*) and a typical question would be “I use my smartphone to escape from my personal problems/issues or from feeling down.” Just like the SPTMDS, this scale has 20 items in total and had high internal reliability with a Cronbach Alpha of .88.

Loneliness. The UCLA Loneliness Scale 3 (Russell, 1996; appendix G) was used to assess loneliness. This questionnaire consists of 20 items and the participants are to rate how often they feel their behavior reflects those items. Example questions include “How often do you feel left out?” and “How often do you feel part of a group of friends?” The UCLA Loneliness Scale (Version 3) has historically had high internal consistency (coefficient alpha vacillating

between .89 to .94) and good test-retest reliability over a 1-year period ($r = .73$) (Russell, 1996). For this study it had high internal reliability, $\alpha = .92$.

Depression. The Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977; appendix E) measures how frequently they have experienced symptoms related to depression within the last week. The CES-D is a 20-item measure with responses range from 0 to 3 for each question with 0 indicating *Rarely or None of the Time* and 3 representing *Most of Almost All of the Time*. The CES-D provides a cutoff of 16 or greater to aid in detecting participants prone to diagnosis of clinical depression. Historically, the scale has high internal consistency (Lewisohn, Seeley, Roberts, & Allen, 1997). For our study it had high internal reliability, $\alpha = .89$.

Personality Traits. The Big Five Inventory (BFI; John & Srivastava, 1999; appendix D) was used to measure personality traits. The BFI evaluates participants on the dimensions of five personality traits; openness, conscientiousness, extroversion, agreeableness and neuroticism. Individuals who score high on measures of openness are often artistic, open to change, and thus are often socially liberal. A representative question pertaining to openness would be “I see myself as someone who is original, comes up with new ideas.” Conscientiousness can be described as a trait that describes someone who is attentive to details, prompt, and organized. A representative question describing this trait would be “I see myself as someone who makes plans and follows through with them.” Extroversion is a personality trait that describes the extent to which someone is outgoing or sociable. An example question of this trait would be “I see myself as someone who is full of energy.” Agreeableness is the extent to which an individual seeks peace with others. People who score high in this trait tend to avoid conflict. An example question

is “I see myself as someone who likes to cooperate with others.” Neuroticism is the personality trait that describes how easily provoked someone can be to negative emotions such as anxiety. An example question is “I see myself as someone who worries a lot.”

In total the scale has 44 items, including 16 questions that are reverse-scored to prevent acquiescent effects. The BFI historical has a good test-retest reliability for all the five subscales, ranging from .76 to .83 (Gosling, Rentfrow, & Swann, 2003) and has had good internal consistency with each subscale as well: extroversion ($\alpha = .86$), agreeableness ($\alpha = .79$), conscientiousness ($\alpha = .79$), conscientiousness ($\alpha = .82$), neuroticism ($\alpha = .84$) and openness ($\alpha = .80$) (Srivastava, John, Gosling, & Potter, 2003). For our study, we found high internal reliability for extroversion ($\alpha = .88$) and neuroticism ($\alpha = .85$), the personality traits our studied evaluated.

State/Trait Anxiety. The State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg, & Jacobs, 1983; appendix F) assessed state and trait anxiety. The STAI is a 40 item self-report measure with 20 items pertaining to State anxiety, anxiety relating to the current moment and 20 items relating to Trait anxiety, referring to individual differences in personality relating to the likelihood a person experiences anxiety in a situation. The scale uses a 4-point Likert scale ranging from 1 *almost never* and 4 *almost always*. The STAI has historically shown to have good internal consistency with coefficients ranging from .86 to .95 (Spielberger et al, 1983). For this study the STAI had high internal reliability for both State ($\alpha = .92$) and Trait ($\alpha = .92$) anxiety.

Procedure

After receiving Institutional Review Board approval (IRB-201707-008), participants were recruited through SONA, and online research recruitment website. The study was advertised as “The Smartphone Study” and fliers (appendix H) were placed across campus to advertise the study. Participants reported to the research lab in Columbia Hall at the time they signed up for. The Research Assistant (RA) assigned to each timeslot had completed the proper IRB training prior to the start of the study. Those participants providing consent were given the questionnaires to complete in the lab. Questionnaires were counterbalanced to prevent confounding variables relating to the order of the questionnaires. After completing the last questionnaire, participants were debriefed and received their SONA credit within 24 hours of their participation that. These SONA credits were used to fulfil course requirements.

Statistical Analyses

Data was analyzed using Statistical Package for the Social Sciences (SPSS) developed by SPSS Inc. (USA). Reliability of each scale was determined through calculation of Cronbach’s alpha. Pearson correlations were calculated to assess the relationship between variables of interest and independent samples t-test were calculated to analyze differences between groups. Participants indicated their preferred smartphone method of communication in the questionnaire. Individuals who indicated they preferred to contact others by text message or application such as snapchat were put in the asynchronous group. Those who indicated they preferred to contact others by phone call or video chat where placed in the synchronous group. Homogeneity was established.

CHAPTER 3

RESULTS

Table 1 describes descriptive statistics on the smartphone and texting dependence scales, loneliness, extroversion, neuroticism, depression, state anxiety, and trait anxiety. Outliers were identified with box and whisker plots and were corrected with Winsorizing. Scores were replaced with data on the upper and lower fence, depending on which extreme the outlier fell.

Table 1.

Descriptive Statistics of Smartphone Dependence Subscales, Text-Message Dependence Subscales, Extroversion, Neuroticism, State-Trait Anxiety, Depression, and Loneliness

	Mean	SD	Range
Smartphone Dependence – Emotional Reaction	14.3	4.11	5-25
Smartphone Dependence – Excessive Use	18.26	3.49	10-25
Smartphone Dependence – Relationship Maintenance	10.19	3.81	5-19
Smartphone Dependence – Psychological/Behavioral Symptoms	13.57	3.72	5-23
Text-Message Dependence – Emotional Reaction	13.72	4.55	5-25
Text-Message Dependence – Excessive Use	16.73	4.12	6-25
Text-Message Dependence – Relationship Maintenance	10.27	3.91	5-21
Text-Message Dependence – Psychological/Behavioral Symptoms	11.64	3.76	5-21
Extroversion	27.07	6.94	9-40
Neuroticism	23.78	6.23	8-38
State Anxiety	33.29	9.48	20-56
Trait Anxiety	39.41	9.82	20-64
Depression	12.22	8.33	0-33
Loneliness	37.08	9.74	20-64

Smartphone Dependence

All four subscales of the SPSMDS measure had significant and positive correlations with their respective SPTMDS subscale equivalent, with coefficients ranging from .6 to .794. These correlations were significant at the .001 level, thus supporting hypothesis 1. Additionally, all the SPSMDS subscales were significantly correlated with trait anxiety and all subscales except for the excessive use subscale were significantly correlated with depression, loneliness and state anxiety. This suggests that excessive smartphone use is not related to depression, loneliness or state anxiety. Given the nature that trait anxiety was related to all four subscales, partial support was found for hypothesis 4. (See table 2 for correlation diagnosis of smartphone dependence as it relates to hypotheses 1 and 4.)

Table 2

Correlation coefficients of Smartphone Dependence subscales and Text-Message Dependence, State/Trait Anxiety, Depression, and Loneliness

	S – ER	S – EU	S – RM	S- PBS
T - ER	.664 ***	.448 ***	.442 ***	.432 ***
T – EU	.486 ***	.765 ***	.409 ***	.347 ***
T – RM	.491 ***	.291 ***	.794 ***	.413 ***
T – PBS	.352 ***	.315 ***	.406 ***	.604 ***
State Anxiety	.246 ***	.055	.229 ***	.261 ***
Trait Anxiety	.333 ***	.141 *	.282 ***	.315 ***
Depression	.255 ***	.069	.229 ***	.242 ***
Loneliness	.232 ***	.023	.338 ***	.264 ***

Note: S indicates Smartphone; T indicates Texting; * $p < .05$; ** $p < .01$; *** $p < .001$

Personality Traits

Extroversion had a significant positive correlation with the excessive use subscale ($r(237) = .147, p < .05$), providing support for hypothesis 2. Additionally, neuroticism had a significant positive correlation with the relationship maintenance subscale ($r(237) = .442, p < .001$) and the emotional reaction subscale ($r(237) = .398, p < .001$), providing support for hypothesis 3. These findings advocate the notion that differences in personality can account for differences in these subscales.

Loneliness

Though loneliness was associated with three of the SPSPDS subscales (See table 2), there was not a relationship between loneliness and the frequency of text messages ($r(233) = -.070, p > .05$) or phone calls ($r(237) = -.079, p > .05$), this advocates that the quantity of communication is not related to how lonely someone is. Though the frequency of communication was not related to loneliness, an independent samples t-test indicated that participants who preferred to communicate with an asynchronous method ($M= 37.94, SD= 9.77$) were significantly lonelier than individuals who preferred synchronous methods ($M=35.07, SD= 9.77$); $t(237) = -2.093, p = .037, d = .30$. In other words, it appears the preferred method of communication method is related to loneliness. A follow-up analysis indicated that individuals who preferred asynchronous methods scored significantly higher on the emotional reaction ($M= 14.76, SD= 4.03$; $t(237) = -2.691, p = .009$) and relationship maintenance ($M= 10.81, SD= 4.12$; $t(237) = -1.122, p = .000$) subscales of the SPSPDS compared to those who preferred synchronous methods ($M= 13.21, SD= 4.12$; $M= 8.93, SD=3.27$ respectively). A follow-up analysis indicated that loneliness was significantly related to depression ($r(237) = -.070, p < .001$). Though asynchronous users ($M=12.57, SD= 8.32$) did not differ statistically from synchronous user's depression scores ($M=11.39, SD= 8.35$); $t(237) = -.998, p = .321$)

CHAPTER 4

DISCUSSION

The current study evaluated associations among smartphone use. This included an assessment of the relationships of smartphone dependence with texting dependence, state anxiety, trait anxiety, depression, loneliness, extraversion and neuroticism. Additionally, this study aimed to examine if loneliness differs based on preferred communication method of college students and if it is related to amount of text messages and phone calls made each day. This study found that each subscale of smartphone dependence was significantly correlated with their respective text-message dependence scale, and all subscales except for excessive use were significantly correlated with depression, loneliness and state anxiety. Support that personality traits can account for differences in the subscales of emotional reaction, relationship maintenance, and excessive use when considering how someone scores in extroversion and neuroticism. Lastly, support that the frequency of text messages and phone calls being related to how lonely someone is was not found. However, the notion that individuals who prefer synchronous methods of communication are significantly less lonely than individuals who prefer asynchronous methods was found.

Text-Message Dependence

All four subscales of our Smartphone Dependence measure were positively and significantly correlated with their respective Text-Message Dependence subscale, providing support for hypothesis one. These findings suggest that there is overlap between texting and smartphone dependence. Given the utility of texting is a feature of smartphone, these findings may not be surprising, however this overlap provides initial conceptualization that our smartphone dependence scales measured their intended construct. These results were like Ferraro et al's (2014) finding that iPod dependence is related to text-message dependence. Given that Smartphones have generally replaced iPods, our measure addresses the need of providing an updated scale to assess dependence to a common mobile device.

Extroversion and Neuroticism

Hypothesis 2 and 3 were supported, suggesting that personality traits are related to dimensions of smartphone dependence. Specifically, we had a significant correlation with the excessive use smartphone dependence subscale and extroversion. Prior works have advocated that extroverted individuals spend more time texting (Butt & Phillips, 2008; Ehrenberg, Juckes, White, & Walsh, 2008; Hong, Chiu, & Huang, 2012; Igarashi et al, 2008). Perhaps the use of smartphones engenders extroverted individual's opportunities to meet their anticipated level of social engagement that may not be feasible just through their face-to-face encounters? The affordances of smartphones facilitate the opportunity for an individual to carry on numerous conversations at the same time, which may be appealing to extroverted individuals who do not

meet their optimal level of social interaction throughout their day. Unbeknownst to extroverted individuals, this desire for more social interaction may become excessive and result in maladaptive psychosocial health ramifications as advocated through Compensatory Internet Use Theory (CITU; Kardefelt-Winther, 2014).

Additionally, we found that neuroticism was significantly related to the emotional reaction and relationship maintenance subscales of smartphone dependence. The relationship between the emotional reaction subscale and neuroticism was anticipated given neurotic individuals tend to have strong emotional reactions such as anxiety, impulsivity, inability to sleep, and paranoia (Devaraja, Easley, & Crant, 2008; Ostendorf & Angleiter, 2004; Rammstedt & John, 2007). Furthermore, individuals scoring high in this subscale of smartphone dependence are prone to similar emotional reactions and would be anticipated to have similar emotional reactions in the event they cannot use their smartphone. This classification of the emotional reaction subscale has a lot of similarities to attributes of neurotic individuals which only further supports the robust nature of this finding.

The relationship of neuroticism and relationship maintenance was expected given neurotic individual's preference of texting instead of calling (Love & Kewley, 2003) in addition to having anxiety towards interpersonal communication (Leary, 1983). In accordance with Uses and Gratification Theory, individuals choose particular mediums to meet their need (Katz, Blumer, & Gurevitch, 1973). While considering intrinsic factors (Joo & Sang, 2013) such as anxiety, Uses and Gratification Theory explains why there would be a relationship between neuroticism and relationship maintenance subscale. Individuals dependent on their phone to maintain and obtain social relationships and want more control over their communication

methods would be expected to rely on texting (Igarashi et al, 2008) or other features limited to smartphones.

State-Trait Anxiety and Depression

Overall, partial support for hypothesis 4 was met. In Ferraro et al (2014) all four subscales of their iPod dependence measure were associated with state anxiety, trait anxiety, and depression. With our scale for smartphones, three of our subscales were significantly correlated with each of these variables. Though the excessive use subscale was significantly correlated with trait anxiety, it was not associated with state anxiety or depression. This advocates that internal anxiety factors (IE: trait anxiety) is related to excessively using one's smartphone though external anxiety factors (IE: state anxiety) and depression inventory scores is not. For our study, the external anxiety factor was the moment the participant was filling out the questionnaires. A follow-up analysis revealed there was a significant difference between state ($M=33.29$, $SD=9.48$) and trait anxiety ($M=39.41$, $SD=9.82$; $t(236) = (-12.84)$, $p < .001$). This follow-up analysis advocates that participants were significantly less anxiety in the moment of completing the questionnaire compared to how they generally are.

One possible explanation is trait anxiety reflects how individuals generally feel, outside the lab where they can use their phone as often as they want. While reflecting on anxiety in the current moment (IE: state anxiety), the participants were not able to use their phone as they were taking part in the research study. Therefore, participants reflected on their anxiety in context that they may use their phone as well as context in which they could not. This could explain why state anxiety scores were both significantly less than trait anxiety and why the association between state anxiety and the excessive smartphone use subscale was not found as increased

smartphone time has been related to higher levels of anxiety (Demirci et al, 2015). The excessive smartphone use scale pertains to using one's phone often and in multiple situations and locations, so it may not be surprising that reflecting on one's anxiety when they cannot use their phone is not related to scoring high in measures of excessive smartphone use.

Prior works advocated that excessive smartphone use is related to depression symptoms (Demirci et al, 2015; Ferraro et al, 2014; Smetaniuk, 2014; Yen et al, 2009), thus it was surprising that the excessive smartphone use scale was not related to scores of depression. Though it was not a hypothesis for this study, depression was not correlated with texting dependence subscale of excessive use either ($r(237) = .085, p > .05$). This suggests that neither excessive use scales related to the CES-D depression inventory scores. With the stigma associated with depression, perhaps participants did not report accurate responses to the pen and paper measure? In Ferraro et al (2014) they used a Mechanical Turk (MTurk) sample that provided more anonymity given the survey was conducted online. Though participants were not linked to their questionnaires and no identifying information was listed on their surveys, participants could have been concerned that the research assistant conducting the study may see their responses and this could have potentially implicated their responses. Rozgonjuk, Levine, Hall and Elhai (2018) had similar findings in that depression scores had a negative correlation with quantity of screen unlocks and was not related to time spent on smartphone. Perhaps individuals with higher depressive symptomology may prefer social isolation in lieu of phone use (De Silva, McKenzie, Harpham, & Huttly, 2005). Future studies should continue to analyze this relationship between depression and excessive smartphone use to provide a clear understanding.

Loneliness

This study aimed to understand if dimensions of smartphone dependence (Hypothesis 4), the quantity of communication (Hypothesis 5) and the method of communication (Hypothesis 6) is related to loneliness. Partial support for hypothesis 4 was found as each subscale of smartphone dependence except for excessive use was related to loneliness. These results suggest that lonely individuals will react stronger emotionally when unable to use smartphone, depend on their smartphones to maintain and obtain relationships and have psychological and behavioral symptoms relating to their smartphone use. Prior works have highlighted a relationship between loneliness and psychopathology (Cacioppo, Hughes, Waite, Hawkley, & Thisted, 2006) and a dependence of smartphone use to maintain communication with friends (Kim, 2017). Our findings are consistent with the literature in terms of these findings. Like depression, we did not find a significant relationship between the excessive use subscale and loneliness. Learned helplessness theory (Overmier & Seligman, 1967) could explain this finding in the sense that perhaps lonely individuals feel helpless and think no matter how frequently they use their smartphone to communicate, they will still feel as lonely?

Our results suggested that the quantity of text messages and phone calls were not related to loneliness as we were unable to support for hypothesis 5. These findings contradict prior findings that lonely individuals make fewer phone calls (Wei & Lo, 2006). In addition to the thought that lonely individuals send more messages, as seen in Morahan-Martin and Schumacher's (2003) study on emails and Internet use. One plausible explanation of these results is that individuals have historically been bad at accurately recalling smartphone use objectively (Andrews, Ellis, Shaw, & Piwek, 2015; Elhai et al, in press). Participants filled out a self-report

questionnaire about their perceived phone use and it is possible that inaccurate reporting could have greatly skewed these results.

Given that college students are frequently moving about different locations (Donaldson, 1999) it is understandable a large majority of the participants preferred an asynchronous method of communication. Though asynchronous methods do provide affluences that synchronous cannot, it appears these conveniences may come at the cost of loneliness. Uses and gratification theory can be applied to explain most if not all our findings. Though we cannot make the causal claim that asynchronous medium causes individuals to be lonely, the results that they score significantly higher in the relationship maintenance and emotional reaction subscales help suggest that lonely individuals prefer asynchronous methods as they feel they have better chance at success and as a result they are emotionally invested in their smartphone. In that sense the uses and gratification theory would explain why lonely individuals prefer asynchronous communication methods. These findings were similar to Caplan (2005) study on college students that suggested lonely students prefer online social communication.

Our results suggested that a preference for asynchronous communication methods is related to a higher level of loneliness. Park et al (2016) found compelling findings that relate to our findings. In their study of 335 participants, time spent texting was inversely related to how satisfied someone was with their relationship. Yet, they also found that the quantity of text messages was inversely related with loneliness as participants with more text messages had increased intimacy and relationship satisfaction. An interpretation of this finding could be that these participants could be texting with their partners with limited to no delay. Though texting is an asynchronous communication method, individuals could arrange a time to text in sync and the

mechanism of being in sync could replicate the authenticity of communicating with someone in person.

Chapter 5

CONCLUSION

The aims of the current study were to determine and understand smartphone dependence as it relates to psychological constructs and quantity of use, as well as to understand if the method of communication has any impact on how lonely an individual is. Though the current study did not find an association between the excessive use SPSPDS subscale with most psychopathological factors examined and the quantity of calls and text messages were not associated with loneliness, the present study found several noteworthy findings about smartphones and the people that interact with them.

Though the excessive use subscale of SPSPDS was not related to state anxiety, depression and loneliness, the other three subscales (emotional reaction, relationship maintenance and psychological behavioral symptoms) were significantly related to these constructs in addition to trait anxiety. Furthermore, scores obtained through the SPTMDS subscales were each strongly correlated with their respective SPSPDS subscale. This finding was like Ferraro et al's (2014) results that iPod dependence related to texting dependence. Given how iPods have been replaced by iPhones and other types of smartphones that play music, our study facilitates a scale that accounts for the changing of the times. A common concern within Cyberpsychology research, is that technology often evolves quicker than the publication process of empirical works. As a result, the relevance of such works is temporal. Though smartphones

have replaced iPods, the multifaceted nature of smartphones could perhaps keep them relevant for a long period of time. Therefore, the longevity of the SPSPDS should be sound.

Personality traits extroversion and neuroticism were shown to relate to particular SPSPDS subscales. These findings were congruent to the Uses and Gratification theory. As individual's extroversion was significantly related to the excessive use subscale of SPSPDS. This finding would suggest that extroverts use their smartphones when they want to have the gratification of sociability, one of the 5 gratifications sought through technology use (Leung & Wei, 2000). Additionally, participant's neuroticism scores significantly correlated with the emotional reaction and relationship maintenance subscales of SPSPDS. These findings suggest that neurotic individuals both respond strongly when they cannot use their phone and they rely on their mobile phone to maintain their relationships. Through Uses and Gratification Theory, neurotic individuals choose to use their phones based on maintain and obtain social relationships. As a result, they rely on their phones and react strongly when they cannot use them. Individuals who rely on their phones to communicate would be expected to react strongly when they cannot use their phone or don't receive messages as smartphone use is a primary way for them to communicate with others.

Lastly, our study indicated that participants who preferred an asynchronous method of communication scored significantly higher in loneliness than individuals who prefer synchronous methods. Perhaps there is some mechanism related to the variable delay, or lack of variable delay that impacts loneliness? Though our study cannot definitively declare the causal relationship of delay in communication as it relates to loneliness, our study does suggest there is some type of dynamic in relation to loneliness and the preferred method of communication.

Limitations

Due to the design of the study, we cannot claim a causal effect of our findings. Though associations among variables were discovered, a specific research design would need to be implemented to claim a causal result. Due to this, some of the results aren't as lucid. Individuals who indicated they preferred synchronous methods of communication scored significantly lower on loneliness than individuals who preferred asynchronous methods. Due to our methodology we do not know the nature of this result. There are many potential explanations for this discrepancy. One potential rationale for this result is that people who are lonely prefer asynchronous methods as they feel they have more control over their conversations and consistent with Uses and Gratification Theory, they choose this route to communicate. Alternative explanations could be that one of the methods is related to a decrease or increase in loneliness and the other method may have no influence. For example, Pittman and Reich (2016) suggested the quantity of text-based applications an individual uses does not have a positive or negative effect on loneliness. With many of the asynchronous forms of communication (IE: messenger, texting) being text-based, perhaps asynchronous methods do not influence loneliness however the authenticity of hearing the voice of someone through a phone call or face through a video chat makes individuals feel like the people they communicate are with them?

An additional limitation of the study is that the participation pool was made completely of college students and was largely homogenous regarding race, religion, and type of smartphone. Future studies will need to have a sample that is more generalizable with the world we live in. In addition to the sample being unbalanced regarding sex, participants who took part

in the study were all enrolled in a psychology course. Students who take psychology courses may be statistically different from students who do not take psychology courses. Another important consideration is that our measure of smartphone dependence needs further psychometric evaluation. We would need to determine the reliability and validity of the measure. Though there were similarities between texting and smartphone dependence, we would need to use a more sophisticated analysis to establish the validity and reliability of our measure. Another important limitation is though we had strong correlations between the texting and smartphone measures subscales, our highest correlation could only account for 58.52% of the variance we could account (this is related to how our strongest correlation was $r = .765$). This advocates there are more predictors that can account for the remaining variance. Future works should consider building upon our study to determine additional factors that could account for more variance. A potential future direction of our study is to see how executive function and sleep quality relate to smartphone dependence. Prior works have found texting dependence being related to poor sleep quality (Ferraro, Holfeld, Frankl, Fry & Halvorson, 2014) and executive function deficits (Ferraro et al, 2012).

Though these limitations do exist, our study contributed to the literature through identifying the association between loneliness and preferred method of communication. Even though the full picture of loneliness as it relates to phone use is not complete, our study fostered an initial finding that future studies can expand upon. Additionally, our study provided the initial conceptualization of a smartphone dependence measure that uses the foundations of the SPTMDS (Igarashi et al, 2008), which had not been done prior to this study.

APPENDICES

Appendix A
Demographic Information Questionnaire

Background Information Questionnaire

Participant Number _____ Date: _____ Time: _____

Sex: Male _____ Female _____ 2. Age: _____ 3. GPA: _____

4. Race/Ethnicity (select all the apply) 5. Religion / Spiritual Affiliation (select one)

White _____ Christian/Catholic _____

Hispanic or Latino _____ Christian/Non-Catholic _____

Black or African American _____ Jewish _____

Native American or American Indian _____ Muslim _____

Asian or Pacific Islander _____ Atheist _____

Other (please list below) _____ Agnostic _____

_____ Other (please list below) _____

6. Educational History

A. Class Standing: Freshman _____ Sophomore _____ Junior _____ Senior _____

B. Major (Please write in blank) _____

7. How many hours of sleep do you get on a typical day? _____

8. How many text messages do you send and receive each day? _____

9. How many hours per day do you spend sending and receive text messages each day? _____

10. How many phone calls do you make and receive each day? _____

11. How many hours per day do you spend making and receiving phone calls each day? _____

12. How many cell phone applications do you use on a typical day? _____

13. How many hours per day do you spend using cell phone applications? _____

14. How many cell phone applications do you have on your smart phone? _____

15. What is your preferred method of smart phone use to communicate with another person?

(Mark One)

Text Message _____ Phone Call _____ Application Use _____ Video Chat _____

16. Do you typically use your smartphone during the following activities/events? (Mark yes or no)

While in a class/lecture?	Yes _____	No _____
While waiting in line or before an appointment?	Yes _____	No _____
While driving?	Yes _____	No _____
While at work?	Yes _____	No _____
While on a date?	Yes _____	No _____
While having a meal with friends or family?	Yes _____	No _____
While at a sporting event?	Yes _____	No _____
While watching television or a movie?	Yes _____	No _____

17. What type of phone do you have? _____

18. Which cell phone application do you use most often to contact people?

Appendix B
Self-Perception of Smartphone Dependence Scale

Answer the following 15 questions using the following scale. Place your answers in the blanks to the left of the question.

1 – Strongly Disagree

2 – Disagree

3 – Neutral

4 – Agree

5 – Strongly Agree

_____ 1. After using my smartphone, I check it repeatedly to see if I have any text messages or notifications.

_____ 2. I feel disappointed if I don't get to use my smartphone immediately.

_____ 3. I feel anxious when I can't use my smartphone.

_____ 4. I often check my smartphone to see how much battery I have left.

_____ 5. I feel disappointed if I don't get to use my smartphone.

_____ 6. I sometimes use my smartphone while engaging in a conversation with another person.

_____ 7. I sometimes spend many hours on my smartphone.

_____ 8. I often use many applications in a short period of time.

- _____ 9. I use my smartphone even while I am talking with friends.
- _____ 10. I consider myself a quick typist on my smartphone.
- _____ 11. I cannot maintain new friendships without my smartphone.
- _____ 12. I can't form any new relationships without using my smartphone.
- _____ 13. I think my relationships would fall apart without my smartphone.
- _____ 14. Without my smartphone, I would not be able to connect with friends who use similar apps.
- _____ 15. Without using my smartphone, I can't say what is on my mind.

Answer the following 5 questions using the following scale. Place your answers in the blanks to the left of the question.

1 – Not True at All

2 – Somewhat True

3 – Neutral

4 – True

5 – Extremely True

- _____ 16. I have tried to cut down on smartphone use.
- _____ 17. I sometimes worry that life would be boring and empty without my smartphone.
- _____ 18. I use my smartphone to escape from my personal problems/issues or from feeling down.

_____ 19. Using my smartphone breaks up my daily schedule.

_____ 20. I use my smartphone even if I had something else I must do.

Appendix C
Self-Perceptions of Text-Message Dependence Scale

Answer the following 15 questions using the following scale. Place your answer in the blank to the left of the question.

- 1 – Strongly Disagree
- 2 – Disagree
- 3 – Neutral
- 4 – Agree
- 5 – Strongly Agree

_____ 1. After sending a text message, I check my mailbox repeatedly to see if I had received a response.

_____ 2. I feel disappointed if I don't get a reply to my message immediately.

_____ 3. I feel anxious when people don't immediately reply to my text message.

_____ 4. I often check my mailbox to see if I had a new text message.

_____ 5. I feel disappointed if I don't receive any text-messages.

_____ 6. I sometimes send text-messages while engaging in a conversation with another person.

_____ 7. I sometimes spend many hours on text messages.

_____ 8. I often exchange many text-messages in a short period of time.

_____ 9. I use text-messages even while I am talking with friends.

_____ 10. I consider myself a quick-typist on mobile phones.

_____ 11. I cannot maintain new friendships without text-messages.

_____ 12. I can't form any new relationships without using text-messages.

_____ 13. I think my relationships would fall apart without text-messages.

_____ 14. Without text-messages, I would not be able to contact friends who I cannot meet on a daily basis.

_____ 15. Without using text-messages, I can't say what is on my mind

For the following 5 questions use the following scale. Place your answer in the blank to the left of the question.

1 – Not True at All

2 – Somewhat True

3 – Neutral

4 – True

5 – Extremely True

_____ 16. I have tried to cut down on the amount of text-messages I use.

_____ 17. I sometimes worry that life would be boring and empty without text-messages.

_____ 18. I use text-messages to escape from my personal problems/issues or from feeling down.

_____ 19. Using text-messages breaks up my daily schedule.

_____ 20. I use text-messages even if I had something else I must do

Appendix D
Big Five Personality Inventory

Here are a number of characteristics that may or may not apply to you. For example, do you agree that you are someone who likes to spend time with others? Please write a number next to each statement to indicate the extent to which you agree or disagree with that statement.

Disagree Strongly 1	Disagree a little 2	Neither agree nor disagree 3	Agree a little 4	Strongly Agree 5
---------------------------	---------------------------	------------------------------------	------------------------	------------------------

I see myself as Someone Who...

- | | |
|--|---|
| <p>___ 1. Is talkative</p> <p>___ 2. Tends to find fault with others</p> <p>___ 3. Does a thorough job</p> <p>___ 4. Is depressed, blue</p> <p>___ 5. Is original, comes up with new ideas</p> <p>___ 6. Is reserved</p> <p>___ 7. Is helpful and unselfish with others</p> <p>___ 8. Can be somewhat careless</p> <p>___ 9. Is relaxed, handles stress well</p> <p>___ 10. Is curious about many different things</p> <p>___ 11. Is full of energy</p> <p>___ 12. Starts quarrels with others</p> <p>___ 13. Is a reliable worker</p> <p>___ 14. Can be tense</p> <p>___ 15. Is ingenious, a deep thinker</p> <p>___ 16. Generates a lot of enthusiasm</p> <p>___ 17. Has a forgiving nature</p> <p>___ 18. Tends to be disorganized</p> <p>___ 19. Worries a lot</p> <p>___ 20. Has an active imagination</p> <p>___ 21. Tends to be quiet</p> <p>___ 22. Is generally trusting.</p> | <p>___ 23. Tends to be lazy</p> <p>___ 24. Is emotionally stable, not easily upset</p> <p>___ 25. Is inventive</p> <p>___ 26. Has an assertive personality</p> <p>___ 27. Can be cold and aloof</p> <p>___ 28. Perseveres until the task is finish</p> <p>___ 29. Can be moody</p> <p>___ 30. Values artistic, aesthetic experiences</p> <p>___ 31. Is sometimes shy, inhibited</p> <p>___ 32. Is considerate and kind to almost everyone</p> <p>___ 33. Does things efficiently</p> <p>___ 34. Remains calm in tense situation</p> <p>___ 35. Prefers work that is routine</p> <p>___ 36. Is outgoing, sociable</p> <p>___ 37. Is sometimes rude to others</p> <p>___ 38. Makes plans and follows through with them</p> <p>___ 39. Gets nervous easily</p> <p>___ 40. Likes to reflect, play with ideas</p> <p>___ 41. Has a few artistic interests</p> <p>___ 42. Likes to cooperate with others</p> <p>___ 43. Is easily distracted</p> <p>___ 44. Is sophisticated in art, music, or literature</p> |
|--|---|

Appendix E
Center for Epidemiologic Studies Depression Scale

Scale items:

Below is a list of some ways you may have felt or behaved. Please indicate how often you have felt this way during the last week by checking the appropriate space. Please only provide one answer to each question.

	During the past week:	<i>Rarely</i> or none of the time (less than 1 day)	<i>Some</i> or a <i>little</i> of the time (1-2 days)	<i>Occasionally</i> or a moderate amount of time (3-4 days)	<i>Most</i> or all of the time (5-7 days)
1.	I was bothered by things that usually don't bother me.				
2.	I did not feel like eating; my appetite was poor.				
3.	I felt that I could not shake off the blues even with help from my family or friends.				
4.	I felt I was just as good as other people.				
5.	I had trouble keeping my mind on what I was doing.				
6.	I felt depressed.				
7.	I felt that everything I did was an effort.				
8.	I felt hopeful about the future.				
9.	I thought my life had been a failure.				
10.	I felt fearful.				
11.	My sleep was restless.				
12.	I was happy.				
13.	I talked less than usual.				
14.	I felt lonely.				
15.	People were unfriendly.				
16.	I enjoyed life.				
17.	I had crying spells.				
18.	I felt sad.				
19.	I felt that people disliked me.				
20.	I could not get going.				

Appendix F
State-Trait Anxiety Inventory

DIRECTIONS:

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you feel *right now*, that is, *at this moment*. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe your present feelings best.

NOT AT ALL
 SOMEWHAT
 MODERATELY SO
 VERY MUCH SO

- | | | | | |
|--|---|---|---|---|
| 1. I feel calm..... | 1 | 2 | 3 | 4 |
| 2. I feel secure | 1 | 2 | 3 | 4 |
| 3. I am tense | 1 | 2 | 3 | 4 |
| 4. I feel strained | 1 | 2 | 3 | 4 |
| 5. I feel at ease | 1 | 2 | 3 | 4 |
| 6. I feel upset | 1 | 2 | 3 | 4 |
| 7. I am presently worrying over possible misfortunes | 1 | 2 | 3 | 4 |
| 8. I feel satisfied | 1 | 2 | 3 | 4 |
| 9. I feel frightened | 1 | 2 | 3 | 4 |
| 10. I feel comfortable | 1 | 2 | 3 | 4 |
| 11. I feel self-confident..... | 1 | 2 | 3 | 4 |
| 12. I feel nervous | 1 | 2 | 3 | 4 |
| 13. I am jittery | 1 | 2 | 3 | 4 |
| 14. I feel indecisive..... | 1 | 2 | 3 | 4 |
| 15. I am relaxed | 1 | 2 | 3 | 4 |
| 16. I feel content | 1 | 2 | 3 | 4 |
| 17. I am worried | 1 | 2 | 3 | 4 |
| 18. I feel confused..... | 1 | 2 | 3 | 4 |
| 19. I feel steady..... | 1 | 2 | 3 | 4 |
| 20. I feel pleasant..... | 1 | 2 | 3 | 4 |

DIRECTIONS

A number of statements which people have used to describe themselves are given below. Read each statement and then circle the appropriate number to the right of the statement to indicate how you *generally* feel. There are no right or wrong answers. Do not spend too much time on any one statement but give the answer which seems to describe how you generally feel.

ALMOST NEVER
SOMETIMES
OFTEN
ALMOST ALWAYS

- | | | | | |
|--|---|---|---|---|
| 21. I feel pleasant..... | 1 | 2 | 3 | 4 |
| 22. I feel nervous and restless | 1 | 2 | 3 | 4 |
| 23. I feel satisfied with myself..... | 1 | 2 | 3 | 4 |
| 24. I wish I could be as happy as others seem to be | 1 | 2 | 3 | 4 |
| 25. I feel like a failure | 1 | 2 | 3 | 4 |
| 26. I feel rested | 1 | 2 | 3 | 4 |
| 27. I am "calm, cool, and collected" | 1 | 2 | 3 | 4 |
| 28. I feel that difficulties are piling up so that I cannot overcome them..... | 1 | 2 | 3 | 4 |
| 29. I worry too much over something that really doesn't matter..... | 1 | 2 | 3 | 4 |
| 30. I am happy | 1 | 2 | 3 | 4 |
| 31. I have disturbing thoughts | 1 | 2 | 3 | 4 |
| 32. I lack self-confidence..... | 1 | 2 | 3 | 4 |
| 33. I feel secure | 1 | 2 | 3 | 4 |
| 34. I make decisions easily | 1 | 2 | 3 | 4 |
| 35. I feel inadequate..... | 1 | 2 | 3 | 4 |
| 36. I am content | 1 | 2 | 3 | 4 |
| 37. Some unimportant thought runs through my mind and bothers me | 1 | 2 | 3 | 4 |
| 38. I take disappointments so keenly that I can't put them out of my mind..... | 1 | 2 | 3 | 4 |
| 39. I am a steady person..... | 1 | 2 | 3 | 4 |
| 40. I get in a state of tension or turmoil as I think over my recent concerns
and interests | 1 | 2 | 3 | 4 |

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Appendix G
UCLA Loneliness Scale Version 3

INSTRUCTIONS: Please circle how often each of the statements below is descriptive of you.

Statement	Never	Rarely	Sometimes	Often
1. How often do you feel that you are “in tune” with the people around you?	1	2	3	4
2. How often do you feel that you lack companionship?	1	2	3	4
3. How often do you feel that there is no one you can turn to?	1	2	3	4
4. How often do you feel alone?	1	2	3	4
5. How often do you feel part of a group of friends?	1	2	3	4
6. How often do you feel that you have a lot in common with the people around you?	1	2	3	4
7. How often do you feel that you are no longer close to anyone?	1	2	3	4
8. How often do you feel that your interests and ideas are not shared by those around you?	1	2	3	4
9. How often do you feel outgoing and friendly?	1	2	3	4
10. How often do you feel close to people?	1	2	3	4
11. How often do you feel left out?	1	2	3	4
12. How often do you feel that your relationships with others are not meaningful?	1	2	3	4

13. How often do you feel that no one really knows you well?	1	2	3	4
14. How often do you feel isolated from others?	1	2	3	4
15. How often do you feel you can find companionship when you want it?	1	2	3	4
16. How often do you feel that there are people who really understand you?	1	2	3	4
17. How often do you feel shy?	1	2	3	4
18. How often do you feel that people are around you but not with you?	1	2	3	4
19. How often do you feel that there are people you can talk to?	1	2	3	4
20. How often do you feel that there are people you can turn to?	1	2	3	4

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