The Relationship between Personality Facets, Autism Spectrum Disorder, Mobile Phone Use and Attitudes



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Abstract

As mobile phones grow in popularity and become more ubiquitous to our daily lives, the differences in personal use and attitude towards the device may be important to understanding trends in behavior. This study sought to investigate how the different dimensions of the Big Five Personality Facets, as well as the Autism Spectrum Quotient, Empathizing Quotient, and Systemizing Quotient were related to different factors of mobile phone use and attitude. The latter of these measures were designed to discern between self-perceptions of Objective Use and Subjective Attitude. One hundred college students participated in the study completing all factors. The Systemizing Quotient was negatively correlated to forms of use and dependency, while the Autism Quotient was correlated to social application use. All five facets of personality were correlated with use or attitude in some way or another. Neuroticism was positively correlated to multiple forms of use, as well as dependency and enthusiasm for the device, while Openness-to-Experience was negatively correlated to use and dependency.

Mobile Phone Use and Attitudes and its Relationship to Personality Factors

Within the recent past the mobile phone has become a universal communication tool. At a relatively rapid pace it has achieved high levels of market success and is now the dominant technology for vocal communication and short message transmission (Durkin, 2010). Within the growing market boom and demand for updated technology, the typical phone has transformed from a simple tool to a personal computer, or smart phone: a device that subsumes email, phone calls, text messaging, and the internet as a universal handheld. As of January 2014, 90% of American adults owned a cell phone, and 58% owned a smartphone, statistics which increase when focused to those within the ages of 18 to 29 years (PewResearch, 2014). Smartphones allow owners to play, communicate, work, and stay informed with world and personal events, anytime and anywhere. The mobile phone is rarely separated from its user, often leading individuals to form deep relationships with their mobile devices, as well as complex individualization of how they are used (Jarvenpaa & Lang, 2005).

It is widely understood that interpersonal transactions are a fundamental element of society and by extending the reach and immediacy of communication, the mobile phone has changed the scope of social interaction (Argyle, 1998; Butt & Phillips, 2007). From this interpersonal paradigm perspective, social relationships are strongly linked to individuals' mental wellbeing and impaired relationships can evolve into a source of stress capable of damaging individuals' wellness (Lee, Tam, & Chie, 2013*)*. Of late, primary mobile phone research has linked excessive use to depression, anxiety, lack of sleep, obsessive compulsion, impulsivity, reckless behavior and technological addiction (Augner, 2010; Billieux, Gay, Rochat, & Van der Linden, 2010; Thomee, Harenstam, & Hagberg, 2011; Rosen, Whaling,

Rab, & Cheever, 2014; Choliz, 2012; King, Valenca, Silva, Baczynski, Carvalho, & Nardi, 2012).

In addition to these fear inducing diagnoses, Ahonen (2011) quoted research by Nokia that the average person looks at their phone 150 times a day. While these mobile phone interactions may be brief, notifications and checking habits proliferate the day. A Mobile Mindset Study (Lockout Mobile Security, 2012) found that: (1) 58% of adult smartphone users and 68% of young adults do not go one hour without checking their phones; (2) 73% of American smartphone owners feel panicked if they misplace their device, another 14% feel desperate and 7% feel sick when their smartphone is missing; (3) 54% check their phone while lying in bed. PewResearch (2014) found 44% of cell phone owners have slept with their phone next to their bed to make sure they didn't miss any calls, texts or updates during the night and 29% describe their cell phone as 'something they can't imagine living without'. If such an alarming percentage of the population is experiencing this profound reliance on their device, are they all within diagnosis of disordered use? Is it possible to categorize these individuals with a problematic addiction, or pointless? But lastly, could it be best to observe this new proliferation of technology as the shifting paradigm of human experience?

Within the context of the last question, the nature of the present research will not focus on the disordering of mobile phone dependency or scrutinizing the anxiety induced during its removal. Instead, by accepting certain theoretical explanations for the reordering of personal perception of space and time, we accept that these emotional responses are expected from the mobile phone's ability to transcend typical experiential barriers. By dismissing the potential for diagnosing maladaptive habits in a functional population, we can instead be open to a better understanding of the personal effects the device may have due to individual character differences. For these and other reasons, the purpose of this research is to

investigate personality differences in use and attitude towards mobile phones in a college population, with theoretical attention paid to use, frequency, functionality, attitude, and the nature of dependency when arisen.

Mobile Phones:

A mobile phone is a multifaceted technology, a tool always at hand for organization and communication that denotes a tactile presence, but also embodies more complicated representations. We interact with a mobile phone in a way that we do not with other computational devices because it is handheld; we fondle it, clutch it in times of crisis, and turn to it for solace or leisure (Vincent, 2006; Lepp, 2014). While of course used to perform practical tasks, increasingly they are also used as individual expressions of identity through personalization (Jarvenpaa & Lang, 2005). At the same time, a mobile phone is used as a means of achieving constant connectivity with an individual's social world, functioning as a conduit for emotional attachment to friends and family while enabling the possibility of maintaining social and business networks wherever (Vincent, 2006). In this way it can be seen as an umbilical cord for emotional relationships, as well as an object or hard ware (Aoki, 2003). Where some sociologists have reported Westerners' time-use becoming more irregular, fragmented, overlapped, and shifting to new places, social theorists have speculated that because mobile phone use is continuous and allows for instant communication, as a tool it defies previous barriers of human interaction (Oulasvirta & Rattenbury, 2011) . In his book *Mobile Communication and Society*, Castelles (2007) argues that mobile phones enforce a technological change in orientation that critically affects our understanding of spatiotemporal reality, reorienting our frames of space and time so much that everyone transports their world with them, that "the places from which people communicate with their mobile devices [corporeality] become a backdrop of communication, rather than the locality of

communication" (Castelles, 2007, p. 172). To this degree, the effect that mobile phones have on individuals and society may not always be able to be measured with regard to mobile phone proximity, since its constant presence falls into the background of human contact, and the mobile phone is simply an artifact of the near-technological environment itself as an ever present 'technosphere' or 'telecacoon' (Zhang & Dong, 2013; Ling & Campbell, 2011, p. 3). This aligns with Vincent (2006) who found that people's attachment with the mobile phone is not a result of a solitary pre-occupation with the device, but rather it is the users' relationship with others that provide the stimuli for individual attachments to the mobile phones. Therefore in order to study the nature of the functionality and dependence of individuals to their mobile phones, emotional attachment must be involved.

If mobile phones can then be seen as tools for social contact but also conduits to larger social networks, it makes sense that its presence elicits a strong positive emotional attachment, and its absence creates an alienating anxiety as a consequence for the emotional investment (Vincent, 2006). The reward for personal connectivity is sometimes greater than the potential danger of anxiety, which explains why most users are ready to tolerate the loss of personal freedom in exchange for gains in social involvement (Geser, 2006). King et al (2012) found that modern devices reveal certain acquired habits, including both "good and bad" feelings, symptoms, and emotions. The "good" aspects of the technology are its qualities of convenience, comfort, and availability, while some of the "bad" aspects are pathological dependency, fear of missing out, and anxiety as a result of not being able to use modern devices. For many the mobile phone embodies paradoxical emotions and behaviors that seem to have contradictory or inconsistent qualities that may lead to negative behavioral implications (Jarvenpaa & Lang, 2005).

For example, cell phones can more effectively be used to shield oneself from wider surroundings by escaping into the narrower realm of highly familiar, predictable, and self-controlled social relationships with close friends or family (Vincent, 2006). Smetaniuk (2013) suggests that social etiquette for phones is still developing, which may account for the blurring of public and private space. To this degree mobile phones may therefore support tendencies towards closure rather than towards the opening up to new acquaintances and public interactions (Geser, 2006). Where the phone may reduce feelings of loneliness and vulnerability in any place and time, they could become a "pacifier for adults" in which users may become less prone to develop certain social competencies, such as the ability to react adaptively to unpredictable encounters (Geser, 2006). However not enough research has been conducted to solidify that mobile phone use changes social behavior, and overall it has been found that distinct attitudinal differences exist among cell phone users, and psychological factors such as personality can influence individual's use and perception of mobile phones (Aoki, 2013; Lee, Tam, & Chie, 2013).

Big-Five Personality Dimensions

While factors involving social anxiety, stress, and depression have been investigated in relation to mobile phone use, my research will investigate personality difference as a larger context of attitudinal attachment and behavior. Since mobile phones mediate social interactions, personality has been found to predict individual differences in smartphone use, which could imply differences in attitude and perception (Chittaranjan et al., 2011; Butt & Phillips, 2011). In personality psychology, personality traits play a central role in describing a person and is the way most individuals structure their habits, lifestyle, and general interactions with the environment (McCrae & John, 1992; Kim et al., 2014). Costa and McCrae (1995) define personality as a unique constellation of enduring traits and

dispositions that govern individuals' consistent cognitive, affective, and behavioral patterns. Multiple studies have been conducted investigating the correlation between the Five-Factor Personality Model defined by Costa and McCrae (1995) and mobile phone use, but few have investigated attitudinal differences. The Big-Five framework is a hierarchical model of personality traits that represent personality at the broadest level of abstraction. Within the five-factor model are facets of Neuroticism, Extraversion, Agreeableness, Conscientiousness, and Openness-to-Experience.

Neuroticism, identified as the opposite of emotional stability, is characterized by attributes such as anxiety, angry hostility, depression, self-consciousness, impulsiveness, and vulnerability (Costa & McCrae, 1995). Neuroticism is more likely to be associated with negative emotions such as depression, and is also linked to immoderate behaviors such as eating disorders and drug dependency (Butt & Phillips, 2007; Smetaniuk, 2013). Butt and Phillips (2007) found that individuals ranking higher on Neuroticism preferred the disinhibiting qualities of text messaging over voice calling and predicted that individuals were less likely to use communication through the phone to transmit more information about themselves. Still, research presents contradictory elements in that where some suggest that high Neuroticism individuals spent more time sending and receiving text messages and less using voice calling (Ehrenberg et al., 2008; Lee et al., 2013), other research shows that people who score high on Neuroticism do not find the mobile phone appealing (Bianchi & Phillips, 2005; Chittaranjan et al., 2011). This may be in accordance with research suggesting that social contact does not decrease individuals' level of loneliness; instead it might even enhance it (Lee et al., 2013). While neurotic individuals may not enjoy mobile phone use they may be attracted to the idea that its use will improve their happiness. Other facets of Neuroticism such as self-consciousness and impulsiveness were also predictors of mobile

phone use (Kim et al., 2014). It has similarly been found that problematic mobile phone use was associated with self-monitoring and approval motivation as well as “trendy” and “impulsive” consumption styles (Takao et al., 2009; Augner & Hacker, 2010; Wilska, 2003). While Neuroticism has not been directly found in relation to maladaptive mobile phone dependency, individuals who score highly on this parameters attitudes, usage habits, and emotional impression of the device is generally unknown (Smetaniuk, 2013).

The personality trait Extraversion is defined by warmth, gregariousness, assertiveness, activity, excitement seeking, and positive emotion (Costa & McCrae, 1995). Individuals rating high on Extraversion were found to have higher text message and incoming call frequency, and increased relational application use, implying a proclivity for being in constant contact with friends (Lee et al., 2013; Butt & Phillips, 2007; Kim et al., 2014). Lepp et al. (2015) investigated personality, mobile phone use, and leisure, and found the two groups “low use extrovert” and “low use introvert” were found to have a significantly more positive leisure experience than those with ‘high use’. They speculate that because extroverts have been found to enjoy and undertake mental challenges and effortful thinking, they in turn spend less time on mass media devices like smartphones than individuals averse to such pursuits (Lepp et al., 2015). The Low Use Introvert group appear to be a function of their introverted personality, as introverts are more likely to have smaller, less active social networks, and to feel more independent of their social networks (Lepp et al., 2015). This research could imply that the factor of Extraversion, either scoring high or low, could be correlated with lower use than other groups.

Yet, in accordance with the contradictory nature of past research, multiple studies have found Extraversion to be positively related to problematic mobile phone use, potentially due to what Bianchi and Philips (2005) allocates to their tendency to seek social contact

because they are primarily underaroused (Augner & Hacker, 2010; Smetaniuk, 2013). Alternatively, Kraut et al. (1998) longitudinal study observed that internet use made introverts more introverted, and that like neurotic individuals, the phone may lead to a negative attitude towards mobile phones. Bianchi and Phillips (2005) found that disagreeable extraverts, a combination of two personality facets, focused upon the superficial elements of their mobile phone presumably for self-stimulatory purposes or for the purposes of attracting the attention of others. In general, the contradictory nature of this personality facet will probably be unable to stand alone in its relation to mobile phone use and attitude.

Agreeableness is understood in relation to interpersonal relationships, related to trust, straightforwardness, altruism, compliance, modesty and tender-mindedness (Costa & McCrae, 1995). Past research suggests that Agreeableness was not a significant predictor of voice calling or text messaging frequency, but disAgreeableness had predicted incoming phone calls and game playing (Lee et al., 2013; Butt & Phillips, 2007). Within pair-wise correlations with gender, Chittaranjan et al. (2011) found that Agreeableness was associated with longer and more frequent text messages and calls by agreeable women, and an opposite trend among men. In Lepp et al. (2015) high use individuals, who reported using the cell phone for over 10 hours per day, were characterized as agreeable and conscientious. They speculated that the agreeable trait could suggest that considering others' needs is important as well as a preference for social harmony, which might partially explain the sense of obligation to remain constantly connected to their phones which high frequency users have expressed (Lepp et al., 2015). This obligatory communal sense could compound to guilt for highly agreeable individuals potentially leading to a more stressful experience, higher use, but not necessarily an allocation to positive or negative emotional response.

Conscientiousness is related to competence, order, dutifulness, achievement, striving, self-discipline and deliberation Costa & McCrae, 1995). Lee et al., (2013) found Conscientiousness was not a significant predictor of text message frequency, but unconscientious individuals were less likely to use phone to transmit more information about themselves (Butt & Phillips, 2007). Kim et al. (2014) found Conscientiousness to be associated with an increased likelihood of owning a smartphone and a decreased use of e-commerce applications. Because Conscientiousness is associated with self-control and occupational success these individuals may devote more of their online time to productivity, or a heightened awareness of social etiquette. Un-Conscientiousness has been linked to procrastination, so the personal perception of an individual high in Conscientiousness may have in regard to the distracting power of the mobile phone is of interest.

Lastly, those who rate highly in Openness-to-Experience are imaginative, artistic, and original, with a wide range of interests, active seeking and appreciation of vast experiences (Costa & McCrae, 1995). Past research has found that high openness was associated with a higher voice calling frequency and increased usage of video/audio/music apps in females, and a low openness was associated with higher usage of Office, Internet, Video, and Calendar applications among males, and use of text messaging was usually associated with low-openness of both sexes (Lee et al., 2013; Chittaranjan et al., 2011). These findings were speculated to have occurred due to users who are more open to experience relying on other forms of communication and organization than their mobile phones, and coincide with other correlations between openness and low use (Kim et al., 2014). Still, openness and associated traits predict greater adoption of smartphone use and technology adaptation, as well as perceived usefulness and ease of use (Kim et al., 2014). It could be possible that open

individuals are not emotionally opposed to the device, but simply have lower scores of use and dependency.

Autism Spectrum Disorder:

While it has been posited that the emotional dependence an individual may feel towards their mobile device precedes a tangible fixation, are there still individuals who are merely attracted to its tactile presence and feel indifferent to it emotionally? Autism Spectrum Disorder is characterized by persistent deficits in social and communication development, and unusually strong, restricted repetitive patterns of behavior, interests, or activities (Hollander, 2011). While Autism research has exploded within the past 15 years, it was originally identified by Leo Kanner in 1943. Over its history researchers attempted to identify Autism through a multitude of different dimensions including very crude understandings of brain size and schizophrenia (Rutter, 2011). The Autism Spectrum Quotient (Baron-Cohen et al 2001c, 2006) is a screening instrument that when distributed among a large population results resemble a normal distribution. Data has shown that 93% of the general population fall in the average range while 99% of the autistic population fall in the high end of the scale. Typically men have been found to score slightly, yet statistically significantly, higher than females (Baron-Cohen, 2009). While Autism Spectrum Disorder (ASD) is more common in males than in females, this has suggested that the number of autistic traits an individual expresses are related to a sex-linked biological factor (Baron-Cohen et al, 2014, 2005).

To date, many theories attempt to explain the disorder, but the Empathizing-Systemizing Theory (E-S Theory) poses that the deficits in social communication that individuals on the spectrum experience are related to the impairment on the cognitive component of empathy, and the rigidity of interest and fixation are explained through their

superior skill in systemizing (Baron-Cohen, 2002). Systemizing is understood by the drive to analyze and explore a system and to extract underlying rules that govern their behavior, where empathizing is related to interest in others, awareness and understanding of implicit social cues, and an ability to envisage another person's mental state (Daley, Lawson & Zee, 2009). Generally researchers have found that individuals with high functioning Autism or Asperger's syndrome test at average or above-average levels on the systemizing quotient and below average on the empathizing quotient (Baron-Cohen et al., 2003).

Within this framework of understanding Autism Spectrum Disorder this study will implement the Autism Spectrum Quotient, Empathizing Quotient and Systemizing Quotient. The Empathizing Quotient assess both cognitive and affective empathy, covering both an individual's ability to recognize, as well as have an appropriate emotional response to another's thoughts and feelings. Individuals with ASDs typically score lower than comparison groups. Alternatively, the Systemizing Quotient assesses the drive to analyze or construct systems by noting regularities and rules within certain groups of information or technology. Individuals with high functioning Autism or Asperger's disorder have been found to have higher scores on the Systemizing Quotient compared with people of the general population (Baron-Cohen et al., 2003). While there are discrepancies whether the individual on the ASD spectrum is high functioning or low functioning, within a college population it is assumed, for the sake of this study, that these students will not suffer from severe developmental functioning.

Differences in emotional attachment to the mobile phone and compulsion to check and hold the device tactilely may be investigated in comparison to traits related to characteristics found in individuals on the Autism spectrum. Within the neurotypical population (those without developmental disabilities) research has shown that mobile devices

are “habit-forming” and that the checking habit, often due to external cues, may lead to more use overall once the individual experiences a sense of informational reward when mobile applications are opened (Oulasvirta & Rattenbury, 2011). Other research suggests that compulsory mobile phone use was not sought for pleasure, but to relieve anxiety (Billieux et al., 2010). The rewards users experience from checking the device help avoid boredom and cope with a lack of stimuli in everyday situations as well as make them aware of interesting events and social networks (Lepp, 2014). Lepp (2014) also found that users themselves do not necessarily describe habit-formation as problematic. Within this frame, the mobile phone does not always function as an emotional conduit but a simple tool for greater connectivity.

Alternatively, those who do not feel an emotional connection to the device may think of the device more as a tactile tool or device of technological interest. In accordance with the E-S theory, while there are many forms of systemizing, the skills are usually reflected in memorization, organization, and fixed interest (Baron-Cohen, 2002). Within fixated interests those on the spectrum have been drawn to computers and technology because their calculative and mathematical nature. Current research has found that individuals on the ASD spectrum benefit greatly from mobile technology devices for social function acquisition and organization (Burke & Kraut, 2010; Mechling, 2011; Stephenson & Limbrick, 2013). Not much research has investigated the systemizing nature of those on the ASD spectrum and their specific mobile phone use, but the present predicts to find a correlation between high Autism Quotient and Systemizing scores and dependency scores to the device tactilely instead of its role as a social conduit. Research comparing the use of neurotypical mobile phone use and individuals with Asperger’s found that more often the device was used to keep in contact with family and play games, and less valued as a tool to keep in contact with friends (Durkin et al, 2010). Mazurek and Wenstrup (2012) investigated children with

Autism and their neurotypical siblings to study behavioral distances in screen usage. They found that children with ASD spent 62% more time watching television and playing video games than in all non-screen activities combined. Compared with their neurotypical siblings, children with ASD spent more hours per day playing video games and had higher levels of problematic video game use. In contrast to their high rates of screen time usage, children with ASD spent little time using social media or socially interactive video games (Mazurek & Wenstrup, 2012).

In Autism Spectrum Disorder research the smartphone has been celebrated not only as a device that aids in asynchronous communication, helpful video instruction and its ability to fade into the average population of mobile phone users, but its sensory control is beneficial in regards to sensory overload and sensory underload many individuals on the spectrum experience. Tactilely the device is ideal for those within the diagnostic spectrum, but within the neurotypical population individuals who score higher on the Autism Spectrum Quotient (ASQ), and Systemizing Quotient (SQ), may uncover mobile phone use patterns that have yet to be studied. With a proclivity to fixation and rigidity in interest, if mobile phone dependence were to develop in an individual who scored higher on the ASQ and SQ, I expect that use will be high in regards to non-social applications (i.e., games, organization, internet) but will not yield in any severe dependency, attitude, or emotional response.

As mentioned above the Empathizing Quotient (EQ) will be utilized to assess the individual's ability to both cognitively and behaviorally empathize. If an individual who scores more highly on the SQ will express less social use and more of an interest in its tactile presence, the EQ will be expected to show the opposite mobile phone manifestation. These individuals will potentially have greater frequency of use and sense of attachment to the device, as well as contradictory elements of positive and negative attitude and emotion.

Regardless of the type of attachment to the mobile device, certain trends of dependency have arisen, which has lead to the popular culture phrase “nomophobia” or the anxiety that arises from not having ones phone present (*no-mo*bile) (King et al., 2013). Clinically a severe reliance on this technology has been linked to social phobia disorder, panic disorder, body dysmorphic disorder, avoidant personality disorder, atypical depression and obsessive compulsive disorder (King et al, 2013). In this light nomophobia may be comorbid to other deeper psychological disorders, which manifest themselves in a compulsory tendency for self-protection. Others on the less severe end of the dependency spectrum can sometimes still feel great discomfort when they need to disconnect (Javenpaa & Lang, 2005). Whether this is due to the user being in a constant state of anticipation to receive a new message, because of its function as a safety net for unexpected social situations, or because of its simple tactile presence is yet to be investigated. Conclusively, it is not for me to decide the negative effects the device may have on individuals, as that negative perception may be a subjective facet that not every mobile phone user experiences. Because of this we can only investigate the relationship between certain personality facets and different areas of mobile phone use.

Research Questions and Hypothesis:

How do the five factors of personality (Neuroticism, extroversion, Agreeableness, Conscientiousness and Openness-to-Experience) correlate with personal attitudes, behaviors and dependency to mobile phones?

1. Personality factors will correlate with different facets of objective use, subjective attitude, and emotional response to mobile phones.
    2. Those who rate high on Neuroticism will have high use and dependency but a negative attitude.
    3. Those who rate high on extroversion will have high use and dependency but a positive attitude.
    4. Those who rate high on Agreeableness will have mixed results in use, dependency and attitude.
    5. Those who rate high on Conscientiousness will have mixed results in use, dependency and attitude.

6. Those who rate high on Openness-to-Experience will have mixed use, low dependence and mixed attitude.

How do scores on the Autism Spectrum Quotient, Empathizing Quotient and Systemizing Quotient correlate with personal attitudes, behaviors and dependency to mobile phones?

7. Those rating high on the SQ and AQ will have high use and dependency, but mixed or non-affective attitude.
8. Those scoring high on the EQ will have mixed use results but a strong attitude, either positive or negative.

Methods

Participants

Research was conducted in a small liberal arts institution in North Western Pennsylvania with approximately 2,100 students, all of who are in the young adult population and may own a mobile phone. A hundred students participants in the study, thirty two were males, sixty seven were females, and one chose not to identify. The majority of the testing went on within the Psychology building, while others were able to participate when it was placed solely online in mid-February.

Materials

Informed consent (Appendix A) form was given before the testing, and a debriefing form (Appendix B) was provided after the completion of the study.

Eight self-report questionnaires were utilized in this study:

The demographics form (Appendix C) was given to all participants in the study which collected general information as to the individual's ethnicity, sex, age, college year, college major, the type of mobile phone owned, the length of possession of the device, and whether or not they are responsible for its payment.

The Big Five Inventory (BFI) (John et al., 2008*)* (Appendix D) measure contains 44 items measuring five personality trait dimensions of Neuroticism, Extraversion, Agreeableness, Conscientiousness, and Openness-to-Experience on a five-point Likert scale,

ranging from strongly agree (five points) to strongly disagree (zero points). The 44 questions are divided into representations of the personality dimensions with certain questions reverse scored, and then compiled for a total of each factor. Higher scores indicate more dominant personality traits in that dimension. The BFI demonstrates high degrees of internal consistency with Cronbach's Alphas ranging from 0.79 to 0.87 across all five dimensions (M=0.83) and good convergent validity to the NEO-FFI, another measure of the Big-Five Personality facets, ranging from 0.72 to 0.81 (M = 0.77).

The Autism Spectrum Quotient (AQ) (Baron-Cohen, 2001) (Appendix E), measures the degree to which an individual possesses sub-diagnostic traits associated with the autistic spectrum. The AQ is comprised of 50 forced-choice questions, made up of 10 questions assessing 5 different areas: social skill, attention switching, attention to detail, communication, and imagination. The individual answers each item according to a four-point scale to the level which they agree to each factor. Depending on the question the answers receive zero or one point. Within normal populations the scores range from 10-30, a score of 32 or higher is within diagnostic range.

The Empathizing Quotient (EQ) (Appendix F) was created by Baron-Cohen (2009) to investigate empathy as an affective, cognitive and mixed component in adults. The Systemizing Quotient (SQ) (Appendix G) measures the degree to which an individual has the drive to analyze and explore a system, extract underlying rules that govern the behavior of a system, and the drive to conduct systems. Studies by Baron-Cohen (2009) investigated the dual presence of systemizing characteristics and empathizing characteristics in individuals with autism using the full version of both SQ and EQ. Wakabayashi and Baron-Cohen (2006) found that test results for both SQ and EQ short version, comprised of 25 and 22 questions respectively, are highly correlated with the full scale versions, comprised of 60 questions

each (Wakabayashi & Baron-Cohen, 2006). The internal consistencies (Cronbach's alpha) of these quotients are 0.89 for the SQ-Short (25 items) and 0.90 for the EQ-Short (22 items).

Mobile Phone Objective Use (Appendix H) is comprised of 29 items, divided into seven subsets. Each of the items assesses self-reported tendencies of use, 28 of which are reported on a five-point scale ranging from Always, Often, Sometimes, Rarely, Never. These string variables were recoded to numerical scales which were compiled in each subfactor. The first subfactor is entitled *Total Application Use* and is the individual's total report of all 10 application possible uses (α= .850). *Practical Application Use* and *Social Application Use* are comprised of 9 of the above 10 questions but categorized based on whether the application use can be generally described as practical (5 items; i.e., organization, information, navigation) or social (5 items; i.e., calling, texting, social media). *Practical Application Use* and *Social Application Use* have Cronbach's alphas of .796, and .772 respectively. *Emotional Escapism* is made up of 4 items that are designed to explore the emotional state of the individual who may go on their phone if they did not specifically receive an urgent notification. These 'checking' reasons are loosely based on feelings of loneliness, boredom, awkward encounters, or habit. Cronbach's alpha for *Emotional Escapism* is .742. *Proximity to the Device*, comprised of 7 items, are designed to encapsulate the proximal closeness the individual is to their phone daily. These questions attempt to be direct in the location of the phone throughout or at different times of the day (α=.582). The final subfactor of *Frequency of Use* is defined by 8 items that attempt to describe how often the individual checks their phone, either during specific moments of the day, how often it is turned on, and the nature of their response time. Seven of these items are five-point Likert scale, the eighth is a forced choice yes or no answer in which the individual must state whether they believe they check their phone approximately 150 times a day. Agree was

coded as 5 points, disagree was coded as 0, and added to the total of frequency. Cronbach's alpha for *Frequency of Use* is .780.

Mobile Phone Subjective Attitude (Appendix I) is compiled of 26 items assessing for three subfactors; dependence, anxiety, and enthusiasm. For each item, participants were asked to answer if they either agree or disagree with the statements. Agreeing was coded as 2 points, disagreeing was coded for 1. Five items were reverse scored, in which agreeing was coded as 1 point, disagreeing 2. Each subfactor was totaled and used to describe the specific personal attitude. *Dependence* on the device, comprised of 13 items, is intended to categorize an individual's strong feeling of attachment and need for the device, without measuring any emotional affect (i.e., feeling incomplete without phone, anxious if they do not know where the phone is, feeling urges to check phone, feeling that without the phone they would be disconnected from the world). Cronbach's alpha for *Dependence* is .760. *Anxiety* towards the device has 6 items which attempt to describe negative feelings for the device or resent towards mobile phone culture that individuals may feel ($\alpha = .668$). *Enthusiasm* towards the device is made up of 7 items, designed to describe an individual's positive regard that they may have for the device and its presence in their lives ($\alpha = .642$).

Mobile Phone Emotional Response has one multiple-choice question of emotion elicited at personal use and provides seven options, of which the participant may choose more than one. Each emotion is coded as either positive, negative or indifferent, and added together with negative as -1, indifferent as 0, and positive at +1. This variable is described as *Emotional Response Total*. Additionally the number of responses are tallied for each individual, a score that is titled *Number of Emotional Responses.* Both of these variables were not used during my research but are outlined in the Appendix J.

Procedure

My study was run with co-investigator Katie Mohan. Katie is also a comping senior with her own study and research questions. Since we are using three of the same instruments, the Autism Quotient, Empathizing Quotient, and Systemizing Quotient, we recruited participants together and shared the data from these three instruments. After permission from instructors we recruited from different classrooms of various departments in order to get a larger population to find more meaningful comparisons within questionnaire correlates. Once they agreed to participate they came to the research rooms of the Psychology department building during respected time slots and began both of our comps. Two initial informed consent forms were administered to each student, which explained the voluntary nature of the comp and the lack of any foreseeable risks of the study. My portion was accessed through SONA and began with a demographic form which asked for year, gender, major, how long they have owned the mobile phone, if they pay for the mobile phone, and type of mobile phone owned. After completion they moved through the study to complete the Empathizing Quotient, Systemizing Quotient, Autism Quotient, Big Five Personality Correlate and the three quotients of my design: Mobile Phone Objective Use, Mobile Phone Subjective Attitude and Mobile Phone Emotional Response. After the completion of my part of the study the participants went on to take part in my co-investigators portion. My part of the study took approximately 30 minutes. The entire study, with her and my data collection combined took approximately an hour. After the studies' completion the participants received two debriefing forms explaining the general nature of our research, omitting the Autism Spectrum Disorder research. The motivation for individuals to participate was the prospect of 3 credits for psychology students who are required to fulfill a certain amount of psychology research, or if not, the automatic enter into a raffle of 1 of 6 $20 raffle tickets. At the

completion of the manual sign up my study was made available online for the accessibility of other people willing to participate.

Statistical Analysis

Once data collection was completed, exploratory analysis of descriptive variables were observed. Next, measures of central tendency were investigated to see if the sample was representative of the population. Analysis of variance was conducted in regard to gender and the various scores on the AQ, EQ, and SQ. Correlations between all variables were then conducted.

Results

The final number of participants in the research was 100 (67 females, 32 males). Age ranged from 18 to 22 years with an average age of 19.86 (SD= 1.172). Varying disciplines of college majors were represented in the sample, 13% were Humanities majors, 38% were Natural Science majors, 28% were Social Science majors, 16% were double majors and 5 participants declined to answer. Overall 92% of participants owned a smartphone, 7% owned a conventional or non-smartphone and 1% owned a prepaid phone. Excluding one participant who declined to respond, 46% of participants report checking their phone around 150 times per day, while 53% said they did not. Demographic information is available in Table 1.

Online responses were recorded using SONA management system and analyzed using SPSS version 19. Few individuals opted not to answer certain questions; these answers were coded as missing. The participants' raw data was scored appropriately with regards to scoring manuals for the Big Five Inventory of Personality (John et al, 2008) and Autism Quotient (Baron-Cohen et al, 2001). As per Wakayabashi et al (2006) the Empathizing Quotient (EQ) Short Scores and Systemizing Quotient (SQ) Short-Scores were coded as their full versions

(Baron-Cohen & Wheelwright, 2004). The factors of my design were coded as intended and not used in their final subfactor if their deletion would improve internal consistency.

Table 1:

Demographic Descriptive

	N (%)	Mean (SD)
Gender:		
Male	32 (32.3%)	—
Female	67 (67.7%)	
Age (years):		19.69 (1.968)
Range	—	18-22
Ethnicity:		
White	86 (86%)	—
Black	3 (3%)	—
Asian	4 (4%)	—
Hispanic	4 (4%)	—
Other	1 (1%)	—
Major:		
Natural Science	38 (38%)	—
Social Science	28 (28%)	—
Humanities	13 (13%)	—
Double Major	16 (16%)	—
College Year:		
Freshman	23 (23%)	—
Sophomore	31 (31%)	—
Junior	26 (26%)	—
Senior	20 (20%)	—
Type of Mobile Phone:		
Smartphone	92 (92%)	—
Conventional	7 (7%)	—
Prepaid	1 (1%)	—
Responsible for Phone Bill:		
Yes	11 (11%)	—
No	88 (88%)	—
Check 150 times daily:		
Yes	46 (46%)	—
No	53 (53%)	—

The means, standard deviations, minimum and maximum values, and skewness were calculated for all variables, illustrated in Table 2 and 3. To get a better understanding of the sample, descriptive statistics were utilized to measure the frequency of the scores to ensure the data sample was meeting normative assumptions. The skewness of EQ and all five factors of personality scores had relatively normal distribution patterns, while a more significant skewness was seen negatively for AQ (-.993), and positively for SQ (.729). Yet a closer

examination revealed that there were no significant outliers that needed to be accounted for so further analysis was continued without transformation. The AQ scores were consistent with neurotypical populations seeing that all participant scores were between 10 and 30 (M = 22.21, SD = 3.83) while 32 or higher is thought of as being at the clinical end of the spectrum.

Table 2:

*Descriptive Statistics for Independent Variables**

	Mean	Std. Deviation	Minimum	Maximum	Skewness	N
AQ Scores	22.210	3.833	10.00	30.00	-.993	100
SQ Scores	18.240	9.464	2.00	45.00	.729	100
EQ Scores	25.880	8.124	5.00	44.00	.033	100
Extraversion	3.372	.853	1.25	5.00	-.461	100
Conscientiousness	3.796	.681	2.00	5.00	-.406	100
Agreeableness	3.852	.606	1.78	5.00	-.475	100
Neuroticism	2.927	.842	1.38	4.88	.202	100
Openness-to-Experience	3.685	.651	2.00	5.00	-.239	100

* The following variables have been abbreviated: Autism Quotient (AQ), Systemizing Quotient (SQ), and Empathizing Quotient (EQ)

Table 3:

Descriptive Statistics for Dependent Variables

	Mean	Std. Deviation	Minimum	Maximum	Range	N
Objective Use						
Total Application Use	38.32	7.333	12.00	50.00	38.00	100
Practical App Use	18.88	4.293	5.00	25.00	20.00	100
Social App Use	23.13	4.510	8.00	30.00	22.00	100
Emotional Escapism	14.27	3.271	7.00	20.00	13.00	100
Proximity to Device	27.65	3.828	18.00	36.00	18.00	100
Frequency of Use	28.13	5.118	12.00	40.00	28.00	100
Subjective Attitude						
Dependence	6.44	3.191	0.00	13.00	13.00	100
Anxiety	3.26	1.586	0.00	6.00	6.00	100
Enthusiasm	4.54	1.737	0.00	7.00	7.00	100

Analysis of variance was then conducted and showed a main effect of gender on Systemizing Quotient (SQ) Scores, F (1, 97) = 27.325, p= .000, but no effect on Empathizing Quotient (EQ) Scores and Autism Quotient (AQ) Scores. The mean scores indicated that SQ scores were lower for female participants (M = 15.27, SD = 7.63) than for male participants (M = 24.72, SD = 9.88). Results can be found in Table 4.

Table 4:
Associations between AQ, SQ, EQ and Gender

	n	AQ Scores	SQ Scores	EQ Scores
M (SD)				
Gender				
Female	67	21.97 (3.98)	15.27 (7.62)	25.77 (8.53)
Male	32	22.62 (5.53)	24.72 (9.87)	26.31 (7.35)
F(p)		.63 (.43)	**27.33 (.001)**	.09(.76)

Mobile Phone Use and Traits of ASD Correlations:

Many of the original hypotheses were confirmed as the Systemizing Quotient, Autism Quotient and all five personality factors had some relation to mobile phone use, which can be observed in Table 5. The Systemizing Quotient had significant negative correlations to Social Application Use (OU), Proximity to the device (OU), Frequency of use (OU), and use as Emotional Escapism (OU). Dependence on the device was also negatively correlated to SQ scores. The Autism Quotient was found to have a significant positive correlation with Social Application Use. No mobile phone characteristics yielded significant correlations with the Empathizing Quotient.

Mobile Phone Use and Five Factors of Personality:

The five factors of personality also proved to be correlated with different trends and attitudes for mobile phone use, illustrated in Table 6. Neuroticism and Mobile Phone Use

were highly correlated within the subfactors of Proximity to the device (OU), Emotional Escapism (OU), Dependence and Enthusiasm.

Table 5:
Correlations between AQ, SQ, EQ Scores & Mobile Phone Objective Use, Subjective Attitude

	AQ Scores	SQ Scores	EQ Scores
Objective Use			
Total Application Use	.16	-.170	.119
Practical App Use	.140	-.127	.110
Social App Use	**.209***	**-.242***	.120
Emotional Escapism	.183	**-.370****	-.070
Proximity to Device	.088	**-.200***	-.001
Frequency of Use	.189	**-.215***	.039
Subjective Attitude			
Dependence	.149	**-.318****	-.065
Anxiety	-.023	-.019	-.075
Enthusiasm	.149	-.135	.003

**. Correlation Is Significant At The 0.01 Level (2-Tailed).
*. Correlation Is Significant At The 0.05 Level (2-Tailed).

Table 6
Correlations between Big Five Factors & Mobile Phone Use, Subjective Attitude

	Extraversion	Conscientiousness	Agreeableness	Neuroticism	Openness-to-Experience
Objective Use					
Total Application Use	**.224***	.100	.119	.163	**-.222***
Practical App Use	.148	.064	.124	.159	-.170
Social App Use	**.349****	.098	.090	.136	**-.221***
Emotional Escapism	-.006	.147	-.078	**.356****	-.261
Proximity to Device	-.065	-.180	**-.028***	**.287****	-.183
Frequency of Use	.087	.006	-.114	.184	**-.314****
Subjective Attitude					
Dependence	.026	**-.217***	-.114	**.334****	**-.258****
Anxiety	-.078	-.018	.109	.098	.141
Enthusiasm	.075	-.008	-.017	**.275****	-.151

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Openness-to-Experience yielded the same amount of correlations with use factors, with negative correlations to Objective Use subfactors Social Application Use, Emotional Escapism, and Frequency of use. The other three factors of personality had interactions with different subfactors of use; Extraversion and Social Application Use (OU) were positively correlated, Conscientiousness and Dependence (SA) were negatively correlated, and Agreeableness and Proximity to the device (OU) were negatively correlated.

Although it was not an intended area of interest there were correlations between the Big Five variables and ASQ, EQ and SQ, detailed in Table 7. The Empathizing Quotient and Systemizing Quotient were positively correlated with various factors of personality, but both negatively correlated to Neuroticism. The Autism Quotient scores were positively correlated with Extraversion.

Table 7
Correlations between Big Five Factors & ASQ, EQ, SQ

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
(1) AQ Scores	1	.041	.013	**.315****	.045	-.063	-.035	-.048
(2) SQ Scores		1	**.237***	.076	**.240***	**.211***	**-.361****	**.316****
(3) EQ Scores			1	**.319****	**.475****	**.427****	**-.231***	**.304****
(4) Extraversion				1	.086	.150	-.191	.149
(5) Conscientiousness					1	**.353****	**-.329****	-.081
(6) Agreeableness						1	**-.230***	.189
(7) Neuroticism							1	-.098
(8) Openness-to-Experience								1

**. Correlation is significant at the 0.01 level (2-tailed).
*. Correlation is significant at the 0.05 level (2-tailed).

Discussion

A summary of the study findings are as follows:

Big Five Facets of Personality and Mobile Phone Use and Attitude:

Hypothesis (1) Personality factors will correlate with different facets of objective use and subjective attitude to mobile phones.

Overall, every facet of the big five inventory of personality had a correlation with either one or more of the mobile phone variables. While my predictions as to how the different dimensions would correlate was not consistently supported, the interaction maintains that perceptions of the presence the mobile phone fulfills in the individuals life and their use patterns may be better understood within the context of personality, rather than trends in a general population. Below, the interactions of mobile phone use and the five subsets of personality are explained more thoroughly.

Hypothesis (2) Those who rate high on Neuroticism will have high use and dependency but a negative attitude.

Neuroticism had some of the most frequent significant correlations with different facets of mobile phone use and attitude. Neuroticism was found to be positively correlated with Objective Use subfactors Proximity to the device and Emotional Escapism, as well as positive correlations to Subjective Attitude subfactors Dependence and Enthusiasm. Thus Hypothesis (2) was only partially supported, in that high Neuroticism scores were significantly correlated with high use and dependency, yet their reported experience with the device was held in positive regard. Past research has shown mixed results in correlations between mobile phone use and Neuroticism, dually predicting high text messaging use, but also reporting that these individuals dislike the device because it perpetuates feelings of loneliness. With this in mind, the correlation with enthusiasm for the device goes against

previous research. The correlation with both dependence and enthusiasm assert that while individuals with high Neuroticism scores may experience feelings of generational pressure, to feelings of attachment and an ability to stop using the phone, they may also have accepted the device as a positive method of connection to others. Again, self-report studies run the risk of personal bias, so there is a possibility that neurotic individuals may be compensating or in denial about their personal attitudes towards mobile phones. Yet this is a stretch, what is more likely is that when given the opportunity to explain their subjective experience with their device, high Neuroticism scores are correlated to contradictory feelings of both dependence and enthusiasm for the device because of its comforting aspect. This coincides with the correlation between Neuroticism scores and Emotional Escapism (OU). These individuals were more likely to use their phones to avoid awkward situations, or go on the device when feeling lonely, and thus may see it as a form of escape and value its presence. *Hypothesis (3)* Those who rate high on extroversion will have high use and dependency but a positive attitude.

Extraversion was found to be highly correlated with Total Application Use (OU) and Social Application Use (OU), but there were no significant correlations within other areas of use or attitude. Thus Hypothesis (3) was partially supported, in that high application use and social use implies higher frequency to check the applications on the device (Oulasvirta & Rattenbury, 2011), yet there was no correlation to dependency or enthusiasm. This may imply that for those scoring high on Extraversion, the device serves a distinct purpose of connectivity and has different meaning depending on other characteristics of the user. Past research supports that extraverted individuals are more likely to use their phones for receiving and making calls and texts, as well as other forms of social media, in order to keep in touch with their larger social networks (Lee, Tam & Chie, 2013; Butt & Phillips, 2007,

Kim et al., 2014).

Hypothesis (4) Those who rate high on Agreeableness will have mixed results in use, dependency and attitude.

High Agreeableness scores were only negatively correlated with Proximity to the device (OU), but no other scores of use or attitude. While this somewhat supports the hypothesis, it was potentially hypothesized that because agreeable individuals prioritize others' needs, they may keep their phone on or around them more often than others. The finding of a negative correlation to proximity goes directly against this prediction, and against prior research that assumes this sort of necessary closeness (Lepp et al, 2015). While there was no correlation to any attitudinal affect, proximity to the device may be avoided in an attempt to stay present to other friends or loved ones in the space around them.

Hypothesis (5) Those who rate high on Conscientiousness will have mixed results in use, dependency and attitude.

Like Agreeableness, Conscientiousness had only one significant correlation. Conscientiousness scores were negatively correlated with Dependence (SA). Conscientiousness has not had significant ties to other mobile phone use trends, except for an increased likelihood of owning a smartphone or having e-commerce applications (Kim et al., 2014). Because those who score more highly on Conscientiousness may have better self-discipline they may be able to have a greater handle on impulses to use their phone or have a greater social awareness of etiquette and therefore better able to discern the difference between public and private life. Because of the lack of correlation with other variables, the negative correlation to dependence may precede high use and other personal attitudes.

Hypothesis (6) Those who rate high on Openness-to-Experience will have mixed use, low dependence and mixed attitude.

Openness-to-Experience was correlated with an equal amount of mobile phone use and attitude scores as Neuroticism. Yet Openness-to-Experience yielded high negative correlations to Total Application Use (OU), Social Application Use (OU), Frequency of Use (OU) and Dependency (SA). While this partially supports hypothesis (6), it depicts a much more specific picture than the mixed use and attitude that was expected. Originally it was speculated that because individuals with high openness scores are willing to try new things they would be more open to the devices presence, but the strong negative correlations may suggest otherwise. While there were no correlations to emotional factors of Anxiety (SA) or Enthusiasm (SA), a strong negative correlation to Dependence (SA) may show that these individuals take active measures to not feel dependent or attached to their device. Past research has found correlations between openness and low use, speculating that these individuals may favor physical forms of communication, but this seems counterintuitive for those scoring high on an 'Openness-to-Experience' personality factor (Kim et al., 2014). Even so, the consistent negative correlations to the different factors of use and dependence, but without a correlation to the anxiety subfactor, we can speculate that these individuals do not harbor personal resentment or negative feelings towards the device, they just use the device less and feel less dependence on its presence.

AQ, EQ, SQ and Mobile Phone Use and Attitude:

Hypothesis (7) Those rating high on the SQ and AQ will have high use and dependency, but mixed or non-affective attitude.

While the Systemizing Quotient and Autism Quotient scores were found to be correlated with areas of mobile phone use and dependency, the discrepancies in the areas of correlation supports that they are not as similar as I was to suspect. Thus my hypothesis that their patterns could be grouped together is wrong. Similarly there was no correlation between

those scoring highly on the Autism Quotient and Systemizing Quotient.

Scoring highly on the SQ was negatively correlated to Social Application Use (OU), Frequency of use (OU), use as Emotional Escapism (OU), Proximity to the device (OU), and Dependence (SA). While I had hypothesized that SQ scores would have correlations with high use and dependency, yet no attitudinal affect, the findings support somewhat the reverse. The negative correlations posit that individuals scoring highly on the SQ do not report using their phones for social reasons, are not constantly near their phones, do not feel or respond to compulsions to check the device when lonely or bored, use it less frequently and feel less tied to the device in general. Because of the consistency in negative correlations it might be thought that individuals with high SQ scores are disinterested in their phones, as the strong negative correlation to Dependence (SA) and the lack of correlation between Anxiety (SA) or Enthusiasm (SA) might show. The sample of participants were not within the range of ASD diagnosis, so subclinical systemizing individuals may just have a general interest in different knowledge and have less rigidity to change.

It is perhaps worth mentioning now that SQ Scores were highly correlated to Openness-to-Experience scores, perhaps providing insight into the individuals who scored highly on both. The nature of both personality facets is to explore and understand the world around them, SQ individuals perhaps with more intent on categorical information and Openness individuals with more interest in personal narrative, but all in the same, the trends in their responses show negative correlations to both use and dependency, potentially implying that these individuals are less interested in the mobile phone than other personality dimensions due to their corporeal interests.

Overall the SQ is a fascinating variable in showing the general disinterest of the device, which was the opposite of what had been thought in the distinction between the

mobile phone as a tool as well as an emotional conduit to social groups. However this seems to coincide with what was posited in that those who scored higher on the SQ were disinterested in the social nature of the device and thereby the emotional attachment.

The Autism Quotient scores yielded one interesting positive correlation to mobile phone use, and that is with Social Application Use (OU). Not only does this greatly differ from the SQ's negative correlation with social application use, but generally diverts from my interpretation of how subclinical AQ scores would appear. Because no participants were within the range of diagnosis, and further investigation of the AQ sample supported no significant outliers, it is difficult to speak to this correlation. Taking into consideration the lack of correlation between other areas of use, such as proximity or frequency, it is possible that these individuals may use their phone solely for the purposes of social communication. However, high Social Application Use (OU) may show that these individuals prefer the disinhibiting qualities that mobile phones provide in social communication, such as texting, in which a successful conversation may be possible without inherent knowledge in social cues and recognition. This coincides with the social compensation hypothesis that states that individuals who are more socially anxious and lonely prefer online communication to face-to-face (Valkenburg & Peter, 2010). Mobile phone communication not only allows the user to have social contact without implicit cues in tonality or facial emotion, but is asynchronous, allowing for more response time, which leads to a greater feeling of control.

Hypothesis (8) Those scoring high on the EQ will have mixed use results but a strong attitude, either positive or negative

The Empathizing Quotient scores were found to have no correlation with any of the mobile phone use or attitudinal factors. Although the frequency of the scores were evenly distributed the general mean was higher than the other variables, which might imply that a

more diverse representation of users scored highly. The individuals with high EQ scores could have mixed mobile phone use and attitude, which would lead to a lack of significant correlations between variables.

Other Findings:

While not an intended area of interest for this study, correlations between the Big Five and AQ, EQ & SQ were interesting enough to mention. First and foremost AQ scores were found to be correlated with Extraversion scores, which goes directly against past research which found negative correlation between AQ scores and Extraversion (Austin, 2004; Wayakabashi, Baron-Cohen & Wheelwright, 2006). Their research conducted joint factor analysis suggested that autistic traits are independent of the big five personality dimensions, so the possibility of a high correlation between AQ scores and Extraversion does not necessarily mean there was fault with the sample. Analysis into my sample found a lack of significant outliers that might have skewed the data. These results could be due to the fact that because the sample was subclinical and not within the range of diagnosis the correlation is not as alarming as it may seem. Yet in accordance with the correlation between the AQ and Social Application Use (OU), these individuals may be more social than presumed because of their high social application use.

Correlations were also found between SQ and EQ scores and other factors of personality. The SQ had positive correlations with Conscientiousness, Agreeableness and Openness-to-Experience, yet negatively correlated with Neuroticism. No research specifically points to correlations between these factors, yet they make sense in light of the correlation between Agreeableness and Conscientiousness, and the Openness-to-Experience factors discussed previously. EQ scores were positively correlated with Extraversion, Conscientiousness, Agreeableness and Openness-to-Experience but negatively correlated to

Neuroticism. This makes sense in that those who would have higher empathizing scores would be more concerned and opened to others, as well as new experiences. A positive correlation was also found between the SQ and EQ, which may be as result of the similar correlations with personality variables.

Through the analysis of variance a main effect of gender on the Systemizing Quotient shows that even through the disproportionate gender distribution of the participants, the SQ scores were lower for female participants than for male. This finding supports copious amounts of past research that show the SQ and EQ related to gender, data used to support the male-brain theory of Autism Spectrum Disorder (Baron-Cohen, 2009). This finding is important to show that the sample was a good representation of the general population.

Strengths and Limitations:

The young adult population of the college was ideal for mobile phone research in that the fastest growing population most affected by mobile phone use are between the ages 20-24 years (Lee, Tam & Chi, 2013). Similarly research indicates that younger and well-educated individuals typically adopt innovative behavior more quickly (Kim et al., 2014). Through this understanding it makes reasonable sense that 92% of participants owned a smartphone. Psychological research into mobile phone use, beginning somewhat 10 years ago, speculated that cell phone use by teenagers is of developmental significance because of the changing patterns of relations with parents and the increasingly salient process of peer communications and networking (Durkin et al., 2010). A majority of the current sample of college students have been in possession of a cell phone from their teenage years through their young adulthood, which may lend itself to say that their cell phone patterns and use have been well practiced and solidified.

That being said, one potential limitation to this study was the unequal proportion of

women to men that were represented in the sample. While gender was not discussed within the introduction, it has been found to predict certain trends of mobile phone use, and although was analyzed within my findings, there could be problems due to proportional disparity. Alternatively, because studies that found gender differences examined specific application use and frequency of calls and texts, variables which my study did not isolate, could indicate that there are not as strong differences in attitudinal preference for the device and overall use.

Another possible problem with the data was the skewness for AQ and SQ variables which might have affected some of the correlations. Any self-report assessment runs the risk of not correctly measuring use exactly, but the intention of this study was to study the individuals' perception of their use and whether they saw it as problematic.

While the intent of my research was to investigate mobile phone use and attitude through comparison to various personality dimensions, I found that no present quotients existed that examined what it was I was interested in, thus why I created my own measures. Since I was unable to test the psychometrics of my surveys before running the actual study, there are noticeable drawbacks in defending the implementation of these quotients without prior validity. The most notable drawback is the inability to discern if the subfactors are in fact measuring what they are intended to investigate.

Yet the success of the correlations and the variability between different factors of personality shows that there was enough distinction for some variables to be correlated while others were not. While certain factors, such as Anxiety (SA) was not correlated with any areas of personality, this may be a fault in my own design, or a lack of significant anxious feelings towards mobile phones within the sample. While I tried to ensure internal consistency, it may be too difficult to discern what this specific lack of finding is a result of.

The collinearity between the Big Five variables, AQ, EQ and SQ was also an area of

concern, as the correlations between the SQ, EQ and AQ with different personality facets suggest that these variables are not as isolated as had thought. Specific correlations, such as the positive correlation between Systemizing Quotient and Openness-to-Experience personality facet, which both yielded similar negative correlations with areas of use, makes it difficult to know which has a stronger influence on use.

Application and Future Research:

The general success of this study was finding significant correlations within areas of personality that had not yet been identified. Similarly the intent of this research was to find differences within personal attitudes to mobile phones, as well as use, which was sustained in that different facets were correlated with different personality dimensions. Overall the variation points to personality being a good distinction of how people use and perceive the device, which is important in attempting to predict over-dependency or maladaptive habits. Undoubtedly mobile phone use will continue to advance and become completely ubiquitous over time so it is generally important to try to understand the effects the device has on the lives of its users.

This research only investigated the correlations between subfactors of use and facets of personality, hopefully future research will look more directly into whether personality can predict personal attitudes towards the device and specific trends of use.

The factors of my design proved useful in describing the areas of use and attitude of users, and hopefully they can be utilized and improved in the future. My research had intended on investigating Mobile Phone Use, Attitude, and Emotional Response, but the later proved too difficult to code and defend. While this factor was then omitted from the research, the quotient is included as Appendix J which could hopefully be investigated in the future. The intention of this measure was to examine both the paradoxical nature of user's feelings

towards their devices when using them, such as both lonely and happy, as well as count how many emotions the participant supplied and investigate if the number of responses had significance.

References

Aoki, K. & Downes, E.J. (2003). An analysis of young people's use of and attitudes toward cell phones. *Telematics and Information, 20,* 349-364

Augner, C. & Hacker G. W. (2010). Associations between problematic mobile phone use and psychological parameters in young adults. *International Journal of Public Health, 57,* 437-441

Austin, E. (2004). Personality correlates of the broader autism phenotype as assessed by the Autism Spectrum Quotient (AQ). *Personality and Individual Differences, (38)* 451 460

Baron-Cohen, S. "Autism-Spectrum Quotient." N.p.: n.p., 2001. N. pag.*PsycTESTS*. Web. 11 Apr. 2014. <http://search.proquest.com.ezproxy1.allegheny.edu:2048/docview/1038211496?accountid=8268>.

Baron-Cohen, S. (2009). Autism: The Empathizing-Systemizing (E-S) Theory. *The Year in Neuroscience 2009,* 1156, 68-80

Bianchi, A. & Phillips, J. (2005). Psychological Predictors of Problem Mobile Phone Use. *CyberPsychology & Behavior, (8)* 39-51

Billieux, J., Gay, P., Rochat, L., & Van der Linden, M. (2010). The role of urgency and its underlying psychological mechanisms in problematic behaviors. *Behavior Research and Therapy, 48,* 1085-1096

Brown, Anna, and Alberto Maydeu-Olivares. "Big Five Questionnaire." N.p.: n.p., 2011. N. pag. *PsycTESTS*. Web. 11 Apr. 2014. <http://search.proquest.com.ezproxy1.allegheny.edu:2048/docview/1038215086?accountid=8268>.

Burke, M., Kraut, R., & Williams, D. (2010). Social use of computer-mediated communication by adults on the Autism Spectrum. *Proceedings of the 200 ACM conference on Computer supported cooperative work,* 425-434

Butt, S. & Phillips, J. G. (2008). Personality and self reported mobile phone use. *Computers in Human Behavior, 24,* 346-360

Castelles, M., Fernandez-Arevol, M., Qiu, J. L. & Sey, A. (2007). *Mobile Communication and Society*. Massachusetts: Massachusetts Institute of Technology.

Chittaranjan, G., Blom, J., & Gatica-Perez, D. (2011). Mining large-scale smartphone data for personality studies. *Symposium of Wearable Computers,* 1-18

Choliz, M. (2012). Mobile-phone addiction in adolescence: The Test of Mobile Phone Dependence (TMD) *Progress in Health Sciences, 2,* 33-44

Daley, L., Lawson, S. & van der Zee, E. (2009). Asperger Syndrome and Mobile Phone Behavior. *Universal Access in HCI, 4614*, 344-352

Durkin, K., Whitehouse, A., Jaquet, E., Ziatas, K., & Walker, A. J. (2010). Cell phone use by adolescents with Asperger Syndrome. *Research in Autism Spectrum Disorders, 4*, 314-318

Geser, H. (2006). Is the Cell Phone Undermining the Social Order: Understanding Mobile Technology from a Sociological Perspective. *Knowledge, Technology & Policy, 19*, 8-18

Hollander, E., Kolevzon, A., & Coyle, J. T. (2011). *Textbook of autism spectrum disorders*. Washington, DC: American Psychiatric Publishing, Inc.

Hourcade, J. P. (2012). Multitouch tablet applications and activities to enhance the social skills of children with autism spectrum disorders. *Pers Ubiquit Comput, (16)* 157-168

Jarvenpaa, S. L. & Lang K. R. (2005). Managing the Paradoxes of Mobile Technology. *Information Systems Management, 22:4*, 7-23

John, O. P., Naumann, L. P., & Soto, C. J. (2008). Paradigm shift to the integrative big-five trait taxonomy: History, measurement, and conceptual issues. In O. P. John, R. W. Robins, & L. A. Pervin (Eds.), *Handbook of personality: Theory and research* (pp. 114–158). New York: Guilford Press.

Kim, Y., Briley, D., & Ocepek, M. (2014). Differential innovation of smartphone and application use by sociodemographics and personality. *Computers in Human Behavior, (44)* 141-147

King, A. L. S., Valenca, A. M., Silva, A.C.O., Baczynski, T., Carvalho, M.R., & Nardi, A.E. (2013). Nomophobia: Dependency on virtual environments or social phobia? *Computers in Human Behavior, 29*, 140-144

Ling, R. & Campbell S. W. (2011). *Mobile Communication: Bringing Us Together or Tearing Us Apart*. New Jersey: Transaction Publishers.

Lee, S., Tam, C.L., & Chie, Q.T. (2013). Mobile Phone Usage Preferences: The Contributing Factors of Personality, Social Anxiety and Loneliness. *Social Indicator Research*, 1-24

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

Lepp, A., Li, J., Barkley, J. E. & Salehi-Esfahani, S. (2015). Exploring the relationships between college students' cell phone use, personality and leisure. *Computers in Human Behavior, (43)* 210-219

Mazurek, M.O., & Wenstrup, C. (2012). Television, Video Game and Social Media Use Among Children with ASD and Typically Developing Siblings. *Journal of Autism Developmental Disorders, 43*, 1258-1271

McCrae, R. & John, O. P. (1992). An Introduction to the Five-Factor Model and Its Applications. *Journal of Personality*, 60, 175-215

Mechling, L.C. (2011). Review of Twenty-First Century Portable Electronic Devices for Persons with Moderate Intellectual Disabilities and Autism Spectrum Disorders. *Education and Training in Autism and Developmental Disabilities, 46(4)*, 479-498

Oulasvirta, A., Rattenbury, T., Ma, L. & Raita, E. (2012). Habits make smartphone use more pervasive. *Personal and Ubiquitous Computing, 16*, 105-114

Rosen, L.D., Whaling, K., Rab, L.M. & Cheever, N.A. (2013). Is Facebook creating "iDisorders"? The link between clinical symptoms of psychiatric disorders and technology use, attitudes and anxiety. *Computers in Human Behavior, (29)* 1243-1254

Smetaniuk, P. (2014). A preliminary investigation into the prevalence and prediction of problematic cell phone use. *Journal of Behavioral Addictions, 3(1)* 41-53

Stephenson, J. & Limbrick, L. (2013). A Review of the Use of Touch-Screen Mobile Devices by People with Developmental Disabilities. *J Autism Dev Discord, (16)* 157-168

Thomee, S., Dellve, L., Harenstam, A., & Hagberg, M. (2010). Perceived connections between information and communication technology use and mental symptoms among young adults –a qualitative study. *BMC Public Health, (10)* 1-14

Jarvenpaa, S. L. & Lang K. R. (2005). Managing the Paradoxes of Mobile Technology. *Information Systems Management, 22:4*, 7-23

Valkenburg, P. M. & Peter J. (2011). Online Communication Among Adolescents: An Integrated Model of its Attraction, Opportunities, and Risks. *Journal of Adolescent Health, 48,* 121--127

Vincent, J. (2006). Emotional Attachment and Mobile Phones. *Knowledge, Technology & Policy, 19*, 39-44

Wakabayashi, A., Baron Cohen S., et al (2006). Development of short forms of the Empathy Quotient (EQ-Short) and the Systemizing Quotient (SQ-Short). *Personality and Individual Differences, 41, 929–940*

Wakabayashi, A., Baron-Cohen S., & Wheelwright, S. (2006). Are autistic traits independent of personality dimension? A study of the Autism-Spectrum Quotient (AQ) and the NEO-PI-R. *Personality and Individual Differences, 41, 873–883*

Wilska, T. A. (2003). Mobile Phone Use as Part of Young People's Consumption Styles. *Journal of consumer Policy, 26,* 441-563

Zhang, B. & Dong, H. (2013). User-Mobile Phone Interactions: A postphenomenology Analysis. *Design, User Experience and Usability, 8012,* 171-181

Appendix A

Research Participant Informed Consent

Mobile Phone Use

Kathryn Brong
Allegheny College Department of Psychology

DESCRIPTION/PROCEDURE: My project will examine how mobile phone use and personality factors are related. You will be presented with a series of questionnaires concerning your mobile phone use, your own attitudes towards the mobile phones presence in your life, and different facets of your personality. The survey should take approximately 45 -50 minutes.

RISKS: There are no foreseeable risks associated with this study.

BENEFITS: I understand that the main benefit of participating in this study is a general exposure to research designs at Allegheny College. I also understand the important applications this research may have. Upon completion I will be able to choose to be either entered into a raffle or will receive class credit according to my instructor's policy. Additionally I will be familiarized with the SONA Experiment Management System.

ALTERNATIVE PROCEDURES: At any point during taking the surveys I may exit the study and withdraw my participation. I understand that I will not be penalized for doing so, and it will not affect my enrollment in the raffle.

CONFIDENTIALITY: I understand that all data collected upon the completion of the questionnaire will be kept anonymous at all times.

CONTACT INFORMATION: If I have any questions after the completion of this study, I may contact Katie Brong, student researcher at brongk@allegheny.edu, or Dr. Chowdhury at mchowdhury@allegheny.edu. If I have any questions, comments, or concerns about the treatment of research participants in regards to this study I can contact the Institutional Review Board Chair, Ann Kleinschmidt at akleinschmidt@allegheny.edu

VOLUNTARY PARTICPATION: I understand that my participation in this study is voluntary. I understand I may receive class credit by my professor for participation in this study, but this is not applicable to every participant. My participating in this study I am being entered into a raffle for a gift card. I understand I can exit the study whenever I choose and this will not affect my submission to the raffle. I acknowledge that I am of age (18 years or older) and can legally participate in the study.

☐ **I understand the description of the study and procedures, and have accepted to continue as a participant of this study.**

☐ I DO NOT AGREE TO PARTICIPATE IN THE STUDY

Continue

Appendix B

Research Participant Debriefing Form

Mobile Phone Use: Personality and Attitudes

Katie Brong
Allegheny College Department of Psychology

Thank you for your participation in my research project. The purpose of this study was to investigate the relationship between individual mobile phone use and dependence with different dimensions of personality. In the past three years alone the number of Americans using smart phones has jumped from 35 percent to 58 percent (Fox & Raine, 2014). Mobile phone use in young adult populations has become of great interest of investigation because of potential influences it may have on interpersonal relationships, communication style and public and private behavior (Jarvenpaa & Lang, 2005). As more individuals experience anxiety due to the absence of their mobile phone, personal perception of the role of the device in their lives and differences in attitude and emotional response elicited from the device is the focus of my research.

It has been found that psychological factors such as personality can influence individuals' perception of mobile phones or have their feelings and emotions affected by interaction through the mobile phone (Lee, Tam & Chie, 2013). I chose to follow past research that used the Big Five personality factors of Extraversion, Neuroticism, Openness to Experience, Agreeableness and Conscientiousness and found that these different aspects of personality were related to intensity and type of mobile phone use (Butt & Phillips, 2007). There has been a gap in the literature as to how an individual scores on the Empathizing Quotient, which investigates the presence empathy in an individual, and Systemizing Quotient, measuring the systemizing tendencies in an individual, and how they are associated to trends in mobile phone usage. To better expand the dimensions of mobile phone use, attitude and emotional response I created three questionnaires addressing Objective Use, Subjective Attitude and Emotional Response. I hypothesized that certain factors of personality would correlate with different trends of mobile phone use, such as that individuals with higher scores of Openness-to-Experience and Agreeableness would have low use, mixed attitude and strong emotional response, those who scored high on the Empathizing Quotient would have mixed use, mixed attitude and high emotional response, and those who scored high on the Systemizing Quotient would have high use, passive attitude and low emotional response.

I request that you please keep the intention of this study confidential until it is completed. If you have any additional questions about the experiment or nature of the research, please contact Dr. Monali Chowdhury at mchowdhury@allegheny.edu. If at any point throughout the questionnaires you experienced any psychological discomfort, please contact the Allegheny College Counseling Center at 814-332-4368 or the 24-Hour Mental Health Emergencies Hotline at 814-724-2732 or 814-724-2739. Additionally, if you have any questions, comments or concerns about the treatment of research participants in this study (including yourself), Ann Kleinschmidt Chair of Institutional Review Board at Allegheny College at akleinschmidt@allegheny.edu.

If you would like to learn more about this topic, please refer to the following articles:

Butt, S. & Phillips, J. G. (2008). Personality and self reported mobile phone use. *Computers in Human Behavior, 24,* 346-360

Jarvenpaa, S. L. & Lang K. R. (2005). Managing the Paradoxes of Mobile Technology. *Information Systems Management, 22:4,* 7-23

Lee, S., Tam, C.L., & Chie, Q.T. (2013). Mobile Phone Usage Preferences: The Contributing Factors of Personality, Social Anxiety and Loneliness. *Social Indicator Research,* 1-24

Vincent, J. (2006). Emotional Attachment and Mobile Phones. *Knowledge, Technology &Policy, 19,* 39-44

Appendix C

Demographic Information

Katie Brong & Katie Mohan
Allegheny Department of Psychology

Please answer honestly as to your:

Ethnicity:
_White _Hispanic or Latino _Black _Asian American _Native American
_Pacific Islander _Two or More Races _Other

Biological Sex:
_Male _Female _Non-identifying

Age:
_17 _18 _19 _20 _21 _22 _23 _Other

Year:
_Freshman _Sophomore _Junior _Senior

College Major:
_Natural Science _Social Science _Humanities
If doubling majoring, mark that which apply

Type of mobile phone used:
_Smart Phone _Conventional/Non-Smartphone_Prepaid

Length of use for current mobile phone
_Less than 1 year _1 year _2 years _3 years _more than 4 years

If you do not have a smart phone if they would like one?
_Yes _No
Why or why not? _____

Are you responsible for your mobile phone bill?
_Yes _No

Do you have a diagnosis of Learning Disability or other Mental Health Condition:
_No _Yes
If yes, what is diagnosis _____

Appendix D

Big Five Inventory (BFI)

How I am in general

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.**

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

I am someone who…_____ Is talkative

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

Appendix E

Autism Spectrum Quotient (ASQ)

1. I prefer to do things with others rather than on my own.	definitely agree	slightly agree	slightly disagree	definitely disagree
2. I prefer to do things the same way over and over again.	definitely agree	slightly agree	slightly disagree	definitely disagree
3. If I try to imagine something, I find it very easy to create a picture in my mind.	definitely agree	slightly agree	slightly disagree	definitely disagree
4. I frequently get so strongly absorbed in one thing that I lose sight of other things.	definitely agree	slightly agree	slightly disagree	definitely disagree
5. I often notice small sounds when others do not.	definitely agree	slightly agree	slightly disagree	definitely disagree
6. I usually notice car number plates or similar strings of information.	definitely agree	slightly agree	slightly disagree	definitely disagree
7. Other people frequently tell me that what I've said is impolite, even though I think it is polite.	definitely agree	slightly agree	slightly disagree	definitely disagree
8. When I'm reading a story, I can easily imagine what the characters might look like.	definitely agree	slightly agree	slightly disagree	definitely disagree
9. I am fascinated by dates.	definitely agree	slightly agree	slightly disagree	definitely disagree
10. In a social group, I can easily keep track of several different people's conversations.	definitely agree	slightly agree	slightly disagree	definitely disagree
11. I find social situations easy.	definitely agree	slightly agree	slightly disagree	definitely disagree
12. I tend to notice details that others do not.	definitely agree	slightly agree	slightly disagree	definitely disagree
13. I would rather go to a library than a party.	definitely agree	slightly agree	slightly disagree	definitely disagree
14. I find making up stories easy.	definitely agree	slightly agree	slightly disagree	definitely disagree
15. I find myself drawn more strongly to people than to things.	definitely agree	slightly agree	slightly disagree	definitely disagree
16. I tend to have very strong interests which I get upset about if I can't pursue.	definitely agree	slightly agree	slightly disagree	definitely disagree
17. I enjoy social chit-chat.	definitely	slightly	slightly	definitely

	agree	agree	disagree	disagree
18. When I talk, it isn't always easy for others to get a word in edgeways.	definitely agree	slightly agree	slightly disagree	definitely disagree
19. I am fascinated by numbers.	definitely agree	slightly agree	slightly disagree	definitely disagree
20. When I'm reading a story, I find it difficult to work out the characters' intentions.	definitely agree	slightly agree	slightly disagree	definitely disagree
21. I don't particularly enjoy reading fiction.	definitely agree	slightly agree	slightly disagree	definitely disagree
22. I find it hard to make new friends.	definitely agree	slightly agree	slightly disagree	definitely disagree
23. I notice patterns in things all the time.	definitely agree	slightly agree	slightly disagree	definitely disagree
24. I would rather go to the theatre than a museum.	definitely agree	slightly agree	slightly disagree	definitely disagree
25. It does not upset me if my daily routine is disturbed.	definitely agree	slightly agree	slightly disagree	definitely disagree
26. I frequently find that I don't know how to keep a conversation going.	definitely agree	slightly agree	slightly disagree	definitely disagree
27. I find it easy to "read between the lines" when someone is talking to me.	definitely agree	slightly agree	slightly disagree	definitely disagree
28. I usually concentrate more on the whole picture, rather than the small details.	definitely agree	slightly agree	slightly disagree	definitely disagree
29. I am not very good at remembering phone numbers.	definitely agree	slightly agree	slightly disagree	definitely disagree
30. I don't usually notice small changes in a situation, or a person's appearance.	definitely agree	slightly agree	slightly disagree	definitely disagree
31. I know how to tell if someone listening to me is getting bored.	definitely agree	slightly agree	slightly disagree	definitely disagree
32. I find it easy to do more than one thing at once.	definitely agree	slightly agree	slightly disagree	definitely disagree
33. When I talk on the phone, I'm not sure when it's my turn to speak.	definitely agree	slightly agree	slightly disagree	definitely disagree
34. I enjoy doing things spontaneously.	definitely agree	slightly agree	slightly disagree	definitely disagree

35. I am often the last to understand the point of a joke.	definitely agree	slightly agree	slightly disagree	definitely disagree
36. I find it easy to work out what someone is thinking or feeling just by looking at their face.	definitely agree	slightly agree	slightly disagree	definitely disagree
37. If there is an interruption, I can switch back to what I was doing very quickly.	definitely agree	slightly agree	slightly disagree	definitely disagree
38. I am good at social chit-chat.	definitely agree	slightly agree	slightly disagree	definitely disagree
39. People often tell me that I keep going on and on about the same thing.	definitely agree	slightly agree	slightly disagree	definitely disagree
40. When I was young, I used to enjoy playing games involving pretending with other children.	definitely agree	slightly agree	slightly disagree	definitely disagree
41. I like to collect information about categories of things (e.g. types of car, types of bird, types of train, types of plant, etc.).	definitely agree	slightly agree	slightly disagree	definitely disagree
42. I find it difficult to imagine what it would be like to be someone else.	definitely agree	slightly agree	slightly disagree	definitely disagree
43. I like to plan any activities I participate in carefully.	definitely agree	slightly agree	slightly disagree	definitely disagree
44. I enjoy social occasions.	definitely agree	slightly agree	slightly disagree	definitely disagree
45. I find it difficult to work out people's intentions.	definitely agree	slightly agree	slightly disagree	definitely disagree
46. New situations make me anxious.	definitely agree	slightly agree	slightly disagree	definitely disagree
47. I enjoy meeting new people.	definitely agree	slightly agree	slightly disagree	definitely disagree
48. I am a good diplomat.	definitely agree	slightly agree	slightly disagree	definitely disagree
49. I am not very good at remembering people's date of birth.	definitely agree	slightly agree	slightly disagree	definitely disagree
50. I find it very easy to play games with children that involve pretending.	definitely agree	slightly agree	slightly disagree	definitely disagree

Appendix F

Empathizing Quotient (EQ)

1.	I can easily tell if someone else wants to enter a conversation.	definitely agree	slightly agree	slightly disagree	definitely disagree
2.	I really enjoy caring for other people.	definitely agree	slightly agree	slightly disagree	definitely disagree
3.	I find it hard to know what to do in a social situation.	definitely agree	slightly agree	slightly disagree	definitely disagree
4.	I often find it difficult to judge if something is rude or polite.	definitely agree	slightly agree	slightly disagree	definitely disagree
5.	In a conversation, I tend to focus on my own thoughts rather than on what my listener might be thinking.	definitely agree	slightly agree	slightly disagree	definitely disagree
6.	I can pick up quickly if someone says one things but means another.	definitely agree	slightly agree	slightly disagree	definitely disagree
7.	It is hard for me to see why some things upset people so much.	definitely agree	slightly agree	slightly disagree	definitely disagree
8.	I find it easy to put myself in somebody else's shoes.	definitely agree	slightly agree	slightly disagree	definitely disagree
9.	I am good at predicting how someone will feel.	definitely agree	slightly agree	slightly disagree	definitely disagree
10.	I am quick to spot when someone in a group is feeling awkward or uncomfortable.	definitely agree	slightly agree	slightly disagree	definitely disagree
11.	I can't always see why someone should have felt offended by a remark.	definitely agree	slightly agree	slightly disagree	definitely disagree
12.	I don't find social situations confusing.	definitely agree	slightly agree	slightly disagree	definitely disagree
13.	Other people tell me I am good at understanding how they are feeling and what they are thinking.	definitely agree	slightly agree	slightly disagree	definitely disagree
14.	I can easily tell if someone else is interested or bored with what I am saying.	definitely agree	slightly agree	slightly disagree	definitely disagree
15.	Friends usually talk to me about their problems as they say that I am very understanding.	definitely agree	slightly agree	slightly disagree	definitely disagree
16.	I can sense if I am intruding, even if they other person doesn't tell me.	definitely agree	slightly agree	slightly disagree	definitely disagree
17.	Other people often say that I am insensitive, though I don't always see why.	definitely agree	slightly agree	slightly disagree	definitely disagree
18.	I can tune into how someone else feels rapidly and intuitively.	definitely agree	slightly agree	slightly disagree	definitely disagree

19.	I can easily work out what another person might want to talk about.	definitely agree	slightly agree	slightly disagree	definitely disagree
20.	I can tell if someone is masking their true emotion.	definitely agree	slightly agree	slightly disagree	definitely disagree
21.	I am good at predicting what someone will do.	definitely agree	slightly agree	slightly disagree	definitely disagree
22.	I tend to get emotionally involved with a friend's problems.	definitely agree	slightly agree	slightly disagree	definitely disagree

Appendix G

Systemizing Quotient (SQ)

1.	If I were buying a car, I would want to obtain specific information about its engine capacity.	definitely agree	slightly agree	slightly disagree	definitely disagree
2.	If there were a problem with the electrical wiring in my home, I'd be able to fix it myself.	definitely agree	slightly agree	slightly disagree	definitely disagree
3.	I rarely read articles or webpages about new technology.	definitely agree	slightly agree	slightly disagree	definitely disagree
4.	I do not enjoy games that involve a high degree of strategy.	definitely agree	slightly agree	slightly disagree	definitely disagree
5.	I am fascinated by how machines work.	definitely agree	slightly agree	slightly disagree	definitely disagree
6.	In math, I am intrigued by the rules and patterns governing numbers.	definitely agree	slightly agree	slightly disagree	definitely disagree
7.	I find it difficult to understand instruction manuals for putting appliances together.	definitely agree	slightly agree	slightly disagree	definitely disagree
8.	If I were buying a computer, I would want to know exact details about its hard drive capacity and processor speed.	definitely agree	slightly agree	slightly disagree	definitely disagree
9.	I find it difficult to read and understand maps.	definitely agree	slightly agree	slightly disagree	definitely disagree
10.	When I look at a piece of furniture, I do not notice the details of how it was constructed.	definitely agree	slightly agree	slightly disagree	definitely disagree
11.	I find it difficult to learn my way around a new city.	definitely agree	slightly agree	slightly disagree	definitely disagree
12.	I do not tend to watch science documentaries on television or read articles about science and nature.	definitely agree	slightly agree	slightly disagree	definitely disagree
13.	If I were buying a stereo, I would want to know about its precise technical features.	definitely agree	slightly agree	slightly disagree	definitely disagree
14.	I find it easy to grasp exactly how odds work in betting.	definitely agree	slightly agree	slightly disagree	definitely disagree
15.	I am not very meticulous when I carry out D.I.Y.	definitely agree	slightly agree	slightly disagree	definitely disagree

16. When I look at a building, I am curious about the precise way it was constructed.	definitely agree slightly agree slightly disagree definitely disagree
17. I find it difficult to understand information the bank sends me on different investment and saving systems.	definitely agree slightly agree slightly disagree definitely disagree
18. When traveling by train, I often wonder exactly how the rail networks are coordinated.	definitely agree slightly agree slightly disagree definitely disagree
19. If I were buying a camera, I would not look carefully into the quality of the lens.	definitely agree slightly agree slightly disagree definitely disagree
20. When I hear the weather forecast, I am not very interested in the meteorological patterns.	definitely agree slightly agree slightly disagree definitely disagree
21. When I look at a mountain, I think about how precisely it was formed.	definitely agree slightly agree slightly disagree definitely disagree
22. I can easily visualize how the motorways in my region link up.	definitely agree slightly agree slightly disagree definitely disagree
23. When I'm in a plane, I do not think about the aerodynamics.	definitely agree slightly agree slightly disagree definitely disagree
24. I am interested in knowing the path a river takes from its source to the sea.	definitely agree slightly agree slightly disagree definitely disagree
25. I am not interested in understanding how wireless communication works.	definitely agree slightly agree slightly disagree definitely disagree

Appendix H

Objective Use

Application use; Practical: (5) α = .796	1 -- 2 -- 3 -- 4 -- 5
(1) I use my mobile phone for organization (calendar, notes, alarm)	
(3) I use my mobile phone for Work/School Connection (email, calendar, reminders)	
(4) I use my mobile phone to keep up with Current Topics (news, sports, humor)	
(6) I use my mobile phone for information (Google, Siri)	
(9) I use my mobile phone for navigation (directions, maps, weather)	
Application use; Social: (5) α = .692	
(2) I use my mobile phone for Social Media (Facebook, Twitter, Instagram, Snapchat)	
(5) I use my mobile phone for Games	
(7) I use my mobile phone to make calls	
(8) I use my mobile phone for texting	
(10) I use my mobile phone for music, camera or video	
Use as Emotional Escapism: (4) α = .774	
(11) When I feel lonely I use my mobile phone	
(12) I go on my phone when I am bored	
(13) I look at my phone to escape awkward situations	
(14) I check my phone out of habit	
Proximity: (7) α = .534	
(16) I keep my phone on me during class	
(17) I know where my phone is at all times	
r(18) I leave my house/room without my mobile phone	
(19) I have my phone on my person	
(20) I sleep with my phone within arm's reach	
(21) I keep my phone on the table during meals	
(28) I experience phantom vibrations from my phone	
Frequency: (7) α = .780	
(22) My phone is turned on	
(23) I check my phone immediately when I wake up	
(24) I respond to calls and texts as soon as I receive them	
(25) I check my phone right before I go to sleep	
(26) I use my mobile phone during moments of solitude (walking, bathroom)	
(27) I agree to receive push-notifications on my phone	
(29) When I am around friends, I am on or check my phone	

(30) Research Claims that the average person looks at their phone 150 times a day (Ahonen, 2011). **Do you feel like this statistic is accurate in describing your mobile phone use?**

☐ Yes

☐ No

Appendix I

Subjective Attitude

Dependence: (14) α = .760	Agree	Disagree
(1) I feel very anxious if I do not know where my phone is		
(2) I worry about my phone breaking		
(3) I experience panic when my phone dies and I will not have access to a charger for a few hours		
(4) I feel incomplete without my mobile phone		
(5) I have trouble putting down my device and being present		
r(23) I could stop using my phone for a week		
r(24) I could spend a day without my phone and feel socially connected		
(25) I have urges to look at my phone		
(26) I am emotionally attached to my mobile phone		
r(27) I have set limits for my mobile phone use which I can uphold		
(29) If I am not involved in mobile phone culture, I would feel left out of my generation		
(31) Without my phone I would feel disconnected from the world		
(32) My mobile phone has more meaning to me than a tool		
Anxiety: (7) α = .668		
(6) I worry about the influence my mobile phone has on my life		
(7) I am worried about our generation's reliance on mobile phones		
(8) We miss out on our surroundings because of mobile phones		
(9) Mobile phones isolate us from one another		
(10) I feel overwhelmed at my reliance on my mobile phone		
r(21) I feel in control of my mobile phone use		
Enthusiasm: (10) α = .642		
(13) I cannot see why anyone would not like their mobile phone		
(14) My phone is socially gratifying		
(15) It feels good to have my phone in my hand		
(17) Mobile phones better connect us to the world and each other		
(18) I appreciate having a mobile phone		
(19) I love my mobile phone		
(20) I use my mobile phone to relax		

Appendix J

Emotional Response

My mobile phone makes me feel:
Negative: -1 point
_Guilty
_Lonely

No-affect: 0 point
_Occupied
_Indifferent

Positive: 1 point
_Happy
_Connected
_Relaxed