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**The Relation of Problematic Mobile Phone Use with
Personality Traits and Demographic Characteristics
Including Age, Gender, Relationship Status, and Level of
Education in a Large Norwegian Survey**

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PREFACE

It has been more than a quarter of a century since mobile phones have entered our lives. It is known that almost everyone has at least one mobile phone. These devices, which were intended only to communicate in the first years, have been used as entertainment tools for more than ten years. Thanks to the features developed in the following years, a photographer can take photos with the same quality as a mobile phone without using a camera, while a journalist can use these devices as a voice recording device for interviews. Even now, there are such applications that we can prepare a presentation draft using a mobile phone for a seminar without using our computer and even check our e-mails. In this widespread use network, the use of mobile phones has also been added to the routine flow of our daily life such as breathing, eating, reading newspapers, and watching television. For a person wearing glasses, the first thing to do after waking up is to wear glasses and then check the messages and social media accounts on their mobile phone, while for some people, it is to fulfill the tasks that are left incomplete in the games, and for others, to check their social environments from social media stories. When going to a restaurant, an office, or even a dental clinic, the first question usually asked is to learn the wireless network password. Even on public transport or long-distance travel, people prefer to spend time with their mobile phones instead of watching the scenery. Most books, newspapers, magazines, etc. even the publications can be read easily with these communication tools since they are now available for download online. The movies are shown in cinema take their place in TV series and movie viewing platforms after a very short time. Some series are now prepared to be broadcast only on these platforms. Therefore, rather than being a device that only fits in our pockets, it turns into a need that serves a wide purpose that covers a whole world. Of course, it is easier to develop behavioral addiction because it provides such ease and daily needs. Anxiety or behavioral disorders began to be observed in individuals when the battery of the mobile phone was exhausted or damaged and became unusable. The concept of addiction to mobile phones has become more and more perceived day by day. The long-term negative effects of these devices, which make a positive contribution to our lives, have now become debatable among the authorities. For these reasons, I would like to state that I want to write this research as my master's thesis, knowing that it is a duty towards humanity.

ABSTRACT

Background: Research into problematic mobile phone use has considerably increased during recent years. Although the concept of problematic mobile use, also known as mobile phone addiction or mobile phone overuse, was first introduced in literature two decades ago, empirical research on the phenomenon is still limited. Important questions concerning the conceptualization, operationalization, antecedents and outcomes of problematic mobile phone use remain to be answered scientifically.

Objective: The overall aim of this thesis was to investigate and broaden our understanding of the timely concept of problematic mobile phone use in terms of potential antecedents and correlates as measured by the Mobile Phone Addiction Index (MPAI). It is important to know personality traits in order to plan targeted prevention interventions in individuals with a tendency to show problematic behavior. Previous studies of the relationship between the Five Factor Model (FFM) and problems were based on small samples not representative of the general population. Within the framework of contemporary theoretical models, the aim of this study was to examine the relationships between problematic mobile phone use and demographical and personality characteristics.

Methods: The MPAI was administrated online to a cross-sectional national sample of 23,533 adults (mean age = 35.8 years [$SD = 13.3$], range 16–88), together with an assessment of demographic variables (age, gender, relationship status, and education) and the five-factor model of personality (extroversion, agreeableness, conscientiousness, neuroticism, and openness to experience). Differences between groups were analyzed by regression models, adjusting got demographic variables.

Results: Demographic and personality factors were associated with problematic mobile phone use. In a multiple linear regression analysis, problematic mobile phone use was positively associated with lower age, being female and lower education. Extroversion, neuroticism, and agreeableness were positively associated with higher scores on the MPAI, whereas conscientiousness and openness to experience were inversely associated with MPAI scores. Demographic (13.7%) and personality (6.4%) variables explained 20.1% of the total variance in problematic mobile phone use. Age was the strongest predictor in the model, followed by neuroticism, conscientiousness, gender, and extroversion.

Conclusions: Higher levels of mobile phone problems appear to be associated with higher scores on neuroticism, extraversion, and agreeableness, and with lower scores on conscientiousness and intellect. The results obtained on addiction are consistent with the demographic estimates and associations contained in central theories. Thus, the cross-sectional study design makes reasoning about directionality impossible. Given this, the findings may assist the future practice in providing appropriate prevention and targeted intervention.

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1. INTRODUCTION

1.1. Background

Nowadays one of the most important issues is to use time efficiently where work and private life boundaries are becoming increasingly indeterminate in the pace. At such a time it has become vital importance to be accessible from anywhere, anytime, to reach everyone, to receive and give information instantly especially in business life. Apart from professional business life, the social communication process continues in the private lives of individuals. At the present time, it is possible to manage such communication intensity effectively with only "mobile phones". In the nineties, mobile phones which were a status symbol by the vast majority, have now turned into multifunctional media devices for all humans.

The entry of smartphones into our lives caused a change in our daily habit stripes. The first smartphone in history, which was a combination of mobile phone technology and computing features was released by IBM on 16th August 1994 (Pothitos, 2016). And is obvious that the proliferation of the phones has started with taking place of applications on the screens. We can no longer call the smartphones as only ordinary 'phones' because there is not much that these devices in our pockets cannot do. We use smartphones for everything else, besides verbal, written, and visual communication. Millions of people now keep their photos on their smartphones or cloud systems instead of nostalgic albums. A lot of habits such as reading newspapers, taking photos, listening to the radio and music, playing games, and hanging calendars on the wall changed by coming up with numerous applications and social media which is just one click away from us. The number of people watching movies or series via smartphones from online popular channels like Netflix cannot be underestimated. In some countries like Norway, there is no need to carry a wallet anymore, because online payments by online banking system can be done via smartphones. Also, smartphones have replaced computers mostly due to working like computers and being small and portable in size.

This thesis was written in the quarantine period when the coronavirus emerged and peaked. The role of smartphones attracted more attention in our lives during this period. Almost every country in the world started an isolation process by calling people to stay at home to prevent this virus from being easily transmitted. This process was important for people to put a social distance from

each other. In this process, it has been seen that the widespread use of the mobile phone has enabled people to communicate with their loved ones and each other at any time and to prevent the spread of the virus by providing the necessary social distance. In addition, if we consider the psychological factor, with the help of mobile phones people have played an important role in increasing social motivation during the lockdown days. In this direction, with the aim of raising awareness, different "challenges" have been initiated by people all over the world in social media such as playing music in the balconies or taking and sharing photos based on specific concepts.

Mobile phones have become indispensable parts of daily life. Although these smart devices brought benefits to our lives, it should be kept in mind that there are many negative factors that affect individuals in terms of physical, mental, and social aspects. Using these devices in the prohibited and dangerous conditions (Bianchi & Phillips, 2005), the distraction of the driver by the phone while driving (O'Connor et al. 2013, 2017), mobile social networking applications that can cause addiction (Salehan & Negahban, 2013), and so on can be examples of the specified negative aspects. Especially in the corona crisis process, which there was a sensitivity to receive information, the wrong and unknown-sourced information that may cause panic in the society has been easily spread through social media.

Moreover, in this period, instead of spending time with each other, households spent most of their time with their phones, and that caused interpersonal communication restrictions as well. Based on the United Nations' report of Population Division of the Department of Economic and Social Affairs, the world's population in mid-2019 reached 7.7 billion (United Nations et al., 2019, p. 5). The Swedish-based multinational telecommunications company 'Ericsson', announced in its 2019 report that the number of mobile phone subscribers worldwide was 8 billion in the third quarter of 2019 (Jonsson et al., 2019, p. 4). According to the numbers in the relevant reports, the number of mobile phone subscribers is higher than the total population of the world in 2019. Thus, it can be said that many individuals own more than one mobile phone. Today, our overwhelming enthusiasm for these smart gadgets can be problematic in some cases.

1.2. Purpose of the Study

The purpose of this thesis research is to investigate the connections of problematic mobile phone use which has become a behavioral addiction with the big five personality traits, and to discuss the

measures that can be taken in this regard, and to better understand the effects of this common communication network at the point of addiction more specifically. the aim of the empirical research was to: 1) Investigate factors that might contribute to developing an addictive use of mobile phones in the Norwegian general population; 2) to investigate the potential contribution of personality dimensions to mobile phone addiction. This thesis will begin with a reflection on the concept and theory of mobile phone addiction before an overview of the context is presented.

The research methods used in this research will be described before the results are presented and discussed. In addition to this, as mentioned before this research was carried out on the days of COVID-19 quarantine, which is an epidemic that affects the whole world. While there have been restrictions around the world for about a year, people have lived in isolation for months in their homes. This process has also made it easier to understand the effects of mobile phones on our lives much more clearly. Understanding and identifying possible risk factors of problematic mobile phone use is valuable in terms of making suitable preventive efforts and helping professionals in their work. Well-known risk factors have been evident in the existing literature.

It is currently unknown how addictive use is related to the five-factor model, representing neuroticism (being nervous and sensitive), extraversion (being social and outgoing), conscientiousness (being organized and efficient), agreeableness (being sympathetic and friendly) and openness (being imaginative and inventive). Previous studies reported that while addictions are positively associated with neuroticism, they are negatively associated with conscientiousness and agreeableness (Andreassen, 2015; Andreassen et al., 2013; Peterka-Bonetta et al., 2019; Volungis et al., 2019).

Against this background, this thesis will seek to scientifically frame the concept of problematic mobile phone use in terms of its measurement, its potential antecedents and outcomes. This introductory chapter will therefore provide an overview of the existing literature in the research field, and to understand the topic and hypotheses that will be investigated in this thesis.

1.3. Theoretical Framework

1.3.1. Problematic Mobile Phone Use & Mobile Phone Addiction

With the advancement of technology, the time people spend on mobile phones has increased. Some researchers discuss the existence of problematic mobile phone use (Salehan & Negahban, 2013; Soror et al., 2015). But still, the concept of mobile phone addiction continues to evolve (Panova & Carbonell, 2018). Different terms have been used to explore this problem due to the lack of consensus among researchers on the concept that have been used to describe the same phenomenon such as; “mobile phone dependence” (Billieux et al., 2008; Lopez-Fernandez et al., 2017), “Smart phone addiction” (Kwon et al., 2013a), “mobile phone addiction” (Bhutia & Tariang, 2016; Ishfaq Ahmed, 2011; Szpakow et al., 2011), “compulsive mobile phone use” (Matthews & Pierce, 2009), “mobile phone overuse” (Perry & Lee, 2007; Soror et al., 2015), “nomophobia” (Adawi et al., 2018) and “problematic mobile phone use” (Beranuy et al., 2009; Bianchi & Phillips, 2005; Takao et al., 2009).

The mentioned terms are used interchangeably by researchers (Kuss & Griffiths, 2017), and it is not the focus of this study to discuss which term is better than the other. It has been suggested that overuse does not mean problematic, and problematic use does not mean absolutely addiction (Jameel et al., 2019). Research on mobile phone addiction is still developing and more specific determining criteria are needed in that field (Kardefelt-Winther et al., 2017). It is difficult to specify exactly where mobile phone use becomes an addiction (Griffiths, 2013), therefore smartphone use can be confused with addictive behavior and a common behavior can be made pathological (Jameel et al., 2019).

In regard to problematic use of the mobile phone, it is not distinct that, whether problem use should be defined by usage amount, usage patterns, or negative outcomes of use because of insufficient research in exploring mobile phone use (Harris et al., 2020). Problematic mobile phone use has been defined as “*an inability to regulate one’s use of the mobile phone, which eventually involves negative consequences in daily life*” (Billieux, 2012, p. 1; Billieux et al., 2015). Based on the definition of Bianchi & Phillips (2005), problematic mobile phone use means that in spite of the possible negative outcomes of mobile phone use, people tend to extreme use their phones. In this

study mobile phone addiction and problematic mobile phone use are used interchangeably as umbrella terms to explain the problematic behavior on mobile phones.

1.3.2. Behavioral Addiction

Problematic mobile phone use is not recognized as a diagnostic benchmark thus far (Hong et al., 2012). Even so several scholars consider problematic mobile phone use as a behavioral addiction (Andreassen et al., 2013; Bianchi & Phillips, 2005; Billieux, 2012). The concept of “addiction” has been used in order to extreme use or uncontrolled use of chemical substances, drugs, and alcohol (Rachlin, 1990; Walker, 1989). Yet, in recent decades, interest and controversy over “behavioral addiction” as a non-chemical addiction have increased considerably (e.g., Andreassen et al., 2013; Griffiths, 1996; Marks, 1990; Orford, 2001). As a form of addiction, behavioral addiction is the compulsion to continually engage in an activity or behavior without using any alcohol or chemical-substances as a result of the individual's feeling of relaxation and peace. So, the person feels get rewarded which can be called "natural reward". Thus, the individual raises dependency on this behavior despite all negative consequences (Olsen, 2011; Robison & Nestler, 2011; Stein et al., 2010). There are some differences and similarities between substance addiction and behavioral addiction (Alavi et al., 2012a; Grant et al., 2010). In this regard, it can be pointed to some examples. While behavioral addictions show psycho-pathological symptoms such as depression, withdrawal, and social anxiety (Alavi et al., 2012b), physical symptoms stand out in substance abuse (Davis, 2001). However, a study claims that individuals with behavioral addiction experience the same consequences as individuals with substance addiction (Young & Rogers, 1998).

The concept of behavioral addiction which categorized as “the impulse control disorder” in the DSM-5 classification (American Psychiatric Association [APA], 2013), first presented by Dr. Fenichel in 1945. This behavioral addiction includes varied subgenres such as; video game addiction (Fisher, 1994), gambling (Griffiths, 1995), sex addiction (Carnes, 2001), Facebook addiction (Andreassen et al., 2012), food addiction (Orford, 2001), exercise addiction (Griffiths, 1997), Internet addiction (O’Reilly, 1996), shopping addiction (Christenson et al., 1994), work addiction (Andreassen et al., 2010), pornography addiction (Ley et al., 2014), and mobile phone addiction (Chóliz, 2010). In the 10th version of the International Classification of Diseases (ICD-10), behavioral addiction is categorized as “Habit and impulse disorders” that include pathological

gambling, pathological pyromania, pathological kleptomania, trichotillomania, other and unspecified habit, and impulse disorders. (World Health Organization [WHO], 1992). Some changes were made in the most recent version of the ICD (World Health Organization [WHO], 2019). In this version addictions are categorized as disorders into two main headings. One is “Disorders due to substance use or addictive behaviors” and the other one is “Impulse control disorders” (pyromania, kleptomania, compulsive sexual behavior disorder, and intermittent explosive disorder). The first mentioned heading includes two separate subheadings such as 1) Disorders due to substance use and 2) Disorders due to addictive behaviors (gambling disorder, gaming disorder, other specified and unspecified disorders due to addictive behaviors) (World Health Organization [WHO], 2019).

Also, in the DSM-5, pathological gambling is classified as non-substance related disorders while other behavioral addictions classified in the compulsive disorder group (American Psychiatric Association [APA], 2013). As it is seen, “Gaming Disorder” (e.g., video game playing) was included as an addictive behavior diagnosis in the ICD-11; and “Internet Gaming Disorder” was included in the appendix section 3 of the DSM-5 as the only non-substance related disorder that has been recognized by the American Psychiatric Association and World Health Organization (American Psychiatric Association [APA], 2013; World Health Organization [WHO], 1992, 2019). However, it is obvious that problematic mobile phone use is not considered in a diagnostic category in any of the official classification manuals thus far.

On the other hand, Billieux et al. (2015) argued that this is a ‘unique’ term as opposed to being called behavioral addiction in many studies. He claimed that problematic mobile phone use cannot be classified as a behavioral addiction due to the lack of evidence regarding the validity of the behavioral addiction model and, being a heterogeneous and multi-faceted condition (Billieux et al., 2015). All these aside, discussions started in the direction of problematic mobile phone use as a possible public health issue. In this context, at the meeting held by WHO in 2014 to discuss public health consequences related to the excessive use of technology including mobile phones, addictive mobile phone use was considered as a public health issue and emphasized the importance of the need for more researches (Billieux et al., 2015, p. 157).

Some researchers like Erickson don’t like to use the term “addiction” as he finds the word unscientific and too broad. He explains the reason for finding unscientific as addiction has very recently included in the best mental health diagnostic guide even though it does not have great

importance. In other diagnostic guides, addiction refers to dependency syndrome. Also in most of the scientific journal articles addiction refers to diverse types of drug problems and in a limited number of articles it refers to a process or behavioral addiction. Erickson states that sometimes people use the term "addiction" when they cannot find suitable words to describe the over-involvement in any activities which can ruin the person's life and this shows the wide meaning of this word which may causes misunderstandings. (Erickson, 2018, Chapter 1).

Griffiths (1996) suggested that behavioral addiction has similar effects on individuals with known addiction types such as alcohol and substance abuse. Griffiths (2005) points out that addiction is socially and physiologically constructed which is something beyond problematic behavior. He suggests that a combination of physiological and psychological rewards and physical, social, and cultural factors associated with any specific behavior would have an important effect on understanding the possibility of an over-involvement of any specific behavior. Hence, he presents six components of addiction which were modified from Brown (1993) including salience, mood modification, tolerance, withdrawal, conflict, and relapse (Griffiths, 2005). He stated that the term "addiction" can be used as long as all the components can be present in a certain behavior (Griffiths, 2002).

- *Salience* refers to a situation that an activity dominates an individual's thoughts, feelings, and behavior in the way that the related activity becomes the primary focus in a person's life.
- *Mood modification* refers to feelings that a person experiences when s/he exhibit a certain behavior. People repeat the behavior in order to create some feelings in themselves, and therefore a behavior can be exhibited to experience different feelings. For example, a smoker can fire a cigarette to enjoy and celebrate anything, while sometimes can do the same when feels sad.
- *Tolerance* refers to the need to increase the duration or dose of a certain behavior to get the previous effect.
- *Withdrawal symptoms* refer to physiological (e.g., sweating, loss of appetite, headache) or psychological (e.g., aggression, anger, nervous breakdowns, restlessness) negations that may occur as a result of reducing or quitting a substance or behavior following regular use and repetition.

- *Conflict* refers to a conflict within an individual's own inner or with surrounding people. As a conflict the individual ignores one's own important problems and take more refuge in the substance or behavior s/he depends on, and begins to lose the various relationships with significant others. In some cases, even though the individual wants to stop the behavior, he or she feels cannot.
- *Relapse* refers to the desire to repeat a certain behavior after quitting or a long time being away from that behavior (Griffiths, 2005).

1.3.3. The Biopsychosocial Model

Addiction is a versatile behavior that cannot be explained by a single theoretical point of view. Therefore, clinical and research interferences are more meaningful by “Biopsychosocial Model” that biological (e.g., genes, neurotransmitter systems), psychological (e.g., coping skills, social skills, self-esteem, mental health) and socio-cultural factors (e.g., peer-pressure, role models) determine the process of this complex behavior. All mentioned factors are part of the addiction process which can get involved in various shapes and levels (Griffiths, 2005).

1.4. Assessments of Problematic Mobile Phone Use

Many different scales have been developed by researchers to measure and assess individuals' problematic mobile phone use and mobile phone addiction. The most used ones have been mentioned in this section.

1.4.1. Mobile Phones Problematic Use Scale (MPPUS)

The mobile phone problematic use Scale consists of 27 questions including the addictive symptoms such as 'tolerance', 'escape from other problems', 'withdrawal', 'craving', and 'negative life consequences' with a five-point Likert scale which varies from "not true at all" to "extremely true" measures the level of problematic mobile phone use by obtaining total scores. Developers of the scale reported a Cronbach's $\alpha=0.93$ which represents a high level of internal consistency (Bianchi & Phillips, 2005). MPPUS is one of the most widely and effective tools which validated

and used by different researches in many countries such as Iran (Kalhori et al., 2015), United Arab Emirates (Vally & El Hichami, 2019), Spain (de-Sola et al., 2017), Britain (Lopez-Fernandez et al., 2014a), Germany (Montag et al., 2015) and so on.

1.4.2. Smartphone Addiction Scale (SAS)

The smartphone addiction scale is a self-diagnostic scale which was developed by Kwon et al. based on the Korean self-diagnostic Internet addiction (K-Scale), and the smartphone's basic properties (Kwon et al., 2013a). SAS is comprised of 33 questions that evaluate six factors related to smartphone use by using a six-point Likert scale. This scale includes six different choices that vary from "strongly disagree" to "strongly agree" and total scores indicate the level of smartphone addiction risk. Six factors of SAS are as follows: 1) daily-life disturbance, 2) positive anticipation, 3) withdrawal, 4) cyberspace-oriented relationship, 5) overuse, and 6) tolerance (Kwon et al., 2013).

Daily-life disturbance consists of "*missing planned work, having a hard time concentrating in class or while working, suffering from lightheadedness or blurred vision, pain on the wrists or at the back of the neck, and sleeping disturbance*" (Kwon et al., 2013a, p. 6). Positive anticipation was defined as "*feeling excited about and getting rid of stress with smartphone use and feeling empty without a smartphone*" (Kwon et al., 2013a, p. 6). Withdrawal refers to "*being impatient, fretful, and intolerable without a smartphone, constantly having one's smartphone in one's mind even while not using it, never giving up using one's smartphone, and becoming irritated when bothered while using one's smartphone*" (Kwon et al., 2013, p.7). The cyberspace-oriented relationship has questions related to "*the feeling that one's relationships with his/her friends obtained through a smartphone are more intimate than his/her relationships with his/her real-life friends, experiencing an uncontrolled feeling of loss when not able to use one's smartphone, and consequently constantly checking one's smartphone*" (Kwon et al., 2013, p.7). Overuse means "*the uncontrollable use of one's smartphone, preferring to conduct searches using one's smartphone to asking help from other people, always preparing one's charging pack, and feeling the urge to use one's smartphone again right after one stopped using it*" (Kwon et al., 2013, p.7). Tolerance was defined as "*always trying to control one's smartphone use but always failing to do so*" (Kwon et al., 2013, p.7). Kwon et al., reported the measured internal consistency as Cronbach $\alpha=0.967$ (Kwon et al., 2013).

In addition to the mentioned scales, the MPAI is another high validated scale that falls into this category and will be discussed in the measurements section of the study.

1.5. Prevalence of problematic mobile phone use

De-Sola Gutiérrez et al. mentions the increasing use of cell phones among children, while 30% of 10-year-old children in Spain have a phone, this rate rises to 70% by age 12 and up to 83% at age 14 (De-Sola Gutiérrez et al., 2016). In the same way, children at the age of 7-8 years old in Poland own their first cell phones and spend approximately 2.5 hours daily of their time using cell phones (Demkow & Jakubczyk, 2019). Lopez-Fernandez et al. conducted a large self-reported survey about dependence on the mobile phone in Northern, Eastern, Southern, and Western Europe. In this survey, Belgium (3.9%), United Kingdom (3.5%) and France (3.4%) had the highest percentages of problematic mobile phone use while Poland (1%) showed the lowest percentage (Lopez-Fernandez et al., 2017). In Spain, 10.4% of college students between 18-32 years old matched the diagnosis of pathological mobile phone use (Jenaro et al., 2007). A study reported that 29% of young adults between 18-33 years old age in the Arab Emirates have a dependency on their mobile phones (Vally & El Hichami, 2019). In addition to this, the prevalence of problematic mobile phone use among British adolescents 11-14 age range was reported as 10% (Lopez-Fernandez et al., 2014b). Addiction percentage for the same age group in India was reported as 39-44% (Davey & Davey, 2014). In a survey which was done in 2014 by de-Sola et al., 20.5% of Spanish adults show problematic use of their mobile phone, while 15.4% of these individuals are among "at-risk" users (de-Sola et al., 2017). Alosaimi et al., mentioned that university students in Saudi Arabia are at the risk of mobile phone addiction (Alosaimi et al., 2016).

1.6. Sociodemographic Differences

In regard to demographic differences in problematic mobile phone use, there are numerous studies with different findings. In terms of demographic differences by *gender*, some studies have found that men are more prone to problematic mobile phone use than women (e.g., de-Sola et al., 2017; Takao et al., 2009). Also, men have shown more inclination to use their mobile phones while driving (Billieux et al., 2008). Furthermore, studies have shown that men often use their mobile

phones for voice conversations, text messages (Billieux et al., 2008; Igarashi et al., 2005), watch videos, listen to music, and play games (Chen et al., 2017).

On the other hand, some studies have found that women are more lean-to problematic mobile phone use alongside their high probability of having problems related to mobile phone use (Augner & Hacker, 2012; Billieux et al., 2008; Lee et al., 2014; Leung, 2008; Oviedo-Trespalacios et al., 2019). Cell-phone use of women is mostly for socializing purposes (Bianchi & Phillips, 2005). In this regard, they are more eager to establish interpersonal and social communication by using fast methods such as SMS and social media than men, which may lead them towards problems related to this (Chen, 2006; D. J. Kuss et al., 2018; Toda et al., 2006).

Other studies have found that gender has no impact on problematic mobile phone use (Ahmed & Qazi, 2011; Chen et al., 2017; Dixit et al., 2010; Kumcagiz & Gunduz, 2016).

In terms of differences by *age*, studies consistently show that younger users are more prone to problematic mobile phone use (Billieux et al., 2008; Leung, 2008). Time spent on mobile phones decreases with increasing age, and the longest spending time was reported for users under 20 years old (De-Sola Gutiérrez et al., 2016; Lopez-Fernandez et al., 2014b; Mazaheri & Najarkolaei, 2014). One study suggests that children are more likely to be dependent on mobile phones in the future when they get their first phone before the age of 13 (Sahin et al., 2013). In a recent survey conducted by a communications regulator company in the UK it was found that 50% of 10 years old kids in the UK possess their own smartphone (Ofcom, 2020). In a research conducted by Csibi et al. (2019), participants were divided into four age groups as 3–11, 12–19, 20–34, and 35–50. The results demonstrated that those who were aged 20–34 years reported the highest level of mobile phone addiction, while those who were 12-19 years reported the lowest level (Csibi et al., 2019).

In terms of differences by *marital status*, one study found that individuals being single were more prone to mobile phone addiction (Miri et al., 2020), while another study found the opposite association suggesting that being married was a risk factor for MPA (Shahrestanaki et al., 2020). Yet other studies found that mobile phone addiction was unrelated to marital status (Khoury et al., 2019; Naser Abed et al., 2017).

According to some studies, students from families with high *education, economic and cultural status* report to be more dependent on their mobile phones (Mazaheri & Najarkolaei, 2014),

although one study found no significant relation between problematic mobile phone use and the economic status of the family (Kumcagiz & Gunduz, 2016). Further, Lopez-Fernandez et al., (2014) found that children of highly educated parents are less inclined to problematic mobile phone use. Similarly, one study found that problematic mobile phone use level of Swiss adolescents increased with decreasing levels of parents' education (Roser et al., 2016). Furthermore, undergraduate students reported higher levels of smartphone addiction than graduate and PhD students (Dikec & Kebapci, 2018).

Based on a study by Shin (2014) comparing problematic mobile phone use among Koreans and Americans, they emphasized the role of cultural differences. Due to remarkable mobile phone offers by different companies and the influence of technology within the young Korean population (e.g., free messaging, video conversation, mobile TV services, and bandwagon effect, etc.), Koreans (11.2%) reported a higher level of mobile phone dependency, compared to Americans (6.4%).

1.7. Personality Variables

In previous passages, it has been mentioned about different factors that may have effects on behavioral addictions and especially on problematic mobile phone use/addiction. In addition, it has also been linked to different personality traits (Griffiths, 2017; Kayış et al., 2016).

1.7.1. Big Five Personality Traits (Five Factor Model)

The big five personality traits model which also known as the five-factor model as measured by the Neo-Personality Inventory-Revised (NEO-PI-R) is an efficacious model that focuses on distinguish between five major components such as Neuroticism, Extroversion, Openness to Experience, Agreeableness, and Conscientiousness. (McCrae & Costa, 1997; Wiggins, 1996). Cross-cultural testing of the big five personality model in more than 50 societies of six continents supported the existence and universality of the model (McCrae, 2002; McCrae et al., 2005). The validity, effective use of the model, and the fact that it has been tested on a large population have caused it to be preferred as a reliable method to be used in this study.

Neuroticism

Neuroticism is the propensity to be nervous and be in negative moods such as anxiety, depression, anger, disgust, embarrassment, and guilt (e.g., Rothmann & Coetzer, 2003; Terracciano et al., 2008; Wiggins, 1996). Neuroticism is related to the need for social acceptance and low self-esteem (Takao et al., 2009). Neurotic individuals have difficulty controlling impulses and dealing with stress. High scores can cause psychiatric problems and low scores can show emotional stability (Rothmann & Coetzer, 2003). In this case, mobile phones become an option to relieve the stress (Jung, 2014; Konok et al., 2017). Neurotic individuals may use their mobile phones excessively to reduce their psychological distress (Kim et al., 2015). Therefore, it has been reported that adolescents and adults with higher levels of neuroticism are more prone to get addicted to mobile phones (Cocoradă et al., 2018; Horwood & Anglim, 2018). Also, as neurotic individuals have difficulty in providing emotional stability, they can develop problematic mobile phone use behavior in order to achieve emotional satisfaction (Jiang et al., 2018).

While many studies have found an association between problematic mobile phone use and neuroticism (Augner & Hacker, 2012; Carvalho et al., 2018; Gao et al., 2017; Li & Lin, 2019; Takao, 2014; Volungis et al., 2019), a few studies have not found a significant relationship (Andreassen et al., 2013; Bianchi & Phillips, 2005).

Extroversion

Extroversion is the tendency to be sociable, self-confident, active, cheerful, and interact with people (Rothmann & Coetzer, 2003; Terracciano et al., 2008; Wiggins, 1996). Individuals with a high score on extroversion tend to be warm, outgoing, energetic, talkative, and optimistic (Rothmann & Coetzer, 2003; Terracciano et al., 2008; Wiggins, 1996). Extroverted individuals are dominant in social settings (Friedman & Schustack, 2016), and this trait is positively associated with the number of friends (McCrae & John, 1992). Therefore, the need and desire for communication lead extroverts to problematic text messaging (Igarashi et al., 2008). In extroverted individuals, notifications from mobile phone applications can be perceived as a reward stimulus by creating excitement and a desire to participate, thus may causing excessive use of mobile phones

and problematic mobile phone use (Elhai et al., 2017; Oulasvirta et al., 2012). It has been reported that there is a strong positive relationship between the use of mobile phones as a means of socialization and extroversion (Hsiao, 2017).

Several studies have found a positive relation between extroversion with problematic and addicted use of mobile phones (Andreassen et al., 2013; Bianchi & Phillips, 2005; Kim et al., 2016; Kita & Luria, 2018; Takao, 2014), but, some showed a negative relation (Gao, 2017; Tao, 2016).

Openness to Experience

Openness to experience is the tendency to be imaginative, intellectual oriented, aesthetic sensitivity, independence of judgment, curiousness, variety of experience, unconventional, and attentiveness to inner feelings (McCrae & Costa, 1987; Rothmann & Coetzer, 2003; Terracciano et al., 2008; Wiggins, 1996). Since these people are open to getting new experiences, new applications in mobile phones and the desire for continuous updates, this type of individuals can be expected to be prone to mobile phone addiction. (Gao et al., 2020). Also, due to their aesthetic sensitivity, artistic applications in mobile phones may lead them to the problematic use of mobile phones (Phillips, 2018).

However relevant studies have shown that there is a negative association between openness to experience and problematic mobile phone use (Hussain et al., 2017; Lachmann et al., 2019a; Peterka-Bonetta et al., 2019; Takao, 2014; Volungis et al., 2019). But, some showed no relation between mobile phone addiction/problematic use of mobile phones with openness to experience (Roberts et al., 2015).

Agreeableness

Agreeableness is the tendency to be sympathetic and kind to others, these types of individuals are altruistic like to help people and think that in return they will help as well (Rothmann & Coetzer, 2003). Graziano et al. (2007) suggested that agreeableness is positively correlated with prosocial emotions and behavior. Hence, agreeable people are more prone to participate in volunteering activities (Carlo et al., 2005). The prosocial behavior of agreeable individuals may be a protective factor against problematic mobile phone use (Gao et al., 2020). For instance, Andreassen et al.

(2013) found a negative association between agreeableness with mobile phone addiction. Moreover, other studies supported the idea that low agreeableness could be a risk factor for problematic mobile phone use (Lachmann et al., 2019a; Peterka-Bonetta et al., 2019; Volungis et al., 2019). Conversely, some studies reported no significant correlation between agreeableness and problematic use of mobile phones (Cocoradă et al., 2018; Hussain et al., 2017).

Conscientiousness

Conscientiousness is the propensity to be organized, self-disciplined, prompt, and active in planning (Barrick & Mount, 1993). Individuals with high scores on this trait are strong-minded, purposeful, and stable. Conscientiousness manifests itself in dependability, success orientation, and regularity (Rothmann & Coetzer, 2003). Thereby, these individuals tend to invest in work, family and their prosocial activities (Lodi-Smith & Roberts, 2007), and may occupy themselves more with health-promoting habits and behaviors (Bogg & Roberts, 2004). In this respect, a study has positively linked conscientiousness to exercise addiction and study addiction (Andreassen et al., 2013). Highly conscientious individuals are more likely to use technology to be more efficient and perform at a higher level at work (Barrick & Mount, 1993). Thus, few studies suggested that conscientiousness is in a positive association with the obsessive drive component of workaholism (Andreassen et al., 2010; Burke et al., 2006; Clark et al., 2010).

According to Billieux et al. (2015), lack of planning skills and problems in self-control are powerful factors that have an impact on problematic cell phone use. Based on this, high levels of conscientiousness may be a protective factor against problematic mobile phone use (Jiang & Zhao, 2016; Kwan & Leung, 2017). While a study did not find a direct relationship between mobile phone addiction and conscientiousness (Roberts et al., 2015), many recent studies have indicated that problematic mobile phone use is positively related to lower scores of conscientiousness (Hussain et al., 2017; Kavčič et al., 2019; Kita & Luria, 2018; Lachmann et al., 2019b; Peterka-Bonetta et al., 2019; Volungis et al., 2019).

1.8. Causes and Consequences

In addition to all the conveniences and advantages provided by technology especially by mobile

phones, some problems and disadvantages also arise. Problematic mobile phone use, that is one of the most important problems of nowadays, arises due to many different factors.

Bhardwaj & Ashok (2015), found a considerable correlation between loneliness and mobile phone addiction. Similarly, Tan et al. (2013), have reported a considerably higher level of loneliness among Turkish university students with telephone addiction than those who do not have. In a study, it has been found that the risk of smartphone addiction in individuals with social anxiety symptoms and social phobia has been increased due to avoiding real-life relationships (Enez Darcin et al., 2016). Whilst, another study showed that mobile addiction has a direct link with mobile social networking applications as a result of the need for reaching out to more people and making a large communication network (Salehan & Negahban, 2013). Fear of Missing Out (FoMO) may be one of the predictors of the problematic use of mobile phone (Dhir et al., 2018), which refers to the fear of being deprived of developments when the person remains away with social media (Coskun & Karayagız Muslu, 2019).

Also, some studies showed that mobile phone addiction may have an association with childhood relationships with the mother. In these studies, women with high maternal protection and strict maternal attitude show higher levels of problematic mobile phone use than those with lower levels of maternal protection. But they found no association with paternal rearing attitudes (Kumcagiz & Gunduz, 2016; Toda et al., 2008). And also, Kumcagiz and Gunduz (2016) have found a correlation between psychological wellbeing and mobile phone addiction. Based on their findings, mobile phone addiction decreases as psychological well-being increases.

Problematic mobile phone usage can be an option for individuals to escape from feelings of anxiety or depression, to produce a relieving effect. As a result, it would support the start of addictive behaviors and actions. It has been named “maladaptive coping process” to escape from real life and reduce the negative outcomes (Long et al., 2016).

A strong relation has been found between hyperactivity and problematic mobile phone use as a consequence of eluding the boredom due to the problems of maintaining attention (Roser et al., 2016). Additionally, Roser et al. (2016) state that worse home and school environments as external factors, and health-related quality of life and behavioral problems as internal factors in adolescents have a direct correlation with problematic mobile phone use.

Studies have suggested that students spend their time inefficiently by connecting to social networks, playing games, or watching videos during studying (Jacobsen & Forste, 2011) and it was concluded that excessive use of the mobile phone can lead to low academic achievement and productivity (Duke & Montag, 2017; Montag & Walla, 2016; Samaha & Hawi, 2016). Decreased mood and psychological well-being can be a consequence of problematic mobile phone use due to the generated stress in person based on the thought of being constantly reachable (Roser et al., 2016).

Reported mental health issues including poor social skills, negative effects on emotional intelligence, self-motivation, empathy, and ability to deal with conflict can be other consequences of dependency on technology and mobile phones (Scott et al., 2017).

In terms of physical problems, studies presented that musculoskeletal disorders such as problems in the neck and upper body can be some of the outcomes of the smartphone addiction (AlAbdulwahab et al., 2017; Gustafsson et al., 2017). Some other studies reported an increase in fat mass, as well as a decrease in muscle mass due to low physical activity (Kim et al., 2015), and having access to smartphones in the bedroom increases the risk of obesity as a consequence of smart phone addiction (Dube et al., 2017). Eye strain, ear tinnitus, back and limb pains also are common physical problems due to problematic mobile phone use (Acharya, 2013). The number of hours spent on the phone is directly linked to headaches. Researchers suggest that headache symptoms due to mobile phone use occur not before but after the use of these devices (Auvinen et al., 2019), and the increased risk of headache is tied up to problematic mobile phone use (Wang et al., 2017).

1.9. The Present Study

There is not much and widespread information about the link between the five factor model personality traits and problematic mobile phone use, and how these factors may affect each other. In this context, in regard to the role of different personality traits on problematic mobile phone use and smart phone addiction, there is not enough research to obtain concrete results. On top of that, there has been little English-based research done in Norway specifically on this topic. As a result, this study attempted to contribute to the deficiency in research by focusing on the relation between personality traits and problematic mobile phone use in the Norwegian population.

1.10. Research Questions & Hypotheses

Based on the empirical findings in the field, the following formulated hypotheses were tested to determine the breadth and boundaries of the study, and to reveal the relationship between the variables. It's respective that mobile phone addiction would be related to demographical variables and personality traits. It is expected that:

Table 1.10. 1 Hypothesis and Sub-Hypothesis

Hypothesis 1 H1 *There is a significant association between problematic mobile phone use and demographic factors (H1)*

Hypothesis 1a: There is significant association between problematic mobile phone use and female gender (H1_a)

Hypothesis 1b: There is a significant association between problematic mobile phone use and younger age groups (H1_b)

Hypothesis 1c: There is a significant association between problematic mobile phone use and single status (H1_c)

Hypothesis 1d: There is a significant association between problematic mobile phone use and lower education (H1_d)

Hypothesis 2 H2 *There is a significant association between problematic mobile phone use and five factor model of personality (H2)*

Hypothesis 2a: There is a significant positive association between problematic mobile phone use and extroversion (H2_a)

Hypothesis 2b: There is a significant positive association between problematic mobile phone use and neuroticism (H2_b)

Hypothesis 2c: There is a significant negative association between problematic mobile phone use and lower agreeableness (H2_c)

Hypothesis 2d: There is a significant negative association between problematic mobile phone use and conscientiousness (H2_d)

Hypothesis 2e: There is a significant negative association between problematic mobile phone use and lower Openness (H2_e)

2. METHODS

This methodology chapter will provide an overview of the sample, procedure and ethical considerations, instruments, and statistical analyses used in the research of the thesis and provide the reader with sufficient information to understand the methods used to test the hypotheses of the thesis. The survey of the study was developed and conducted by Cecilie Schou Andreassen and colleagues at the University of Bergen, Norway. The institutional review board at the Faculty of Psychology at the University of Bergen approved the study protocol.

2.1. Sample

The research sample comprised 23,533 participants in the online survey (see Table 3.1). A majority of the participants were female (65%) and 35% were male. Participants ranged in age from 16 and 88, with a mean age of 35.8 ($SD = 13.3$). A majority of participants were aged between 16–30 years (40.7%), 35.0% were 31–45 years, 19.8% were 46–60 years, 4.5% were 61–88 years. The corresponding percentage age group distribution of the population in Norway in 2014 was 25.0%, 26.3%, 24.5%, and 24.2%, respectively. The difference between the study sample and the Norwegian population in the same year is statically significant ($\chi^2 = 6974.5$, $df = 3$, $p < .0001$) (Andreassen et al., 2016, 2017). The sample contains men (35.0%) and women (65.0%), while the percentage distribution in 2014 in Norwegian population is 50.3% men and 49.7% women which has a significant difference ($\chi^2 = 2206.2$, $df = 1$, $p < .0001$). With regards to educational level 2,350 (10.0%) had completed compulsory school, 5,949 (25.3%) had completed high school, 3,989 (17.0%) had completed vocational school, 7,630 (32.4%) had completed a Bachelor's degree, 3,343 (14.2%) had completed a Master's degree, and 272 (1.2%) had a PhD degree. A majority of the participants were in a relationship (65.3%) (i.e., married, common-law married, boyfriend or girlfriend), 34.7% were not in a relationship (i.e., single, separated, widow or widower, divorced). Since the data related to education level and marital status could not be found at the Norwegian general population level, it could not be compared with the collected sample data.

2.2. Procedure

All individuals participated anonymously in a cross-sectional online web-based questioning over the legal websites of five different nationwide Norwegian newspapers in 2014. Comprehensive information regarding the study was given to all participants on the first page of the survey before starting to give their answers. Also, they were notified that they may get feedback related to their own scores of problematic mobile phone use right after the survey. For the duration of one week, the link to the survey was published on different newspaper websites. All the anonymous collected data was saved in a server led by the survey company SurveyXact before delivering it to the research team without any conducted intervention. Those participants who gave no answers or incomplete and partial answers were eliminated from the data set ($n = 18,438$). The study was conducted in accordance with the Helsinki Convention and the Norwegian Health Research Act. No financial or any other encouragement was provided apart from the above-mentioned feedback. The study protocol was approved by the Institutional Review Board at the Faculty of Psychology, University of Bergen.

2.3. Measurements

2.3.1. Mobile Phone Addiction Index (MPAI)

MPAI was developed based on MPPUS scale of Bianchi & Phillips (2005) to measure the mobile phone addiction index by Leung (2007). 17 items of 27 in MPPUS was used in MPAI, 8 of these items were revised from the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) that Young used these items to develop the Diagnostic Questionnaire for Internet Addiction (Young, 1998). 17 items in MPAI evaluate different facets of mobile phone addiction such as 1) control craving, 2) anxiety and feeling lost, 3) withdrawal and escape, and 4) productivity loss. Each item in the questionnaire is evaluated based on a five-point Likert scale ranging from “not at all” to “always”. The reliability of the MPAI scale reported by Leung (2007) was Cronbach $\alpha=0.89$.

2.3.2. Mini International Personality Item Pool (Mini-IPIP)

Personality was measured using the Mini-IPIP developed by Donnellan et al. (2006) based on the 50-item International Personality Item Pool (IPIP) of Goldberg (1999). The Mini-IPIP consists of 20 items answered on a five-point Likert scale ranging from 1 (*strongly disagree*) to 5 (*strongly agree*). The Mini-IPIP is a short measure for assessing the five basic dimensions of the five-factor model (Costa & McCrae, 1992), also referred to as the “Big Five”: Extroversion (e.g., “I am the life of the party”), Agreeableness (e.g., “I sympathize with others’ feelings”), Conscientiousness (e.g., “I get chores done right away”), Neuroticism (e.g., “I have frequent mood swings”), and openness to experience (e.g., “I have a vivid imagination”). Each dimension is measured by four items, yielding a total subscale score from 4 to 20. High scores indicate that the individual possesses the trait to a strong degree, whereas low scores indicate that the trait is present to a small degree (e.g., a low score on Extraversion indicates that the respondent is actually introverted). The Mini-IPIP has been validated in several studies, and has shown good psychometric studies (ref). In the present study, the Cronbach’s alpha was .81 for Extroversion ($M = 13.47$, $SD = 3.65$), .76 for Agreeableness ($M = 16.32$, $SD = 2.95$), .70 for Conscientiousness ($M = 14.90$, $SD = 3.22$), .73 for Neuroticism ($M = 11.81$, $SD = 3.54$), and .69 for openness to experience ($M = 14.26$, $SD = 3.14$).

2.4. Demographics

Participants answered to general demographic questions about gender, age, marital status, and education level. Demographic characteristics (e.g., age, gender, marital status, education) were measured by closed-ended questions with between two and five response alternatives. Age was measured by an open response alternative (year of birth: 1997 to 1900). Gender was measured using two categories: male (coded: 1) and female (coded: 2). Marital status was also measured using two categories: married, partner, boyfriend or girlfriend (coded: 1) and single, divorced, separated, widow or widower (coded: 2). The highest completed level of education was measured using six different categories: primary school (coded: 1), high school (coded: 2), vocational school (coded: 3), bachelor’s degree (coded: 4), master’s degree (coded: 5), and PhD (coded: 6).

2.5. Statistical Analyses

All statistical analyses were conducted with IBM SPSS Statistics for Mac, Version 25 (IBM Corp., Armonk, NY, United States). Descriptive statistics in terms of internal consistencies, means, standard deviations, percentage frequencies, distributions, and intercorrelations were calculated for each variable of interest. Reliability in terms of internal consistencies were calculated using Cronbach's alpha coefficients. Alpha values above .70 were considered to be satisfactory. To evaluate the interrelationships between study variables, Pearson's product-moment correlation coefficients were calculated to test the association between numerical variables, and one-way ANOVA to test associations between categorical and numerical variables. The relationship between the variables of the study is based on bivariate correlation coefficients. For r coefficients, .10, .30, and .50 were considered weak, moderate, and strong associations. Finally, a linear multiple hierarchical regression analysis was conducted in order to assess the effects of demographics and personality traits on mobile phone addiction in more detail. The total MPAI (continuous) score comprised the criterion/dependent variable. The independent variables were entered into the equation in two steps. In the first step, demographics in terms of age, gender, marital status, and educational level were entered as predictors. Educational level was dummy coded (so that having a bachelor's degree comprised the reference category). In the second step of the analysis, the composite score on the five personality dimensions (subscales of the Mini-IPIP: extroversion, agreeableness, conscientiousness, neuroticism, and openness to experience) were entered. Preliminary analyses were conducted to make sure no violation of the supposition of homoscedasticity, linearity, normality, homoscedasticity and multicollinearity.

2.6. Ethics

In this study data have been collected by online self-report questionnaire in 2014. The ethical guidelines for research developed by the Norwegian National Committee for Research Ethics in the Social Sciences and the Humanities (NESH) were used across the study. Full informed online consent forms were obtained from all participants after clicking to the survey link on the first page before starting to answer the questions of the questionnaire. The consent form was created to give detailed information about participant's rights to volunteer participation and to protect their autonomy. Personalized interactive feedback was given to all participants regards to their answers

right after completing the survey. Participants of this study were not subjected to any kind of harm, and respect for the dignity of participants was prioritized. To protect the privacy and confidentiality, all participants' data of this study are anonymous and no personal information or identity was shared. All kinds of deceit or overstatement contradicting the goals and objectives of the study were refrained. All communications in relation to the research were done with honesty and transparency. Also, this study was kept away from any misrepresentation and preconceived opinions. The study was conducted in accordance with the Helsinki Convention and the Norwegian Health Research Act. No financial or any other encouragement was provided apart from the above-mentioned feedback. The study was granted approval by the IRB of the Faculty of Psychology, University of Bergen, Norway.

3. RESULTS

This chapter will provide a summary of the accumulated results from the thesis study by presenting descriptive statistics, group differences, correlations, and regression analysis.

3.1. Descriptive Statistics

Table 3.1 shows descriptive statistics of responses to the study variables. The mean score on the MPAI in the present sample was 13.96 ± 6.29 . Table 3.2. presents the results from the group comparison across demographic variables.

Women reported a mean score ($M = 14.5 (6.6)$) and men $M = 13.0 (5.6)$. The youngest age group (16-30 years; $M = 16.1 (6.9)$) scores highest followed by 31-45 age group ($M = 13.6 (5.9)$), 46-60 years ($M = 11.3 (4.2)$) and the 61-88 years old ($M = 9.8, SD 3.0$). Single scored 14.5 (6.7) and married ($M = 13.7, 6.1$). Table 3.1 shows descriptive statistics of all study variables.

Table 3. 1

Descriptive statistics in terms of percentages or man and standard deviation (SD) of the study variables (N = 23 533)

Variable	Percentage	Mean (SD)
Gender	Male	35.0
	Female	65.0
Age group	16–30 years	40.7
	31–45 years	35.0
	46–60 years	19.8
	61–88 years	4.5
Relationship status	In a relationship	65.3
	Not in a relationship	34.7

Level of education	Primary school	10.0
	High school	25.3
	Vocational school	17.0
	University–Bachelor	32.4
	University–Master	14.2
	University–PhD	1.2
Personality	Extroversion	13.47 (3.65)
	Agreeableness	16.32 (2.95)
	Conscientiousness	14.90 (3.22)
	Neuroticism	11.81 (3.54)
	Openness to Experience	14.26 (3.14)
Mobile phone addiction		13.96 (6.29)

SD, standard deviation.

3.2. Group Differences

Table 3.2 shows the ANOVA of group differences in terms of MPAI scores. The ANOVA revealed that scores on problematic mobile phone use (MPAI score) were higher among women compared to men, $F(1, 23531) = 291.77, p < .001, \eta^2 = .012$; younger compared to older age groups, $F(3, 23529) = 934.47, p < .001, \eta^2 = .11$; those not in a relationship compared to those in a relationship, $F(1, 23531) = 81.51, p < .001, \eta^2 = .003$; and lower educated compared to higher educated, $F(5, 23527) = 99.65, p < .001, \eta^2 = .021$. Overall, the η^2 values indicated small to medium sized effects ranging from .11 (age groups) to .003 (relationship status).

Table 3. 2

Descriptive sample statistics and analyses of variance comparing the Mobile Phone Addiction Index (MPAI) score (N = 23 533)

Variable		<i>n</i>	<i>M (SD) MPAI</i>	<i>F</i> _{df1,df2}	<i>p</i>	η^2
Gender	Male	8234	13.01 (5.64)	291.77 _{1,23531}	.000	.012
	Female	15299	14.47 (6.56)			
Age group	16–30 years	9572	16.07 (6.92)	934.47 _{3,23529}	.000	.106
	31–45 years	8233	13.64 (5.85)			
	46–60 years	4671	11.13 (4.21)			
	61–88 years	1057	9.81 (3.02)			
Relationship status	In a relationship	15373	13.69 (6.08)	81.51 _{1,23531}	.000	.003
	Not in a relationship	8160	14.47 (6.65)			
Level of education	Primary school	2350	15.84 (7.53)	99.65 _{5,23527}	.000	.021
	High school	5949	14.66 (6.63)			
	Vocational school	3989	12.72 (5.56)			
	University–Bachelor	7630	13.79 (6.02)			
	University–Master	3343	13.39 (5.74)			
	University–PhD	272	12.45 (5.43)			

M = mean, SD, standard deviation, η^2 eta-squared value

3.3. Correlations

Reliability – all subscales were tested for internal consistency using Cronbach’s alpha (see Table 3.3). Alpha above .70 was considered to be satisfactory, whereas only the openness to experience subscale had an alpha below this (.69). however, it should be noted that this subscale only consisted

of four items, and a high Cronbach's alpha could thus not be expected. Internal consistency is the degree of reciprocal relationship among scale items. This measure of reliability was reported for the study scales in the form of a Cronbach's α value. The Cronbach's α values that were obtained ranged from 0.69 (openness to experience) to 0.90 (MPAI). Although there is contradictoriness in the field about at what point Cronbach's α values should be assessable to be sufficient or acceptable, acceptable values of alpha have been reported to range from 0.70 to 0.95 (DeVellis, 2016; Nunnally & Bernstein, 1994). Using the lowest value as being admissible or sufficient as a cutoff, one of the scales in the present study (Mini-IPIP Intellect subscale) would arguably not meet that standard.

Correlations – there were significant correlations between all the personality traits and mobile phone addiction, with the strongest relation being between mobile phone addiction and neuroticism (.25) (see Table 3.3). Three out of the five personality traits were positively correlated to mobile phone addiction, neuroticism, extraversion, and agreeableness; whereas two traits were negatively correlated to mobile phone addiction - conscientiousness and openness to experience.

The correlation analysis between study variables found significant associations, with correlation coefficients ranging from $r = .30$ (between extraversion and agreeableness) to $-.003$ (non-significant, between openness to experience and neuroticism). The MPAI is positively correlated with neuroticism ($r = .25, p < .001$), extroversion ($r = .07, p < .001$), agreeableness ($r = .05, p < .001$) and is negatively correlated with conscientiousness ($r = .19, p < .001$) and openness to experience ($r = .04, p < .001$) The relationship between problematic mobile phone use and personality traits is shown in the table of correlation between the descriptive data correlation coefficients and study variables in Table 2. The obtained values were calculated as problematic mobile phone use (Cronbach $\alpha = .901$), Extroversion (Cronbach $\alpha = .808$), Agreeableness (Cronbach $\alpha = .759$), Conscientiousness (Cronbach $\alpha = .700$), Neuroticism (Cronbach $\alpha = .733$) and Openness to experience (Cronbach $\alpha = .687$). In the light of these data, while there is a positive relationship between problematic mobile phone use and Neuroticism, it is in a negative correlation with Conscientiousness. Also, Agreeableness and Extroversion are in a positive correlation. On the other hand, there is a negative relationship between Neuroticism and Conscientiousness. Meanwhile, a positive relationship is observed between Openness to experience and Extroversion, a negative relationship with Conscientiousness is observed. In the present study, Skewness and Kurtosis values were examined to determine whether the groups were normally distributed. The

value of Skewness was calculated as (1.29) and Kurtosis value (1.30), so it was accepted that there was a moderate asymmetrical distribution.

Table 3. 3

Descriptive data and correlation coefficients between study variables (N = 23 533).

Variables	1	2	3	4	5	6
1 Mobile phone addiction	.901					
2 Extroversion	.074**	.808				
3 Agreeableness	.052**	.296**	.759			
4 Conscientiousness	-.186**	.093**	.131**	.700		
5 Neuroticism	.254**	-.098**	.093**	-.157**	.733	
6 Openness to Experience	-.044**	.163**	.116**	-.116**	-.003	.687
Range	8-40	4-20	4-20	4-20	4-20	4-20
Items	8	4	4	4	4	4
Skew	1.29	-0.337	-0.912	-0.419	-0.020	-0.241
Kurtosis	1.30	-0.416	0.796	-0.339	-0.540	-0.278

Cronbach's alpha coefficients, on the diagonal bold.

** $p < .01$.

3.4. Regression Analysis

Table 3.4 presents the results of the multiple linear regression analysis. With the purpose of investigating factors related to problematic mobile phone use, a linear regression analysis was applied. The regression analysis summary for demographic and personality variables predicting problematic mobile phone use. The independent variables were entered in two steps. Step 1 comprised gender, age, relationship status, and education, whereas Step 2 entered the subscales of the Mini-IPIP. Education was dummy coded so that the greatest category (i.e., Bachelor's degree) contain the reference category.

Step 1, Problematic mobile phone use was positively associated with female sex ($\beta = .12$), younger age ($\beta = -.35$) and being in a relationship ($\beta = -.014$). Compared with the reference category (Bachelor's degree), vocational school ($\beta = -.03$) reduced the risk of reporting problematic mobile phone use, whereas primary school ($\beta = .03$) increased the risk. The model was significant, $F(8, 23524) = 468.71, p < .001$, and explained 13.7% of the variance ($R^2 = .137$). Age seemed to be the best predictor of problematic mobile phone use. Adding personality factors did improve the model. Step 2 was significant, $\Delta F(5, 23519) = 374.94, p < .001$, and explained a total of 6.4% of the variance (adjusted $\Delta R^2 = .064$).

The model as a whole was significant, $F(13, 23519) = 455.57, p < .001$ and explained a total of 20.1% of the variance (adjusted $R^2 = .201$). Problematic mobile phone use was positively associated with female sex ($\beta = .06$) and younger age ($\beta = -.31$). Compared with the reference category (Bachelor's degree), vocational school ($\beta = -.03$) and high school ($\beta = -.02$) reduced the risk of reporting problematic mobile phone use. Moreover, problematic mobile phone use was positively associated with extraversion ($\beta = .11$), neuroticism ($\beta = .19$) and agreeableness ($\beta = .02$), whereas openness to experience ($\beta = -.08$) and conscientiousness ($\beta = -.13$) were inversely related to problematic use of mobile phones.

Table 3. 4

Results from the multiple hierarchical regression analysis of demographic and personality characteristics on the Mobile Phone Addiction Index (MPAI) score (N = 23 533).

	B	SE B	β	t	p	ΔR^2
Step 1						0.137***
Sex (1 = male, 2 = female)	1.555	0.081	0.118	19.233	.000	
Age	-0.163	0.003	-0.346	-53.247	.000	
In a relationship (1 = yes, no = 2)	-0.190	0.083	-0.014	-2.285	.022	
Education (Bachelor = reference)						
Primary school	0.565	0.143	0.027	3.960	.000	
High school	-0.125	0.103	-0.009	-1.206	.228	
Vocational school	-0.466	0.115	-0.028	-4.041	.000	
University–Master's degree	-0.176	0.121	-0.010	-1.450	.147	
University–PhD degree	-0.347	0.361	-0.006	-0.960	.337	

Step 2						0.064***
Sex (1 = male, 2 = female)	0.842	0.086	0.064	9.738	.000	
Age	-0.145	0.003	-0.306	-48.169	.000	
In a relationship (1 = yes, 2 = no)	-0.124	0.080	-0.009	-1.546	.122	
Education (Bachelor = reference)						
Primary school	0.261	0.138	0.012	1.892	.058	
High school	-0.251	0.100	-0.017	-2.516	.012	
Vocational school	-0.561	0.112	-0.033	-5.031	.000	
University–Master’s degree	0.029	0.117	0.002	0.245	.807	
University–PhD degree	-0.093	0.348	-0.002	-0.267	.789	
Extroversion	0.190	0.011	0.111	17.713	.000	
Agreeableness	0.038	0.014	0.018	2.744	.006	
Conscientiousness	-0.244	0.012	-0.125	-20.173	.000	
Neuroticism	0.342	0.011	0.193	31.022	.000	
Openness to Experience	-0.169	0.012	-0.084	-13.755	.000	

Note. B, unstandardized regression coefficient; SE B, unstandardized standard error; β , standardized regression coefficient; t, t-test value; p , probability value; R^2 , squared multiple correlation coefficient; ΔR^2 change in R^2 between steps. Education: Bachelor’s degree comprises the reference category. *** $p < .001$

4. DISCUSSION

Constantly developing and changing the information and communication technologies have paved the way for some behavioral addictions like problematic mobile phone use that threatens the life quality and well-being of individuals. The present study measured problematic mobile phone use based on the big five personality traits by using MPAAI (Leung, 2007), and Mini-IPIP (Donnellan et al., 2006) measurements among the Norwegian population. Based on the obtained result of the current study, demographic and personality types of the population were discussed and their relationship with problematic mobile phone use was explained.

This final chapter discusses the overall main findings, relating the hypotheses to each other and to the field of research. Important findings that merit separate and more in-depth discussion follows the same order as the research questions set out in the introductory chapter of the thesis. Strengths and limitations, implications and future research directions to the research field will be presented before the conclusion is drawn.

4.1. The Association Between Demographics and Problematic Mobile Phone Use

The first set of research questions in this thesis concerned sociodemographic correlates of mobile phone addiction. The demographic factors were entered in the first step of the regression analysis, and explained 13.7% of the variance of problematic mobile phone use. In summary, the findings demonstrated that those who were women, young, in a relationship, and education category (referent to bachelor's degree: primary school more likely, vocational school less likely) were more likely to score higher on the Mobile Phone Addiction Index. Hence, the first set of hypotheses were largely supported by the data.

Results from the multiple regression analysis showed that problematic mobile phone use was associated with being female. The effect size for gender appeared to be small-to-medium. This finding is in line with several previous studies and corresponds to empirical evidence suggesting that women are more prone to developing addictions to behaviors involving aspects of social interaction over less social or solitary behaviors (more often by men, e.g., gambling) (Andreassen

et al., 2013, 2016). In the light of these data, the first hypothesis (H1a) was supported by the empirical data. Many studies also support our findings (Augner & Hacker, 2012; Billieux et al., 2008; Lee et al., 2014; Leung, 2008; Oviedo-Trespalacios et al., 2019). The previous research on women preferring to use social media and text messaging more than men in order to socialize more easily coincide with the data we obtained (Chen, 2006; Kuss et al., 2018; Toda et al., 2006).

The results showed that age was inversely related to problematic mobile phone use. This is also in line with previous studies (Van Deursen et al., 2015), and probably reflects that due to development delay of frontal cortical at young ages, then being young can be a vulnerability factor for addiction (Crews et al., 2007). Although it has a moderate contribution, it is the strongest variable in the model among other variables. As age increases, the inclination to problematic mobile phone use decreases. The effect size of age (medium-to-large) was the largest in the present study (considered as medium-to-large, and the largest in the current study). Consequently, the second hypothesis (H1b) was supported by the empirical data of the present study, and corresponds well with the findings have been reported by scientific studies previously (Billieux et al., 2008; Leung, 2008).

An association between relationship status and problematic mobile phones use was expected. It was hypothesized (H1c) that those not being in a relationship would report higher on the MPAI. The results from the various analyses were mixed, however, with insubstantial effects. Although the findings concerning marital status was significant ($p < 0.05$) and contributed very little to the model, the impact of relationship status on problematic mobile phone use was very small. In this case, the third hypothesis (H1c) was not supported by the empirical data of the present study. Although there are studies that support the hypothesis we defend (Khoury et al., 2019; Naser Abed et al., 2017), there is another research that has supported the conclusion we have obtained (Shahrestanaki et al., 2020).

In terms of differences by educational level, the results suggest that compared with the reference category (Bachelor's Degree), participants with lower education were less likely to report problematic mobile phone use. Again, although findings were statistically significant, the effect of the educational level was very small without any practical meaning. Nevertheless, the finding was in line with the hypothesis (H1d), supporting both the hypothesis and general findings demonstrating that the educational level is positively related to good health behaviors (Mocan & Altindag, 2014).

Taken together, demographic variables contributed statistically and significantly to the variance in problematic mobile phone use. However, the meaningfulness and practical importance of the significance of demographic variables have been clarified with the measures of effect sizes. Impact in terms of marital status and highest completed education, are likely better represented by age. That is, there is a possibility that compared to older people, young individuals use mobile technology, be in a relationship, and have lower education. Therefore, any importance beyond age can show the relationship between age and mobile phone use. Hence, other demographic variables likely do not contribute significantly to our understanding of addictive mobile phone use in the current analysis. This idea is also supported by the low sizes of beta for all demographic variables except age and gender.

4.2. The Association Between Personality Traits and Problematic Mobile Phone Use

The second set of research questions in this thesis concerned the potential personality antecedents of problematic mobile phone use/mobile phone addiction.

In general, the MPAI scores were significantly correlated with personality traits, as expected, with the strongest relation being between MPAI and neuroticism (.19). In fact, all five traits correlated with MPAI. It was positively correlated with extraversion and agreeableness, and negatively with conscientiousness and openness to experience. The multiple regression analysis showed that the big five traits explained 7% of the variance in MPAI, as reported in Table 3.4.

Firstly, individuals who scored higher in neuroticism, extroversion, agreeableness, and lower on conscientiousness and openness to experience reported higher levels for MPAI. Taken together, the results from the study indicate that problematic mobile phone use may be related to basic personality traits, based on the FFM of personality, thus supporting previous postulations.

In the sense of personality, extroversion was positively associated with problematic mobile phone use, that conceivably shows the inclination of extroverts to be concerned in terms of signifying their individuality and enhancing their personal attractiveness (Verplanken & Herabadi, 2001). Extroversion was considered to have a small-to-medium sized effect on problematic mobile phone use, after controlling for the demographics and other personality traits, thus being significantly

related to the construct. This was in keeping with both the hypothesis (H2a) and previous research (Kita & Luria, 2018; Li & Lin, 2019; Volungis et al., 2019). Mobile phone and social media applications can be an ideal environment for individuals who enjoy and are interested in their social interactive activities (Allen et al., 2014; Kuss & Griffiths, 2011; Ryan et al., 2014), as enables individuals to support their social needs through immediate feedback from potentially large numbers of other individuals. It could therefore be predicted that individuals with highly extroverted traits use mobile phone excessively because these media may meet the need for commitment and confirms the sense of social self. This is in line with studies showing that extroversion is positively related to excessive social media use (Pornsakulvanich, 2020), Facebook and mobile phone addiction (Andreassen et al., 2013). It has suggested that extraverts use social media to make and improve social networks, however, introverts use them to atone for their difficulties and fears in contacting others. (Kuss & Griffiths, 2011).

Neuroticism was also positively associated with problematic mobile phone use, and appeared to have a medium-sized effect after controlling for demographics and the other personality traits. The effect size was considered the largest among the personality traits in the present study, and therefore essentially and expressively related to the construct. The hypothesis (H2b) was supported by the empirical data, and has been consistently reported in the literature (Li & Lin, 2019; Volungis et al., 2019; Kita & Luria, 2018). As this corroborates findings from previous studies, it is compatible with the assumption that addictive behavior may have an anxiolytic effect (Andreassen, 2015). Consequently, it has been suggested that mobile phone use may be a way of dealing with unpleasant feelings (Kim et al., 2015; Roberts et al., 2015).

A positive association between agreeableness and problematic mobile phone use was also found. This finding is at odds with the hypothesis (H2c). Hence, although the findings were statistically significant, the effect of agreeableness on problematic mobile phone use was very small, and should be interpreted with caution. One explanation for the positive association is that agreeable people may excessively use their mobile phones as they believe in the innovations and benefits of technology (Devaraj et al., 2008). Another possible explanation for the positive association may be the motives of agreeable individuals for satisfaction with all types of interpersonal relationships (Tov et al., 2016). Regardless, it was expected to find a negative relation between problematic mobile phone use and agreeableness due to addictive behaviors involve conflicts, creating conflicts in the relation to others because of the behavior. Hence, as mentioned before agreeableness is usually considered as a protecting factor for developing addictive behaviors, as agreeable people

are seeking harmony and avoiding potential conflicts, which is incompatible with addictive behaviors.

Conscientiousness was inversely associated with problematic mobile phone use. More specifically, the effect size was small-to-medium, thus being meaningfully related to the structure. This corroborates findings from previous studies, and is compatible with the assumption that conscientiousness may serve as a protective factor against addictions in general (Volungis et al., 2019). However, trait conscientiousness has been positively associated with “productive” addictions such as workaholism and exercise addiction (Andreassen et al., 2010, 2013). Some studies found that mobile phone addiction was related to workaholism (Andreassen, 2014; Spagnoli et al., 2019). Most studies have, however, reported a negative association between conscientiousness and problematic mobile phone use, a finding which supported the hypothesis (H2d) (Hussain et al., 2017; Takao, 2014).

A negative association between openness to experience and problematic mobile phone use was also found. The effect size was small. This finding was in line with the hypothesis (H2e) and has been reported previously in the literature (Takao, 2014). One explanation for this finding that mobile phone use can be regarded as a traditional activity, which contradicts with main characteristics of the openness to experience traits such as openness, curiosity and unaccustomed values (Costa & Widiger, 2002).

4.3. Limitations and Strengths of the Present Study

Several limitations and strengths should be taken into account in the present study. The sample is predominantly composed of young individuals and women, and clearly, there is no gender balance. In addition, there is an imbalance in regard to relationship status as well, participants who are in a relationship constitute almost twice those who are not. Therefore, it has not been possible to generalize the findings to the whole population unconditionally. Since the problematic mobile phone use and its various definitions studied in the present study are not recognized in current psychiatric diagnostic systems, hence the validity of the mentioned definitions can be inquirable. Also, as the participants were notified in advance that feedback would be given at the end of the questionnaire, so the answers may not fully reflect the reality with considering the possibility of having concern about their results. Multiple attendances were not checked since the questionnaire

was quite long considering that it had more than 225 items. Repeated responses included in the data set were identified and not classified after analysis. Further, a cross-sectional design was used in this study for this reason it is not possible to come to the conclusion related to cause and effect. Since this research was conducted on quarantine days, the data obtained from the research conducted in 2014 and covering a wide audience were used. Therefore, to observe the change in the last six years, therefore up-to-date research needs to be done. On the other side, the large sample size and used validated tools in evaluating the variables represent the main strengths of this study. Another strong feature of this study is that the survey was conducted in five national newspapers known to have the most various readership groups. Therefore, the example presumably represents a large Norwegian population. Therefore, it should be mentioned that 98% of the Norwegian population has internet access (Schmidt, 2020), and has significant numbers of newspaper readers (Stoll, 2020).

4.4. Implications and Future Research Directions

As included in the research hypothesis, factors such as anxiety, socialization disorder, the need to adapt to innovations, and excessive sociability are among the factors that increase mobile phone addiction. The results from a large Norwegian population showed that being a woman, being in a relationship, being young and low education leads to develop more mobile phone addiction. This type of addiction, which has gradually become a social problem, directly threatens the quality of life and comfort of individuals. The deterioration of social relations between individuals, the decrease in educational achievement of young students, and the deepening of the gap between generations are worrisome, as mobile phone addiction has long-term consequences. In this study, the mass prevalence of cell phone addiction was shown and the problems that risk groups may face were discussed.

According to the results of our study based on five personality traits, Neurotic, Extroverted, and Acceptable individuals are prone to developing mobile phone addiction. Therefore, it is recommended especially for practitioners, and professionals to learn more about these characteristics in order to help individuals with these characteristics, and enhance the needed interventions to minimize future problems more accurately. Methods should be developed to minimize the harmful aspects of technology that can turn into addiction by correctly managing the gains of technology. Considering that the technology is advancing very rapidly, it is recommended to implement longitudinal studies on large samples.

4.5. Conclusion

Based on the findings of the present study, it suggests that the primary demographic variables such as age, gender, level of education, and marital status are all more or less in association with problematic mobile phone use. Problematic mobile phone use was positively associated with being a female, being in a relationship, being at a younger age, and having a low level of education. Therefore, the aforementioned groups can be considered as the target populace in preventing the increase in problematic mobile phone use. Also, among the big five personality traits as secondary variables showed that Neuroticism and Extraversion with moderate contribution and Agreeableness with a low contribution are in a positive relationship with problematic mobile phone use, while Conscientiousness and Openness to Experience with a low contribution are in a negative relationship. If individuals with these primary characteristics and reported personality traits are screened, they could know their inclination to problematic mobile phone use and be taught convenient mobile phone use. Further studies are required with more variables to better identify the relationship with problematic mobile phone use. Hence, choosing a larger sample and longitudinal design is recommended.

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Appendix A

Mobile Phone Addiction Index (MPAI; Leung 2007)

<i>Instruction:</i> Based on your current situation, to what extent do you agree with the following statements?	
5-point Likert scale ranging from 1 = not at all, 2 = rarely, 3 = occasionally, 4 = often, 5 = always	
1	You have been told that you spend too much time on your mobile phone
2	Your friends and family complained about your use of the mobile phone
3	You have tried to hide from others how much time you spend on your mobile phone*
4	You find yourself engaged on the mobile phone for longer period of time than intended*
5	You can never spend enough time on your mobile phone*
6	You have attempted to spend less time on your mobile phone but are unable to*
7	You lose sleep due to the time you spend on your mobile phone
8	When out of range for some time, you become preoccupied with the thought of missing a call*
9	You feel anxious if you have not checked for messages or switched on your mobile phone for some time*
10	You find it difficult to switch off your mobile phone
11	You feel lost without your mobile phone
12	You have used your mobile phone to talk to others when you were feeling isolated
13	You have used your mobile phone to talk to others when you were feeling lonely
14	You have used your mobile phone to make yourself feel better when you were feeling down*
15	You find yourself occupied on your mobile phone when you should be doing other things, and it causes problem*
16	Your productivity has decreased as a direct result of the time you spend on the mobile phone
17	There are times when you would rather use the mobile phone than deal with other more pressing issues

Appendix B

Mini International Personality Item Pool (Mini-IPIP; [Donnellan et al., 2006](#))

<p><i>Instruction:</i> Here are some statements about self-emotions, attitudes and behaviors. Please read each statement carefully to see if it is appropriate to describe yourself. Please mark “O” on the corresponding options (1 = strongly disagree; 2 = disagree; 3 = no comment; 4 = agree; 5 = very agree) to indicate your degree of agreement with the opinion.</p>	
<p>5-point Likert scale ranging from 1 = Strongly Disagree to 5 = Strongly Agree</p>	
1	I am the life of the party
2	I sympathize with others’ feelings
3	I get chores done right away
4	I have frequent mood swings
5	I have a vivid imagination
6	I don’t talk a lot
7	I am not interested in other people’s problems
8	I often forget to put things back in their proper place
9	I am relaxed most of the time
10	I am not interested in abstract ideas
11	I talk to a lot of different people at parties
12	I feel others’ emotions
13	I like order
14	I get upset easily
15	I have difficulty understanding abstract ideas
16	I keep in the background
17	I am not really interested in others
18	I make a mess of things
19	I seldom feel blue
20	I do not have a good imagination