The Effect of a Text Message-Based Intervention System on Meditation Practice

by

Ellis Nathan Bernstein

A dissertation submitted to the Graduate Faculty of
Auburn University
in partial fulfillment of the
requirements for the Degree of
Doctor of Philosophy

Auburn, Alabama
August 3, 2019

Keywords: Behavior Implementation, Text Message-Based Intervention, Accountability,
Mindfulness Meditation, Self-Efficacy

Approved by

Dr. Randolph Pipes [Chair], Professor Emeritus, Department of Special Education,
Rehabilitation, and Counseling
Dr. Marilyn Cornish, Assistant Professor, Department of Special Education, Rehabilitation, and
Counseling
Dr. Daniel Svyantek, Professor, Department of Psychology
Dr. Mary Rudisill, Distinguished Professor, School of Kinesiology
Dr. Ford Dyke, Assistant Clinical Professor, School of Kinesiology

Abstract

This study investigated the use of a text message-based intervention system on meditation practice. The study compared an experimental group who utilized a text message-based intervention system that included a perceived accountability partner with a control group who utilized a similar system that did not include the perceived accountability partner. Dependent variables included the recorded number of text messages sent by participants (a proxy for frequency of meditation in the design), measures of mindfulness, and measures of self-efficacy. Pre- and post-test data from 84 participants were analyzed using independent samples t-tests, between-subject analysis of variance (ANOVA), repeated measures ANOVA, and Pearson correlation. Results indicated a significant main effect of condition (i.e., experimental vs. control) on texting behavior, and a non-significant effect of condition on pre- and post-test self-report measures. These results indicate that the use of this text message-based intervention system increased the likelihood that participants would engage in the practice of mindfulness meditation, however this engagement did not lead to differential changes between groups in self-reported mindfulness or feelings of self-efficacy.

Acknowledgments

This dissertation is dedicated to Dr. Pipes. Carl Rogers once said, "The only man who is educated is the man who has learned how to adapt and change; the man who has realized that no knowledge is secure, that only the process of seeking knowledge gives a basis for security." Dr. Pipes, you have taught me how to conduct research and how to be an effective therapist. You have taught me how to stand up for my beliefs, through rigorous (and numerous) challenges. Most importantly, you have taught me how to love the process of learning. Thank you for being the best teacher that I have ever had.

This dissertation is also dedicated to my family. Dad, thank you for teaching me how to work really, really hard. During the long process of this dissertation, I regularly relied on your voice in the back of my head reminding me to, "always finish the job." Mom, thank you for being my "Microdeal" (accountability) partner, for being my therapist, and for being the most psychologically healthy person in the universe. I am honored to follow in your footsteps as a therapist. Daniel, thank you for being my role model. Thank you for tenaciously chasing what you love, and for inspiring me to do the same. Joycie, thank you for being my endless source of joy. I laugh harder with you than I do with anyone else, and it means the world to me. Last, I would like to dedicate this dissertation to my late Uncle Steve. Thank you for fostering my interest in research, and for showing me what it means to view the world from the lens of a scientist.

Table of Contents

List of Tables

List of Figures

List of Appendices

Informal Beginnings of the Study

The origins of the present study are partially rooted in my own experience of using this intervention. More specifically, some time ago I had a conversation with a colleague, which revealed that we both had the desire to implement a regular meditation practice, but also found it quite difficult to make ourselves engage in this practice with any degree of regularity. Thus, we devised a system whereby we would meditate for 5 out of 7 days per week, and would send text-messages to one another after we had done our meditation practice for the day. This meant that we were accountable to each other for our spending some time (or not) in meditation. For the past 5 years, we have continued this practice, using this implementation technique to successfully implement a wide variety of behaviors (e.g., flossing, exercising, writing this dissertation). After having this experience, I began to wonder about the research literature related to beginning, maintaining, and enhancing health-related behaviors through the utilization of text messages.

1. Introduction

The French writer Antoine de Saint-Exupérya once stated, "a goal without a plan is just a wish." This dissertation explores one possible 'plan' to help individuals move their desired goals from wish to behavioral implementation. Research suggests that individuals are oftentimes unsuccessful in implementing their desired behaviors. For example, when considering New Year's resolutions, or goals which individuals set themselves to achieve in the coming year, Miller and Marlatt (1998) found that 67% of participants stated that they made at least three resolutions, and only 25% of participants reported succeeding at their attempted resolutions. More recent studies have shown that when individuals state that they are going to give up the popular social media outlet Twitter for the 40 days of Lent (a religious observance within the Christian religion), only 64% of users are able to successfully do so (Schoenebeck, 2014). Likewise, a survey done by TIME magazine and Stanford University demonstrated that of 2,330 American adults who were polled, 77% reported wanting to live to 100, and more than a third believed they will live past 90. However, the same survey showed that only 25% of individuals reported eating as well as they thought they should, and only 24% exercised as much as they thought they should (Sifferlin, 2016). Thus, for many people, there is a discrepancy between predicted outcomes (e.g., longevity of life) and the completion of behaviors which would theoretically help fulfill this outcome (e.g., physical exercise or healthy eating).

There is a large body of research regarding which health-related behaviors correlate with increased levels of well-being. However, there seems to be insufficient research regarding the actual implementation of these behaviors (Schwarzer, 2001; Craig et al., 2008). Findings about ways in which we can improve our well-being mean very little if individuals cannot implement these behaviors in their lives. Thus, the present study investigated the promotion of well-being

1

through the use of intentional activities; defined as actions that people can choose to do and which take some degree of effort to enact (Lyubomirsky et al., 2005; Lucas & Donnellan, 2007). While research on happiness and well-being is certainly limited in terms of measurement, positive psychology researchers have theorized that approximately 40% of happiness can be credited to these intentional activities. These researchers suggest that the use of "intentional activities offer the best potential route to higher and sustainable levels of happiness" (Lyubomirsky et al., 2005, p. 9). Some examples of intentional behaviors, such as engaging in physical activity, implementing optimal sleep routines, or practicing mindfulness meditation have shown significantly positive effects on participants' self-reported levels of well-being (Dolan et al., 2014; Gish & Wagner, 2016; Fredrickson et al., 2008; Kong et al., 2014).

The aforementioned research suggests that if individuals are better able to complete desired behaviors, their level of self-reported well-being would likely increase (Lyubomirsky et al., 2005). This process could also bolster one's sense of self-efficacy. Self-efficacy can be thought of as one's confidence regarding their capability of performing desired behaviors (Bandura, 1994). Self-efficacy is an important determinant of a number of behaviors, however our knowledge of how to actually change self-efficacy remains limited (Ashford et al., 2010). Bandura (1977) proposed that self-efficacy is the consequence of four informational sources: enactive mastery experience, vicarious experience, verbal persuasion, and the reduction of negative affective states. Enactive mastery refers to one's performance of a target behavior. Successful performance of a target behavior theoretically enhances one's perception of their self-efficacy, while failure to perform the behavior undermines it. Vicarious experience refers to the appraisal of one's performance of a target behavior when compared with similar others who have attempted to perform the same behavior. Verbal persuasion refers to situations in which others express faith in the individual's

capabilities to perform a desired behavior. Lastly, Bandura proposed that reducing negative affective states can enhance self-efficacy perceptions (Bandura, 1977). Thus, it is hypothesized that the successful performance of intentional activities can lead to both increased self-efficacy and increased happiness.

The author hypothesizes that one avenue worth exploring to help individuals implement their desired behaviors is the avenue of technology utilization. The average American spends over 10.5 hours per day consuming digital media (Nielson Total Audience Report, 2016). Oftentimes, these screens are attached to one of the estimated 7 billion cellular phones that currently exist around the globe (Roberts et al., 2014; Central Intelligence Agency, 2015). In fact, cell phone usage has currently penetrated 96% of the global adult population (Sanou, 2015). One notable class of behavior which has come from cell phone technology has been our newly acquired ability to communicate via text message. The average U.S. mobile cellular user sends and receives 764.2 text messages per month, and 81% of Americans report texting regularly (Nielsen, 2013; Pew Research Center, 2015). Texting seems to be especially pronounced among college-aged students, with this population spending an average of 94 minutes per day texting (Roberts et al., 2014). In the recent past, text-based technology has regularly been utilized in relation to health psychology (for review, see Hall et al., 2015). The aim of this study was to incorporate this novel technology as a method of interpersonal communication to enhance a particular health behavior, namely mindfulness meditation.

One specific way in which the aforementioned technology could influence the implementation of desired behavior is through the use social influence. Cialdini and Goldstein (2004) remark on how, "The study of social influence is renowned for its demonstration and explication of dramatic psychological phenomena that often occur in direct response to overt social

forces" (p. 591). Perhaps the most notable psychological experiment to demonstrate this effect was Milgram's work in 1974, whereby the effect of social influence was pronounced enough to lead individuals to theoretically administer a lethal level of electric shock to individuals. Another notable example of the power of social influence can be seen in Asch's (1956) famous line-judgement conformity experiments, whereby individuals seemed to go against their own perceptions regarding judgements of line lengths on 37% of trials because of the social influence of others. This behavior seems to be driven by a fundamental human motivation to affiliate with others in order to create and maintain meaningful social relationships (Baumeister & Leary, 1995). A more recent study looking at rates of obesity in relation to large social networks provides further evidence of the powerful impact of social influence. This study (Christakis & Fowler, 2007) found that if an individual has an obese social contact within one degree of separation, the probability of that individual also being obese increase by 45%. In the same vein, meta-analytic research on food intake has shown that individual's eating behaviors seem to be moderated by the modeling of others when individuals are consuming a meal together (Vartanian et al., 2015; Herman, 2015). These studies, and many more, validate Aristotle's assertion that "man is by nature a social animal" (1905, 1253a).

While these foundational studies demonstrated how individuals are influenced by others during in-person interpersonal interactions, our move into a more online lifestyle has given way to more complex networks. Grudz and Wellman (2014, p. 1252) note that because "social media has extended the scope, speed, and complexity of communication models – social influence needs to take these changes into account." Research done by Zhu and Huberman (2014) demonstrated this concept. Namely, they first asked participants to provide their preference from pairs of items. They were then asked to make second choices about the same pairs of items in the context of knowing

the preferences of others through an online study platform which simulated the format of popular online electronic commerce sites such as Amazon.com. Unsurprisingly, the results of this study demonstrate how individuals will swap their original choices based on the opinions of others up to 22.4% of the time when they are asked to make their second decision sometime later. If these individuals are asked whether they want to swap immediately, individuals will switch their preferences 14.1% of the time (Zhu & Huberman, 2014).

Since our new level of technology-facilitated social connectedness might provide a new terrain for social influence, it seems reasonable to assume that this new form of social influence could be used to help individuals engage in desired intentional behaviors. While the present dissertation will focus on the use of text messaging with a successful accountability partner, it should be noted that social influence occurs on a variety of other new technological mediums (e.g., Facebook, Instagram, Twitter, Snapchat, Reddit, Amazon, Yelp, etc.).

Recent research has examined use of text messaging for health-related behaviors. Hall and colleagues (2015) looked at slightly more than a decade of scientific literature regarding text messaging and its relation to health by reviewing 15 reviews and meta-analyses regarding text messaging interventions for health outcomes. These reviews and meta-analyses looked at studies with text-message intervention durations between nine days and two years, all within the time period of 2009 – 2014. All six of the meta-analyses in this study concluded that text messaging interventions had statistically significant positive effects on health-related outcomes (Hall et al., 2015). This review, "identified and coded the results of the highest-quality reviews and found that the majority of published text message interventions were effective at addressing diabetes self-management, weight loss, physical activity, smoking cessation, and medication adherence for antiretroviral therapy" (Hall et al., 2015, p. 412). The authors of this study hypothesized that the

likelihood of implementing desired behaviors can be increased from the power of social influence; in particular, through the utilization of technology, specifically, text messaging.

1.1. Significance to Counseling Psychology

This dissertation was designed to test a technology-based implementation system using social influence to increase the likelihood that individuals engaged in intentional behaviors. Counseling psychologists regularly encourage clients to engage in intentional behaviors. One example of this can be seen with the use of Behavioral Activation, a technique in which individuals intentionally increase reinforcing activities (e.g., exercising, journaling, or socializing with friends) to bring these individuals more into contact with health-related behaviors. This changing of behavior theoretically facilitates change in both affect and cognition. A meta-analysis considering thirty-four studies with 2,055 adult participants reporting symptoms of depression showed a large and significant effect size (0.78) of behavioral activation when it was compared with control groups (Mazzucchulli et al., 2009). Many ethical considerations should be addressed before a method such as this is used in a therapist-client relationship. For example, frequent digital communication between therapist and client outside of a therapy session could increase the likelihood of exploitative relationships, breaches of confidentiality and boundary violations.

1.2. Conceptual Definitions

Intentional Behavior: A purposeful and wanted behavior. As mentioned previously, there is evidence that engaging in certain health-related behaviors increases one's self-reported well-being. However, when intentional behavior is mentioned, it is not meant to be restricted to health-related behaviors, but it also refers to any behavior that an individual may desire.

Social Influence: A process whereby one's attitudes, cognitions, or behaviors are changed through the actions of another individual or group of individuals (Baumeister & Finkel, 2010).

Successful Accountability Partner: Participants in this study's experimental group were paired with what they perceived to be a successful accountability partner. A successful accountability partner can be defined as an accountability partner who sends text messages to their "partner" (a participant) one time per day, five times per week for four consecutive weeks during the course of the study. These text messages were actually sent by the experimenter posing as a participant (as explained in the Method chapter). The text messages communicated that the sender, whom the participant assumed was another participant, successfully meditated that day.)

1.3. Operational Definitions

Self-Efficacy: Self Efficacy is conceptually defined as self-confidence for performance of desired behaviors (Zimmerman, 2000). A more specific aspect of self-efficacy utilized in this study is meditation self-efficacy, which reflects one's perceived competence with respect to tasks in the domain of mindfulness meditation practice. For the present study, one's level of self-efficacy will be defined as one's scores on the General Self-Efficacy Scale (GSES; Schwarzer & Jerusalem, 1995).

Mindfulness: Mindfulness is conceptually defined as the state of being attentive to and aware of what is taking place in the present moment in a manner that is non-judgmental (Brown & Ryan, 2003). The Five Facet Mindfulness Questionnaire (FFMQ-15) characterizes the five subsets of mindfulness. The five facets include (1) observing (e.g., "When I take a shower or a bath, I stay alert to the sensation of water on my body"), (2) describing (e.g., "I'm good at finding words to describe my feelings"), (3) acting with awareness (e.g., Reverse scored: "I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted"), (4) non-judging (e.g., Reverse scored: "I believe some of my thoughts are abnormal or bad and I shouldn't think that way"), and (5) non-reactivity (e.g., "When I have distressing thoughts or

images, I "step back" and am aware of the thought or image without getting taken over by it"; Baer et al., 2006). In the present study, FFMQ-15 scores were utilized as a metric for participants' level of mindfulness.

1.4. Research Questions

Q1: Can text messaging with a successful accountability partner be used to increase the likelihood of meditating for individuals who report wanting to practice meditation?

Q2: Does text messaging with a successful accountability partner change one's reported level of mindfulness, self-efficacy, or likelihood of utilizing an accountability partner in the future?

Q3: Does text messaging with a successful accountability partner change one's reported feelings of obligation, responsibility, and/or motivation towards achieving their desired goal (in this case, meditation)?

2. Review of the Literature

2.1. Happiness and Intentional Behavior

Martin Seligman emphasized the field of positive psychology and urged psychologists to investigate topics such as happiness, health, and human flourishing (Seligman & Koocher, 1998). Research in this area has identified a variety of correlates of happiness, such as certain demographic variables, personality traits, attitudes, and goal characteristics (DeNeve and Cooper, 1998; Sheldon and Lyubomirsky, 2006). These data have provided conflicting viewpoints in regard to the possibility of increasing one's well-being. Specifically, Sheldon and Lyubomirsky (2006) divide research on happiness into two viewpoints: one "pessimistic" and one "optimistic," both of which will be briefly reviewed. The pessimistic viewpoint puts significant weight on the idea of a genetically-determined set point for happiness. A study of over 3,000 identical and fraternal twins found that identical twins reported more similar levels of happiness than fraternal twins. Specifically, authors note that "income, marital status, nor an indicant of religious commitment could account [separately] for more than about 3% of the variance in well-being. From 44% to 52% of the variance in well-being, however, is associated with genetic variation" (Lykken and Tellengen, 1996 p. 186). The pessimistic viewpoint also cites the theory of hedonic adaptation, which posits that increases in happiness are typically short-lived due to our ability to quickly adapt to both positive and negative changes. Dan Gilbert (2009) refers to this as the "psychological immune system," and one noteworthy point of evidence comes from the work of Brikman and colleagues (1978), which demonstrated that recent lottery winners, recent victims of paralysis, and a control group showed no significant differences in self-reported happiness over time.

While genetic determination and quick adaptation seem to be part of the equation, Sheldon and Lyubomirsky (2006) argue that there is still sufficient reason for optimism regarding the

acquisition of sustainable increases in happiness and well-being. Namely, research has demonstrated notable success in enhancing happiness using specific interventions such as practicing gratitude (Emmonsa and McCullough, 2003), practicing forgiveness (McCullough et al., 2000), writing about life goals (King, 2001), avoiding social comparison and self-evaluations (Lyubomirsky and Ross, 1997), and choosing to feel a sense of optimism (Seligman, 1991).

To make sense of this conflicting evidence regarding one's volitional control of happiness, Lyubomirsky et al. (2005) developed a model of longitudinal well-being which specifies three specific determinants of one's well-being at a given time point: one's genetic set point, current circumstances (demographic, geographic, and contextual), and current intentional activities. One's genetic set point seems to be unchangeable, and Lyubomirsky notes that circumstance-based changes are most often one-time changes that tend to occur independently of effort and engagement. Additionally, evidence has been found that hedonic adaptation occurs more quickly with respect to these circumstantial changes, as compared with changes in intentional activities (Sheldon and Lyubomirsky, 2006).

Thus, it seems that the area of most volitional control with respect to happiness comes in one's intentional behaviors, which are less subject to hedonic adaptation. This theoretically is based on the amount of diversity and variance present in intentional activities (Sheldon and Lyubormisrky, 2006). Diversity and variance in intentional activities can also drive new happiness, increasing opportunities and possibilities, in a term coined by researchers as an "upward spiral" (Fredrickson and Joiner, 2002; Sheldon and Houser-Marko, 2001). It appears that one powerful way to increase happiness is through optimization of one's intentional behavior.

2.2. Behavior Implementation

Taxonomical approach. Researchers who investigate how to intentionally change behavior have posited two separate processes, motivation and volition (Schwarzer, 2011). The motivational process involves developing intention to change, which is oftentimes interrelated with self-beliefs. The volitional process involves planning, initiating, and maintaining change. While the motivational process relates to self-beliefs, the volitional process relates more to self-regulation (Schwarzer, 2011). The motivation process (i.e., goal setting) has received more attention than research addressing the volitional process related to whether behaviors change (Bandura, 1997; Schwarzer & Fuchs, 1995, 1996).

Part of the volitional process involves techniques used to change behavior. Behavior change has been a focal point of psychology for many years, starting with theories such as Thorndike's "Law of Effect," which posited that the production of a satisfying effect after a behavior increase the likelihood of that behavior occurring again (Thorndike, 1927). Our understanding of behavior change has recently benefited from a thorough taxonomical system which organizes behavioral change techniques (BCTs). Michie and colleagues (2013) used the techniques of meta-regression and the Delphi method to analyze BCTs across studies. More specifically, 14 experts rated labels and definitions of 124 BCTs from six published classification systems. Next, a different group of 18 experts grouped BCTs according to similarity of active ingredients in an open-sort task. This has enabled researchers to uncover BCTs have strong effects and face validity, allowing future research to move forward, despite the heterogeneity of interventions within the BCT literature (Moller et al, 2017). This categorization delineated 93 distinct BCT's (Michie et al., 2013). When reviewing text-based interventions for health-related outcomes, Hall et al (2015) noted that a number of review authors called for more research on the use of BCTs for text message-based interventions. Similarly, in their review of BCTs in the context

of a digital health revolution, Moller and colleagues gave credence to Michie et al.'s taxonomical approach, stating that, "in order to maximize opportunities, researchers should explicitly identify and systematically apply evidence-based BCTs in their interventions" (Moller et al., 2017 p. 94).

Applying BCTs to intentional behavior. Despite being in its infancy, research on digital use of BCTs in relation to health-related behavior has moved quickly since Michie et al's (2013) taxonomy. Four recent reviews will be discussed. Special reference is made to the most commonly used BCT's within each examination.

Lyons and colleagues (2014) examined BCTs implemented in 13 available electronic lifestyle activity monitors, such as the Fitbit, Jawbone, Nike Fuelband SE, etc. They found that all monitors provided tools for "self-monitoring," "feedback," and "environmental change." The most prevalent techniques were "goal-setting" (100%) and "emphasizing discrepancies between current and goal behavior" (100%). "Review of behavioral goals," (77%) "social support," (62%) "social comparison," (62%) "prompts/cues," (54%) "social rewards," (62%) and "a focus on past success" (54%) were found in more than half of the systems (Lyons et al., 2014). Crane and colleagues (2015) considered BCTs used in 61 popular alcohol reduction smart phone applications. They found that the most used BCTs were "facilitate self-recording" (54%), "provide information on consequences" (43%), "provide feedback on performance" (41%), "give options for additional and later support" (25%), and "offer/direct towards appropriate written materials" (23%). Morrisey and colleagues (2016) identified and coded 166 medication adherence applications, finding that of all 166 applications, a total of 12 change techniques were present. The most commonly used BCTs included "action planning" and "prompt/cues," which were included in 96% of apps, followed by "self-monitoring" (37%) and "feedback on behavior" (36%). Conroy and colleagues (2014) examined BCT's in 167 top-ranked mobile applications for physical activity based on lists of top-

ranked apps from Apple and Google Play retrieved on August 28, 2013. They found that most descriptions of applications incorporated fewer than four BCTs. The most common techniques involved "providing instruction on how to perform exercises" (66%), "modeling how to perform exercises" (53%), "providing feedback on performance" (50%), and "goal-setting for physical activity" (38%; Conroy et al., 2014). While this study utilized Michie et al. (2011) refined CALO-RE BCT taxonomy, a notably small proportion of applications utilized BCTs similar to those used within the current study. More specifically, only 37% used "Plan social support/change," 28% used "Information about others' approval," 15% used "Facilitate social comparison," 10% used "Prompt self-monitoring of behavior," and 6% used, "Provide rewards contingent on successful behavior" (Conroy et al., 2014). This review of literature illuminates the fact that the literature on BCT's in technology has yet to crystallize specific interventions which work best within digital contexts. This could certainly relate to the recency of this literature (e.g., the Michie et al. taxonomy was created in 2013).

However, there has been one review of a particular BCT, that being "self-monitoring" (Harkin et al., 2016). Self-monitoring refers to the establishment of a method for a person to monitor and record the outcomes of their desired behavior (Michie et al., 2013). Self-monitoring has been shown to lead to an increase in success of interventions across many health-related behaviors. In a review of mobile apps in health interventions, researchers found self-monitoring to be the most commonly utilized BCT (Payne et al., 2015). Harkin and colleagues (2016) identified 138 studies (N = 19,951) comparing groups who monitored their goal progress to control groups who did not monitor this progress. Research revealed that, on average, interventions were successful at increasing the frequency of monitoring goal progress, and that this monitoring promoted goal attainment. Changes in the frequency of self-monitoring mediated the effect of the

interventions on goal attainment. Further, tests of moderation revealed that the effects of monitored progress increased if participants made their progress public and when information was physically recorded (Harkin et al, 2016). Researchers have also identified self-monitoring to be an effective component of many interventions such as increasing physical activity and healthy eating (Michie et al., 2011), decreasing alcohol consumption (Michie et al., 2012), and smoking cessation (West et al., 2011). Further evidence for this has been found in a replication study by Dombrowski et al., who examined effective use of self-monitoring in physical activity and dietary interventions for those who were overweight with co-morbidities (Dombrowski et al., 2012). There also seems to be some evidence that socially-based BCT's, such as those used in the current study, might be efficacious and frequently absent. Some examples include how the most popular of the alcohol reduction apps used the BCT "advise on/facilitate the use of social support" (Crane et al., 2015), and the effectiveness of self-monitoring was found to be more efficacious if progress was made public (Harkin et al., 2016). Moller et al. (2017) emphasized this finding, noting that in the context of digital health interventions, "research should investigate how to maximize the potential for positive social network effects" (Moller et al., 2017 p. 93).

Gamification. Gamification refers to an "emerging technological approach for motivating people toward different types of beneficial behaviors," which contain "elements familiar from games to create similar experiences as games commonly do" (Hamari & Koivisto, 2015 p. 333). For example, gamification includes such elements as badges, leaderboards, time constraints, limited resources, clear goals, and playful design elements (Deterding et al., 2011). While the technique of gamification has not been labeled as a discrete BCT, it seems to be an important and novel technique that is currently used for behavioral change (e.g., Google employees in London meet monthly to discuss utilization of gamification; King et al., 2013, p. 76). An analysis of 132

health and fitness apps related to physical activity and diet revealed a widespread use of gamification principles, but low adherence to any professional guidelines or industry standard. (Lister et al., 2014). In a review of gamification approaches for encouraging daily physical activity, researchers found that the most common game-elements used were rewards and competition (Tabak et al., 2015). When more stringent inclusion criteria were used for elements of gamification, Edwards and colleagues found that only 64 of 1680 (4%) of health apps included elements of gamification. Researchers then explored BCTs utilized within these 64 apps. Notable techniques used were: self-monitoring of behavior (86%), non-specific reward (82%), social support (75%), non-specific incentive (82%) and focus on past success (73%) (Edwards et al., 2016).

When investigating a variety of gamification services and their relationship to exercise, Hamari and Koivisto (2015) found that social influence, positive recognition, and reciprocity have a positive impact on how much people are willing to exercise. Furthermore, the authors posited that, "getting recognized, receiving reciprocal benefits and networking effects contribute to use continuance" (Hamari & Koivisto, 2015, p. 333). This provides evidence that like BCTs, gamification techniques seem to benefit from social elements. Chen and Pu (2014) reported that adding social interaction could enhance one's experience when using a health-related application by making one's experience more meaningful and adding additional incentive to earn rewards. For example, in the researcher-developed game 'StepCity,' one's goal is to compete against friends on building a crime-free city. The users earn currency based on the number of steps they take each day, and they can use these steps to buy items that help to achieve the goal of fighting crime. The study found that when using this multiplayer game-based interface, participants increased their physical activity compared with a control group who didn't have this social gamification aspect

(Walsh and Golbeck, 2014). In a similar study, Chen and Pu (2014) looked at physical activity increases in a cooperation condition, a hybrid condition, and a competition condition. They found that when comparing all three groups to a control group where participants exercised alone, physical activity increased by 15%. Among the specific group settings, the cooperation saw a 21% increase, the hybrid group saw an 18% increase, and the competition saw an 8% increase, leading researchers to conclude that some users could be demotivated by competition, while exercising in a group seems to increase physical activity (Chen and Pu, 2014). This positive effect can be seen with the recent rise in group fitness classes (Choi et al., 2016). Gockley et al. (2006) found that when women aged 18 - 45 were surveyed on social influence and health, 83% of women reported that they would prefer to exercise with a friend and 76% would share their goal and progress with another person.

Gamification has not been mapped directly onto the taxonomical system undergirding the BCT literature. However, there are other behavioral change systems that are captured within the gamification literature, such as receiving time constraints, reciprocal benefits, and cooperation. It is also worth noting that like research related to BCTs, the gamification literature provides further evidence that socially-focused techniques seem to be particularly impactful in changing behavior through digital behavioral change systems.

2.3. Attributes of Text Message-Based Interventions

Directionality of text messages. Previous literature related to text messaging and health-related outcomes has illuminated various attributes of text-based paradigms that modulate the likelihood of behavior implementation. One such attribute is directionality (i.e., whether participants only receive messages, or whether they both send and receive messages). When reviewing 8 studies aimed at promoting adherence to antiretroviral therapy, Finitsis et al. (2014)

found that, "Designs that allowed, encouraged, or required message recipients' response exhibited better outcomes than ''one-way'' reminder messages" (pg. 7). The authors of this review theorize about why this difference in directionality exists. They point to two specific factors: engagement and trust. "Engagement" refers to an idea from Motivational Interviewing which can be defined as, "the process of establishing a mutually trusting and respectful helping relationship" (Miller & Rollnick, 2013, p. 482). This idea overlaps with the concept of trust. For example, in patients with HIV, levels of perceived trust, caring, and liking from medical providers correlates with the degree to which patients adhere to antiretroviral therapy (Russell et al., 2004). This is consistent with Baumeister and Finkel's aforementioned theory regarding social influence, whereby social influence is more powerful when the relationship is between individuals who like one another (2010). While it is hypothesized that bidirectionality increases participant engagement in behavioral implementation, it should be noted that previous studies addressing directionality involve thorough connection between participants and text message providers (or trained peers). For example, one common paradigm in research on antiretroviral therapy adherence is to have text messages assess treatment status for participants. If participants send text messages indicating that treatment is not going well, medical providers will call participants (on phones provided for the study) to discuss improvements to treatment (Lester et al., 2010; Mbaugbaw et al, 2012; Simoni et al., 2009). Similarly, bidirectional paradigms in text messages and behavior implementation will oftentimes strictly require participants to send messages. For example, Hardy et al. (2011) provided participants with phones to track medication adherence, and if patients didn't respond after receiving a reminder text message, the phones that experimenters provided would use a built-in feature which would beep every 15 minutes until the patient responded. While these studies provide evidence that messaging back and forth with others may lead to higher levels of

implementation than unidirectional messages, more work could be done to examine whether these directionality differences are present in study designs where participants have a more typical relationship with their phone (e.g., using their own phone, not being required to respond to messages). Researchers also looked into the directionality of initial text messages (i.e., whether the experimenter or the participant initiated dialogue). However, in a review of 14 studies, researchers found that, "there were no clear differences in intervention outcomes based on SMS dialogue initiation" (Fjeldsoe et al., 2009, pg. 170).

Timing of text messages. Another variable that is currently being explored in text-message based interventions is the timing of text messages. In one study, the Centers for Disease Control and Prevention (CDC) and its partners in research developed a text message-based vaccine reminder system to remind college students who receive a first dose of pandemic influenza vaccine to receive the second dose. This intervention involved participants receiving 13 text messages over 21 days, followed by an optional questionnaire about how well the system worked. Of those participants who began participation in the reminder system, 46% verified via text message that they had received their second dose of the pandemic influenza vaccine. This study also gathered useful insight from the 59 participants who completed the optional follow up questionnaire. Namely, participants seemed to rate reminders as being useful, and did not seem to not differ substantially on preferences for the time of day that text messages were sent (Lehnert et al., 2018). When Finitsis et al. (2014) reviewed text message intervention designs to promote adherence to antiretroviral therapy, they found that interventions messaging participants once or more times daily demonstrated smaller effects than interventions that messaged several times a week or weekly. Authors theorized that this relationship between increased frequency and decreased response "may have resulted from habituation, response fatigue and the possible intrusion that

multiple daily messaging could represent" (pg. 6). A final facet of timing relates to how text-message correspondence relates to timing of dosage in medication adherence studies. Finitsis et al. (2014) note that when messaging is matched to dosage timing (e.g., text messages received in the morning when medication is to be taken in the morning), researchers observed a greater effect.

Content of text messages. Few research has examined the content in text-message reminders. Researchers investigating this have drawn a distinction in this regard between standardized and personalized messages, whereby standardized messages are perceived to be held standard across participants, while personalized messages are perceived to be unique to each participant. For example, Hardy et al. (2011) devised a research paradigm whereby participants were sent medication reminders that could include popular news, sports, weather information, etc. Researchers reported that to their knowledge, this was the first randomized controlled trial of a personalized cellular phone reminder system, and that it showed significantly better short-term improvement in adherence to medication (measured by pill count and self-report) when compared to a standardized beeper reminder system. It is also worth noting that one study examined whether there was a difference in outcome between reminders that are delivered via text message and reminders delivered via telephone (by health care facility staff). This study found no difference between the text message and telephone message group (Free et al., 2013).

2.4. Social Influence

The aforementioned literature points to the idea that social influence provides effective motivational qualities for behavior implementation, and that this motivational quality can lead to behavior change through text message-based intervention systems. Literature on social influence further underscores this impact on behavior. For example, interventions using social influence have been shown to increase physical activity, recreational reading, and healthy eating behavior

(Hamilton and White, 2010; Merga and Moon, 2016; Ashida et al., 2012). Prestwich et al. (2014) used social influence in partner-based interventions to reduce fat intake based on self-report measures of dietary fat intake, psychosocial mediators, weight, and waist size. At three and six-month follow-ups, the partner-based groups increased the ratio of 'good' fats to 'bad' fats and lost more inches on their waist size, as compared with the non-partner groups (Prestich et al., 2014). Cialdini and Griskevicius (2010) break social influence into six principles: reciprocity, consistency, social validation, liking, authority and scarcity (Baumeister & Finkel, 2010). It should be noted that scarcity, authority, and liking do not apply to the intervention being utilized for this study. Thus, the three salient social influence constructs will now be reviewed in turn.

Reciprocity. Reciprocity refers to the idea that we are likely to return the form of behavior that we have received from another individual. This has been described as "one of the most powerful norms in all human cultures" (Baumeister & Finkel, 2010 p. 388). For example, Cunningham, Strassberg, and Hann (1986) found that in the case of disclosure regarding sex roles, participants who had heard such self-disclosure were more likely to engage in similar disclosure. Cialdini, Green, and Rusch found (1992) that participants were more likely to yield to the persuasive appeals of individuals if these individuals had previously yielded to one of their own persuasive appeals. In these examples, participants theoretically experienced internal reactions to the disclosure or yielding of others, which were followed by reciprocal behaviors. Reciprocity has also been demonstrated when individuals are explicitly given tangible items. For example, in a study conducted by Strohmetz et al. (2002), restaurant servers gave two candies to customers when the check was presented. Tips for these servers increased by 14.1% when candies were presented (as compared with having no candies presented). This effect seems to happen even with items of little value. Similarly, actions which communicate a positive relationship have been shown to have

an impact on behavior. For example, in a 2005 study, Garner found that people were more than twice as likely to fill out a lengthy survey when the request asking to complete the survey was accompanied by a hand-written 'Post-It' note. Despite the fact that a 'Post-It' note is only a small item, individuals apparently felt some sense of obligation to reciprocate by completing the requested survey. Individuals who received a survey with an affixed Post-it note also returned their materials more promptly with more detailed responses (Garner, 2005). Thus, there are a variety of situations in which behavior may activate a sense of reciprocity, which in turn may instigate behavior change.

Consistency. The "consistency rule" can be expressed as follows: "After committing yourself to a position, you should be more willing to comply with requests for behaviors that are consistent with that position" (Baumeister & Finkel, 2010 p. 395). For example, Pliner, Hart, Kohl, and Saari (1974) found that, "home owners who had agreed to accept and wear a small lapel pin promoting a local charity were consequently more likely to contribute money to that charity when asked during a later donation drive. Ostensibly, after taking and wearing the pin, participants saw themselves as favorable towards this charity, which would lead them to want to remain consistent with the "charitable" trait that they had assigned to themselves (Pliner et al., 1974). Similarly, Greenwald and colleagues (1987) asked individuals whether they expected to vote in an upcoming election. When individuals reported that they expected to vote, they voted significantly more than individuals who did not receive a phone call asking about expectations. The authors hypothesized that reporting one's expectations to others served as a form of commitment, and one's desire to behave consistently with this commitment led to an increased likelihood of voting. While consistency depends on adhering to a commitment, these commitments do not have to be explicitly stated (Baumeister & Finkel, 2010.) For example, insurance agents stress how the purchasing of

a new house might reflect commitment to the wellbeing of one's family. Drawing attention to this commitment would theoretically lead the homeowner to feel pressure to behave in a manner with this commitment and buy home insurance (Baumeister & Finkel, 2010; Cialdini et al., 1998). Based on the construct of consistency, one could theorize that individuals would likely have the desire to appear consistent in completing their intentional behaviors when these behaviors are communicated to others.

Social validation. Humans seem to "follow the lead of others" in the sense that they "use the beliefs, attitudes, and actions of others, particularly similar others, as a standard of comparison against which to evaluate the correctness of their own beliefs, attitudes, and actions" (Baumeister & Finkel, 2010 p. 392). For example, Shultz and colleagues (2007) found that individuals are influenced by others in deciding whether to conserve energy in their homes, and the more similar individuals are to others, the more likely they are to behave in a way similar to others. While citizens of the same state influenced individual's conservation practices, one experiment in 2008 showed that behavior was more strongly influenced by the conservation practices of residents of the same city, and even more strongly when influenced by the residents of their own neighborhood (Schultz et al., 2007). Other recent research on social validation demonstrates that hotel guests utilize it when deciding whether to reuse their towels (Goldstein et al., 2008), audience members use it in deciding whether to laugh at a joke (Provine, 2000), National Park visitors use it when deciding whether to commit theft (Cialdini, 2003), and bar patrons use it when deciding whether to leave tips (Griskevicius et al., 2008).

One important area of social validation is Festinger's (1954) social comparison theory, which states that when objective cues are unavailable, individuals evaluate their opinions and beliefs by comparing themselves to others, and social comparison is most likely to be directed at

similar others (Goldstein et al., 2008). In a similar fashion, social facilitation theory suggests that people increase their performance in the presence of others (Aiello and Douthitt, 2001). Social facilitation and social comparison have been studied extensively in terms of human eating behaviors. For example, Clendenen and colleagues (1994) examined these constructs by comparing groups eating with others to groups eating alone. They found that people eating with others ate 90% more than did solo diners. Similarly, in a non-laboratory setting, Patel and Schlundt (2001) had obese women keep diaries for two weeks, recording the presence/absence of others during eating occasions. Diarists reported eating much more with others than when alone, between 24% and 33% more depending on the diarists' mood. (For a review of social facilitation of eating, see Herman, 2015). It is also important to note the role of modeling within the realm of social validation.

In a similar vein to social validation, modeling of behavior has also shown to be a powerful source of social influence. Modeling can be thought of as observational learning, or the acquisition and/or performance of behaviors based on the observation of other people performing these behaviors (Bandura, 1977; Bandura, 1997). Over the course of his career, Albert Bandura demonstrated that modeling has a profound impact on development of behaviors. One of his most noteworthy experiments, oftentimes termed the 'Bobo Doll Experiment,' showed that the modeling of aggression towards a doll will increase the likelihood that the children exposed to this modeling will behave aggressively towards the same doll. One interesting application of Bandura's seminal work has been video modeling programs for individuals with autism. Bellini and Akullian (2007) conducted a meta-analysis of video modeling programs for individuals with autism and found it to be an effective treatment approach for a variety of presenting problems, including social communication, self-help, and behavioral skills. Recent research has also investigated how

modeling might be used within emerging technologies. More specifically, Fox et al. (2009) constructed an interesting experiment, whereby participants used virtual reality technology to observe digital renderings of themselves consume food and either having or not having their digital bodies experience weight changes. Participants were then moved to a different room and led to believe that they were performing an unrelated task in a room that had food options available. Researchers found that individuals showed significant differences in whether they ate this available food based on whether they observed the digital rendering of themselves that gained weight or did not gain weight. In the intervention used in the current study, individuals in the experimental group received text-messages noting that others have completed their desired behavior. Thus, it is hypothesized that this feedback allows an opportunity for behavior-modification through the avenue of modeling.

2.5. Mindfulness

The present study examined an implementation technique; therefore, a behavior had to be selected which participants could reasonably implement. Mindfulness meditation was utilized as it appears to be a health-related behavior with increasingly positive empirical support. For example, studies on mindfulness meditation have suggested meditation shows positive effects in relation to anxiety, depression, chronic pain, well-being, attention span, memory capacity, and many other psychological factors (Chiesa et al, 2011; Miller et al., 1995; Hofmann, 2010; Rosenzweig et al., 2010; Valentine, 1999). Meditation has also shown promise in medical literature including, but not limited to, decreases in heart rate, decreases in blood pressure, decreases in dementia, and even decreases in cancer in some studies (Carlson et al., 2007; Lavetsky et al., 2013; Ledesma, 2009). The practice of mindfulness meditation was also popular in the cultural context of this study, which allowed for the recruitment of sizeable numbers of participants interested in

increasing this behavior. Lastly, practice of mindfulness meditation seems to be quite a safe practice, with no known negative consequences or side-effects, making it a reasonably safe behavior for participants to implement.

2.6. Current Study

The study of intentional behaviors has a rich tradition in psychological research. A central question about such intentional behaviors relates to successful implementation. Research reviewed above explores behavior implementation through a BCT taxonomical approach and an approach from gamification literature. Both avenues of research highlight the importance of how social factors (such as reciprocity, consistency, and social validation) have a pronounced influence on behaviors. Due to a lack of studies investigating whether social influence can be used to increase intentional behaviors, especially in the context of text-based technology, there is a clear need for experimental studies which explore this new terrain. This has been indexed by measuring changes in behavioral implementation through a format designed to compare an experimental intervention to a control group. This format is consistent with BCTs such as "self-monitoring," "social comparison," "prompts/cues," and "monitoring outcomes of other's behavior without feedback." For the BCT "monitoring outcomes of other's behavior without feedback," individuals in the present study did not directly observe behavior, but were instead notified when the behavior was completed. This study represents a natural progression of the literature, since many reviews of similar implementation systems have called for more socially-focused BCTs to be used in emerging technologies. Furthermore, I have found no studies have yet explored the presently studied text-message based methodology for administering social influence, despite the current widespread adoption of text-message capable devices.

3. Hypotheses

1. Among individuals reporting that they want to practice meditation, those who are paired with a successful accountability partner will report (via text message) more days meditating than will individuals who do not have an accountability partner.

2. Among individuals reporting that they want to practice meditation, those who are paired with a successful accountability partner will show increases in (a) mindfulness (as measured by the FFMQ-15), (b) self-efficacy (as measured by the General Self-Efficacy Scale and the Scale of Meditation Self-Efficacy) and (c) likelihood of utilizing an accountability partner in the future (as measured by a subscale from the Follow-Up Questionnaire) when compared to a control group consisting of participants who are not paired with a successful accountability partner.

3. Among individuals reporting that they want to practice meditation, those who are paired with a successful accountability partner will show increases in reported feelings of obligation, responsibility, and motivation to meditate (each measured by targeted items within Post-Test Supplemental Questions) when compared to a control group consisting of participants who are not paired with a successful accountability partner.

4. Method

4.1. Summary of Design

This study utilized a posttest between-subjects design with a control group. It also contains within-subject measurements with pre- and post-manipulation measures. Participants (described in more detail below) who expressed an interest in meditating or meditating more often were randomly assigned to either a control group or an experimental group. The experimental group completed a text-based accountability partner intervention (see Appendix H). Both the control group and the experimental group received educational materials related to meditation, and they were given post-test measures 28 days after their experiment start-date. Both groups were also given the option to complete follow-up measures 42 days after the beginning of the experiment for extra financial compensation ($2), however only 6 participants completed this part of the experiment. Participants in the experimental group were told that they had an "accountability partner." This accountability partner was described simply as a "graduate student at Auburn University." For all participants in the experimental group, the role of the accountability partner was actually assumed by the experimenter, and participants did not know this fact until after the experiment concluded. Participants in the experimental group were asked to send text messages to this accountability partner after each time they were able to complete their daily goal of a 10-minute meditation (details in Appendix H). Participants in the control group also had a daily goal of a 10-minute meditation. They were asked to track their implementation of meditation behavior by sending a text-message to a phone number which provided no responses (see Appendix G). Pre- and Post-test instruments were the same for both the experimental and control groups. For pre-testing, participants completed demographic questions, the Five Facet Mindfulness Questionnaire (FFMQ-15), the General Self Efficacy Scale (GSES), and the single-item scale created for this

study called the Scale of Meditation Self-Efficacy (SOMSE). For post-test measures, participants completed the Five Facet Mindfulness Questionnaire (FFMQ), the General Self-Efficacy Scale (GSE), the Scale of Meditation Self-Efficacy (SOMSE), and Post-Test Supplemental Questions (Baer et al., 2008; Schwarzer & Jerusalem, 1995; Ajzen, 2006). For the optional follow-up measures administered 42 days after beginning the experiment, participants were given a battery of questions developed by the author to examine hypothesized changes in the dependent variables (see Appendix K).

4.2. Participants

A power analysis based on an independent samples t-test at alpha .05 with 80% power revealed that this study needed to include a minimum of 88 participants, and that it was estimated to have a moderate effect size. This study included 181 participants who completed the pre-test, 84 participants who completed the post-test, and 6 participants who completed follow-up measures. It should be noted that 375 participants were excluded based on not meeting minimum exclusionary criteria requirements (*Appendix C*). Participants were recruited through the College of Education Research Participation System (SONA), which works with undergraduate education classes (see Appendix A for description of study used in SONA system). All participants were Auburn University students. Participants in this study were on average 21 years old, and were majority female (86.9%). A majority of participants identified as White or Caucasian (80.8%), and nearly all participants identified as not being in a committed romantic relationship (97%).

4.3. Measures

Demographics (Appendix D). Demographic information was gathered from participants by way of Qualtrics survey during the pre-test portion of the experiment (see above for pre-test protocol). Information gathered included self-reports of gender, age, race/ethnicity, college GPA,

and a question about the extent to which they have attempted to meditate prior to this experiment. The purpose of collecting these data were for use in post-hoc examinations, and none of the aforementioned demographic data was used for exclusionary purposes.

      Five Facet Mindfulness Questionnaire (FFMQ-15). Self-reported level of mindfulness was measured using the Five Facet Mindfulness Questionnaire (FFMQ; Baer et al., 2006). There are currently two versions of the FFMQ, the FFMQ-15 and FFMQ-39, which have 15 and 39 items respectively. The FFMQ-39 and FFMQ-15 both measure one's tendency to be mindful in daily life, and it consists of the following five facets: observing, describing, acting with awareness, non-judging, and non-reactivity (Baer et al., 2006). Items are rated on a Likert-type scale, ranging from 1 (never or very rarely true) to 5 (very often or always true). Each of these facets is composed of three questions. An example of one question from each subscale is listed below:

      -Observing: "When I take a shower or a bath, I stay alert to the sensations of water on my body."

      -Describing: "I'm good at finding words to describe my feelings."

      -Acting with Awareness: "I don't pay attention to what I'm doing because I'm daydreaming, worrying, or otherwise distracted" (reverse scored).

      -Non-judging: "I believe some of my thoughts are abnormal or bad and I shouldn't think that way" (reverse scored).

      -Non-reactivity: When I have distressing thoughts or images, I 'step back' and am aware of the thought or image without getting taken over by it."

The FFMQ - 39 originated from a factor analysis of many different questionnaires measuring one's general tendency to be mindful in daily life. Baer et al. (2012) selected three items for each of the five facets based on their factor loadings within the original exploratory factor

analysis of presently used mindfulness questionnaires, as well as the ability of items to "represent the breadth of content of each facet" in order to develop the FFMQ-15, which will be utilized in the present study. The FFMQ-15 uses the same five-factor scale as the FFMQ-39, and its facet scores range from 3−15.

Current findings support the FFMQ-15 as a "valid and reliable alternative measure to the original FFMQ for use in studies administering multiple measures and/or questionnaires at multiple time points" (Gu et al., 2016, p. 800). After administering the FFMQ-15 for 7 consecutive weeks, Baer et al., 2012 reported that "internal consistency was largely adequate despite the brevity of these subscales." Specifically, "of the 35 subscales, only four had alphas below .75" (p. 758). While this measure does not appear to have been used to investigate short-term change, Baer et al. have reported that participants have shown significant increases in FFMQ scores by the second week of a Mindfulness Based Stress Reduction (MBSR) program (Baer et al., 2012). In the current landscape of mindfulness research, the FFMQ-39 is the most frequently studied questionnaire, and seems to have appeal because of its factor analytic roots (de Bruin et al., 2012).

General Self-Efficacy Scale (GSES). Self-efficacy has shown positive effects on a myriad of positive psychological outcomes, such as well-being, life satisfaction, motivation, and academic achievement (Strobel et al., 2011; Lachman & Weaver, 1998; Zimmerman, 2000; Komarraju et al., 2013). Although self-efficacy has often been used as a predictor variable, it has also been used in some instances as an outcome variable (e.g., Gist & Mitchell, 1992). The General Self-Efficacy Scale (GSES) is a 10-item Likert style measure of general self-efficacy (Schwarzer & Jerusalem, 1995). It is currently the "world's most widely used questionnaire to assess general self-efficacy" (Damanasio et al., 2016, p. 1). A representative item on this scale is, "Thanks to my resourcefulness, I can handle unforeseen situations." (Damanasio et al., 2016, p. 1). The GSES

was originally developed by Ralf Schwarzer and Matthias Jerusalem in 1981, and since then, it has been translated into at least 31 languages, and its psychometric properties have been extensively evaluated (Damasio et al., 2016). In a study employing samples from 25 nations (Scholz et al., 2002), the GSES has displayed satisfactory reliability coefficients, with Cronbach´s alpha ranging from .75 to .91. The GSES also showed evidence for prognostic validity. For example, in a Costa Rican sample, the GSES correlates with optimism r =.60 (women; n = 393) and r = .52 (men; n = 258). This same sample displayed prognostic validity with anxiety (women r = -.43, men r = -.42), depression (women r = -.46, men r = -.33), and expected social support (women r = .43, men r = .30) (Scholz et al., 2002). An extensive confirmatory factor analysis (n = 19,120) has also displayed "good fit indexes" (Scholz et al., 2002). This and other research have provided evidence towards the view that there is a single factor underlying the responses to items on the GSES (Scherbaum et al., 2006).

While this study gathered data related to the general concept of self-efficacy using the GSES, it was also important to examine specific behaviors using scales which were targeted more specifically. When discussing use of self-efficacy scales, Schwarzer (2014) encouraged researchers to design items tailored to one's specific study if an important part of one's study is to predict a particular behavior, so I created an additional instrument for this particular study: The Scale of Meditation Self Efficacy (SOMSE; Schwarzer, 2014).

Scale of Meditation Self Efficacy (SOMSE) (Appendix E). In his "Guide for Constructing Self-Efficacy Scales," Bandura aligns himself with Schwarzer in stating that, "The 'one measure fits all' approach [to self-efficacy scales] usually has limited explanatory and predictive value because most of the items in an all-purpose test may have little or no relevance to the domain of functioning" (Bandura, 2006 p. 307). When creating one's own measurement, Bandura stresses

the use of gradations, the pretesting of scale items, and the requisite of face validity (Bandura, 2006). Thus, the one-item Scale of Meditation Self Efficacy (SOMSE) has been created for the present study, which contains the question, "How difficult do you think it would be for you to practice meditation for 10 minutes per day for at least 5 days per week?" (Appendix E).

4.3. Procedure

Pre-test. As noted above, participants were recruited through the College of Education Research Participation System (SONA). All participants who initiated participation in the study (i.e., clicked the Qualtrics link via SONA) were directed to a page containing the information letter (Appendix B), exclusionary criteria (Appendix C), demographic questions (Appendix D), Five Facet Mindfulness Questionnaire (FFMQ-15), General Self Efficacy Scale (GSES), and Scale of Meditation Self-Efficacy (SOMSE) (Appendix E). Instruments were administered in the order listed above. After participants in all groups completed the aforementioned items, they were given educational materials related to mindfulness meditation (Appendix F). Participants were then randomly divided into two groups via Qualtrics randomization. Each participant in the experimental group was paired with an accountability partner (who was actually the experimenter). Participants in the control group did not have an accountability partner. Those with an accountability partner were given information regarding use of an accountability partner (Appendix H), and those without were given information on text messaging to keep track of their progress (Appendix G). After completing this Qualtrics portion of the experiment, participants in both groups were contacted within 24 hours via text message and reminded of text messaging guidelines. The specific content of both the experimental and control group text messages can be seen in Appendix I. After this text message is sent, the pre-test portion of the experiment was considered to be complete, and participants received the first half of their SONA credit.

Text messaging with perceived accountability partner. Participants in the experimental condition were informed that in order to help them meditate regularly, they were paired with a "graduate student at Auburn University," and they were told that this individual would act as their "accountability partner." Participants were informed that they would be part of a group text message that contained both the experimenter and their accountability partner. Unbeknownst to participants, messages from both phone numbers were controlled by the experimenter. Participants were told that they shared a common goal with their accountability partner of meditating for 20 out of 28 days. Specifically, the goal would be to meditate for at least 5 out of 7 days, for at least 10 minutes, every week for the next month. Participants were asked to send messages to their accountability partner each day after they meditated. These text messages could be sent at any time during the day, and were to contain only the written-out day of the week (e.g., "Monday"). For more specifics regarding the text messaging explanation, see Appendix H. The experimenter phone number only sent the initial message containing a reminder of instructions regarding how to use one's accountability partner. The accountability partner phone number sent a text message containing the day of the week for 5 out of 7 days over the one- month course of the experiment. The specific days of the week, as well as times for the delivery of accountability partner text messages were randomized. Specifically, prior to each week, 5 days were randomly chosen. Next, a random number generator was used to select specific times for text messages to be sent from the accountability partner each day (between 05:30AM and 11:00PM, delineated in 30-min increments).

The phone used to text participants was password-protected, and names of participants were never present on cellular devices. Text message data were used quantitatively in order to track the precise amount of meditation (at least as far as can be verified by text messages reporting

33

such meditation) done within the experimental group. If participants sent text messages other than those delineating the days of the week, neither the experimenter nor the accountability partner numbers responded, and the accountability partner continued to send the days of the week. Instructions, including those asking participants to send only the days of the week, were part of the initial text message which participants received from the experimenter (see Appendix I).

Text messaging in control group. Participants in the control group were told that in order to help them meditate regularly, they were to keep track of the days they meditated by sending text messages to an "experiment phone number, where [their] responses will be logged into a computer." Participants were informed that their goal would be to meditate for at least 5 out of 7 days, for at least 10 minutes, every week for the next month. Participants were asked to send messages to the experiment phone number each day after they meditated. These text messages could be sent at any time during the day, and were to contain only the written-out day of the week (e.g., "Monday"). Participants in this group did not receive any text messages aside from the initial text message reminding participants of text messaging expectations (Appendix I). See Appendix G for an explanation of text-messaging procedures in the control group.

Post-test. Twenty-eight days after participants completed the pre-test portion of the experiment, participants completed the post-test portion. At this time, participants were emailed a Qualtrics link which led to post-test instruments. Participants they were given one week to complete these instruments. This link contained the Five Facet Mindfulness Questionnaire (FFMQ-15), the General Self Efficacy Scale (GSES), the Scale of Meditation Self Efficacy (SOMSE), and Post Test Supplemental Questions (Appendix J). After completion of this portion of the experiment, participants were given the second half of their course credit via SONA. Data

from participants who failed either of the two attention checks within the study was excluded prior to data analysis.

Follow-up. During the last part of the experiment, 42 days after participants completed pre-test instruments, participants were contacted via email and given one-week to respond to a Qualtrics link. In this link, participants were given either the control or experimental group "follow up questionnaire" based on the group to which they were assigned (see Appendix K). Participants from all groups were then sent the Debriefing Form (Appendix L). Those who participated in the optional follow-up were given financial compensation of $2. Payment was offered via check or digital monetary transfer services (e.g., Venmo, SquareCash, Apple Wallet, PayPal, etc.).

5. Results

5.1. Normality of Distribution: Number of Text Messages Sent

In order to assess the normality of number of text messages sent by all participants who completed pre-test instruments, a Shapiro-Wilk's test ($p <. 05$) and a visual inspection of histograms and box plots, as well as a calculation of z-values showed that the number of text messages sent were not normally distributed for the control condition, with a skewness of 1.135 ($SE = 0.243$; $Z = 4.671$). Control condition kurtosis of 0.257 ($SE = 0.481$; $Z = 0.534$) fell within normal range. For the experimental condition, data analysis showed an approximately normal distribution, with a skewness of -0.322 ($SE = .266$; $Z = -1.21$) and a kurtosis of -1.001 ($SE = 0.526$; $Z = -1.903$) (See Figure 1).

The same normality testing was completed with participants who completed both pre- and post-test measures, which revealed that the number of text messages sent were normally distributed for the control condition, with a skewness of 0.185 ($SE = 0.388$; $Z = 0.477$) and kurtosis of -1.027 ($SE = 0.759$; $Z = -1.353$). For the experimental condition, data analysis also showed an approximately normal distribution, with a skewness of -0.682 ($SE = 0.347$; $Z = -1.965$) and a kurtosis of -.427 ($SE = 0.681$; $Z = -0.63$) (See Figure 2).

5.2. Randomization of Participants

A one-way between subjects analysis of variance (ANOVA) was conducted to see whether pre-test scores on the Five-Factor Mindfulness Questionnaire (FFMQ), General Self-Efficacy Scale (GSES), and perceived difficulty of meditating (as measured by one item on pre-test) varied as a function of group assignment. There was not a significant effect of group assignment at the $p <. 05$ level on FFMQ [$F(1,82) = 0.98$, $p = 0.33$], GSES [$F(1,82) = 0.91$, $p = 0.34$], or perceived difficulty meditating [$F(1,82) = 0.21$, $p = 0.65$]. This lack of significant effect provides evidence

that after completing the dependent measures for the first time (but before beginning text messaging), the participants were successfully randomized into the two groups in terms of pre-test scores.

5.3. Characteristics of Drop-Out Participants

A Chi-square test was conducted to compare dropout rates in the control and experimental conditions, and it revealed a significant difference in dropout rate based on group assignment; $X^2(1, N = 179) = 7.316$, $p > .05$. This provides evidence that the participants who dropped out of the study differed by group assignment, in the sense that those in the control group dropped out of the study (i.e., did not complete post-test measures) more frequently than participants in the experimental group. In order to assess the possibility of differential attrition, a one-way between subjects ANOVA was conducted to compare the effect of group assignment of only drop-out participants (those who completed pre-test but not post-test measures, regardless of text messaging behavior) on number of text messages sent and all pre-test data. This ANOVA revealed a significant effect on group assignment at the $p < .05$ level on number of text messages sent [$F(1, 95) = 24.09$, $p < .001$], with the experimental group sending significantly more text messages. However, there was no significant difference between groups on any other demographic or pre-test measure (see Table 2).

Table 1.

Demographic Information

		Control (Pre-Test)	Experimental (Pre-Test)	All Dropout Participants	Control (Post-Test)	Experimental (Post-Test)
Number of Participants		99	82	97	37	47
Age (Avg.)		21.0	21.0	21.2	20.0	21.0
Sex	Female	86.9%	91.5%	86.1%	89.2%	94.7%
	Male	13.1%	8.5%	13.9%	10.8%	5.3%
Race/ Ethnicity	American Indian or Alaska Native	1.0%	0.0%	1.0%	0.0%	0.0%
	Asian American	4.0%	3.7%	4.1%	2.7%	4.3%
	Black or African American	11.1%	8.5%	11.3%	8.1%	8.5%
	Native Hawaiian or Other Pacific Islander	0.0%	0.0%	0.0%	0.0%	0.0%
	White	80.8%	81.7%	78.4%	89.2%	80.9%
	Prefer Not to Say	3.0%	6.1%	5.2%	0.0%	6.4%
Marital Status	Single	97%	98.8%	96.9%	100.0%	97.9%
	Married or Domestic Partnership	3%	1.2%	3.1%	0.0%	2.1%
Work Hours per Week	> 35 Hours per Week	40.4%	36.6%	40.2%	37.8%	36.2%
	< 35 Hours per Week	11.1%	7.3%	10.3%	10.8%	6.4%
	Not Currently Employed	48.5%	56.1%	49.5%	51.4%	57.4%
Prior Meditation Experience	Never Meditate	35.4%	40.2%	35.1%	43.2%	38.3%
	Sometimes Meditate	63.6%	58.5%	64.9%	54.1%	59.6%
	Regularly Meditate	1.0%	1.2%	0.0%	2.7%	2.1%
	Prefer Not to Say	0.0%	0.0%	0.0%	0.0%	0.0%

Note: "Pre-Test" refers to participants who completed only the pre-test, regardless of whether post-test was completed. "Post-Test" refers to participants who completed both pre- and post- tests. "All Dropout Participants" refers to participants who completed pre-test but not post-test measures, regardless of text messaging behavior.

Table 2.
Characteristics of Drop-Out Participants
(Control Condition n = 62, Experimental Condition n = 35)

Variable	Mean	Standard Deviation
TEXTS	4.71	6.15
Pre-FFMQ Total	48.38	7.39
Pre-FFMQ Observing	10.24	2.41
Pre-FFMQ Describing	9.71	2.59
Pre-FFMQ Acting	9.81	1.91
Pre-FFMQ Non-judging	9.87	2.59
Pre-FFMQ Non-reacting	9.31	2.13
Pre-GSES Total	30.67	3.72
Pre-Difficulty	37.77	23.60

Note. TEXTS: Total number of text messages sent; PRE_FFMQ_TOTAL: FFMQ All Items (Pre-Test); PRE_FFMQ_OBSERV: FFMQ Observe Items (Pre-Test); PRE_FFMQ_DESCRIB: FFMQ Describe Items (Pre-Test); PRE_FFMQ_ACTING: FFMQ Act with Awareness Items (Pre-Test); PRE_FFMQ_NONJUDGE: FFMQ Non-judge Items (Pre-Test); PRE_FFMQ_NONREACT: FFMQ Non-react items (Pre-Test); PRE_GSES_TOTAL: GSES All Items (Pre-Test); PRE_DIFFICULTY: "How difficult do you think it would be for you to practice meditation for 10 minutes per day for at least 5 days per week?" (0 – 100 with higher numbers indicating more difficulty) (Pre-Test)

5.4. Hypothesis Testing

Hypothesis 1: Among individuals reporting that they want to practice meditation, those who are paired with a successful accountability partner will report (via text message) more days meditating than will individuals who do not have an accountability partner.

In order to test hypothesis 1, an independent-samples *t*-test was conducted to compare number of text messages sent in experimental and control conditions for all participants who completed pre-testing (see Table 3). There was a significant difference in the number of text messages sent in experimental (M = 12.41, SD = 7.31) and control (M = 5.06, SD = 6.02) conditions. These results suggest that the use of the intervention (an accountability partner) did have an effect on number of text messages sent. Specifically, when participants utilized an accountability partner, they sent more text messages indicating that they had meditated when compared to the participants in the control condition (see Fig. 1). Since a large number of participants in the control group sent no text messages, an independent-samples t-test was conducted to compare the effect of group assignment on number of text messages sent, with participants who sent zero text messages removed. After removing these participants, there was still a significant difference in number of text messages sent in the experimental ($M = 13.57$, $SD = 6.52$) and control ($M = 7.95$, $SD = 5.82$) conditions; $t(136) = -5.29$, $p = 0.000$. This significant effect provides evidence that among participants who send at least one text, utilizing this behavior implementation technique significantly increases amount of text messages sent in the experimental condition compared to the control condition. An independent-samples t-test was also conducted to compare group differences in the number of text messages sent for participants who completed both pre- and post-test measures. There was a significant difference in the scores for experimental ($M = 15.43$, $SD = 5.64$) and control ($M = 9.11$, $SD = 6.57$) conditions; $t(82) = -4.73$, $p = 0.000$. A

Cohen's d analysis reveals that the effect size of this difference is large ($d = 1.03$). These results

suggest that the use of the behavior implementation technique does have an effect on number of

text messages sent. Specifically, these results suggest that when participants utilize this system,

they send more text messages indicating they meditated compared to participants in the control

condition.

Table 3.
Independent-Samples T-Test Comparing text messages sent in experimental/control groups (All Participants)

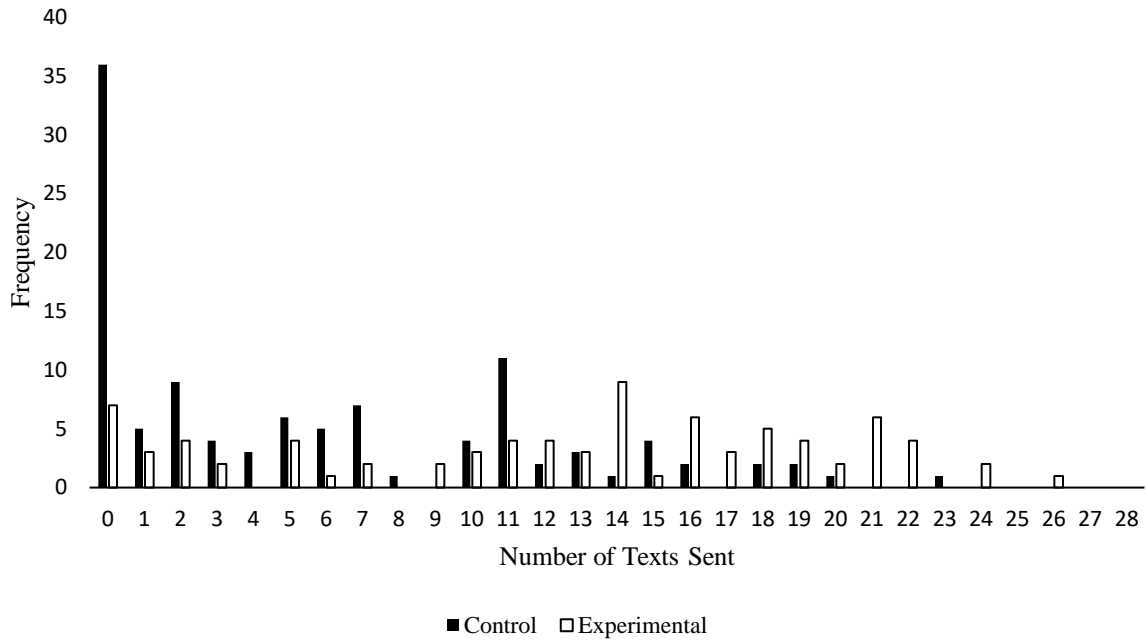| t-value	Degrees of freedom	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval	
					Lower	Upper
-7.424	179	.000**	-7.354	.991	-9.309	-5.399

*p < .05; **p < .01

Figure 1. Total number of text messages sent over entire study (All participants).
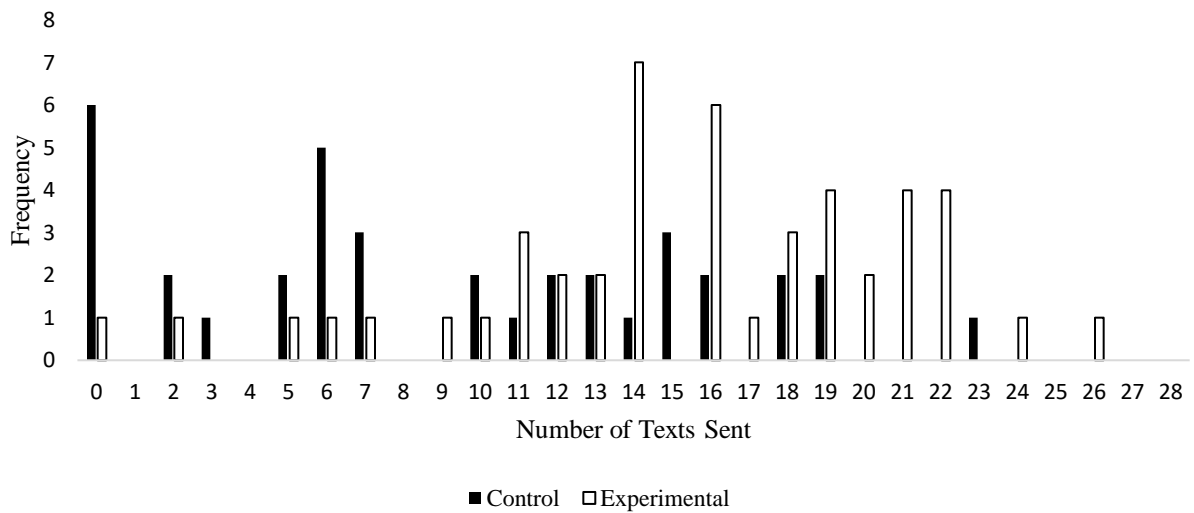

Figure 2. Total number of text messages over the entire study (participants who completed both pre- and post-test).

Hypothesis 2: Among individuals reporting that they want to practice meditation, those who are paired with a successful accountability partner will show increases in (a) mindfulness (as measured by the Five Factor Mindfulness Questionnaire), (b) self-efficacy (as measured by the General Self-Efficacy Scale and the Scale of Meditation Self-Efficacy) and (c) likelihood of utilizing an accountability partner in the future (as measured by a subscale of the Follow-Up Questionnaire) when compared to a control group consisting of participants who are not paired with a successful accountability partner.

In order to test Hypothesis 2, a repeated measures ANOVA was conducted to compare the effect of treatment condition on FFMQ score, GSES score, and rating of difficulty. There was not a significant effect for treatment condition on FFMQ, GSES, or SOMSE. There was also no significant effect for treatment condition on difficulty practicing meditation, which was measured at pre- and post-test with the question, "How difficult do you think it would be for you to practice meditation for 10 minutes per day for at least 5 days per week?" While participant change from pre- to post-test did not depend on condition, there was significant change over time when comparing change in all participants, regardless of group assignment in FFMQ, GSES, and difficulty (see Table 4 and Table 5), with post-test scores being non-significantly higher than pre-test scores for all measures. Participant likelihood of utilizing an accountability partner in the future (Hypothesis 2, item C) was to be measured by the optional follow-up portion of this experiment. Since only 6 participants completed this follow-up portion, there was insufficient data to provide evidence for or against my hypothesis.

Table 4.
Repeated Measures ANOVA

Scale	Degrees of Freedom	Mean Square	F	Sig.
		FFMQ		
Time	1, 82	259.61	18.58	.000**
Time*Condition	1, 82	18.38	1.32	.255
		GSES		
Time	1, 82	62.67	7.21	.009**
Time*Condition	1, 82	5.53	.636	.427
		Difficulty		
Time	1, 82	2809.38	7.37	.008**
Time*Condition	1, 82	505.04	1.33	.253

$*p < .05$; $**p < .01$

Note. FFMQ: FFMQ All Items; GSES: GSES All Items; Difficulty: responses to the following item, "How difficult do you think it would be for you to practice meditation for 10 minutes per day for at least 5 days per week?" (0 – 100 with higher numbers indicating more difficulty); Time: difference between pre- and post- group measurements. Condition: assignment of participants in control or experimental group.

Hypothesis 3: Among individuals reporting that they want to practice meditation, those who are paired with a successful accountability partner will show increases in reported feelings of obligation, responsibility, and motivation to meditate (each measured by targeted items within Post-Test Supplemental Questions) when compared to a control group consisting of participants who are not paired with a successful accountability partner.

A one-way between subjects ANOVA was conducted to compare the effect of group assignment on all self-report measures in the post-test portion of this experiment (Table 6; see Appendix J for specific items). There was not a significant effect of group assignment at the p<.05 level on FFMQ, perceived difficulty meditating, feelings of obligation to send text messages, extent to which decision to meditate was based on feelings of responsibility to others, motivation to meditate, difficulty of practicing meditation, or utilization of Headspace. This lack of significant effect provides evidence that during the post-test portion of the experiment (e.g., when participants completed computerized self-reports 28 days after beginning the study), participants in the experimental and control groups displayed no significant difference on all self-report measures, aside from feelings of obligation to meditate. There was a significant effect of group assignment on feelings of obligation to meditate. There were also significant positive correlations ($p < .01$) between number of text messages sent and participants feeling obligated to meditate (r = .422), feeling obligated to send text messages to accountability partners (r = .432), and participants feelings of motivation to engage in meditation (r = .426). There were also significant negative correlations ($p < .01$) between number of text messages sent and how difficult participants thought it would be to practice meditation in the future (r = -0.395), and how difficult participants found the practice of meditation during the study (r = -.291) (see Table 7).

Table 5.

Variable Means and Standard Deviations (participants who completed both pre- and post-test)

Variable	Control (n = 37)		Experimental (n = 47)	
	M	*SD*	*M*	*SD*
TEXTS	9.11	6.569	15.43	5.644
PRE_FFMQ_TOTAL	49.16	6.685	47.79	6.021
POST_FFMQ_TOTAL	51.00	5.297	50.96	6.150
PRE_FFMQ_OBSERV	10.54	2.206	10.26	2.172
POST_FFMQ_OBSERV	11.05	2.054	11.15	1.922
PRE_FFMQ_DESCRIB	9.27	2.557	8.91	2.205
POST_FFMQ_DESCRIB	9.78	2.335	9.87	2.028
PRE_FFMQ_ACTING	9.68	1.600	9.66	1.891
POST_FFMQ_ACTING	9.00	2.041	9.21	2.116
PRE_FFMQ_NONJUDGE	10.84	2.500	10.74	2.141
POST_FFMQ_NONJUDGE	11.30	1.956	10.98	2.364
PRE_FFMQ_NONREACT	9.62	1.722	9.15	1.853
POST_FFMQ_NONREACT	9.86	1.619	9.74	1.581
PRE_GSES_TOTAL	31.22	3.938	30.47	3.256
POST_GSES_TOTAL	32.08	4.179	32.06	3.674
PRE_DIFFICULTY	34.43	23.861	36.64	19.957
POST_DIFFICULTY	46.16	21.771	41.38	24.155
OBLIGATED_MEDITATE	52.54	24.516	62.34	20.812
OBLIGATED_TEXT	58.49	27.320	66.30	23.333
RESPONSIBILITY	55.14	24.342	58.19	23.160
MOTIVATION	53.30	21.992	61.57	22.893
PAST_MONTH_DIFFICULTY	55.68	24.152	50.89	25.262
HEADSPACE	5.05	5.925	6.96	7.065

Note. TEXTS: Total number of text messages sent; PRE_FFMQ_TOTAL: FFMQ All Items (Pre-Test); POST_FFMQ_TOTAL: FFMQ All Items (Post-Test); PRE_FFMQ_OBSERV: FFMQ Observe Items (Pre-Test); POST_FFMQ_OBSERV: FFMQ Observe Items (Post-Test); PRE_FFMQ_DESCRIB: FFMQ Describe Items (Pre-Test); POST_FFMQ_DESCRIB: FFMQ Describe Items (Post-Test); PRE_FFMQ_ACTING: FFMQ Act with Awareness Items (Pre-Test); POST_FFMQ_ACTING: FFMQ Act with Awareness Items (Post-Test); PRE_FFMQ_NONJUDGE: FFMQ Non-judge Items (Pre-Test); POST_FFMQ_NONJUDGE: FFMQ Non-judge Items (Post-Test); PRE_FFMQ_NONREACT: FFMQ Non-react items (Pre-Test); POST_FFMQ_NONREACT: FFMQ Non-react items (Post-Test); PRE_GSES_TOTAL: GSES All Items (Pre-Test); POST_GSES_TOTAL: GSES All Items (Post-Test); PRE_DIFFICULTY: "How difficult do you think it would be for you to practice meditation for 10 minutes per day for at least 5 days per week?" (0 – 100 with higher numbers indicating more difficulty) (Pre-Test); POST_DIFFICULTY: "How difficult do you think it would be for you to practice meditation for 10 minutes per day for at least 5 days per week?" (0 – 100 with higher numbers indicating more difficulty) (Post-Test); OBLIGATED_MEDITATE: "During the past month, how obligated did you feel to meditate for 10 minutes per day, 5 days per week?" (0 – 100 with higher numbers indicating more obligation); OBLIGATED_TEXT: "During the past month, how obligated did you feel to send a text message verifying that you meditated for 10 minutes per day, 5 days per week (regardless of whether you did or did not meditate)?" (0 – 100 with higher numbers indicating more obligation); RESPONSIBILITY: "To what extent was your decision to meditate over the past month based on feelings of responsibility to others?" (0 – 100 with higher numbers indicating more responsibility); MOTIVATION: "How motivated did you feel to practice meditation over the past month?" (0 – 100 with higher numbers indicating more motivation); PAST_MONTH_DIFFICULTY: "How difficult was it for you to practice meditation over the past month?" (0 – 100 with higher numbers indicating more difficulty); HEADSPACE: "During this experiment, how many times did you utilize guided meditations from Headspace?" (Scale from 1 – 28, with one option for "greater than 28")

Table 6.

One-Way Between Subjects ANOVA on Group Assignment for Post-Test Measures (participants who completed both pre- and post-tests)

Variable	Sum of Squares	Degrees of Freedom	Mean Square	F	Sig
POST_FFMQ_TOTAL	.04	1, 82	.04	.001	.97
POST_GSES_TOTAL	.01	1, 82	.01	.000	.98
POST_DIFFICULTY	472.86	1, 82	472.86	.88	.35
OBLIGATED_MEDITATE	1988.21	1, 82	1988.21	3.92	.05*
OBLIGATED_TEXT	1263.21	1, 82	1263.21	2.00	.16
RESPONSIBILITY	193.39	1, 82	193.39	.35	.56
MOTIVATION	1418.35	1, 82	1418.35	2.80	.10
PAST_MONTH_DIFFICULTY	473.42	1, 82	473.42	.77	.38
HEADSPACE	75.00	1, 82	75.00	1.73	.19

$*p < .05; **p < .01$

Note. POST_FFMQ_TOTAL: FFMQ All Items (Post-Test); POST_GSES_TOTAL: GSES All Items (Post-Test); POST_DIFFICULTY: "How difficult do you think it would be for you to practice meditation for 10 minutes per day for at least 5 days per week?" (0 – 100 with higher numbers indicating more difficulty) (Post-Test); OBLIGATED_MEDITATE: "During the past month, how obligated did you feel to meditate for 10 minutes per day, 5 days per week?" (0 – 100 with higher numbers indicating more obligation); OBLIGATED_TEXT: "During the past month, how obligated did you feel to send a text message verifying that you meditated for 10 minutes per day, 5 days per week (regardless of whether you did or did not meditate)?" (0 – 100 with higher numbers indicating more obligation); RESPONSIBILITY: "To what extent was your decision to meditate over the past month based on feelings of responsibility to others?" (0 – 100 with higher numbers indicating more responsibility); MOTIVATION: "How motivated did you feel to practice meditation over the past month?" (0 – 100 with higher numbers indicating more motivation); PAST_MONTH_DIFFICULTY: "How difficult was it for you to practice meditation over the past month?" (0 – 100 with higher numbers indicating more difficulty); HEADSPACE: "During this experiment, how many times did you utilize guided meditations from Headspace?" (Scale from 1 – 28, with one option for "greater than 28")

Table 7.
Pearson Correlation Scores

	1	2	3	4	5	6	7	8
1. TEXTS	-							
2. PRE_DESIRE	0.080	-						
3. PRIOR_MED	-0.008	0.003	-					
4. PRE_FFMQ_TOTAL	0.016	0.003	0.152	-				
5. PRE_GSES_TOTAL	-0.113	-0.009	0.173	.380**	-			
6. PRE_DIFFICULTY	-0.109	-0.157	-0.093	-0.113	0.085	-		
7. POST_FFMQ_TOTAL	0.144	-0.061	0.017	.619**	0.155	-.294**	-	
8. POST_GSES_TOTAL	-0.015	0.020	0.152	0.168	.379**	0.079	0.187	-
9. POST_DIFFICULTY	-.395**	-.314**	-0.121	0.004	0.157	.238*	-0.109	-0.002
10. OBLIGATED_MEDITATE	.422**	0.157	0.156	0.084	-0.072	0.080	0.050	0.039
11. OBLIGATED_TEXT	.432**	0.142	0.025	-0.022	0.016	0.077	0.046	-0.086
12. RESPONSIBILITY	0.151	0.115	-0.002	-0.130	0.078	0.149	-0.068	0.136
13. MOTIVATION	.426**	.222*	0.080	0.009	-0.211	0.146	0.004	-0.075
14. PAST_MONTH_DIFF	-.291**	-0.085	0.014	-0.053	0.156	0.196	-0.119	0.058
15. HEADSPACE	0.213	0.160	0.180	-0.097	-0.136	0.031	0.016	-0.023

Table 7. (Continued)
Pearson Correlation Scores

	9	10	11	12	13	14	15
1. TEXTS							
2. PRE_DESIRE							
3. PRIOR_MED							
4. PRE_FFMQ_TOTAL							
5. PRE_GSES_TOTAL							
6. PRE_DIFFICULTY							
7. POST_FFMQ_TOTAL							
8. POST_GSES_TOTAL							
9. POST_DIFFICULTY	-						
10. OBLIGATED_MEDITATE	-0.125	-					
11. OBLIGATED_TEXT	-0.143	.577**	-				
12. RESPONSIBILITY	-0.055	.407**	.466**	-			
13. MOTIVATION	-.385**	.519**	.346**	-0.017	-		
14. PAST_MONTH_DIFF	.703**	-0.038	0.049	0.187	-.404**	-	
15. HEADSPACE	-.319**	0.153	0.162	-0.016	.251*	-.225*	-

Note. TEXTS: Total number of text messages sent; PRE_DESIRE: "On a scale from 1-10, with 1 being a very small amount of desire and 10 being a very large amount of desire, how much do you want to engage in 10 minutes of meditation for 5 out of 7 days during the next 28-day period?" (1-10 scale); PRIOR_MED: "To what extent have you attempted to meditate prior to this experiment?" (given four choices: "I have never meditated," "I have sometimes meditated," "I meditate regularly," and, "I'd prefer not to say"; PRE_FFMQ_TOTAL: FFMQ All Items (Pre-Test); PRE_GSES_TOTAL: GSES All Items (Pre-Test); PRE_DIFFICULTY: "How difficult do you think it would be for

you to practice meditation for 10 minutes per day for at least 5 days per week?" (0 – 100 with higher numbers indicating more difficulty) (Pre-Test); POST_FFMQ_TOTAL: FFMQ All Items (Post-Test); POST_GSES_TOTAL: GSES All Items (Post-Test); POST_DIFFICULTY: "How difficult do you think it would be for you to practice meditation for 10 minutes per day for at least 5 days per week?" (0 – 100 with higher numbers indicating more difficulty) (Post-Test); OBLIGATED_MEDITATE: "During the past month, how obligated did you feel to meditate for 10 minutes per day, 5 days per week?" (0 – 100 with higher numbers indicating more obligation); OBLIGATED_TEXT: "During the past month, how obligated did you feel to send a text message verifying that you meditated for 10 minutes per day, 5 days per week (regardless of whether you did or did not meditate)?" (0 – 100 with higher numbers indicating more obligation); RESPONSIBILITY: "To what extent was your decision to meditate over the past month based on feelings of responsibility to others?" (0 – 100 with higher numbers indicating more responsibility); MOTIVATION: "How motivated did you feel to practice meditation over the past month?" (0 – 100 with higher numbers indicating more motivation); PAST_MONTH_DIFFICULTY: "How difficult was it for you to practice meditation over the past month?" (0 – 100 with higher numbers indicating more difficulty); HEADSPACE: "During this experiment, how many times did you utilize guided meditations from Headspace?" (Scale from 1 – 28, with one option for "greater than 28");

*p < .05; **p < .01

6. Discussion

The purpose of this study was to investigate the role of a text message-based intervention system on meditation practice for college students. The results of this study suggest that college students who used the text message-based intervention engaged in significantly more text messaging behavior (thereby, presumably, having done more meditating) compared to a control group who used a similar system without an accountability partner. However, the data suggests that there is no statistically significant difference between the experimental and control groups on post-test self-report measures used in this study, suggesting that use of this system for one month does not result in changes on some measures of self-efficacy and mindfulness.

While this study demonstrated a significant difference between the experimental and control group on text messaging behaviors, it did not control for or study the impact of how text messages could have served as reminders for participants to send text messages. Specifically, in the experimental group, participants received text messages 20 times during the course of the one-month study, while participants in the control group did not receive any text messages. In the current study, there is no way to know whether increased text messaging behavior in the experimental group was due to aspects of this intervention such as social influence or feelings of accountability, or if this effect was simply due to receiving text messages that served as reminders. When reviewing 8 studies aimed at promoting adherence to antiretroviral therapy, Finitsis et al. (2014) found that, "Designs that allowed, encouraged, or required message recipients' response exhibited better outcomes than ''one-way'' reminder messages" (pg. 7). This review provides some evidence that the two-way nature of the intervention used in this study impacted its efficacy, and that this impact likely led to better outcomes (e.g., increased practice of mindfulness meditation). However, there is also research indicating the efficacy of only text message

reminders. For example, Armstrong and colleagues found that daily text message reminders (with no response necessary) improved sunscreen use among adult participants (2009). In future studies, the reminder aspect of this intervention could be examined by having a third group who were not led to believe that they were paired with an accountability partner, but who did receive automated text message reminders.

A large number of participants in this study sent zero text messages – particularly those in the control group. For example, in the group of participants who only completed the pre-test, 33% of participants in the control group sent zero text messages (as compared with 8.5% of participants in the experimental group). It is theorized that this phenomenon is related to the aforementioned impact of text messages serving as reminders. More specifically, those in the experimental group were sent text messages 5 out of 7 days during the course of the study, and these text messages could have served as reminders. These text messages serving as reminders would likely increase the likelihood that participants in the experimental condition would send text messages indicating that they had meditated. While this phenomenon of text messages serving as reminders was not directly investigated in this study, it is hypothesized that many of the same social influence factors influenced this behavior. Specifically, when participants in the experimental condition received text messages from perceived accountability partners, these messages may have caused participants to feel motivated to reciprocate text messaging behavior and behave in a way that was acceptable when compared to others (i.e., sending text messages). Those participants in the control condition likely were not influenced by these social influence factors. It is also hypothesized that this aspect of the intervention modeled and normalized the act of sending text messages. Whitby and colleagues (2006) highlighted the importance of modeling and normalization when they investigated why healthcare workers don't engage in handwashing behavior with the

recommended frequency. Researchers found that even when they made adherence easier (e.g., implementing the use of alcoholic hand wipes in order to decrease the effort required to wash hands), healthcare workers continued to not wash their hands. Researchers explained this by discussing how compliance was "highly dependent on altering behavioral perceptions" of handwashing. Perhaps in the current study, having a successful accountability partner modeled engagement with the intervention system, which altered participant's perceptions of this behavior in a way that led those in the experimental group to engage with the intervention, and left those in the control group to perceive the intervention in a way that allowed for disengagement (i.e., sending zero text messages). It should be noted that even though there was a large number of participants who sent zero text messages, differences in text messaging behavior between control and experimental groups were still significant when those participants who sent zero text messages were removed from data analysis.

Many steps were taken to maximize internal validity of the present study, including standardization through the use of a "controlled" perceived accountability partner instead of a real one, limiting of communication to only the day of the week (thereby reducing extraneous influences that might accompany uncontrolled text content), and having participants engage in text communication knowing that the experimenter could see this behavior. However, it is likely that these aspects of the experiment changed the way in which social influence factors (e.g., reciprocity, consistency, social validation, modeling) impacted participant behavior, and in doing so, decreased generalizability and real-world applicability. For example, Schultz and colleagues discuss how individuals are more likely to behave in a way that is similar to others when they perceive themselves as more similar to others (2007). However, in this study, participants were only told that they would be paired with "a graduate student" at their same university. With so little

information about the (purported) accountability partner, it may have been difficult for participants to identify with the partner; thus, leading to a failure to develop liking, trust, or care about their partner. In turn, this may have led to being influenced less by that partner. It is hypothesized that if the intervention system utilized in this study were to be utilized in the "real world," social influence would have a greater impact on how users engage with this intervention system.

When considering the results of this study, it is important to consider the nature of the control group. An ideal control group is a group that does not receive treatment. In the current study, the control group did not receive treatment per se, however, they did participate in some parts of the intervention that could have led control group participants to change their meditation behavior (e.g., completion of instruments which cause participants to think about meditation, viewing an educational video about meditation, text messaging an "experiment phone number" that will be "logged into a computer"). Thus, it is difficult to compare use of this intervention system to using no intervention system. Future studies could compare meditation behavior using this intervention with participants who are motivated to meditate but who do not engage in any meditation-related behaviors (e.g., completing self-report instruments) or text messaging behaviors (e.g., text messaging an "experiment phone number").

6.1. Limitations

The present study has several limitations. The first limitation involves outcome measures. The primary outcome measure for this study was the number of text messages sent from participants indicating that they had meditated that day. Participants were told that sending this text message would indicate that they had practiced mindfulness meditation for at least 10 minutes on the day that the text was sent. However, there is no way to know if participants actually

practiced mindfulness meditation or if they just sent text messages. We know that sometimes people do lie, perhaps especially when they want to be seen in a positive light. For example, in diary studies of lying behavior, college students reported telling an average of 2 lies per day (Depaulo et al., 1996). Investigators attempted to examine lying behavior in this study by asking participants in follow-up measures how often they sent text messages when they did not meditate. However, only 6 participants (3 in each group) completed follow-up measures. Despite this extremely small sample size, it may be useful to note that participants in the control group reported sending text messages when they did not meditate an average of 2.67 times, and participants in the experimental group reported this behavior an average of 1.67 times. Of course, these numbers represent only those who "admitted to lying". There is no way of knowing how many participants sent text messages when they did not meditate, and who did not admit this behavior.

Similarly, it is impossible to know exactly what behavior participants were engaging in when they were "meditating." I tried to clarify this behavior by asking participants to watch a video educating them on mindfulness meditation, providing written instructions (Appendix F), and by recommending use of a popular meditation smartphone application. However, it is not possible to know with precision what behavior(s) participants "counted" as mindfulness meditation. For example, they may have "daydreamed" and called that meditation, or they may have reflected on their goals in life (or anything else for that matter) and reported this behavior as meditation. In addition to this limitation, it should be noted that remaining measures used were all self-report measures, which rely on the assumption that participants could and did accurately report their perceived self-efficacy or mindfulness.

There were also limitations regarding the specific sample and population that participated in this study. All data were collected from one public university in the Southeastern United States.

As such, this study largely consisted of White, female participants, which greatly limits generalizability to males and other ethnicities. This study was also administered to only those who expressed relatively high motivation to meditate, so it is unclear if this same methodology could generalize to those with more passive desires to participate in mindfulness meditation. Furthermore, since this study only investigated meditation behavior, it is unclear as to whether this same text message-based intervention system would work in the implementation of other behaviors. Last, it should be noted that a large percentage (53.5%) of participants completed pre-test measures without completing post-test measures. It is theorized that this attrition was related to the amount of time between pre- and post-test measurements, and possibly changes in the desire of participants for extra credit. Similar studies have also shown high attrition rates. For example, Shapiro et al (2008) examined an 8-week text message-based intervention for monitoring sugar-sweetened beverages, physical activity, and screen time in children. This study had a 27.8% dropout rate for participants who used text messaging, a 61.1% dropout rate for participants who completed paper diaries for monitoring, and a 50% dropout rate for a non-monitoring control group. Irrespective of whether a high dropout rate is to be expected when doing this type of research, this limitation must be taken into consideration when reviewing post-test data, as the participants who completed both the pre- and post-tests were actually a minority of the total of participant population, and perhaps shared features (e.g., high trait-conscientiousness) that meaningfully differentiated this sample from the undergraduate student population. It is also worth noting that participants who dropped out of this study differed significantly by group assignment, in the sense that participants in the control group dropped out of the study more frequently than did participants in the experimental group. This provides more evidence that aspects of the experimental condition (e.g., being paired with a successful accountability partner) increased

participant engagement with the study, as those in the experimental condition were more likely to complete post-test measures.

6.2. Implications

The current study was the first known of its kind to investigate the use of a text message-based intervention system utilizing the perception of a paired accountability partner. It was also the first known of its kind to investigate use of a behavior implementation system on mindfulness meditation practice. While further research is needed to clarify the mechanism(s) behind this intervention's efficacy, this study does demonstrate that use of this particular text message-based intervention system leads to an increase in participant text messaging behavior, which, despite some instances of false reporting, presumably reflects an increase in mindfulness meditation. These results provide evidence that this behavior implementation system might be effectively utilized to increase the likelihood of wanted behaviors, which could translate to a counseling psychology setting (e.g., a therapy relationship). However, as stated in the introduction, there are many ethical considerations which must be addressed before a method such as this is used in a therapist-client relationship. This study also showed that for undergraduate participants who expressed motivation to meditate, encouragement and education about mindfulness meditation, followed by control manipulation (report only) or experimental manipulation (text messaging with a successful accountability partner) did not lead to significant differential changes in self-reported levels of self-efficacy, mindfulness, likelihood of utilizing an accountability partner in the future, feelings of obligation, feelings of responsibility, or motivation towards achieving desired behavioral goals.

This study was not designed in a way to delineate factors which may have contributed to

participant engagement in text messaging behaviors (e.g., participants receiving reminders, the impact of social influence). However, this study did provide compelling quantitative evidence (i.e., number of text messages sent) that this particular behavior implementation system increased participant implementation of text messaging behavior (which is assumed to correspond to the practice of mindfulness meditation). Future research in this area should utilize more nuanced control groups (e.g., a reminder-only condition), more realistic pairing of participants with accountability partners (e.g., using a close friend as an accountability partner), and explore the use of this intervention with behaviors other than mindfulness meditation (e.g., physical exercise, journaling, reading, etc.).

7. References

Aiello, J. & Douthitt, E. (2001). Social facilitation from triplett to electronic performance monitoring. *Group Dynamics Theory Research and Practice*, *5,*163–180.

Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior. *Journal of Applied Social Psychology, 32,* 665-683.

Ajzen, I. (2006). Constructing a theory of planned behavior questionnaire. Retrieved from: http://people.umass.edu/~aizen/pdf/tpb.measurement.pdf.

Alahäivälä, T., & Oinas-Kukkonen, H. (2016). Understanding persuasion contexts in health gamification: a systematic analysis of gamified health behavior change support systems literature. *International Journal of Medical Informatics, 96*, 62-70.

Aristotle. (1905). *Aristotle's Politics*. Oxford: Clarendon Press.

Armstrong, A. W., Watson, A. J., Makredes, M., Frangos, J. E., Kimball, A. B., & Kvedar, J. C. (2009). Text-message reminders to improve sunscreen use: a randomized, controlled trial using electronic monitoring. *Archives of Dermatology, 145,* 1230-1236.

Asch, S. E. (1956). Studies of independence and conformity: A minority of one against a unanimous majority. *Psychological Monographs: General and Applied*, *70*, 1.

Ashford, S., Edmunds, J., & French, D. P. (2010). What is the best way to change self-efficacy to promote lifestyle and recreational physical activity? A systematic review with meta-analysis. *British Journal of Health Psychology, 15,* 265-288.

Ashida, S., Wilkinson, A. V., & Koehly, L. M. (2012). Social influence and motivation to change health behaviors among Mexican-origin adults: implications for diet and physical activity. *American Journal of Health Promotion*, *26*, 176-179.

Baer, R. A., Carmody, J., & Hunsinger, M. (2012). Weekly change in mindfulness and perceived stress in a mindfulness-based stress reduction program. *Journal of Clinical Psychology*, *68*, 755-765.

Baer, R. A., Smith, G. T., Hopkins, J., Krietemeyer, J., & Toney, L. (2006). Using self-report assessment methods to explore facets of mindfulness. *Assessment, 13,* 27-45.

Baer, R. A., Smith, G. T., Lykins, E., Button, D., Krietemeyer, J., Sauer, S., & Williams, J. M. G. (2008). Construct validity of the five-facet mindfulness questionnaire in meditating and nonmeditating samples. *Assessment*, *15,* 329-342.

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review*, 84, 191.

Bandura, A. (1977). *Social learning theory.* Englewood Cliffs, NJ: Prentice-Hall.

Bandura, A. (1994). *Self-efficacy*. New York: John Wiley & Sons, Inc.

Bandura, A. (1994). Self-efficacy. *Encyclopedia of Human Behavior* (Vol. 4). New York: Academic Press.

Bandura, A. (1997) *Self-efficacy: the exercise of control.* New York: Freeman.

Bandura, A. (2006). Guide for constructing self-efficacy scales. *Self-Efficacy Beliefs of Adolescents*, 307-337.

Baumeister, R. & Finkel, E. (2010). *Advanced Social Psychology: The State of the Science.* New York: Oxford University Press.

Bayley, P., Frascino, J., & Squire, L. (2005). Robust habit learning in the absence of awareness and independent of the medial temporal lobe, *Nature, 436*, 550 – 53.

Beaman, A. L., Cole C. M., Preston, M., Klentz, B. & Steblay, N. M. (1983). Fifteen years of foot-in-the-door research: A meta-analysis. *Personality and Social Psychology Bulletin, 9,* 181-196.

Bernstein, K & Bernstein, B. (1987). Marriage of Barbara and Keith Bernstein. *Bernstein Family Review; A.J., 33-36,* 3420.

Bellini, S. & Akullian, J. (2007). A meta-analysis of video modeling and video self-modeling interventions for children and adolescents with Autism Spectrum Disorders. *Exceptional Children*, *73,* 264-287.

Brickman, P., D., Coates, R., & Bulman, J. (1978). Lottery winners and accident victims: Is happiness relative? *Journal of Personality and Social Psychology 36,* 917-927.

Brown, K. W., & Ryan, R. M. (2003). The benefits of being present: mindfulness and its role in psychological well-being. *Journal of Personality and Social Psychology*, *84*, 822.

Burger, J. M., Messian, N., Patel, S., del Prado, A., & Anderson, C. (2004). What a coincidence! The effects of incidental similarity on compliance. *Personality and Social Psychology Bulletin, 30,* 35-43.

Carli, L. L., Ganley, R., & Pierce-Otay, A. (1991). Similarity and satisfaction in roommate relationships. *Personality and Social Psychology Bulletin, 17,* 419-426.

Central Intelligence Agency. (2015). The world factbook— Communication: mobile cellular. Retrieved from:

https://www.cia.gov/library/publications/the-world-factbook/geos/xx.html.

Choi, W., Oh, J., Edge, D., Kim, J., & Lee, U. (2016). SwimTrain: Exploring exergame design for group fitness swimming. *2016 CHI Conference on Human Factors in Computing Systems*, 1692-1704.

Christakis, N. A., & Fowler, J. H. (2007). The spread of obesity in a large social network over 32 years. *New England Journal of Medicine*, *357*, 370-379.

Cialdini, R. B. (2003). Crafting normative messages to protect the environment. *Current Directions in Psychological Science*, *12*, 105-109.

Cialdini, R. B. (2008). *Influence: Science and Practice (5ᵗʰ ed.).* Boston, MA: Allyn & Bacon.

Cialdini, R. B., Eisenberg, N., Green, B. L., Rhoads, K., & Bator, R. (1998). Undermining the undermining effect of reward on sustained interest. *Journal of Applied Social Psychology*, *28*, 249-263.

Cialdini, R. B., & Goldstein, N. J. (2004). Social influence: Compliance and conformity. *Annual Review of Psychology, 55*, 591-621.

Clarke T, Black L, Stussman B, Barnes P, Nahin R. (2015). Trends in the use of complementary health approaches among adults: United States, 2002–2012. *National Health Statistics Reports; no 79*. Hyattsville, MD: National Center for Health Statistics.

Clendenen, V. I., Herman, C. P., & Polivy, J. (1994). Social facilitation of eating among friends and strangers. *Appetite*, *23*, 1–13.

Conroy, D. E., Yang, C. H., & Maher, J. P. (2014). Behavior change techniques in top-ranked mobile apps for physical activity. *American Journal of Preventive Medicine*, *46,* 649-652.

Craig P, Dieppe P, & Macintyre S (2008). Developing and evaluating complex interventions: the new Medical Research Council guidance. *BMJ*, 337.

Crane, D., Garnett, C., Brown, J., West, R., & Michie, S. (2015). Behavior change techniques in popular alcohol reduction apps: content analysis. *Journal of Medical Internet Research, 17*, 118

Cunningham, J. A., Strassberg, D. S., & Hann, B. (1986). Effects of intimacy on sex-role congruency of self-disclosure. *Journal of Social and Clinical Psychology, 4,* 393-401.

Damásio, B. F., Valentini, F., Núñes-Rodriguez, S. I., Kliem, S., Koller, S. H., Hinz, A., & Zenger, M. (2016). Is the general self-efficacy scale a reliable measure to be used in cross-cultural studies? *The Spanish Journal of Psychology, 19*, 29.

De Bruin, E. I., Topper, M., Muskens, J. G., Bögels, S. M., & Kamphuis, J. H. (2012). Psychometric properties of the Five Facets Mindfulness Questionnaire (FFMQ) in a meditating and a non-meditating sample. *Assessment, 19,* 187-197.

DeNeve, K.M. & H. Cooper. (1998) The happy personality: A meta-analysis of 137 personality traits and subjective well-being, *Psychological Bulletin 124,*197-229.

DePaulo, B. M., Kashy, D. A., Kirkendol, S. E., Wyer, M. M., & Epstein, J. A. (1996). Lying in everyday life. *Journal of Personality and Social Psychology*, *70,* 979.

Deterding, S., Dixon, D., Khaled, R., & Nacke, L. (2011). From game design elements to gamefulness: defining gamification. *In Proceedings of the 15th International Academic MindTrek Conference: Envisioning Future Media Environments*, 9-15.

Diener, E., Suh, E., Lucas, R & Smith, H. (1999). Subjective well-being: Three decades of progress, *Psychological Bulletin 125*, 276-302.

Dolan, P., Kavetsos, G., & Vlaev, I. (2014). The happiness workout. *Social Indicators Research, 119,* 1363-1377.

Dombrowski, S. U., Sniehotta, F. F., Avenell, A., Johnston, M., MacLennan, G., & Araújo-Soares, V. (2012). Identifying active ingredients in complex behavioral interventions for obese adults with obesity-related co-morbidities or additional risk factors for co-

morbidities: a systematic review. *Health Psychology Review, 6,* 7–32. doi:10.1080/17437199.2010.513298

Drachman, D., DeCarufel, A., & Insko, C. (1978). The extra credit effect in interpersonal attraction. *Journal of Experimental Social Psychology, 14,* 458-469.

Duhigg, Charles. (2012) *The power of habit: why we do what we do in life and business* New York: Random House.

Edwards, E. A., Lumsden, J., Rivas, C., Steed, L., Edwards, L. A., Thiyagarajan, A., ... & Taylor, S. (2016). Gamification for health promotion: systematic review of behavior change techniques in smartphone apps. *BMJ, 6*, 10.

Emmons, R.A. & M.E. McCullough (2003). Counting blessings versus burdens: an experimental investigation of gratitude and subjective well-being in daily life. *Journal of Personality and Social Psychology, 84*, 377-389.

Festinger, L. (1957). *A theory of cognitive dissonance*. Stanford: Stanford University

Fjeldsoe, B. S., Marshall, A. L., & Miller, Y. D. (2009). Behavior change interventions delivered by mobile telephone short-message service. *American Journal of Preventive Medicine*, *36,* 165-173.

Fox, J., Bailenson, J., & Binney, J. (2009). Virtual experiences, physical behaviors: The effect of presence on imitation of an eating avatar. *Presence: Teleoperators and Virtual Environments, 18*, 294-303.

Free, C., Knight, R., Robertson, S., Whittaker, R., Edwards, P., Zhou, W., & Roberts, I. (2011). Smoking cessation support delivered via mobile phone text messaging (txt2stop): a single-blind, randomized trial. *The Lancet*, 378, 49-55.

Frenzen, J. R., & Davis, H.L. (1990). Purchasing behavior in embedded markets. *Journal of Consumer Research, 17,* 1-12.

Fredrickson, B. L., Cohn, M. A., Coffey, K. A., Pek, J., & Finkel, S. M. (2008). Open hearts builds lives: Positive emotions, induced through loving-kindness meditation, build consequential personal resources. *Journal of Personality and Social Psychology, 95,* 1045–1062.

Fredrickson, B. & Joiner, T. (2002) Positive emotions trigger upward spirals toward emotional well-being. *Psychological Science, 13,* 172-175.

Garner, R. (2005). Post-It Note persuasion: A sticky influence. *Journal of Consumer Psychology, 15,* 230-237.

Gilbert, D. (2009). *Stumbling on happiness*. Vintage: Canada.

Girelli, L., Hagger, M., Mallia, L., & Lucidi, F. (2016). From perceived autonomy support to intentional behaviour: Testing an integrated model in three healthy-eating behaviours. *Appetite*, *96,* 280-292.

Gish, J. J., & Wagner, D. T. (2016). The affective implications of sleep. In J. Barling et al., *Work and sleep: Research insights for the workplace (pp. 101-123).* New York, NY, US: Oxford University Press.

Gist, M. E., & Mitchell, T. R. (1992). Self-efficacy: A theoretical analysis of its determinants and malleability. *Academy of Management Review*, 17, 183-211.

Gockley, R. Marotta, M. Rogoff, C. & Tang, A. (2006). Aviva: a health and fitness monitor for young women. *Extended Abstracts on Human Factors in Computing Systems*, *6,* 1819–1824.

Goldberg, L. R., Johnson, J. A., Eber, H. W., Hogan, R., Ashton, M. C., Cloninger, C. R., & Gough, H. C. (2006). The international personality item pool and the future of public-domain personality measures. *Journal of Research in Personality, 40,* 84-96.

Goldstein, N. J., Cialdini, R. B., & Griskevicius, V. (2008). A room with a viewpoint: social norms to motivate environmental conservation in hotels. *Journal of Consumer Research, 35,* 472-482.

Gollwitzer, P.M. & Sheeran, P. (2006). Implementation intentions and goal achievement: A meta-analysis of effects and processes. *Advances in Experimental Social Psychology 38,* 69-119.

Gouldner, A. W. (1960). The norm of reciprocity: A preliminary statement. *American Sociological Review, 25,* 161-178.

Greenwald, A. F., Carnot, C. G., Beach, R., & Young, B. (1987). Increasing voting behavior by asking people if they expect to vote. *Journal of Applied Psychology, 72,* 315 – 318.

Griskevicius, V., Cialdini, R. B., & Goldstein, N. J. (2008). Applying (and resisting) peer influence. *MIT/Sloan Management Review, 49*, 84-88.

Gruzd, A., & Wellman, B. (2014). Networked influence in social media: Introduction to the special issue. *American Behavioral Scientist*, *58(10),* 1251-1259.

Gu, J., Strauss, C., Crane, C., Barnhofer, T., Karl, A., Cavanagh, K., & Kuyken, W. (2016). Examining the factor structure of the 39-item and 15-item versions of the Five Facet Mindfulness Questionnaire before and after mindfulness-based cognitive therapy for people with recurrent depression. *Psychological Assessment, 28,* 791.

Hardy, H., Kumar, V., Doros, G., Farmer, E., Drainoni, M. L., Rybin, D., ... & Skolnik, P. R. (2011). Randomized controlled trial of a personalized cellular phone reminder system to enhance adherence to antiretroviral therapy. *AIDS Patient Care and STDs, 25,* 153-161.

Hall, A. K., Cole-Lewis, H., & Bernhardt, J. M. (2015). Mobile text messaging for health: a systematic review of reviews. *Annual Review of Public Health, 36,* 393-415.

Hamari, J., & Koivisto, J. (2015). "Working out for likes": An empirical study on social influence in exercise gamification. *Computers in Human Behavior, 50,* 333-347.

Hamilton, K., & White, K. M. (2010). Understanding parental physical activity: Meanings, habits, and social role influence. *Psychology of Sport and Exercise*, *11*, 275-285. doi:10.1016.

Harkin, B., Webb, T. L., Chang, B. P., Prestwich, A., Conner, M., Kellar, I., & Sheeran, P. (2016). Does monitoring goal progress promote goal attainment? A meta-analysis of the experimental evidence. *Psychological Bulletin, 142*, 198.

Herman, C. P. (2015). The social facilitation of eating. *Appetite*, *86*, 61-73.

James, W. (1899). *Talks to teachers on psychology and to students on some of life's ideals*. New York: Library of Congress.

Johnson, J. A. (2014). Measuring thirty facets of the Five Factor Model with a 120-item public domain inventory: Development of the IPIP-NEO-120. *Journal of Research in Personality, 51,* 78-89.

Kazdin, A. E. (2003). *Research design in clinical psychology (4th ed.)*. Boston: Allyn & Bacon.

Kenrick, D. T., Griskevicius, V., Neuberg, S. L., & Schaller, M. (2010). Renovating the pyramid of needs: Contemporary extensions built upon ancient foundations. *Perspectives on psychological science*, *5,* 292-314.

King, L.A. (2001). The health benefits of writing about life goals. *Personality and Social Psychology Bulletin*. 27, 798-807.

King, D., Greaves, F., Exeter, C., & Darzi, A. (2013). 'Gamification': Influencing health behaviors with games. *Journal of the Royal Society of Medicine. 106,* 76-78.

Komarraju, M., & Nadler, D. (2013). Self-efficacy and academic achievement: Why do implicit beliefs, goals, and effort regulation matter? *Learning and Individual Differences, 25*, 67-72.

Kong, F., Wang, X., & Zhao, J. (2014). Dispositional mindfulness and life satisfaction: The role of core self-evaluations. *Personality and Individual Differences, 56,* 165–169.

Lachman, M. E., & Weaver, S. L. (1998). The sense of control as a moderator of social class differences in health and well-being. *Journal of Personality and Social Psychology*, *74,* 763.

Langlois, J. H., Kalakanis, A., Rubenstein, A. J., Larson, A., Hallam, M., & Smoot, M. (2000). Maxims or myths of beauty: A meta-analytic and theoretical review. *Psychological Bulletin, 126,* 390-423.

Lehnert, J. D., Shevach, A., Walker, S., Wang, R., Fitzgerald, T. J., & Graitcer, S. B. (2018). Development and pilot testing of a text message vaccine reminder system for use during an influenza pandemic. *Human Vaccines & Immunotherapeutics,* 1-7.

Lester R. T., Ritvo P, Mills E. J., Kariri A, Karanja S., et al. (2010). Effects of a mobile phone short message service on antiretroviral treatment adherence in Kenya: A randomized trial. *The Lancet*, 376, 1838–1845. doi:10.1016/S0140-6736(10)61997-6.

Lister, C., West, J. H., Cannon, B., Sax, T., & Brodegard, D. (2014). Just a fad? Gamification in health and fitness apps. *JMIR Serious Games, 2,* 2.

Lucas, R. E., & Donnellan, M. B. (2007). How stable is happiness? Using the STARTS model to estimate the stability of life satisfaction. *Journal of Research in Personality, 41,* 1091-1098.

Lykken, D., and Tellengen, A. (1996). Happiness is a stochastic phenomenon. *Psychological Science,* 7,186-189

Lynn, M., & Simons, T. (2000). Predictors of male and female servers' average tip earnings. *Journal of Applied Social Psychology, 20*, 241-252.

Lyons, E. J., Lewis, Z. H., Mayrsohn, B. G., & Rowland, J. L. (2014). Behavior change techniques implemented in electronic lifestyle activity monitors: a systematic content analysis. *Journal of Medical Internet research*, 16, 192.

Lyubomirsky, S. & Ross, L. (1997). Hedonic consequences of social comparison: a contrast of happy and unhappy people. *Journal of Personality and Social Psychology, 73*, 1141-1157.

Lyubomirsky, S., Sheldon, K. M., & Schkade, D. (2005). Pursuing happiness: The architecture of sustainable change. *Review of General Psychology*, *9,* 111.

Maples, J. L., Guan, L., Carter, N. T., & Miller, J. D. (2014). A test of the International Personality Item Pool representation of the Revised NEO Personality Inventory and development of a 120-item IPIP-based measure of the five-factor model. *Psychological Assessment, 26*, 1070 – 1084.

Mazzucchelli, T., Kane, R., & Rees, C. (2009). Behavioral activation treatments for depression in adults: A meta-analysis and review. *Clinical Psychology: Science and Practice*, *16,* 383-411.

Mbaugbaw L, Thabane L, Ongolo-Zogo P, Lester RT, Mills EJ, et al. (2012). The Cameroon mobile phone SMS (CAMPS) trial: A randomized trial of text messaging versus usual care for adherence to antiretroviral therapy. Retrieved from: http://www.plosone.org/Article/info%3Adoi%2F10. 1371%2Fjournal.pone.0046909.

Merga, M. K., & Moon, B. (2016). The impact of social influences on high school students' recreational reading. *The High School Journal*, *99,* 122-140.

McCullough, M.E., Pargament, K.I. & Thoresen C.E., (2000). *Forgiveness: theory, research, and practice*. New York: The Guilford Press.

Michie, S., Ashford, S., Sniehotta, F. F., Dombrowski, S. U., Bishop, A., & French, D. P. (2011). A refined taxonomy of behaviour change techniques to help people change their physical activity and healthy eating behaviours: The CALO-RE taxonomy. *Psychology & Health, 26,* 1479-1498.

Michie, S., Richardson, M., Johnston, M., Abraham, C., Francis, J., Hardeman, W., ... & Wood, C. E. (2013). The behavior change technique taxonomy (v1) of 93 hierarchically clustered techniques: building an international consensus for the reporting of behavior change interventions. *Annals of Behavioral Medicine, 46*, 81-95.

Michie, S., Whittington, C., Hamoudi, Z., Zarnani, F., Tober, G., & West, R. (2012). Identification of behavior change techniques to reduce excessive alcohol consumption: Behavior change and excessive alcohol use. *Addiction, 107,* 1431–1440. doi:10.1111/j.

Miller, Elizabeth T. & G. Alan Marlatt (1998), How to keep up with those new year's resolutions: Researchers find commitment is the secret of success," Retrieved from: http://www.washington.edu /newsroom/news/1997archive/122397archive/k122397.html.

Miller W. R, Rollnick S. (2013). *Motivational interviewing: Helping people change (3rd Ed.).* Guilford Press: New York.

Milgram S. 1974. *Obedience to authority.* New York: Harper & Row.

Moller, A. C., Merchant, G., Conroy, D. E., West, R., Hekler, E., Kugler, K. C., & Michie, S. (2017). Applying and advancing behavior change theories and techniques in the context of

a digital health revolution: proposals for more effectively realizing untapped potential. *Journal of Behavioral Medicine*, *40,* 85-98.

Morrissey, E. C., Corbett, T. K., Walsh, J. C., & Molloy, G. J. (2016). Behavior change techniques in apps for medication adherence: A content analysis. *American Journal of Preventive Medicine, 50*, 143-146.

Mukhopadhyay, A., & Johar, G. V. (2005). Where there is a will, is there a way? Effects of lay theories of self-control on setting and keeping resolutions. *Journal of Consumer Research*, *31,* 779-786.

Muraven, M., & Baumeister, R. F. (2000). Self-regulation and depletion of limited resources: Does self-control resemble a muscle? *Psychological Bulletin*, *126*, 247-259.

Neal, D., Wood, W., & Quinn, J. (2006). Habits-a repeat performance. *Current Directions in Psychological Science, 15,* 198 – 202.

Nielson (2016). *Total Audience Report.* Retrieved June 1, 2017 from: http://www.nielsen.com/content/dam/corporate/us/en/reports-downloads/2016-reports/total-audience-report-q1-2016.pdf

Nielson (2013). *Mobile Consumer Snapshot.* Retrieved June 1, 2017 from: http://www.nielsen.com/content/dam/corporate/uk/en/documents/Mobile-Consumer-Report-2013.pdf.

Park, J. H., & Schaller, M. (2005). Does attitude similarity serve as a heuristic cue for kinship? Evidence of an implicit cognitive association. *Evolution and Human Behavior, 26*, 158-170.

Paolini, S., Hewstone, M., & Cairns, E., (2004). Effects of direct and indirect cross-group friendships on judgments of Catholics and Protestants in Northern Ireland: The mediating

role of an anxiety-reduction mechanism. *Personality and Social Psychology Bulletin, 30*, 770-786.

Patel, K. A., & Schlundt, D. G. (2001). Impact of moods and social context on eating behavior. *Appetite*, *36*, 111–118.

Payne, H. E., Lister, C., West, J. H., & Bernhardt, J. M. (2015). Behavioral functionality of mobile apps in health interventions: a systematic review of the literature. *JMIR mHealth and uHealth, 3,* 1.

Pelham, B. W., Mirenberg, M. C., & Jones, J. T. (2002). Why Susie sells seashells by the seashore: Implicit egoism and major life decisions. *Journal of Personality and Social Psychology, 82*, 469-487.

Penedo, F. J., & Dahn, J. R. (2005). Exercise and well-being: a review of mental and physical health benefits associated with physical activity. *Current Opinion in Psychiatry*, *18,* 189-193.

Pettersson, E., & Turkheimer, E. (2010). International personality item pool big five factor markers. Retrieved from: PsycTESTS. doi: http://dx.doi.org/10.1037/t09562-000

Pew Research Center. (2015). *U.S. smartphone use in 2015.* Retrieved from: http://www.pewinternet.org/2015/04/01/us-smartphone-use-in-2015/

Pilcher, J. J., Ginter, D. R., & Sadowsky, B. (1997). Sleep quality versus sleep quantity: relationships between sleep and measures of health, well-being and sleepiness in college students. *Journal of Psychosomatic Research*, *42*, 583-596.

Pinder, C., Vermeulen, J., Wicaksono, A., Beale, R., & Hendley, R. J. (2016). If this, then habit: Exploring context-aware implementation intentions on smartphones. *Proceedings of the*

18th International Conference on Human-Computer Interaction with Mobile Devices and Services Adjunct, 690-697.

Pliner, P. H., Hart, H., Kohl, J., & Saari, D. (1974). Compliance without pressure: Some further data on the foot-in-the-door technique. *Journal of Experimental Social Psychology, 10,* 17-22.

Prestwich, A., Conner, M. T., Lawton, R. J., Ward, J. K., Ayres, K., & McEachan, R. R. (2014). Partner-and planning-based interventions to reduce fat consumption: Randomized controlled trial. *British Journal of Health Psychology*, *19*, 132-148.

Provine, R. (2000). *Laughter: A scientific investigation.* New York: Viking.

Rafaeli, A., & Sutton, R. I. (1991). Emotional contrast strategies as means of social influence. *Academy of Management Journal, 34,* 749-775.

Renfree, I., Harrison, D., Marshall, P., Stawarz, K., & Cox, A. (2016). Don't kick the habit: the role of dependency in habit formation apps. *In Proceedings of the 2016 CHI Conference Extended Abstracts on Human Factors in Computing Systems*. 2932-2939.

Roberts, J., Yaya, L., & Manolis, C. (2014). The invisible addiction: Cell-phone activities and addiction among male and female college students. *Journal of Behavioral Addictions*, 3, 254-265.

Rosenbaum, M. E. (1980). Cooperation and competition. In P. B. Paulus, *The Psychology of Group Influence.* Hillsdale, NJ: Erlbaum.

Russell J, Krantz S., Neville S. (2004). The patient-provider relationship and adherence to highly active antiretroviral therapy. *Journal of the Association of Nurses in AIDS Care 15,* 40–47.

Sanou, B. (2015). *ICT data and statistics division: Facts & figures.* Geneva, Switzerland: International Telecommunication Union (ITU). Retrieved from: https://www.itu.int/en/ITU-D/Statistics/ Documents/facts/ICTFactsFigures2015.pdf.

Seeman, M., & Seeman, T. E. (1983). Health behavior and personal autonomy: A longitudinal study of the sense of control in illness. *Journal of Health and Social Behavior, 24,* 144-160.

Seligman, M. E. (2012). *Flourish: A visionary new understanding of happiness and well-being.* New York: Simon and Schuster.

Seligman, M. & Koocher, G. (1999) The APA 1998 Annual Report. *American Psychologist*, *54,* 537-568.

Scherbaum, C. A., Cohen-Charash, Y., & Kern, M. J. (2006). Measuring general self-efficacy: A comparison of three measures using item response theory. *Educational and Psychological Measurement, 66,* 1047-1063.

Schoenebeck, S. Y. (2014). Giving up Twitter for Lent: how and why we take breaks from social media. *SIGCHI Conference on Human Factors in Computing Systems*. ACM: Chicago

Scholz, U., Doña, B. G., Sud, S., & Schwarzer, R. (2002). Is general self-efficacy a universal construct? Psychometric findings from 25 countries. *European Journal of Psychological Assessment, 18,* 242.

Schultz, W. (2006). Behavioral theories and the neurophysiology of reward. *Annual Review of Psychology, 57*, 87 – 115.

Schultz, P. W., Nolan, J. P., Cialdini, R. B., Goldstein, N. J., & Griskevicius, V. (2007). The constructive, destructive, and reconstructive power of social norms. *Psychological Science, 18,* 429-434.

Schwarzer, R. (2001). Social-cognitive factors in changing health-related behaviors. *Current Directions in Psychological Science*, *10*, 47-51.

Schwarzer, R. (2014). Everything you wanted to know about the General Self-Efficacy Scale but were afraid to ask. Retrieved from: {http://userpage.fu-berlin.de/health/faq_gse.pdf}.

Schwarzer, R., & Fuchs, R. (1995). Changing risk behaviors and adopting health behaviors: The role of self-efficacy beliefs. *Self-Efficacy in Changing Societies* (pp. 259 - 288). New York: Cambridge University Press.

Schwarzer, R., & Fuchs, R. (1996). Self-efficacy and health behaviors. In M. Cooner & P. Norman, *Predicting health behavior: Research and practice with social cognition models* (pp. 163 – 196). Buckingham, England: Open University Press.

Schwarzer, R., & Jerusalem, M. (1995). Generalized Self-Efficacy scale. In J. Weinman, S. Wright, & M. Johnston, Measures in health psychology: A user's portfolio. Causal and control beliefs (pp. 35- 37). Windsor, England: Nfer-Nelson.

Seligman, M. (1991). *Learned Optimism*. New York: A. A. Knopf.

Shapiro, J. R., Bauer, S., Hamer, R. M., Kordy, H., Ward, D., & Bulik, C. M. (2008). Use of text messaging for monitoring sugar-sweetened beverages, physical activity, and screen time in children: a pilot study. *Journal of Nutrition Education and Behavior, 40,* 385-391.

Sheldon, K. & Houser-Marko, L. (2001). Self-concordance, goal-attainment, and the pursuit of happiness: can there be an upward spiral? *Journal of Personality and Social Psychology 80*, 152-165.

Sheldon, K. M., & Lyubomirsky, S. (2006). Achieving sustainable gains in happiness: Change your actions, not your circumstances. *Journal of Happiness Studies*, *7*, 55-86.

Sifferlin, A. (2016). *Most americans want to live to 100: Survey.* Retrieved from: http://time.com/4216008/americans-live-to-100/

Simoni JM, Huh D, Frick PA, Pearson CR, Andrasik MP, et al. (2009). Peer support and pager messaging to promote antiretroviral modifying therapy in Seattle: A randomized controlled trial. *Journal of Acquired Immune Deficiency Syndromes, 52,* 465– 473.

Strecher, V. J., DeVellis, B. M., Becker, M. H., & Rosenstock, I. M. (1986). The role of self-efficacy in achieving health behavior change. *Health Education & Behavior, 13*, 73-92.

Strobel, M., Tumasjan, A., & Spörrle, M. (2011). Be yourself, believe in yourself, and be happy: Self-efficacy as a mediator between personality factors and subjective well-being. *Scandinavian Journal of Psychology*, *52*, 43-48.

Stawarz, K., Cox, A. L., & Blandford, A. (2015). Beyond self-tracking and reminders: designing smartphone apps that support habit formation. *Conference on Human Factors in Computing Systems, 33,* 2653-2662.

Strohmetz, D. B., Rind, B., Fisher, R., & Lynn, M. (2002). Sweetening the till: The use of candy to increase restaurant tipping. *Journal of Applied Social Psychology, 32,* 300 - 309.

Thorndike, E. L. (1927). The law of effect. *The American Journal of Psychology*, 39, 212-222.

M. Tabak, M. Dekker-van Weering, H. van Dijk, and M. Vollenbroek-Hutten. (2015). Promoting daily physical activity by means of mobile gaming: A review of the state of the art. *Games Health Journal, 4,* 460-469.

Van Bree, R. J., van Stralen, M. M., Bolman, C., Mudde, A. N., de Vries, H., & Lechner, L. (2013). Habit as moderator of the intention–physical activity relationship in older adults: a longitudinal study. *Psychology & health*, *28*, 514-532.

Vartanian, L. R., Spanos, S., Herman, C. P., & Polivy, J. (2015). Modeling of food intake: a meta-analytic review. *Social Influence*, *10*, 119-136.

Verplanken, B., & Aarts, H. (1999). Habit, attitude, and planned behavior: Is habit an empty construct or an interesting case of goal-directed automaticity? *European Review of Social Psychology, 10,* 101-134.

Verplanken, B. & Wood, W. (2006). Interventions to break and create consumer habits. *Journal of Public Policy and Marketing* 25, 90-103.

Vonk, R. (2002). Self-serving interpretations of flattery: Why ingratiation works. *Journal of Personality and Social Psychology, 82,* 515-526.

Walsh, G., & Golbeck, J. (2014). StepCity: a preliminary investigation of a personal informatics-based social game on behavior change. *Extended Abstracts on Human Factors in Computing Systems*. 2371-2376.

Wen, W., Yamashita, A., & Asama, H. (2015). The influence of goals on sense of control. *Consciousness and Cognition: An International Journal*, 3783-90.

West, R., Evans, A., & Michie, S. (2011). Behavior change techniques used in group-based behavioral support by the English stop-smoking services and preliminary assessment of association with short-term quit outcomes. *Nicotine & Tobacco Research, 13*, 1316-1320. doi:10.1093/ntr/ntr120.

Whitby, M., McLaws, M. L., & Ross, M. W. (2006). Why healthcare workers don't wash their hands: a behavioral explanation. *Infection Control & Hospital Epidemiology*, *27,* 484-492.

Chen, Y., & Pu, P. (2014). HealthyTogether: Exploring social incentives for mobile fitness applications. *Proceedings of the Second International Symposium of Chinese.* 25-34.

Zhu, H., & Huberman, B. A. (2014). To switch or not to switch: understanding social influence in

    online choices. *American Behavioral Scientist*, *58*, 1329-1344.

Zimmerman, B. J. (2000). Self-efficacy: An essential motive to learn. *Contemporary Educational*

    Psychology, *25*, 82-91.

Appendix A: Explanation of Experiment in SONA

<u>A Month of Meditation</u>: You are invited to participate in a one-month study to begin or increase your mindfulness meditation practice. Research has shown that mindfulness meditation can have positive psychological effects such as reducing anxiety and depression or increasing attention and well-being. Successful completion of instruments will result in SONA credit, and students will have the opportunity to receive credit during two points in the study. Completion of the instruments will take approximately 40 minutes. If you have the desire to participate, please go to [insert Qualtirics link].

INFORMATION LETTER

for a Research Study Entitled

"The Effect of a Text Message-Based Intervention System on Meditation Practice"

You are invited to participate in a research study to explore the effect of a text message-based intervention on meditation practice. If you have no desire whatsoever to engage in meditation over the next month, this study is not for you. This information letter describes the study in more detail. This study is being conducted by Ellis Bernstein, B.A., a doctoral student completing a dissertation under the direction of Dr. Randolph Pipes, Professor Emeritus in the Auburn University Department of Special Education, Rehabilitation, and Counseling. You were selected as a possible participant because you are a student at Auburn University and are age 18 or older.

What will be involved if you participate? If you decide to participate in this research study, you will be asked to do the following things: first, you will complete five questionnaires which will take approximately 20 minutes. You will then be given educational information regarding the positive benefits of mindfulness meditation, and you will be given instructions regarding how to complete this practice. Additionally, during some portions of the experiment, you might (or might not, depending on random assignment) be paired with another student who also has the desire to begin a meditation practice. One month (28 days) after you complete the first online portion of the experiment, you will be contacted via email to fill out similar questionnaires. This will take approximately 20 minutes. You will be given course credit after both the first stage (today) and the second stage (in one month). You will then be contacted 42 days (6 weeks) from

the time that you complete the first online portion of the experiment with the option of filling out follow-up measures. This is viewed as an optional portion of the experiment, and you will be given financial compensation ($2.00) if you choose to complete the follow-up portion. Excluding the time spent meditating, the total time of participation is expected to be about 40 minutes over a one-month period, with the option of 2 additional minutes in six weeks.

Are there any risks or discomforts? The risks associated with participating in this study are no greater than those ordinarily encountered in daily life. While there is no known scientific evidence linking meditation or discussions of self-efficacy/mindfulness to risks or discomforts, it is possible that participants could experience some distress related to these activities. If completing this experiment feels distressing, please discontinue participation at any time. If there is a need for psychological services to address any concerns, please contact the Auburn Student Counseling Services (334-844-5123) or Auburn Medical Clinic (334-844-4416) or refer to the following website to locate a mental health clinician in your area: http://locator.apa.org.

You must have a working cellular phone to complete this experiment. You do not need a smartphone to complete this experiment, but it should be noted that over the course of the experiment, you may need to send up to a maximum of 26 very brief text messages and receive a maximum of 26 such messages. *In order for you to exchange texts, your phone number will be given to an accountability partner, who is a graduate student at Auburn University.* If you are not willing to have your phone number shared with a graduate student, you should discontinue this experiment now by closing your browser. To minimize risk associated with sharing your phone number, please do not share your name with your accountability partner.

Are there benefits to yourself or others? If you participate in this study, you might expect to experience some of the many possible benefits from short-term meditation practice (e.g., decreased anxiety, decreased depression, increased well-being, etc.) and an increased awareness of the effects of mindfulness meditation. We cannot promise you that you will receive any or all of the benefits described.

Will you receive compensation for participating? To thank you for your time, you will be offered extra credit in your Auburn University College of Education class. You will receive credit after completing today's portion. You will also receive credit once you have completed the second portion of this experiment (in one month). We ask that you only sign up for this study if you plan to complete both today's portion and the second portion (in one month). If you do not plan to complete the second portion, we ask that you discontinue the study now by closing your browser.

Are there any costs? There are no financial costs associated with participating.

If you change your mind about participating, you can withdraw at any time during the study. Your participation is completely voluntary. If you choose to withdraw, your data can be withdrawn, as long as it is identifiable. Your decision about whether or not to participate or to stop participating will not jeopardize your future relations with Auburn University, the College of Education, or the researchers involved with this study.

Your privacy will be protected. Any information obtained in connection with this study will remain anonymous. In any sort of report that might be published, information making it possible to identify a participant will not be included. Your phone number, once provided, will be stored on a password protected phone until the experiment is over, at which time, the phone numbers will be deleted. After your completion of the study, data collected will be de-identified, meaning that it will not be associated with you or your phone number. Individuals helping to complete this dissertation (e.g., dissertation committee, statistical consultant, etc.) might also view data, however they will only be able to view data that is de-identified.

If you have questions about this study, please contact the researcher at enb0014@auburn.edu or the project advisor, Dr. Randolph Pipes at pipesrb@auburn.edu.

If you have questions about your rights as a research participant, you may contact the Auburn University Office of Research Compliance or the Institutional Review Board by phone (334)-844-5966 or e-mail at IRBadmin@auburn.edu or IRBChair@auburn.edu.

HAVING READ THE INFORMATION PROVIDED, YOU MUST DECIDE WHETHER OR NOT YOU WISH TO PARTICIPATE IN THIS RESEARCH STUDY. CLICKING ON THE LINK BELOW INDICATES YOUR WILLINGNESS TO PARTICIPATE.

[participants are given a button to click to continue the study, and a button to download a copy of the information letter. If they choose to continue the study, they will be taken to a page with exclusionary criteria (see Appendix C)].

Thank you for taking the time to begin this study. Prior to beginning the study, please answer a few questions to see if you are eligible to participate in this study.

Do you want to engage in 10 minutes of meditation for 5 out of 7 days during the next 28-day period?

[Participants were given the option to answer "yes" or "no."]

[Those who answered "no" were excluded from the study. They were directed to a page which thanked them for beginning participation and told them that they were not eligible for participation.]

On a scale from 1-10, with 1 being a very small amount of desire and 10 being a very large amount of desire, how much do you want to engage in 10 minutes of meditation for 5 out of 7 days during the next 28-day period?

[Those who answered below a 5 were excluded and taken to a page as described above.]

Do you foresee a time in the next month when you will not have daily access to your phone?

[Participants were given the option to answer "yes" or "no."]

[Those who answered "no" were excluded from the study and taken to a page as described above.]

During your average week, do you engage in at least 10 minutes of meditation for at least 5 out of

7 days?

[Participants were given the option to answer "yes" or "no."]

[Those who answered "yes" were excluded from the study and taken to a page as described

above.]

This study involves sharing your phone number with the experimenter and one accountability

partner. Are you willing to share your phone number with these individuals?

[Participants were given the option to answer "yes" or "no."]

[Those who answered "no" were excluded from the study and taken to a page as described

above.]

Age: (Choice of any number between 1 and 70)

Gender: (choice between male, female, other, and prefer not to say)

Race/Ethnicity: (American Indian or Alaska Native, Asian American, Black or African American, Native Hawaiian or Other Pacific Islander, White, and prefer not to say)

Marital Status: What is your marital status? (Single, never married, Married or domestic partnership, Widowed, Divorced, Separated, and prefer not to say)

How many hours per week do you usually work at your job (if you have a job in addition to schooling)? (35 hours a week or more, Less than 35 hours a week, I am not currently employed)

What is your current college GPA: (1.5-2.0, 2.0-2.5, 2.5-3.0, 3.0-3.5, 3.5-4.0, and prefer not to say)

To what extent have you attempted to meditate prior to this experiment? (I have never meditated, I have sometimes meditated, I meditate regularly, I'd prefer not to say)

Please provide your cellular telephone number: _____

(Note: this number may be provided to a graduate student at Auburn University in order to help maintain a meditation practice)

How difficult do you think it would be for you to practice meditation for 10 minutes per day for at least 5 days per week?

0	10	20	30	40	50	60	70	80	90	100
Not very					Moderately					Very
difficult					difficult					difficult

Appendix F: Meditation Explanation

One goal of the current study is to help you to practice meditation. Meditation is oftentimes thought of as being both simple and difficult. The steps to meditate are as follows:

1. Find a quiet place to practice.

2. Sit down comfortably with your eyes closed

3. Gradually become aware of the process of breathing. Pay attention to wherever you feel the breath most clearly.

4. Allow your attention to rest in the mere sensation of breathing. (There is no need to control your breath. Just let it come and go naturally.)

5. When you notice your mind has wandered, simply bring it back to focus on your breath. You will have to do this over and over again.

A common experience when meditating is for your mind to wander. For example, you might be sitting in a chair, focusing on what it feels like to breathe. Suddenly, a thought enters your mind. Perhaps you begin to think about schoolwork, or a recent conversation, or what you want to eat for dinner. The goal of meditation is to notice these moments when your mind has wondered from the breath, and simply return your attention to the sensation of breathing.

You can practice meditation by using the description above. However, those who are new to the practice generally find it useful to hear instructions spoken aloud, in the form of a guided meditation. There is one particularly popular smartphone application that can help you begin meditating called "Headspace." While this app has aspects that cost money, it also has plenty of free guided meditations, and you will not be required to spend any money to access these meditations. Again, we urge you to take the time to download Headspace now, if you have the capability to do so. We have included a 1-minute guided meditation from Headspace below.

[link to video: https://www.youtube.com/watch?v=PFZ6C2XhJAc]

Appendix G: Control Group Text Messaging *Explanation*

In order to help you meditate regularly, part of this experiment involves keeping track of your mediation. We ask that in order to keep track of days that you meditate, you send a text message to the experiment phone number, where your responses will be logged into a computer. Aside from one initial text message within 24 hours of completing today's portion, you will not receive any text messages from this number. You will have a goal of meditating for 20 out of 28 days. More specifically, the goal will be to meditate for at least 5 out of 7 days, for at least 10 minutes, every week for the next 28 days (one month). *For this experiment, meditation means sitting with your eyes closed, while you attempt to focus on what it feels like to breathe.* You will get more specific meditation instructions later in the experiment.

We ask that you send a message to the provided phone number each day after you meditate. You can send messages at any time during the day. In order to indicate that you have meditated, we ask that you simply send the written-out day of the week that you meditated. For example, if you were to meditate on Monday, you would send a text message to the phone number saying "Monday," which would signal that you have meditated on Monday. If you were to skip your meditation on Tuesday, you would not send anything on Tuesday. If you were to pick back up and meditate on Wednesday, you would send "Wednesday" after you have meditated for 10 minutes. This would continue for the entirety of the week, and would continue for the entirety of the experiment. This method will help you keep track of which 5 days per week you are meditating. If you accidentally forget to meditate for more than 2 days per week, please continue to utilize this method and complete your meditation goal. If you end up meditating more than 5 out of 7 days in a given week, please feel free to send text messages for these additional days.

Please do not contact (via text or call) the provided number for reasons other than this. Please limit the language used in the text message to only the days of the week.

Appendix H: Accountability Partner Text Messaging Explanation

In order to help you meditate regularly, part of this experiment involves being paired with an accountability partner. Your accountability partner will be a graduate student at Auburn University. You and your accountability partner will use this system to hold yourselves accountable through text messaging. You will both have a common goal of meditating for 20 out of 28 days. More specifically, the goal will be to meditate for at least 5 out of 7 days, for at least 10 minutes, every week for the next 28 days (one month). *For this experiment, meditation means sitting with your eyes closed, while you attempt to focus on what it feels like to breathe*. You will get more specific meditation instructions later in the experiment.

We ask that you send a message to your accountability partner each day after you meditate. These messages will be sent to your accountability partner via a group text message, which will consist of you, your accountability partner, and the experimenter. If you finish today's portion of the experiment, you will be added to a group message with the experimenter and your accountability partner. Aside from one initial text message within 24 hours of completing today's portion, you will not receive any text messages from the phone number representing the experimenter.

You can send messages at any time during the day. In order to tell your partner that you have meditated, we ask that you simply send them the written-out day of the week that you meditated. For example, if you were to meditate on Monday, you would send a text message to the group saying "Monday," which would signal that you have meditated on Monday. If you were to skip your meditation on Tuesday, you would not send your accountability partner anything on Tuesday. If you were to pick back up and meditate on Wednesday, you would send your accountability

"Wednesday" after you have meditated for 10 minutes. This would continue for the entirety of the week, and would continue for the entirety of the experiment. This method will help both you and your accountability partner to keep track of which 5 days per week you are meditating. If you accidentally forget to meditate for more than 2 days per week, please continue to utilize your accountability partner and complete your meditation goal. If you end up meditating more than 5 out of 7 days in a given week, please feel free to send your accountability partner text messages for these additional days.

Please do not contact (via text of call) your accountability partner outside of your group message or call your accountability partner for any reason. Please limit the language used in the text message to only the days of the week.

Appendix I: Initial Text Messages (Experimental and Control)

Experimental: Thank you for participating in this study of mindfulness meditation. The purpose of this text message is to connect you with your accountability partner, and to remind you how to use the accountability partner system. We ask that you try to practice 10 minutes of mindfulness meditation for 5/7 days per week. We ask that you do this for the next 4 weeks. Each time after you have meditated, please send this group a text message saying simply the day of the week. If you do not meditate, you should not send any message. If you should not succeed in meditating all five days, please continue to utilize this system. Also, we thought we would take the time to remind you of a popular free meditation app that might help you meditate called Headspace. Again, thank you for your participation, and happy meditation!

Control: Thank you for participating in this study of mindfulness meditation. The purpose of this text message is to remind you how to use this system of tracking your meditation. We ask that you try to practice 10 minutes of mindfulness meditation for 5/7 days per week. We ask that you do this for the next 4 weeks. You will be contacted via text message from a phone number devoted to this experiment within 24 hours of your completion of today's portion of the experiment. After you have meditated, please send that phone number a text message saying simply the day of the week. If you do not meditate, you should not send this number any message. If you should not succeed in meditating all five days, please continue to utilize this system. Also, we thought we would take the time to remind you of a popular free meditation apps that might help you meditate called Headspace. Again, thank you for your participation, and happy meditation!

During the past month, how obligated did you feel to meditate for 10 minutes per day, 5 days per week?

      0   10   20   30   40   50   60   70   80   90   100

     Not very   Moderately   Very

     obligated   obligated   obligated

During the past month, how obligated did you feel to send a text message verifying that you meditated for 10 minutes per day, 5 days per week (regardless of whether you did or did not meditate)?

      0   10   20   30   40   50   60   70   80   90   100

     Not very   Moderately   Very

     obligated   obligated   obligated

To what extent was your decision to meditate over the past month based on a feeling of responsibility to others?

      0   10   20   30   40   50   60   70   80   90   100

None of my decision was based   All of my decision was based

on feeling responsible to others   on feeling responsible to others

How motivated did you feel to practice meditation over the past month?

     0   10   20   30   40   50   60   70   80   90   100

     Not very   Moderately   Very

motivated   motivated   motivated

How difficult was if for you to practice meditation over the past month?

0   10   20   30   40   50   60   70   80   90   100

Not very   Moderately   Very

difficult   difficult   difficult

During this experiment, how many times did you utilize guided meditations from Headspace?

[given all numbers between 0 and 28, as well as an option for >28)

Why do you think you were or were not successful in attaining your goals? Please type answer in text box below

[given text box]

Appendix K: Follow Up Questionnaire

Control group:

Hello, you are receiving this message because you completed an experiment two-weeks ago regarding meditation. We would like to offer you $2.00 to complete a 2-minute questionnaire. If you complete this portion of the experiment, we will send you this money via your choice of a mailed check or digital transfer via Venmo, Paypal, SquareCash, or Apple Wallet. Please click the following link to complete the 2-minute measure.

Over the past two weeks (14 days), how many days have you meditated? (given a dropdown menu between 0 and >25).

During part of this experiment, you sent text-messages to express that you completed meditation. How many times would you estimate that you sent these text messages when you did not actually complete your 10 minutes of meditation? (given a dropdown menu between 0 and 28).

Please rate the likelihood of each item on the scale given below:

0	10	20	30	40	50	60	70	80	90	100

  Not likely   Moderately likely   Highly likely

Item	**Likelihood**
I will meditate in the coming week	_____
I will meditate in the coming month	_____
I will meditate in the coming year	_____

I will use the help of others to hold me accountable to a meditation habit in the future

_____

Experimental group:

Hello, you are receiving this message because you completed an experiment two-weeks ago regarding meditation. We would like to offer you $2.00 to complete a 2-minute questionnaire. If you complete this portion of the experiment, we will send you this money via your choice of a mailed check or digital transfer via Venmo, Paypal, SquareCash, or Apple Wallet. Please click the following link to complete the 2-minute measure.

Over the past two weeks (14 days), how many days have you meditated? (given a dropdown menu between 0 and >25).

Have you used an accountability partner (whether from the experiment or from elsewhere) to help you to practice meditation in the last two weeks? (given the options of "yes" or "no").

Would you like to have an accountability partner to help you to practice a health-related behavior in the future? (given the options of "yes" or "no").

Please expand on your answer above, and let us know why you would or would not like to have an accountability partner (given an open text box for typing answers).

During part of this experiment, you sent text-messages to express that you completed meditation. How many times would you estimate that you sent these text messages when you did not actually complete your 10 minutes of meditation? (given a dropdown menu between 0 and 28).

Please rate the likelihood of each item on the scale given below:

0	10	20	30	40	50	60	70	80	90	100

Not likely   Moderately likely   Highly likely

Item	**Likelihood**
I will meditate in the coming week	_____
I will meditate in the coming month	_____
I will meditate in the coming year	_____

I will use the help of others to hold me accountable to a meditation habit in the future

_____

For the Study Entitled:

"The Effect of Text Message-Based Intervention System on Meditation Practice"

Dear Participant,

During this study, you were asked to utilize a text message-based intervention for meditation practice. You were told that the purpose of the study was to explore the effect of this text message-based intervention. The actual purpose of the study was to compare two forms of text message-based interventions: one with a successful accountability partner, and one without an accountability partner. If you were in the experimental condition, you were also told that you would be paired with a "graduate student" accountability partner. While this was technically true, it should also be noted that you were paired with an experimenter, who completed their meditations perfectly over the course of the month.

We did not tell you everything about the purpose of the study because this understanding of both the groups and the specific identity of your accountability partner might have changed your behavior within the study. Further, we felt that pairing with the experimenter was a safe way to establish an accountability partner with your phone number remaining protected.

You are reminded that your original consent document included the following information: "If you change your mind about participating, you can withdraw at any time during the study." If you have any concerns about your participation or the data you provided in light of this disclosure, please contact me at the email address below. I will be happy to answer any questions you have about this study.

If your concerns are such that you would now like to have your data withdrawn, and the data is identifiable, we will do so if you notify me at ENB0014@auburn.edu (you may also contact my faculty advisor, Dr. Randolph Pipes, at pipesrb@auburn.edu).

If you have questions about your rights as a research participant, you may contact the Office of Research Compliance (334-844-5966, IRBadmin@auburn.edu or an Auburn University Institutional Review Board (IRBChair@auburn.edu).

If you have experienced distress as a result of your participation in this study, please contact the Auburn Student Counseling Services (334-844-5123) or Auburn Medical Clinic (334-844-4416) or refer to the following website to locate a mental health clinician in your area: http://locator.apa.org.

Please again accept our appreciation for your participation in this study.

Ellis Bernstein