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Mindful Phone Use

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Submitted in Partial Completion of the
Requirements for Departmental Honors in Psychology

Bridgewater State University

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Abstract

The rapid, global adoption of smartphones is undoubtedly affecting users' quality of life. Existing research has published mixed findings on whether or not these devices are beneficial or detrimental to users' well-being. Phone use shifts a user's focus away from the present moment and towards the device at hand. Mindfulness, or "the state of being attentive to and aware of what is taking place in the present," has been shown to improve individual's well-being through promoting self-awareness that allows for behavior regulation that is congruent with one's basic needs (Brown & Ryan, 2003). The primary aim of this research was to create and empirically test a mindfulness-oriented intervention for nomophobia (the fear of being without one's phone). The secondary aim was to investigate the relationship between nomophobia, psychological well-being, and mindfulness using the Nomophobia Questionnaire, Ryff's Psychological Well-Being Scales, and the Mindfulness Attention Awareness Scale. This research involved two different phases: Phase 1 was a randomized experiment and Phase 2 was a correlational study using the aforementioned measures. It was hypothesized that participants randomized to the mindfulness condition would report decreased nomophobia, increased psychological well-being, and increased mindfulness. It was also posited that post-intervention, those in the mindfulness condition would spend less screen time on their phones than those in the control condition. Additionally, it was expected that nomophobia would be negatively correlated with psychological well-being and mindfulness. Post-intervention, those in the mindfulness condition reported significantly less levels of nomophobia than those in the control condition, however there were no significant changes in psychological well-being, mindfulness, or objective levels of screen time. No significant relationships were found between nomophobia and overall psychological well-being or mindfulness. However, a significant negative relationship was found

between nomophobia and autonomy, a subscale of well-being. Potential implications and future directions of this research are addressed.

Keywords: phone use, nomophobia, psychological well-being, mindfulness, social media

Mindful Phone Use

Since their creation in 1994, smartphones have become an extension of millions of individuals across the globe. With these devices offering access to not only calls and texts, but social networking sites, banking information, alarms, flashlights, the all-knowing internet and more, in Western society mobile phones are often viewed as a necessity rather than a luxury. In just 7 years, from 2011 to 2018, the percentage of Americans who own a smartphone has increased from 35% to 77% (Pew Research Center, 2018a). That means that present day, over 250 million Americans currently use smartphones. For many, these handheld devices have become the primary vehicle for online connection: 1 in 5 Americans report being “smart-phone only internet users” (Pew Research Center, 2018a). As smartphone technology continues to evolve, the devices become increasingly integral to users’ day to day life. The current review aims to explore the effects smartphones have on users, specifically focusing on psychological well-being. The term nomophobia is defined and explained, and the variable of mindfulness is introduced and investigated as a potential intervention strategy for those exhibiting problematic phone use.

Smartphones and Psychological Well-Being

Much of the existing research related to the effects of smartphone use investigates whether or not individuals are benefiting or suffering from continuous use of their devices. Different facets of psychological well-being have been assessed, and the findings offer conflicting results. Some studies have emphasized the key role smartphones and social media use can play in enhancing human connection. Kim, Wang and Oh (2016) found that smartphone use facilitates social engagement for those who desire to belong to a social group. It has also been shown that mobile phones help users regulate their emotions by offering convenient ways to

garner social support (Hoffner & Lee, 2015). This idea that smartphone use can help users fulfill psychological needs is further supported by cross-cultural research that indicated individuals from both the U.S. and South Korea believe smartphone use satisfies safety, belonging, and self-actualization needs such as confidence and capability (Kang & Jung, 2014).

However, research has shown that social use of media (i.e. messaging, social media applications, etc.), which are commonly used features of smartphones, are not sufficient substitutes for face to face communication. One study analyzed 745 U.S. adults and found that time spent communicating online was significantly related to heightened loneliness and decreased life satisfaction (Stepanikova, Nie, & He, 2010). Additionally, Ahn and Shin (2013) surveyed 300 Korean adults and specifically analyzed two key functions of social interaction: social connectedness and avoiding social isolation. Their results indicated that while face to face communication facilitates both social connectedness and avoidance of social isolation, social use of media is only proficient in allowing users to seek connectedness. If users are spending less time directly interacting with others and more time on their devices in hopes to become less social isolated, their subjective well-being may be diminished. Prior findings have shown social loneliness as predictor for problematic phone use, which points to this phenomenon being circular and increasingly problematic (Mahajan, Gupta, & Bakhshi, 2017).

Loneliness is not the only negative feeling associated with smartphone use; anxiety and depression have also been explored. A 2015 study conducted by Demirci, Akgönül, and Akpınar surveyed 319 university students in Turkey and divided participants into three groups: non-use, low smartphone use, and high smartphone use utilizing the Smartphone Addiction Scale. Their findings revealed that depression, anxiety, and daytime dysfunction connected to poor sleep quality were more present in the high smartphone use group in comparison to low/non-use

groups. Additionally, Hawi and Samaha (2017) found that individuals who exhibited high levels of phone use were reported higher levels of anxiety than those in the lower level phone use groups.

It must be noted that these findings are also contrasted by existing literature. One study found that neither depression nor anxiety severity were positively associated with levels of smartphone use; the participants who unlocked their phones the most were actually the least depressed (Rozgonjuk, Levine, Hall, & Elhai, 2018). It has been discussed that those suffering with depression are less apt to use their phones due to social withdrawal, and that active use of social media can be a signifier for overall healthy well-being (Elhai, Levine, Dvorak, & Hall, 2017). It seems that smartphones allow us to feel heightened belonging and connectedness, even if we are using them while we are physically alone.

These conflicting findings pose the question: why do some individuals experiencing depression or anxiety engage in problematic phone use while others do not? One study revealed rumination as a mediating factor (Elhai, Tiamiyu, Week, 2018). Rumination is a maladaptive coping strategy where one's attention is focused on negative-type, self-referencing thoughts, rather than the present stressor. In the context of the aforementioned study, depression and anxiety were not directly related to problematic phone use but were indirectly linked through the mechanism of rumination. It has been postulated that rumination leads to constant checking of one's phone for excessive reassurance seeking (Billieux, Philippot, Schmid, Maurage, Mol, & Van Der Linden, 2015).

The way in which an individual is using their phone may also be a contributing factor to well-being outcomes (Hoffner & Lee, 2015; Elhai, Levine, Dvorak, & Hall, 2017). Social media is one of the more commonly used features of smartphones, especially for teens. A recent Pew

Research study reported that nearly 95% of teens own or have access to smartphones, and 45% of these teens characterized themselves as being constantly online (2018b). This study gauged what platforms teens were engaging with most frequently and compiled the following statistics: YouTube (85%), Instagram (72%), Snapchat (69%), and Facebook (51%). Each of these sites allow for different types of engagements, such as active use and passive use (Verduyn, Ybarra, Resibois, Jonides, & Kross, 2017). Active use involves interaction with the online community, such as posting status updates and liking or commenting on others' content, while passive use is characterized by observing online content without direct engagement. Verduyn et al. (2017) found a positive relationship between active use and well-being and a negative relationship between passive use and subjective well-being. The latter association was linked to social comparison and envy. When an individual is passively scrolling through their social networking sites, they may think negatively about themselves in comparison to others.

Just as social media use can be characterized into active and passive uses, overarching technology use can also be broken down into categories. Two distinctions are process use and social use (Song, Larose, Eastin, & Lin, 2004). This categorization can be applied specifically to smartphone use wherein process use would include non-social functions such as news consumption, relaxation, and entertainment, and social use would include features that facilitate connection such as instant messaging and social media (Elhai, Levine, Dvorak, Hall, 2017). The aforementioned study that defined the two types of smartphone usages found problematic phone use to be associated with both types of use, but more strongly related to process use.

An extensive literature review conducted in the United Kingdom about adolescents' well-being in relation to online communication and social media use summarized the current benefits and harmful effects of this new technology (Best, Manktelow, & Taylor, 2014). The positive

aspects of social media use included improved self-esteem, social connectedness, safe identity experimentation and online support for self-disclosure. The negative aspects included cyber-bullying, social isolation and depression. With social media being one of the most common features of smartphones, it makes sense that there are mixed findings on whether smartphones are a sum positive or negative on users' health and well-being. If individuals are using their phones to augment their social connections and aid in emotional regulation and reappraisal, they may experience psychological benefits (Hoffner & Lee, 2015). However, if users are spending exorbitant time on their devices and therefore lacking sufficient interpersonal connection, they may suffer as a result (Ahn & Shin, 2013).

iGen

While individuals of all ages are currently using smartphones, the iGen, or those born between 1995 and 2012, have grown up concurrently with this technology. Not knowing a life without this tech could be shaping the characteristics of the generation. Twenge (2017) in her book *iGen: Why Today's Super-Connected Kids Are Growing Up Less Rebellious, More Tolerant, Less Happy—and Completely Unprepared for Adulthood—and What That Means for the Rest of Us* delineates how adolescents are far less independent than teenagers in previous generations. They are postponing common markers of adulthood such as driving, working and even having sex. Twenge argues that these generational shifts can be attributed to the rapid adoption of innovative technology in young people's lives. Many adolescents don't feel the need to get their license and earn money so that they can go out and have fun experiences, instead this time is spent scrolling from the comfort of their own beds.

Another notable generational characteristic of iGens regards their sleeping habits. A study published in *Sleep Medicine* in 2017 found that adolescents in 2015 were 16-17% more

likely to report averaging less than 7 hours of sleep per night than teens in 2009 (Twenge, Krizan, & Hisler, 2017). This decline in sleep was linked to electronic device and social media use. In the same study, problematic smartphone users lacked sleep the most; those who used their phone for more than 5 hours per day were 50% more likely to report shorter sleep duration than those who used their phone for an hour a day. Nighttime smartphone use has also been associated with later bedtimes and poorer quality of sleep (Lemola, Perkinson-Gloor, Brand, Dewald-Kaufmann, & Grob, 2014). Sufficient sleep habits have long been associated with overall health and psychological well-being, so this recent decline in adolescents sleep patterns is alarming.

As smartphones become more popular and technologically sophisticated, they find their way into the hands of younger users. A study that surveyed 500 mothers across the United States in January of 2016 indicated that the average age for a child's first smartphone is now 10.3 years ("Kids & Tech," 2016). The participant pool of the current study is comprised of college aged students ($M = 20.48$, $SD = 2.484$), who primarily fall under the iGen categorization. Many individuals who are currently in their early twenties have possessed a mobile phone for nearly half of their lives. Not knowing what life is like without these convenient devices could be leading to attachments, dependencies, and possibly addiction.

Nomophobia

How often individuals are on their devices and how they feel when they are separated from their phones have been common themes in existing research. In 2008, a study that was conducted by the UK Post Office and sponsored by SecurEnvoy, a two-factor authentication company, indicated 53% of the 1,000 participants reported feeling fearful of being without their mobile devices (D'Agata, 2008). This study was the first to coin the term *nomophobia*, which

translates to “no mobile phone” phobia. Four years later, in 2012, an additional study was conducted that showed the percentage of people who experienced this phone related fear grew from 53% to 66% (Wrenn, 2012). The research reported that young adults, age 18-24, reported nomophobia at the highest rates (77%), followed closely by those aged 25-34 (68%). These statistics echo Twenge’s findings regarding the iGen and phone dependencies (2017).

Nomophobia has been deemed a modern-day phobia, one that has resulted from individuals’ evolving relationship with innovative technology (King, Valenca, & Nardi, 2010). Some initial studies regarding nomophobia encompassed both mobile phone use and overarching internet use (King et al., 2010) but due to smartphones offering a variety of functions and quickly becoming the way that many individuals utilize the internet, more recent research exploring nomophobia has focused mainly on anxiety regarding mobile phones (King, Valenca, Silva, Baczynski, & Carvalho, 2013; Park, Kim, Shon, & Shim, 2013).

Different definitions of nomophobia exist in the literature. One early denotation termed the phobia the “discomfort or anxiety when out of mobile phone or computer contact. It is the fear of becoming technologically incommunicable, distant from the mobile phone or not connected to the Web” (King et al., 2010, p. 52). Other definitions include “discomfort, anxiety, nervousness or anguish caused by being out of contact with a mobile phone or computer” (Bragazzi & Del Puente, 2014, p. 156). As the research evolved, the definition of nomophobia did as well. In 2014, the following definition was provided: “the modern fear of being unable to communicate through a mobile phone or the Internet” (King et al.). The latter definition shifts the fear from the device to the environment that the device creates. Rather than the anxiety stemming from the phone, the discomfort instead stems from fear of being in a situation where users are unable to communicate via the mobile devices. This distinction connects nomophobia

to agoraphobia, which is the fear of situations that might cause panic, helplessness, or embarrassment (“Agoraphobia”, 2017).

Through locating common themes that emerged when interviewing undergraduate students about their smartphone use habits, Yilidirim and Correia (2015) identified four distinct dimensions of nomophobia. The dimensions include the following fears: 1) not being able to communicate, 2) losing connectedness, 3) inability to access information, and 4) giving up convenience. Yilidirim and Correia utilized these dimensions to develop a 20-item scale called the Nomophobia Questionnaire (NMP-Q) which is elaborated upon in the Methods section.

Further pointing to the prevalence of smartphone addiction in our society were calls to include nomophobia in the DSM 5 (Bragazzi & Del Puente, 2014). The proposition argued that nomophobia fits the criteria of a specific phobia, which is defined as an “irrational fear prompted by specific stimulus.” The specific stimulus in the case of nomophobia would be the idea of being without one’s phone. Included in the proposal were the clinical characteristics of this “no phone phobia” which included, but were not limited to: habitual use, owning multiple devices, extreme anxiety regarding losing one’s device, obsessively looking at one’s phone, needing the device to always be on, and reduced face-to-face interactions. Although these calls went unheeded, the fact that psychologists are noticing maladaptive behavior connected to problematic phone use is an indicator that as a society we must start bringing awareness to the way we engage with our devices.

Mindfulness

Mindfulness can be defined as “the state of being attentive to and aware of what is taking place in the present” (Brown & Ryan, 2003). The practice and cultivation of mindfulness has been prevalent in humankind for thousands of years, and originally stemmed from Eastern Hindu

and Buddhist traditions. Recent research has linked mindfulness practice with both physiological and psychological benefits which has led to the integration of mindfulness practices into Western society (Kabat-Zinn, 2013). Common mindful practices include meditation, yoga, and psychotherapeutic practices such as Mindfulness Based Stress Reduction (MBSR; Kabat-Zinn, 2013). The assimilation of mindfulness practices into Western culture has been largely attributed to Jon Kabat-Zinn, a world-renowned meditation teacher, researcher, professor, and clinician.

Mindfulness has been associated with positive emotional states, self-regulated behavior, and clarity and vividness of day to day moments, all of which have been found to correspond to heightened well-being (Brown & Ryan, 2003). Other evidence-based benefits of mindfulness include stress reduction, relationship satisfaction, and improved memory and focus (Davis & Hayes, 2011). It has also been found that the cultivation of mindfulness allows for non-discriminatory awareness and an empirical view of reality; meaning that a person practicing mindfulness can directly experience their lives rather than fall into the trap of discerning their experience based on automatic processing and preconceived notions (Brown, Ryan & Creswell, 2007). Having a clear understanding of what is taking place in the present, both internally and externally, allows individuals to make decisions that align with their goals.

In contrast, mindlessness is the absence of mindfulness (Brown & Ryan, 2003). Mindless behavior can be categorized as automatic; a mindless person may be unaware of how they are behaving and fail to understand their motivation behind said behaviors. These types of behaviors may lead to decreased well-being, seeing that mindless decisions would not necessarily align with one's needs and values. As previously mentioned, many individuals believe that their smartphones allow them to fulfill basic psychological needs (Kang & Jung, 2014); practicing

mindfulness regarding one's phone use could therefore ensure one's decision to use their device is aligned with their well-being goals.

Mindfulness and Smartphones

Prior research has examined the relationship between mindfulness and technology use. Sriwalai and Charoensukmongkol (2016) specifically analyzed the impact social media addiction has on mindfulness, coping strategies, and emotional exhaustion. In the context of this study, social media addiction was defined as an urge-driven, compulsive disorder, and was measured using a modified version of the Facebook Addiction Scale. Their results revealed that those with higher levels of social media addiction demonstrated lower levels of mindfulness. They also found that those with higher levels of social media addiction and lower levels of mindfulness were more apt to use emotion-focused coping strategies over problem-focused coping strategies. Emotion-focused coping aims to reduce negative type feelings associated with a problem, whereas problem-focused coping is solution oriented and focuses on eliminating the source of distress (Baker & Berenbaum, 2011). Problem-focused coping has been associated with higher levels of well-being, because negative emotions are faced rather than repressed (Lewin & Sager, 2008). In the Sriwalai and Charoensukmongkol (2016) study, there was a positive relationship between emotion-focused coping strategies and emotional exhaustion, indirectly connecting social media addiction and mindfulness to levels of burnout.

The aforementioned study analyzed how social media use affects our levels of mindfulness, but what about how mindfulness influences the way we interact with these devices? A study focused on the dangerous habit of texting and driving found that those lower in levels of mindfulness, measured using the Cognitive and Affective Mindfulness Scale – Revised (Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2007), were more likely to partake in the

hazardous behavior (Feldman, Greeson, Renna, & Robbins-Monteith, 2011). Furthermore, the relationship between texting and driving and mindfulness was mediated by one's need to alleviate negative type emotions. Hoffner and Lee (2015) framed the smartphone's capacity to aid in emotional regulation as a positive function, but if individuals are mindlessly using their phones in hopes to reduce negative emotions, it could have negative, and in the context of distracted driving, even dire, consequences.

Another study examined the relationship between instant messaging (IM) and mindfulness (Bauer, Loy, Masur, & Schneider, 2017). Mindfulness was measured in two distinct ways: day-specific mindfulness and mindfulness during IM. Day-specific mindfulness was broadly defined as "mindfulness during the day" whereas mindfulness during IM was more specific, assessing individuals' state of mindfulness during the act of instant messaging. Their hypothesis also tested the concept of autonomy; did the motivation behind why people were instant messaging influence their daily affect and how they felt using their phones? To assess autonomous vs. heteronomous phone use, Bauer et al. (2017) presented statements such as "I used IM because I enjoy being in contact with other people" vs. "I used IM because other people might be angry if I don't answer their message."

Participants ($N = 211$) were sent nightly surveys to measure their day-specific mindfulness, mindfulness during IM, autonomous motivation to use IMs, and IM-related positive affect. Using a cross-sectional research design, it was found that mindfulness during IM was associated with IM-related positive affect, meaning mindful instant messengers felt better using IM than those who were not mindful. Additionally, day specific mindfulness was associated with autonomous use of IM, which was subsequently positively related to positive affect and negatively related to stress. This study provided a strong argument for the use of mindfulness-

oriented trainings in the realm of phone use, seeing that those who demonstrated higher levels of mindfulness reported more positive experiences using their devices. However, due to the design of their study, they were unable to assert a causal relationship between mindfulness and phone related affect. Additionally, Bauer et al. (2017) found a significant relationship between mindfulness, IM and well-being, but did not offer any tools for participants to increase their levels of mindfulness. The current study builds on this research by following an experimental design which includes a mindfulness-oriented intervention for the experimental group's daily phone use.

This study was designed intentionally to explore the relationships between nomophobia, psychological well-being, and mindfulness. Seeing that existing literature offers contrasting findings about how smartphones effect our psychological well-being (Stepanikova, Nie, & He, 2010; Kim, Wang & Oh, 2016; Verduyn, Ybarra, Resibois, Jonides, & Kross, 2017; Best, Manktelow, & Taylor, 2014), but also indicates the majority of individuals who own a smartphone are fearful of being without it (D'Agata, 2008), it is important that new research investigates healthy ways for individuals to interact with their devices. Prior research has shown mindfulness to be correlated with positive psychological well-being outcomes (Brown & Ryan, 2003), and research specifically investigating mindfulness and technology use has yielded promising results (Bauer, Loy, Masur, & Schneider, 2017).

Therefore, our hypothesis are as follows:

(H1): Post intervention, those in the experimental group will experience decreased levels of nomophobia, increased levels of psychological well-being, and increased levels of mindfulness.

(H2): Those in the experimental group will spend less time on their phone post-intervention than those in the control group.

(H3): There will be a negative relationship between nomophobia and psychological well-being.

(H4): There will be a negative relationship between nomophobia and mindfulness.

Method

Research Design

The current study was split into two distinct parts: Phase 1 and Phase 2. Phase 1 followed a randomized, experimental design while Phase 2 collected strictly correlational data. The experimental design for Phase 1 was time intensive which limited the number of participants that could be run, therefore we ran Phase 2 to secure a larger sample size for the correlational analyses.

Phase 1 involved the creation and implementation of a mindfulness-oriented intervention regarding participants' smartphone use. Participants in Phase 1 were randomized into either a mindfulness or control condition; both conditions' participation lasted for a duration of two weeks. At the initial meeting, all participants completed a pre-assessment that measured their levels of nomophobia, psychological well-being, and day-specific mindfulness. One week from the initial meeting those in the mindfulness condition met with the researcher to undergo a Mindfulness Integration presentation. At the end of the two weeks, all participants were emailed a post-assessment that re-assessed levels of nomophobia, psychological well-being, and day-specific mindfulness. Throughout the entirety of the study, all participants' smartphone use (screen time in minutes) was tracked objectively using the smartphone application Moment (Holesh, 2019). This information was exported to the research team via email at the conclusion

of the two weeks. This exported data included daily count of screen time in minutes (how many minutes each participant spent actively on their device with the screen unlocked), and number of pick-ups (how many times each individual unlocked their smartphone).

Phase 2 was a single-group, descriptive study that was comprised of an online, self-report survey identical to the pre-assessment survey distributed in Phase 1. Participants in Phase 2 did not participate in the mindfulness-oriented intervention. This data was collected to amass a larger sample size for testing our two correlational hypotheses, due to the time intense nature of Phase 1 that limited number of participants enrolled.

Phase 1

Participants. Out of the 191 students who inquired about Phase 1 of the study via email, 31 students agreed to participate. It is speculated that this low response rate was due to the time intensity of the study. One participant did not complete all portions of the study; therefore, their data was not included in analysis (resulting in $N = 30$). Students were recruited through various methods, including flyers that were handed out and displayed in high traffic areas around campus, emails sent through the campus announcement system, and social media posts on class Facebook pages. To objectively track screen time, the research utilized an application called Moment (described in detail in the Materials and Measures section), which is only compatible with Apple devices. Therefore, students had to be iPhone users in order to participate. All students also had to be 18 years or older.

Ages of participants ranged from 18 to 28 ($M = 20.57$, $SD = 1.888$). Due to error in survey design, gender was not assessed. Educational level varied, with the majority of participants identifying as fourth year students (33.3%), while 10% were first year, 16.7% were second year, 26.7% were third year, and 13.3% were fifth year. A total of 66.7% identified as

white, 13.3% as Asian, 6.7% as Portuguese, 3.3% as Native Hawaiian or Pacific Islander, 3.3% as Cape Verdean, and 6.7% as other. Regarding religion, Christian/Catholic and nonreligious were the two main identifications (43.3% each), with 3.3% identifying as Islamic and 10% other.

Because smartphones are often seen as integral to many jobs and commitments, we also wanted to gauge participants' level of employment and campus involvement. A majority of Phase 1 participants worked 10-20 hours a week (40%), while 16.7% were unemployed, 26.7% worked 1-10 hours a week, and 16.7% worked 20-40 hours a week. In regard to campus engagement, 73.4% reported being involved in at least 1 club or organization (26.7% of which were involved in 3+ clubs or organizations.) A total of 26.7% of participants reported not being involved in any clubs or organizations.

All students who successfully completed Phase 1 received 10 flex dollars, which can be redeemed at various on- and off-campus locations connected to the Bridgewater State University community.

Materials and Measures.

Demographics. Participants were asked questions regarding age, education, race/ethnicity, religion, employment and involvement in clubs and organizations.

Smartphone usage. To gauge subjective phone use, participants were asked how much time they believe they spend on their phone per day. Five options were given, ranging from "less than 1 hour" to "6+ hours," with items consisting of two hour increments in between. Additionally, participants were asked to rank order what smartphone features they most typically use. Features included were social networking, messaging, entertainment, news/information consumption, and relaxation.

Nomophobia Questionnaire. The Nomophobia Questionnaire (NMP-Q; Yildirim & Correia, 2015) measures the severity of nomophobia, or the fear of not being able to use one's phone. The NMP-Q consists of 20 items rated on a 7-point Likert scale ranging from *strongly disagree* (1) to *strongly agree* (7). Total scores range from 20-140. Items assess not being able to communicate (e.g., "I would feel anxious because I could not instantly communicate with my family and/or friends"), losing connectedness (e.g., "I would feel anxious because my constant connection to my family and friends would be broken"), not being able to access information (e.g., "I would feel anxious because I could not check my email messages"), and giving up convenience (e.g., "I would be annoyed if I could not use my smartphone and/or its capabilities when I wanted to do so.") The scores are interpreted as follows: <20 indicating absence of nomophobia, 21-59 indicating mild levels of nomophobia, 60-99 indicating moderate levels of nomophobia and 100-140 indicating severe levels of nomophobia. The assessment has demonstrated good internal reliability ($\alpha=0.945$; Yildirim & Correia, 2015). The current study produced an overall Cronbach's alpha of .926.

Ryff's Psychological Well-Being Scales (PWB). The PWB measures 6 distinct facets of psychological well-being: autonomy, environmental mastery, personal growth, positive relations with others, purpose in life and self-acceptance (Ryff, 1989). There are 7 questions for each of the 6 subscales resulting in 42 items. Responses range from *strongly disagree* (1) to *strongly agree* (6) on a 6-point Likert scale. Half of the items are affirmatively phrased (e.g. "I know that I can trust my friends, and I know that they can trust me.") while half demonstrate diminished well-being (e.g. "I tend to worry about what other people think of me.") Those items reflecting diminished well-being are reverse coded (adjusting 6 to 1, 5 to 2, etc.) Scores for each dimension range from 7-42, with the total score ranging from 42-252. However, due to error, 5 of the items

(1 from each subscale except for personal growth) were not included in analyses. Therefore, regarding the current study, the personal growth subscale ranges from 7-42, while all other subscales range from 6-36. Total scores ranging from 37-222; higher scores indicate higher levels of psychological well-being.

In initial studies, each scale demonstrated high internal validity, with the following Cronbach's alpha coefficients: autonomy, .86; environmental mastery, .90; personal growth, .87; positive relations with others, .91; purpose in life, .90; and self-acceptance, .93 (Ryff, 1989). With the modified scale, the present study produced the following Cronbach's alphas: autonomy, .676; environmental mastery, .716; personal growth, .734; positive relations with others, .738; purpose in life, .652; and self-acceptance, .742. The overall scale produced a Cronbach's alpha of .869.

Mindful Attention Awareness Scale. The Mindful Attention Awareness Scale (MAAS) is a 15-item self-report measure that assesses individuals' attention to and awareness of specific day to day experiences (Brown & Ryan, 2003). The assessment measures frequency of experience utilizing a 6-point Likert scale that ranges from *almost always* (1) to *almost never* (6). For the current study we used a modified version of the MAAS, wherein we removed the option of *somewhat infrequently* resulting in a 5-point Likert scale. Therefore, scores range from 15-75, with higher scores indicating higher levels of day-to-day mindfulness. Example statements include "It seems I am running on automatic without much experience of what I'm doing" and "I could be experiencing some emotion and not be conscious of it until sometime later." The assessment has demonstrated good internal reliability ($\alpha=0.87$) and test-retest reliability ($r=.81$; Brown & Ryan, 2003). The present study produced a Cronbach's alpha of .923.

The Moment App. The Moment App tracks iOS users' screen time by measuring the number of minutes one actively spends on their phone (i.e. when the phone is not locked) as well as how many times one picks up their phone per day (i.e. number of times the phone is unlocked; Holesh, 2019). If notification settings are turned on, Moment offers users daily insight reports delineating their daily usage, as well as reminders throughout the day when the user has reached certain screen time minute marks. Additionally, users can set daily limitations for themselves through the Moment app. The mindfulness condition utilized these functions as a part of the mindfulness-oriented intervention. Those in the control condition were instructed to leave the app running in the background of their device with these notification settings off. The Moment app has demonstrated validity in measuring phone use (Elhai, Tiamiyu, Weeks, Levine, Picard, & Hall, 2018).

Nightly reflection. During the second week of the experiment, those in the mindfulness condition were emailed a reflection each evening between 6-7pm. The nightly assessment included questions about goal setting, function of phone use, phone-related well-being, stress related to phone-use, and objective well-being. Goal setting items included reporting that day's screen time goal and reflecting upon how the amount of time actually spent on their phone compared to the goal that they set. For reflection questions we utilized a 3-item scale that included "I used less screen time than the goal I set," "I met my goal," and "I used more screen time than the goal the I set." To allow for deeper reflection, participants answered an open-ended question asking them to describe how the goal setting experience felt. The assessment also instructed participants to set a new screen time goal for the following day. Additionally, participants rank ordered what features they used on their smartphone that day.

Participants' phone related well-being was assessed ("How did you feel using your phone today?") with a 5-point Likert scale, ranging from *happy* to *unhappy*. To assess stress related to phone use we adapted one item from the Perceived Stress Scale ("Did you feel stressed using your phone today?"; Cohen, Kamarch, & Mermelstein, 1983) and utilized a 5-point Likert scale, ranging from *not at all stressed* to *extremely stressed*. To assess objective well-being, we had participants rate their well-being on a 10-item scale ranging from "I would describe my well-being as *overwhelmingly negative today*" to "I would describe my well-being as *overwhelmingly positive today*."

Procedure. This was a randomized, controlled, non-blinded study. Participants were instructed to contact the researcher via email if they were interested in participation. An email from the researcher was sent in response, which included a short paragraph describing the nature of the study and instructions to fill out a poll to determine availability. The assigned condition determined how many times the participant needed to meet with the researcher in person. The control group met with researcher once at the start of the two weeks, and the mindfulness condition met with the researcher twice, once at the start of the two weeks and once one week from the initial meeting. Therefore, when choosing a time slot all participants were instructed to choose a time where they could meet at the same time for two consecutive weeks. Random assignment was done by placing the name of each condition into a bag and drawing one out each time a new participant enrolled.

At the initial meeting all participants met with the researcher in the Psychology Lab at Bridgewater State University to provide written consent and complete an online, self-report survey that included demographic information and the aforementioned assessments that measured phone use, nomophobia, psychological well-being, and levels of mindfulness. Then, a

guided demonstration was presented to all participants in both conditions that systematically walked participants through altering specific settings on their iPhones (see Appendix A). To ensure that active screen time was tracked correctly and to ensure that participants were not receiving additional notifications about screen time, the settings on the iPhone needed to be standardized. The steps included adjusting participants' auto-lock settings to 30 seconds to ensure that active screen time was being tracked accurately. Additionally, in order to ensure participants were not receiving push notifications regarding their phone use, Apple Screen Time functions were turned off.

All participants were then instructed to download the Moment application on to their devices (Holesh, 2019). Upon launching the app, participants were instructed to turn off all notification and reminder settings offered through the Moment app (e.g. insight reports, pick up goals, and screen time goals). The current version of the Moment app, version 4.0, has a setting where users can exclude charging time from screen time that is measured through the app. For the purpose of getting the most accurate measure of active screen time use, this setting was turned off. Participants were also instructed to have an email account linked to their Apple mail app so that at the conclusion of the study they could export data collected by the Moment app to the researcher.

Control Condition. At the conclusion of the initial meeting, those in the normal-phone use group were instructed to make no changes to their regular phone use for the duration of the two-week period. At the end of the two weeks participants in the control condition received an email from the researcher that included information about how to export data regarding their phone use and an online post-assessment identical to that of the pre-assessment (although withholding questions regarding demographic information.) This assessment was completed

without the researcher present. Participants were offered the opportunity to meet with the researcher post-experiment to learn about the goal-setting functions of the Moment application.

Experimental Condition. At the conclusion of the initial meeting, those in the mindful phone use group were instructed to make no changes to their regular phone use for the first week of the experiment. One week from the initial meeting, participants in the mindfulness condition were invited back to meet with the researcher to begin integrating mindfulness-oriented strategies into their daily phone use. The mindfulness-oriented intervention included various functions of the Moment app as well as a nightly reflection created and distributed by the research team.

The intervention started by having participants open the Moment application on their smartphones and navigate to the app's goal setting functions. The Moment app has a "What I'm Focusing on Feature" that allows individuals to choose specific areas of life they want to improve through bringing mindful awareness to their phone use. Options include "sharpen focus," "have more family time," "sleep better," "feel happier," "stop wasting time," "reduce anxiety," and "improve relationships." Participants were instructed choose all areas that applied to them on both the app itself and a Qualtrics survey.

Next, participants were instructed to reflect on their past week's phone use (utilizing the insight reports offered through the Moment app) and to set a daily screen time goal. Participants were told that each night during their second week of participation they would set a new daily screen time goal depending on their needs for the upcoming day. Participants were instructed to turn on the "nudge me in the right direction" feature, which sends users reminders periodically throughout the day (e.g., "You have been on your phone for 15 minutes!") The frequency of notifications varies based on the goal that is set (e.g. a screen time goal of one hour receives

notifications approximately every 10 minutes, while a screen time goal of three hours receives notifications approximately every 30 minutes.) As users get closer to their set goal, notifications increase in frequency.

Participants were instructed to lock their phones and bring open awareness to the fact that they were using their device each time they received a notification from the Moment app. They could either contemplate the question “Is my current phone use fulfilling a specific goal?” or take a deep breath and simply notice their phone use in that moment. Participants were told that they could decide how to proceed afterwards; they could either resume their phone use or not.

Each night participants were sent a reflection survey that asked questions about that day’s phone use. We chose this approach because we expected the nightly reflection to offer insight as to how integrating mindfulness-oriented strategies was impacting participants’ psychological well-being and phone use. At the end of the two weeks participants received an email detailing how to export data regarding their phone use and they completed the post-assessment identical to the one distributed to the control condition.

Phase 2

Participants. Students (M age = 20.45, SD = 2.824) from the Bridgewater State University Psychology Departmental Participant Pool were recruited utilizing the online computer software SONA. This system grants students credit for the research participation component of their PSYC 100 class. There were 55 participants in this portion of the study. Two participants did not complete the survey, therefore their data were not included in analysis (resulting in $n=53$). Educational level varied, with the majority of participants identifying as first year students (45.3%), while 11.3% were second year, 20.8% were third year, 13.2% were fourth year, 7.5% were fifth year and 1.9% sixth year. A total of 77.4% identified as white, 9.4% as

Hispanic/Latino, 7.5% as Black/African/Caribbean, 1.9% as American Indian/Alaskan Native, 1.9% as Cape Verdean, and 1.9% as Portuguese. Regarding religion, 67.9% identified as Christian/Catholic, 1.9% as Jewish, 22.6% as nonreligious and 7.5% as other. A majority of participants were unemployed (32.1%), while 24.5% worked 10-20 hours a week, 24.5% worked 20-40 hours a week, 11.3% worked 1-10 hours a week and 7.5% worked 40+ hours a week. Additionally, 81.1% were not involved in any Bridgewater State University clubs or organizations, 15.1% were involved in 1-2, and 3.8% were involved in 3 or more.

Materials & Measures. Various measures utilized in Phase 1 were also included in Phase 2. Measures include demographics, smartphone usage, the Nomophobia Questionnaire, Ryff's Psychological Well-Being Scales, and the Mindfulness Attention and Awareness Scale.

Procedure. As previously mentioned, Phase 2 was a single group, non-blinded descriptive study that included an online assessment. Participants were asked to complete an online, self-report survey comprised of demographic information and the aforementioned measures. The survey was created through the software Qualtrics. Participants were not asked to meet with the research team in person; therefore, an online consent form was presented at the beginning of the survey. To ensure confidentiality, no identifiable information was collected. After finishing the survey, students successfully completed their participation in the study. Their responses were saved and later exported to the Statistical Package for Social Sciences (SPSS) for analyses.

Results

Descriptive Phone Use

To better understand participants' relationship with their phone, data on the amount of time spent using the phone, the functionality of phone use and nomophobia scores are reported below.

Phase 1. We were interested in gauging how much individuals thought they used their phone and how much they actually used their phone. Regarding subjective phone use, 10% of participants ($N = 30$) estimated spending 6 or more hours on their phone per day, 26.7% estimated 4-6 hours, 43.4% estimated 2-4 hours and 20% estimated between 1-2 hours. No participants reported spending less than 1 hour per day.

Analyzing the objective (not self-report) data exported from the Moment app, we found participants averaged 167.83 screen time minutes (or, approximately 2 hours and 50 minutes) on their phone per day over the span of the two weeks ($SD = 69.86$). There was a large range in amount of screen time, with the minimum average being 69.73 minutes (a little over an hour) and the maximum meaning being 366.13 minutes (a little over 6 hours). These objective screen time descriptives align with the subjective phone estimates detailed above, with the majority of individuals estimating spending between 2-4 hours on their devices, and then reporting an objective mean screen time of 2 hours and 50 minutes. Comparison of objective screen time of the control group and mindfulness group post is examined below.

Although not one of our initial hypotheses, we were interested to see if there was a relationship between objective phone use and levels of nomophobia. A Pearson correlation coefficient was calculated and a significant relationship between the two variables was not found ($r = .062, p = .743$).

In regard to smartphone feature use, messaging, social networking, and entertainment were the most commonly reported features, with 75.9% of participants ranking messaging as either first or second, and 62.1% reporting social networking or entertainment first or second, respectively.

Mindfulness Intervention Intention. At the beginning of the Mindfulness Intervention we instructed individuals in the mindfulness condition ($n = 17$) to choose areas of their life they would like to improve through bringing mindful attention to their daily phone use. Out of the 17 participants, 82.35% chose “sleep better,” 70.59% chose “stop wasting time,” and 58.82% chose “sharpen focus.”

Phase 2. Out of the 51 participants in Phase 2, 13.2% estimated spending 6 or more hours on their phone per day, 22.6% estimated 4-6 hours, 41.5% estimated 2-4 hours, 18.9% estimated 1-2 hours and 3.8% estimated less than 1 hour. The subjective phone use findings from Phase 2 mirror those found in Phase 1.

For Phase 2 participants, social networking and messaging were the most commonly reported features, with 78% participants ranking social networking either first or second, and 70.8% ranking messaging either first or second. Both Phase 1 and Phase 2 utilized messaging and social networking above other features, however Phase 2 participants did not utilize entertainment with the same frequency.

Combined Phase 1 and Phase 2. Examining pooled data ($N = 81$) specifically regarding the NMP-Q, not one participant reported an absence of nomophobia (indicated by scores < 20). The majority of participants (58.02%) reported moderate levels of nomophobia, while 14.81% reported mild nomophobia and 27.16% reported severe nomophobia.

Effects of Mindfulness-Oriented Intervention

All analyses related to the Mindfulness-Oriented Intervention utilized data collected from Phase 1 participants. Independent-samples t tests were conducted to determine whether there was equivalency between the randomly assigned control and experimental groups. We examined the means of participants' age, pre-assessment levels of nomophobia, psychological well-being, and

mindfulness. There was a significant difference found in the comparison of mean age ($t(28) = 2.460, p = .020$) with the control group having a significantly higher mean age ($M = 21.46, SD = 2.259$) than the experimental group ($M = 19.88, SD = 1.219$). Correlational analyses revealed no significant relationships between age and the outcome variables.

Regarding our predictions, we hypothesized that those in the experimental group would experience decreased levels of nomophobia, increased levels of psychological well-being and increased levels of mindfulness (H1). To test the effectiveness of the mindfulness intervention, independent-samples t tests were conducted, examining participants' post-assessment measures of nomophobia, psychological well-being, and mindfulness (see Table 1). No significant differences were found between the mean scores of psychological well-being ($t(27) = .385, p = .703$) or mindfulness ($t(27) = -.630, p = .521$). Comparing the mean scores of the experimental and control groups' nomophobia scores yielded a significant result ($t(28) = 2.25, p = .033; d = .82$); the mean of the experimental group ($M = 71.29, SD = 19.75$) was significantly lower than the mean of the control group ($M = 89.08, SD = 23.57$). H1 was therefore partially supported. Those in the experimental group experienced decreased levels of nomophobia, but they did not experience increased psychological well-being or mindfulness.

We predicted that post-intervention those in the experimental group would spend less time on their phones in comparison to those in the control group (H2). To compare the mean screen time (in minutes) of the control and experimental group independent samples t -tests were conducted (see Table 3). There were no differences between the groups for Week 1 (pre-intervention; $t(28) = .155, p = .878$). H2 was not supported as there was no significant difference post-intervention between groups (post-intervention; $t(28) = .052, p = .995$).

Relationships Among Nomophobia, Psychological Well-Being, and Mindfulness

Utilizing data collected from Phase 1 ($N = 30$) and the pre-assessment of Phase 2 ($N = 53$), Pearson correlation coefficients were calculated for the relationship between participants' age, level of nomophobia, psychological well-being and day specific mindfulness. Due to failure to complete all parts of the assessment, a number of participants were excluded from analysis. The following sample sizes were examined: age ($N = 72$) nomophobia ($N = 81$), psychological well-being ($N = 79$), and mindfulness ($N = 80$).

We predicted a significant, negative relationship between nomophobia and psychological well-being (H3), as well as nomophobia and mindfulness (H4). Nomophobia and the total score for psychological well-being were not significantly correlated ($r = -.024, p = .833$), nor were nomophobia and 5 of the 6 psychological well-being subscales (environmental mastery: $r = -.013, p = .919$; personal growth: $r = -.128, p = .205$; positive relations: $r = .112, p = .314$; purpose: $r = .057, p = .828$; self-acceptance: $r = .114, p = .367$). However, there was a significant, negative relationship between nomophobia and autonomy ($r = -.230, p = .040$). Therefore, H3 was partially supported. Nomophobia and mindfulness were not significantly correlated ($r = .143, p = .205$), therefore H4 was not supported. Surprisingly, there was a significant, negative relationship between psychological well-being and mindfulness ($r = -.252, p = .025$). Examining the subscales of the PWB, positive relations with other was the only subscales significantly correlated with mindfulness ($r = -.299, p = .05$). Additionally, there was a positive, significant relationship between age and personal growth ($r = .267, p = .025$). See Table 3 for correlations among all outcome variables, including subscales and age.

Additional Qualitative Support

The nightly reflection surveys completed by the experimental group provided the research team with qualitative data describing each participant's daily phone use experience.

Although a qualitative coding scheme was not utilized in this study, I reviewed all responses and noted common themes of busyness and boredom. Many individuals mentioned using less time than their set screen time goal due to a busy schedule, rather than due to bringing mindful awareness to their phone use. Regarding boredom, many participants reported using more time than their set screen time goal due to having nothing to better to do. Various quotations are referenced in the discussion to support key findings.

Discussion

The current study is one of the first to empirically examine the relationship between mindfulness and smartphone use, specifically regarding nomophobia. Prior research investigating similar aims followed a correlational design (Bauer et al., 2017); the current study was the first to implement an experimental design where participants were randomized to a mindfulness condition.

Our first hypothesis (H1), that those in the mindfulness condition would experience decreased nomophobia, increased mindfulness, and increased psychological well-being was partially supported. In comparison to the control group, those in the experimental group did experience significantly less levels of nomophobia post-intervention. However, there was not a significant increase in day-specific mindfulness or psychological well-being. This means that after the intervention, participants were less afraid to be without their phones, but they were not necessarily more mindful or more psychologically well.

We attribute the significant decrease in nomophobia to the way in which the intervention was constructed. Those in the mindfulness condition were instructed to bring mindful attention to their phone use, which allowed them to recognize their ability to disconnect. Although not subjected to coding, participants' nightly reflections provided some support for this inference.

One participant noted, “I feel as if I am unconsciously recognizing how much time I do not need to spend on my phone.” Another stated, “there were times where I’d pick up my phone and ask if it was useful and put it down and do something else which was good.” This increased awareness surrounding their phone use may have decreased the fear they had regarding not having their phones.

The lack of significant change in mindfulness post-intervention could be due to choice in measurements. While the intervention provided instructions to increase phone specific mindfulness, it did not provide directions to increase day-specific mindfulness. In other words, participants were taught how to increase their acceptance and awareness of their phone use, but not shown how to infuse this awareness into their day to day life. The MAAS measures day-specific mindfulness not phone specific mindfulness, so it is understandable that there was not a significant change in mindfulness post-intervention. Perhaps if we assessed phone-specific mindfulness (which was measured in Bauer et. al’s 2017 study), we would have seen a notable shift when comparing the control and mindfulness conditions.

The lack of support of the latter parts of H1 (increased mindfulness and increased psychological well-being) could also be connected to the lack of support for H3 and H4. If nomophobia is not significantly related to mindfulness or psychological well-being, then it makes sense that as levels of nomophobia decreased, levels of mindfulness and psychological well-being could be unaffected.

Our second hypothesis (H2), that postulated differences in objective phone use in relation to the intervention, was not supported; screen time did not differ between the two groups. In fact, although insignificant, we actually saw a slight increase in the amount of screen time the experimental group participants reported post-intervention (see Table 3). This could be attributed

to the way in which we had participants set their screen time goal. They were directed to reflect on the data that was compiled by the Moment app during Week 1 to set their initial goal for Day 1 of Week 2. Although the following instructions were given: “You should aim for your goal to be less than the average amount of time you spend on your phone,” most participants used the average time reported as their baseline.

Participants’ take away may not have been being on their phone less, but rather using their phone more purposefully. For example, one participant said “the time spent on my phone today was much much much more productive. I was actually using social media however to productively connect with people and work my business.” This connects back to our finding regarding nomophobia and autonomy. Bringing conscious awareness to one’s phone use allowed them to make more autonomous decisions in relation to their device.

Regarding H3, we did not find a significant relationship between nomophobia and overall psychological well-being. This could be due to what nomophobia measures: the fear of being *without* one’s smartphone. In general, individuals are not disconnected from their devices, therefore this fear may not outwardly influence their psychological well-being. Perhaps if this study instructed individuals to actively disconnect from their phones, psychological well-being would have been affected.

It is also possible that people are able to live happy, fulfilling lives while having dependencies on their smartphones. The prior research cited regarding smartphones and psychological well-being yielded conflicting results (Stepanikova, Nie, & He, 2010; Kim, Wang & Oh, 2016; Verduyn, Ybarra, Resibois, Jonides, & Kross, 2017; Best, Manktelow, & Taylor, 2014), so it is not completely surprising that nomophobia and psychological well-being were not significantly correlated. For some, their phones may truly be enhancing their well-being,

therefore it would make sense that they would be fearful of not having the device. For others, they may be experiencing the negative side effects of perpetual smartphone use. Research should continue to explore the factors that influence the relationship between smartphone use and psychological well-being (time, function, etc.)

Although we did not find a significant relationship between nomophobia and overall psychological well-being, we did observe a significant, negative relationship between nomophobia and autonomy, a component of well-being. According to the scoring of the PWB, those high in autonomy have the ability to “resist social pressures to act in certain ways” and “regulate behavior from within” (Ryff, 1989). Additionally, individuals with higher autonomy scores “evaluates self by personal standards,” rather than relying on others for external validation. Each of these components of autonomy connect to reasons why individuals utilize their smartphones. Being constantly connected via social media comes with social pressure, especially in terms of fear of missing out and portraying oneself in a positive light (Stead & Bibby, 2017). Perhaps autonomous behaviors allows individuals to feel fulfilled without depending on their devices for their well-being.

This compliments Bauer et al.’s (2017) research, that found that autonomous use of instant messengers (a common use of smartphones) mediated the positive relationship between day-specific mindfulness and well-being. It seems that when individuals are choosing to use their phones in a way that matches their values and needs, they have more positive experiences using their devices, and are less afraid to be without their phones.

Nomophobia was not significantly correlated with the other subscales of the PWB (those being environmental mastery, personal growth, positive relations with others, purpose in life, and self-acceptance). The conflicting findings prior research has yielded regarding smartphones and

psychological well-being could help explain these inconclusive results. Those high in environmental mastery are able to “control complex array of external activities” and those high in purpose have “goals in life and a sense of direction” (Ryff, 1989). On one hand, both of these components of psychological well-being could be supported by the various features on a smartphone (calendars, reminders, messaging, etc.) On the other, if individuals are using their smartphones in a mindless, non-autonomous way, their smartphone use could inhibit their ability to manage their goals and responsibilities.

Personal growth and self-acceptance relate highly to sense of self, with high scores of personal growth indicating seeing oneself as “growing and expanding” and high scores of self-acceptance demonstrating possessing a “positive attitude towards the self.” Social media allows a person to create an online persona that can change immediately via the clicking of buttons, and can positively influence one’s self-esteem (Best, Manktelow, & Taylor, 2014). However, social media use can also damage individual’s self-esteem, especially if they are passively comparing themselves to other people (Verduyn et al., 2017) Lastly, those with high scores in positive relations with other have “warm satisfying, trusting relationships with others.” Prior research about smartphone use and social connectedness found that these devices have the ability to both enhance social support and increase loneliness depending on the individual and how they are interacting with the technology (Kim, Wang, & Oh, 2016; Ahn & Shin, 2013). Perhaps, this lack of significance between nomophobia and various components of the PWB points to smartphones being able to positively or negatively impact our well-being. It could be that the negative relationship found between nomophobia and autonomy indicates that self-regulated behavior is a determining factor in whether or not smartphones are benefitting or hindering our well-being. Additionally, it could be that psychological well-being is too broad of a measure for examining

the relationship between humans and smartphones. Future research may consider utilizing a more focused approach that investigates aspects of well-being most likely to be affected by phone use. This is a contribution to the literature because it helps us to better understand how phone use affects well-being.

Our fourth hypothesis examined the relationship between nomophobia and mindfulness. Based on the current research, it does not seem that day-specific mindfulness affects the level of fear people have of being without their phone. We postulated a relationship between nomophobia and mindfulness based on the presumption that fear of not having one's phone would likely be indicative of perpetual use of one's phone, which would in turn shift one's awareness from the present moment and to the device at hand. Additionally, fear and distress (which are markers of nomophobia) take individuals out of the present moment experience and into their own minds. However, nomophobia was not significantly correlated with objective levels of phone use or day-specific mindfulness.

The lack of relationship between nomophobia and objective phone use points to the fear stemming from accessibility, rather than from active use of the device. A person could theoretically have their phone in their pocket all day without unlocking it and still experience intense anxiety at the thought of being disconnected. Understanding this distinction could help researchers and clinicians better understand the characteristics of nomophobia. As previously stated, the proposed clinical characteristics of nomophobia include, but are not limited to: habitual use, owning multiple devices, extreme anxiety regarding losing one's device, obsessively looking at one's phone, needing the device to always be on, and reduced face-to-face interactions (Bragazzi & Del Puente, 2014). However, this research shows that individuals could

still experience severe levels of nomophobia and not demonstrate decreased levels of various dimensions of psychological well-being (not including autonomy.)

The lack of relationship between nomophobia and day-specific mindfulness could be due to the same inference that was drawn from the lack of support for H3: individuals are not often in situations where they are a) not able to have their phone or b) instructed to think about not having their phone; rather, we are constantly connected. Therefore, this fear lays dormant, not necessarily affecting our mental space on a daily basis.

We were surprised by the lack of positive relationships between mindfulness and the subscales of psychological well-being, especially when considering the research that has shown vast psychological benefits in relation to mindfulness (Brown & Ryan, 2003; Kabat-Zinn, 2013). The only subscale that was significantly related to mindfulness was positive relations with others and it was negatively correlated. We posit that this finding could be due to the often-extroverted nature of social connection. The cultivation of mindfulness involves self-exploration, which is an inward process. Future research should examine mindfulness' relationship with social connectedness.

Limitations and Future Directions

There are several limitations in this research that need to be considered. Firstly, both Phase 1 and Phase 2 had relatively small sample sizes due to the time-intensive nature of the intervention and a small participant pool to draw from. In addition, the pooled sample which was fairly homogenous in terms of demographics thus decreasing external validity. Limited diversity of population could have also led to skewed results, specifically in relationship to the variable of mindfulness. A study conducted by Shook, Ford, Strough, Delaney, & Barker (2017) found that

older individuals reported higher levels of mindfulness than younger adults. Our participant pool was comprised of young adults; diversity in terms of age could have yielded different results.

Secondly, there were areas of concern regarding the logistics of the intervention. Phone tracking was taking place for two weeks, the majority of which the researcher was not present. In order to accurately track phone use, the Moment application must be open in the background of one's phone. In the nightly reflections, a few participants noted that they accidentally closed out the Moment app. The control group did not complete nightly reflections, so it is impossible to know if this occurrence took place. Inaccurate data could have skewed results, specifically regarding H4. Additionally, nightly reflections were sent between 6-7pm each night. Many participants were awake and using their phone long after they submitted the survey, which could have skewed their goal setting reflection.

Thirdly, different measurements may have yielded more conclusive results. We utilized the Nomophobia Questionnaire to measure nomophobia, which assesses the fear one has when thinking about not having their device. For most individuals, quelling this fear involves being constantly in reach of one's device. Instead of assessing the fear one has when not having their device, we could have measured how they felt while being connected to their devices. The Smartphone Addiction Scale (SAS) may have been a better fit, seeing that this measurement assesses how individuals interact with their devices rather than how they feel imagining being without them (Kwon et al., 2013). The SAS includes seven subscales which are: daily-life disturbance, disturbance of reality testing, positive anticipation, withdrawal, cyberspace-oriented relationship, overuse, and tolerance. This measurement may have been more telling regarding participant's psychological well-being, since they are in fact, connected to their phones.

We utilized the MAAS to measure day-specific mindfulness, but our intervention did not include instructions to increase day specific mindfulness. Cultivating mindful attention takes discipline, commitment, and openness, which is often practiced through meditation techniques (Gunatarana, 2002). One of the most renowned mindfulness interventions, Mindfulness Based Stress Reduction, created by Jon Kabat-Zinn, is completed over the course of 8 weeks and includes in person meetings, daily home practice and a silent, day long retreat (Kabat-Zinn, 2013). The program follows an in depth, carefully crafted curriculum that is led by experienced meditators. Due to time and resource constraints, we were unable to follow a similar protocol. This led to our intervention disregarding many facets of mindfulness, such as important lessons of impermanence and dissolution of self. For the current study, it would have been more pertinent to measure phone-specific mindfulness in the pre- and post- assessments. Future studies may explore mindfulness-based interventions in a broader sense, determining if increased day-specific mindfulness influences the way individuals interact with technology. As mindfulness research continues to grow in the field of clinical psychology, it is vitally important that researchers and clinicians understand the complex nature of mindfulness, in order to truly capture the transformative nature of the practice (Kabat-Zinn, 2003).

Lastly, the current study assessed nomophobia in relation to psychological well-being, but future research may consider examining the relationship between nomophobia and physiological well-being; specifically regarding sleep quality. The vast majority of our experimental condition participants (82.35%) reported wanting to improve their sleep quality through bringing mindful awareness to their phone use. Such a large proportion of our participants noting that changing their relationship with their phone could influence their sleeping patterns echoes prior findings that linked smartphone use and poor sleep quality

(Twenge, Krizan, & Hisler, 2017; Lemola, Perkinson-Gloor, Brand, Dewald-Kaufmann, & Grob, 2014).

Conclusion

This research reaffirms how prevalent the fear of being without one's phone is in our society, specifically in the young adult, or iGen, population. While the initial study that coined nomophobia found that 53% of individuals reported nomophobia (D'Agata, 2008), our study found that 100% of participants had this fear, with over 85% expressing moderate to severe levels of nomophobia. As devices become more technologically advanced and integral to our day to day lives, it becomes increasingly important that we learn healthy ways to approach phone use. This study showed that bringing mindful attention to our smartphone use can decrease the fear we have of being without them. Additionally, the negative relationship between nomophobia and autonomy demonstrated that when we are choosing to use our phones in ways that align with our needs, we have less of a dependency on our devices. However, this study did not find a significant relationship between nomophobia and other components of psychological well-being. Further research should examine how being constantly connected affects our mental space. Are we able to live healthy lives with our devices always a reach away?

While the existing research offers conflicting findings about whether or not smartphones are beneficial or detrimental to our overall well-being, it's important to remember that we are in the driver's seat when it comes to utilizing these devices. If we bring mindful awareness to the way we interact with our phones, we can influence our relationship with our devices. Future research should examine if mindless behavior impacts how susceptible we are to falling trap to the negative side effects of perpetual phone use. One participant stated the following in a nightly reflection response: "I used less screen time and I have been doing that consistently throughout

the study. I have felt happier and [I'm] realizing that do not need to be on my phone to feel productive.” It is possible to appreciate the vast utility that these devices provide, use them in a way that benefits our well-being, *and* feel whole in their absence.

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Tables

Table 1

	Group						95% CI for Mean Difference	t	Sig.	df	d
	Control			Experimental							
	M	SD	n	M	SD	n					
NMP-Q	89.07	23.57	13	71.29	19.75	17	1.58, 33.99	2.25	.033*	28	.82
PWB	162.77	13.60	13	160.38	18.71	16	-10.35, 15.14	.385	.703	27	.15
MAAS	41.31	11.07	13	43.63	8.11	16	-9.63, 4.99	-.630	.521	27	.24

Results of t-test and Descriptive Statistics for post-assessment scores of NMP-Q, PWB, and MAAS between groups

*Difference is significant at $p < .05$ level.

Table 2

	Group						95% CI for Mean Difference	t	Sig.	df
	Control			Experimental						
	M	SD	n	M	SD	n				
Week 1 Screen Time	166.08	81.95	13	162.06	60.50	17	-49.19, 56.23	.155	.637	28
Week 2 Screen Time	176.31	75.85	13	174.82	79.10	17	-57.17, 59.96	.149	.753	28

Results of t-test and Descriptive Statistics for Weekly Screen Time comparison between groups

Table 3

Measure	1	2	3	4	n	M	SD
1. Age	-	-.167	-.062	.209	72	20.46	2.495
2. NMP-Q	-.167	-	.148	-.024	81	83.54	22.52
3. MAAS	-.062	.148	-	-.253*	80	52.08	11.32
4. PWB	.209	-.024	-.253*	-	79	158.15	18.08
A. Autonomy	-.001	-.230*	.003	.466**	80	23.59	4.52
B. Environmental Mastery	.141	-.013	-.093	.723**	80	22.04	4.67
C. Personal Growth	.267*	-.128	-.149	.752**	79	33.34	4.38
D. Positive Relations	.097	.112	-.299*	.612**	80	27.71	4.71
E. Purpose	.175	.057	-.048	.694**	80	27.28	4.40
F. Self-Acceptance	.090	.114	-.182	.736**	80	24.68	4.85

Correlations of Age, Nomophobia, Mindfulness and Psychological Well-Being for all participants

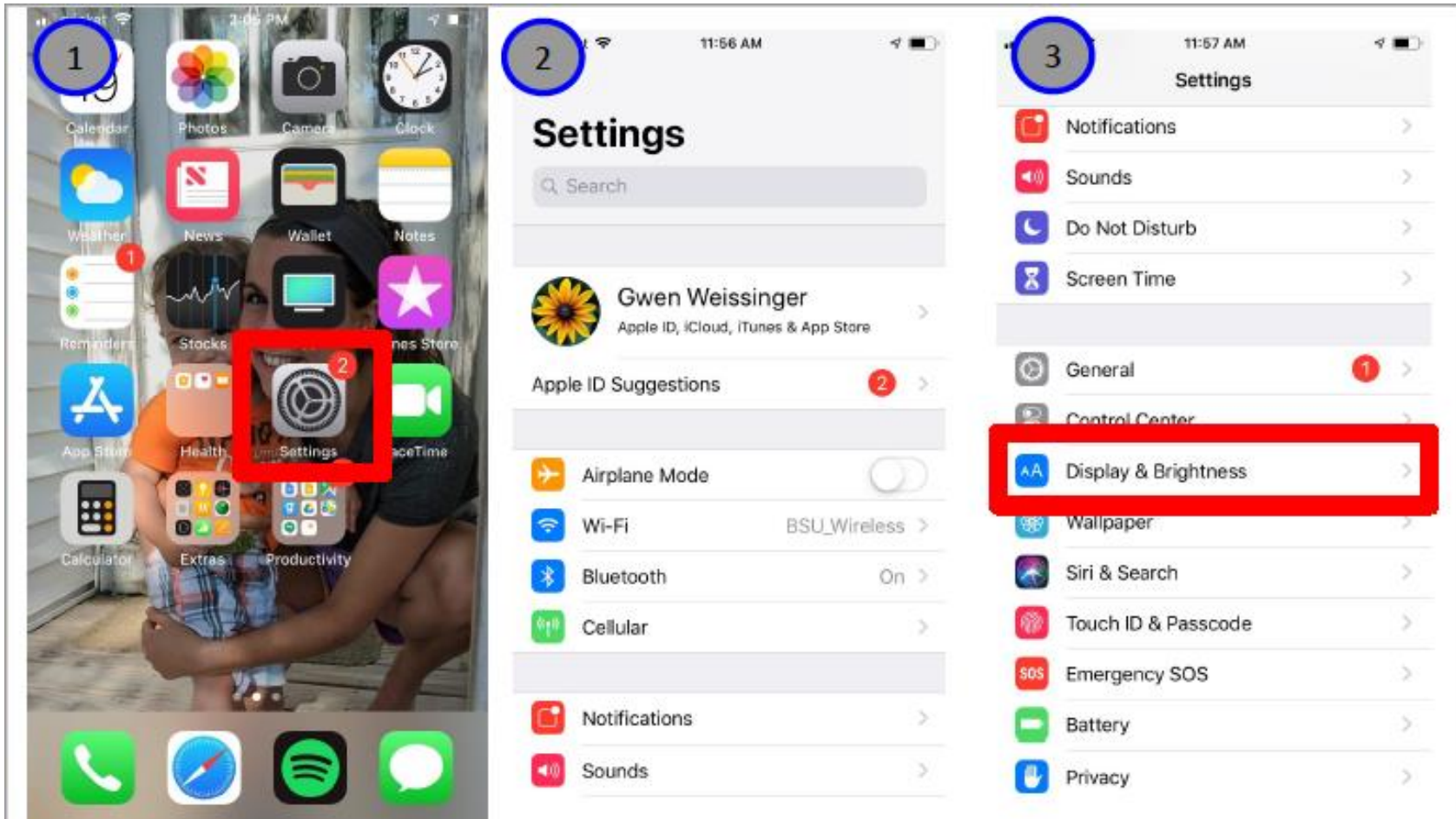
Note. Phase 1 data was collected from participant's pre-assessment scores. NMP-Q: Nomophobia Questionnaire; PWB: Ryff's Psychological Well-being Scales; MAAS: Mindfulness Attention and Awareness Scale.

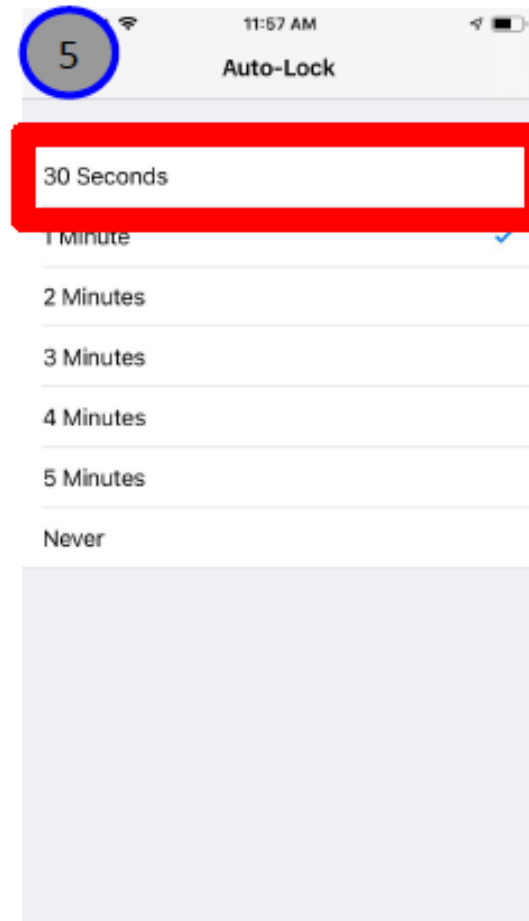
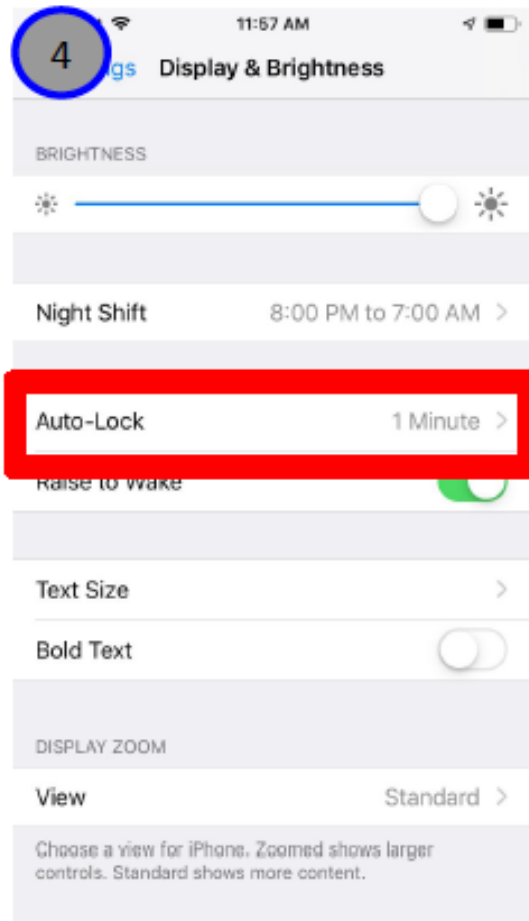
**Correlation is significant at the $p < .01$ level; *Correlation is significant at the $p < .05$ level.

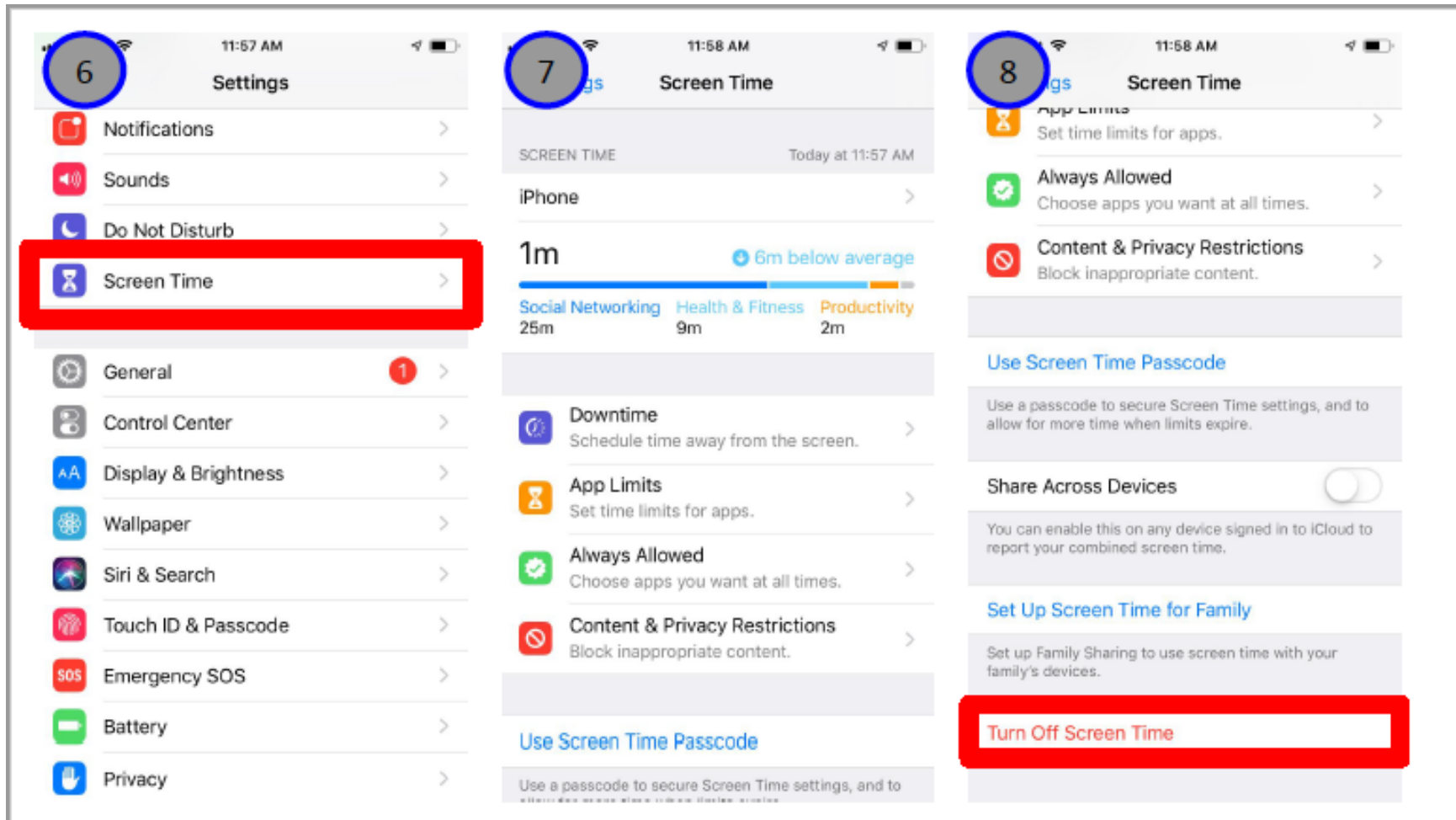
Appendix A

Phone Setting Presentation

Initial Meeting

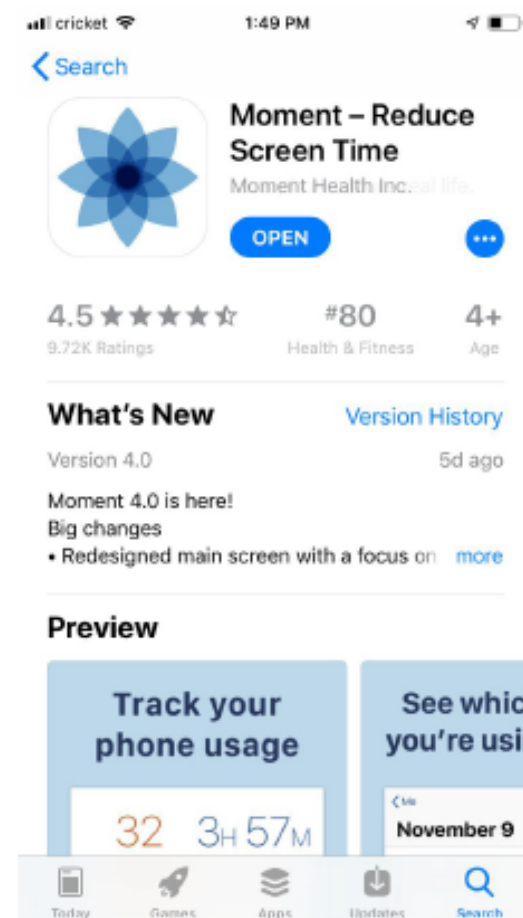




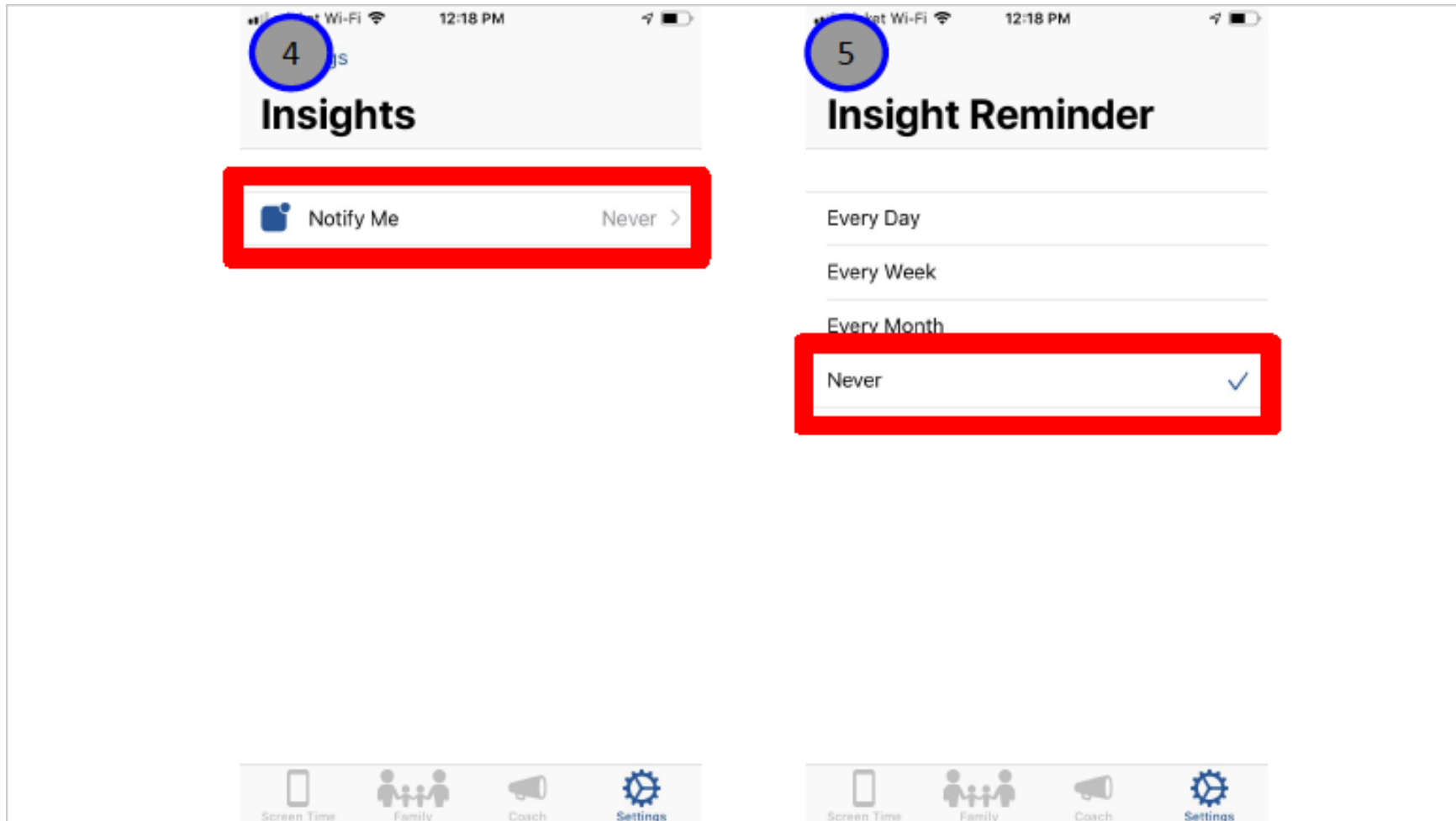


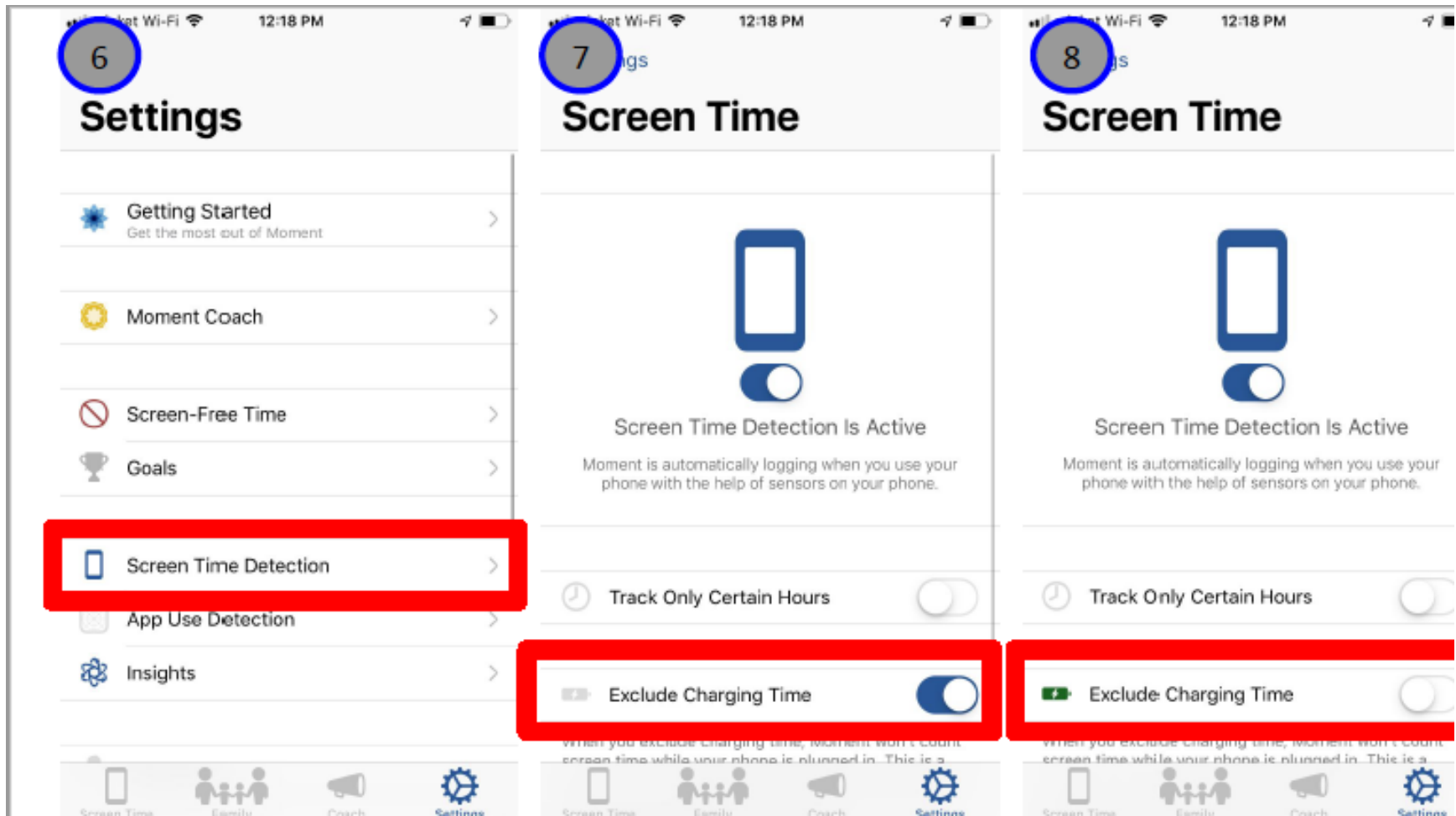


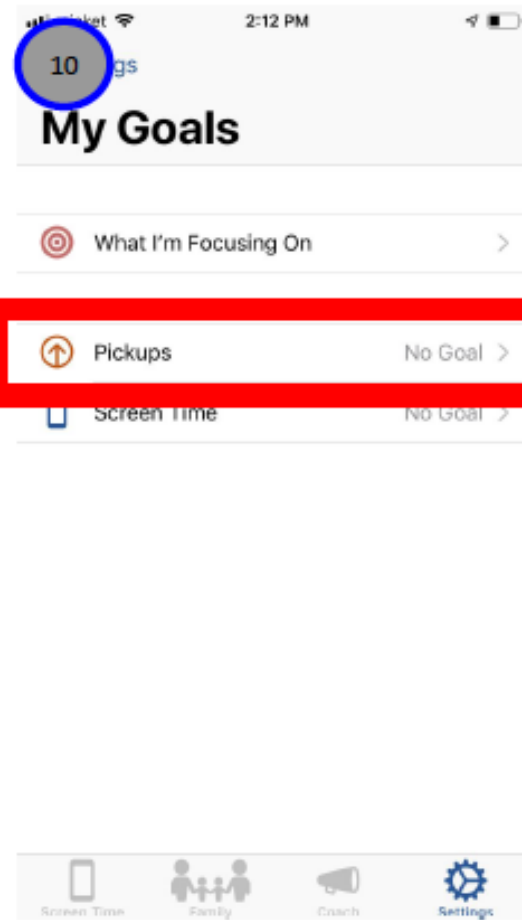
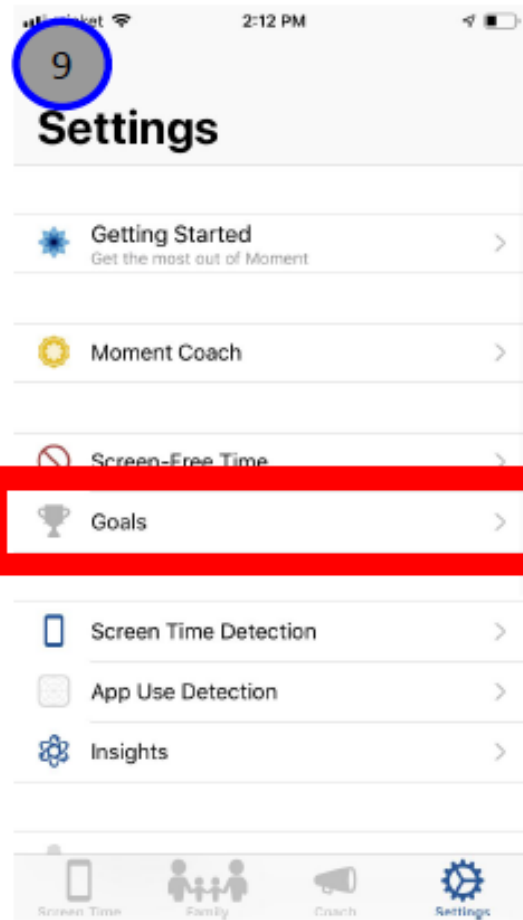
Please go to the
app store and
download the
Moment
application

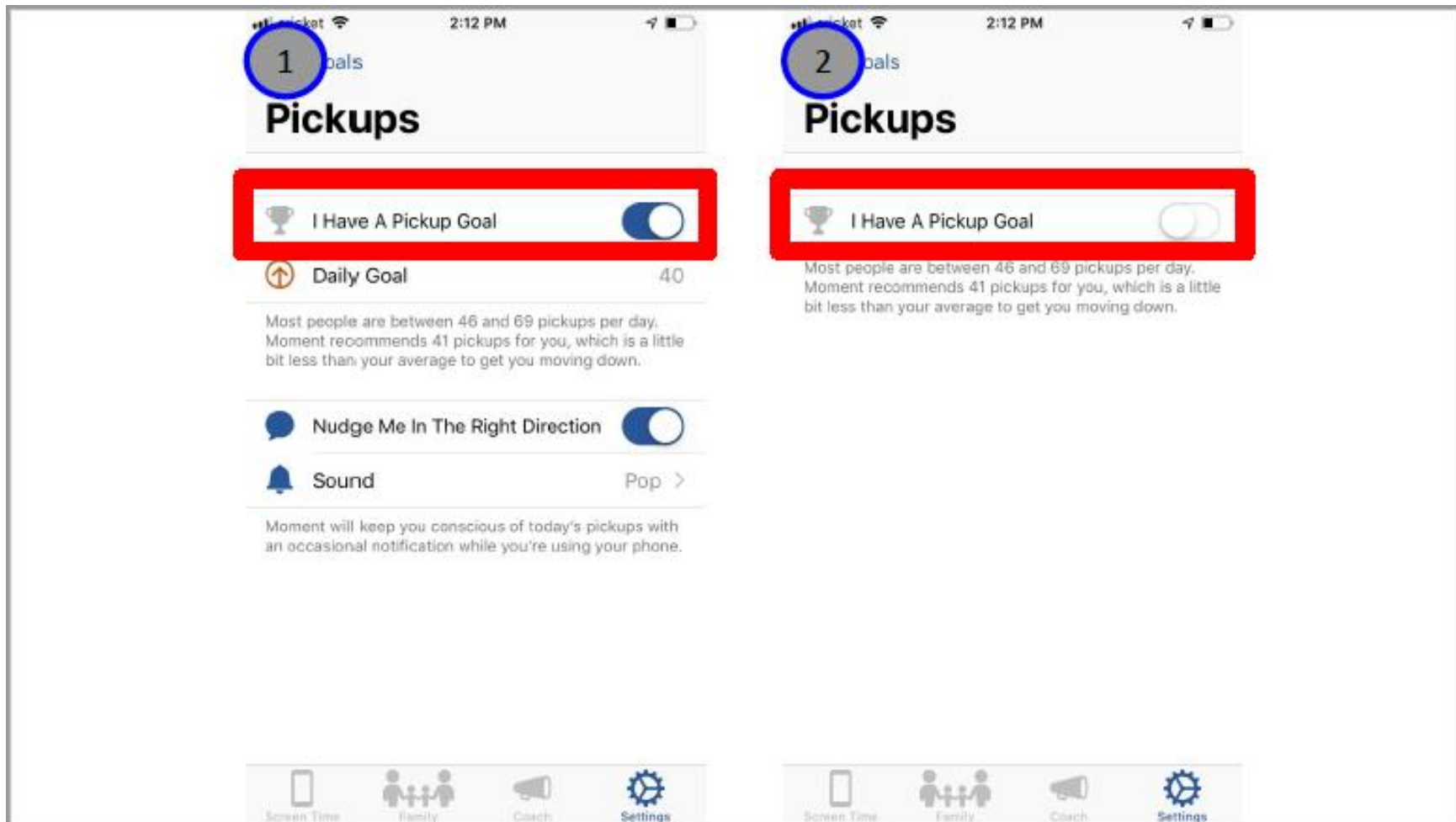


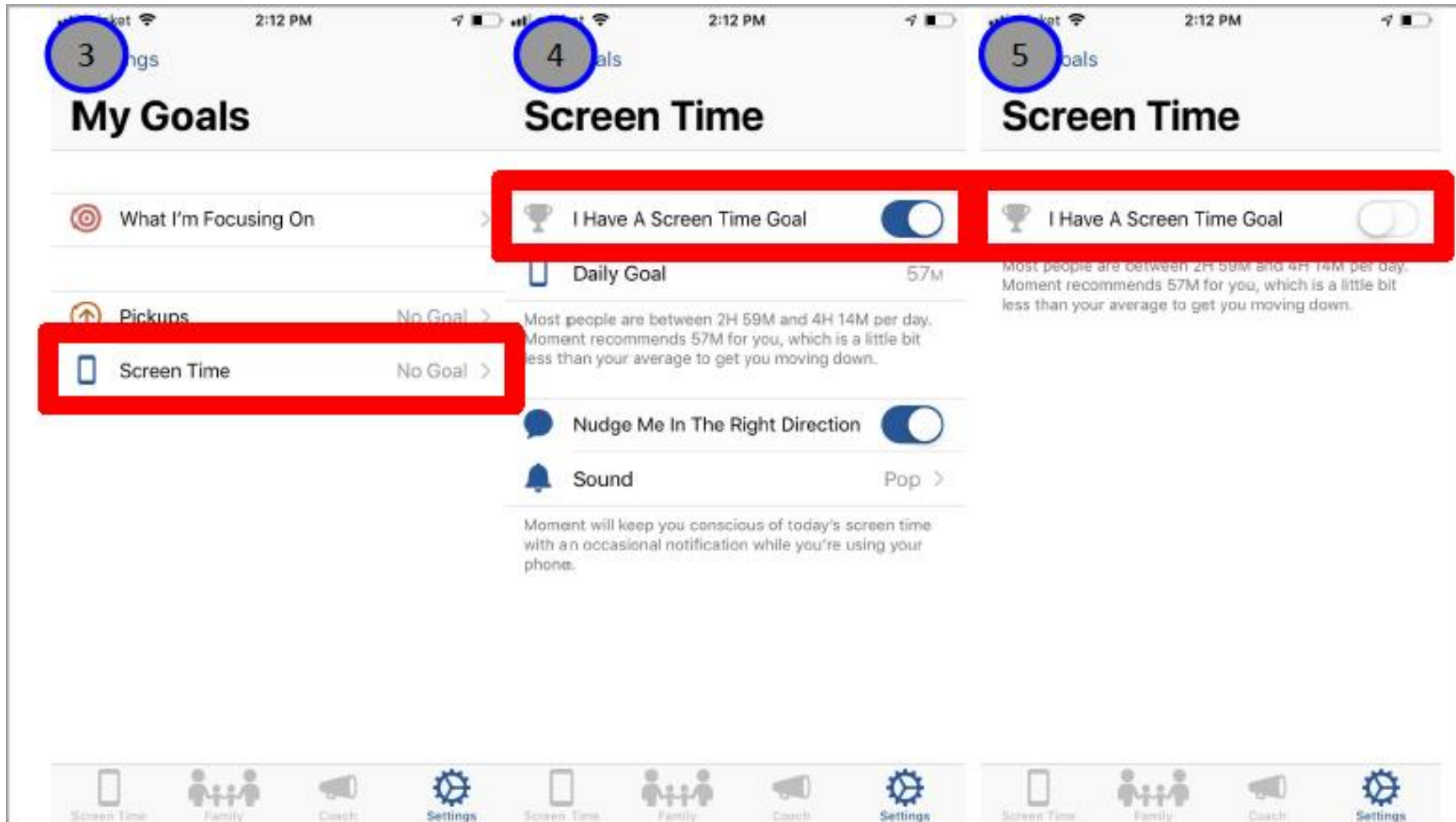












- Go into Phone Settings
- Click Moment
- Do not allow notifications

Instructions

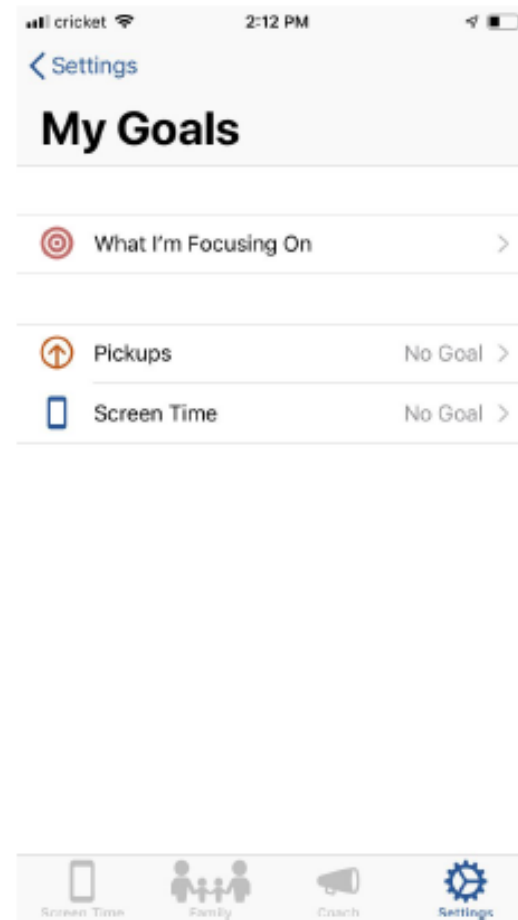
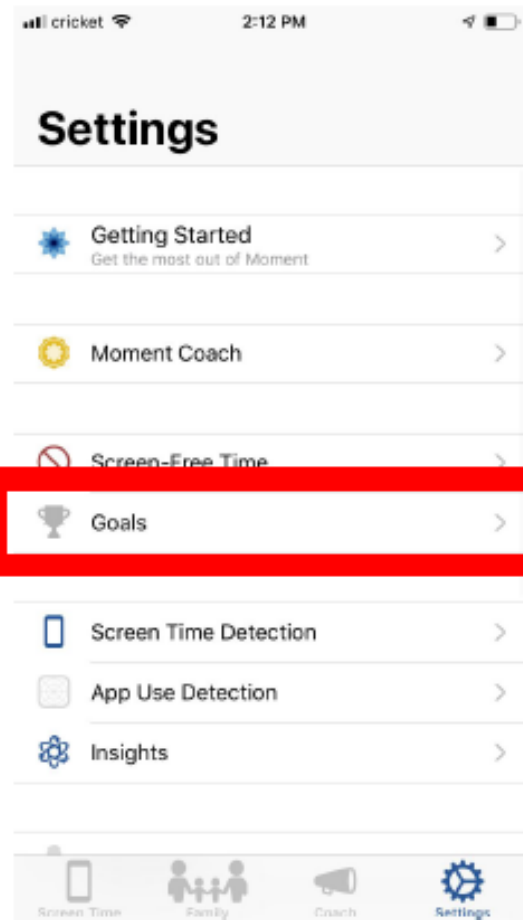
- Do not force quit the Moment app
- Do not disable location services
- Do your best to make no changes to your regular phone use

- If you have any questions during this process, please reach out!

Mindfulness Integration Presentation

Were you receiving notifications this week?

Please go into Settings and turn notifications for the
Moment app on




What are you focusing on?

Bring awareness to why you may want to be more mindful of your phone use.


What aspects of your life would you like to improve through your phone use habits?


Choose all that apply (on both the app and the survey)


I Want To...


 Track screen time


 Sharpen focus

 Have more family time

 Sleep better

 Feel happier

 Stop wasting time

 Reduce anxiety

 Improve relationships


Goal Setting

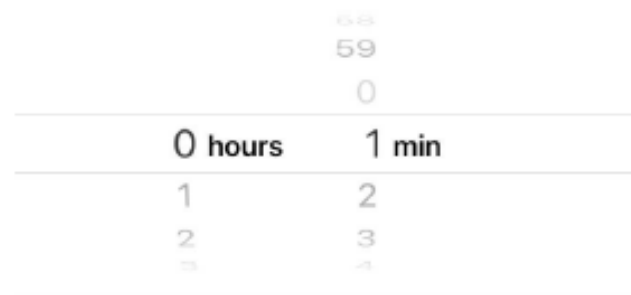
Reflecting on your past week's phone use, please set a Screen Time goal for today.

You should aim for your goal to be less than the average amount of time you spend on your phone.

Screen Time

 I Have A Screen Time Goal

 Daily Goal 1M



 Nudge Me In The Right Direction

 Sound Pop >

When you receive a notification...

Take a moment to lock your phone and bring awareness to your phone use.

You could contemplate the question:

“Is my phone use in this moment fulfilling a certain goal?”

Or, simply take a breath and notice that you were on your phone in that moment.

After pausing, you will decide how to proceed forward.

This Week...

Remember to integrate mindful moments into your phone use.

Each night you will receive an email from me with a **brief survey** about your phone use experience that day.

Please **respond to the survey as soon as you can** (very important it is filled out the night you receive it!)

The survey will instruct you to **set a screen time goal each night**.

If you change your screen time goal from the previous day, please write that in the survey and also change your goal in the Moment app.

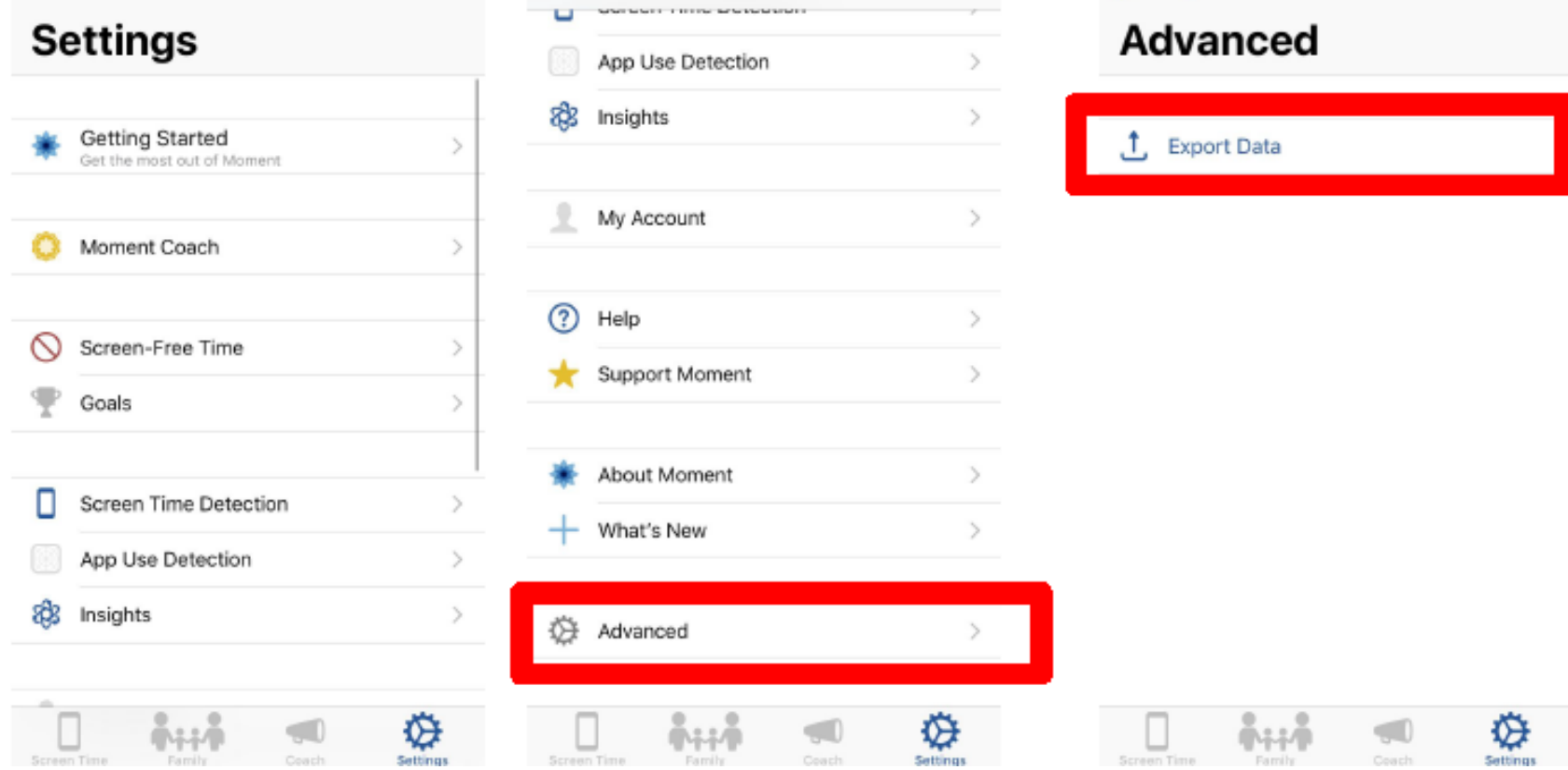
At the conclusion of the study

You will receive a **Post-Assessment Survey** in your inbox, please take it as soon as you can after you receiving it

You will also be responsible for **exporting your data**

10 flex dollars will be added to your card after your completion of the study

How to Export Data



Please reach out if any questions or concerns arise
throughout the week.

Thank you!