

Running head: TEXT MESSAGING POSITIVE PSYCHOLOGY FOR WELL-BEING

EFFECTS OF TEXT MESSAGING POSITIVE PSYCHOLOGY ON WELL-BEING

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### Abstract

This study examined the effects of an Ecological Momentary Intervention (EMI) coupled with Positive psychotherapy (PPT) on well-being. While researchers have examined the effects of positive psychology interventions and of text messaging separately, no research to date has evaluated the effects of text messaging in the service of a positive psychological intervention. The current study is a true experiment in which the participants were asked to complete a positive psychology-based intervention called “Three Good Things” on a daily basis. The experimental group received a reminder text message to complete their daily assignment of the “Three Good Things in life” exercise. The control group did not receive any reminder text messages to complete their daily assignment. Participants (N=112) were randomly assigned to the experimental and the control group. The participant sample was comprised of both males and females ranging in age. Levels of well-being were measured pre- and post-test through the administration of the Satisfaction with Life Scale, the Positive Affect and Negative Affect Scale, and the Patient Health Questionnaire - 9.

*Keywords:* Short Message Service (SMS) text messaging, Ecological Momentary Intervention, Positive psychology, Positive psychotherapy, well-being, Three Good Things exercise, Satisfaction with Life Scale, The Positive Affect and Negative Affect Scale, The Patient Health Questionnaire - 9

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When I was 4 years old, I believed I would become a dentist. Then in seventh grade, we were encouraged to do a little aptitude survey and the occupation that came forth from that exploration was that of an exterminator. Fast forward graduating university with a Bachelors of Commerce, I was all ready to enter the world of business. Another skip and a jump and I re-emerged as a Doctor of Traditional Chinese Medicine. And now, here we are...the culmination of a journey of many lives it seems.

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## Chapter 1

Over the last decade, mobile technology has substantially changed the ways in which people communicate. Our global society has gained the benefit of being able to reach and access one another at a moment's notice through modern technology. The function of the mobile phone has evolved from simple voice communication to the ability to send Short Message Service (SMS) text messages. Globally, there are over 7 billion cellular phones, and a high percentage of them are used for text messaging in many countries (Central Intelligence Agency, 2016; Radwanick, 2011). Moreover, text messaging has risen internationally as a method to dialogue with and motivate people to engage in healthy behaviors (Cole-Lewis & Kershaw, 2010; Krishna, Boren, & Balas, 2009).

Although medical professionals have been some of the earlier adopters of mobile technology for health care and research, its uses for psychological mental health have been slower (Luxton, McCann, Bush, Mishkind, & Reger, 2011). However, the research on the efficacy of mobile phones as an adjunctive technology to traditional psychotherapy, what is known as mHealth, is starting to mount. Thus far, most mHealth research has focused on the effects of Cognitive Behavioral Therapy (CBT) in combination with technological aids. Cognitive Behavioral Therapy (CBT) has an impressive evidence base due to its efficacy and effectiveness for certain conditions such as depression and anxiety and thus has received increasing prominence (Butler, Chapman, Forman, & Beck, 2006). However, conditions such as substance use problems and depression have high relapse rates (Evans, 2007; Maisto & Connors, 2006). In addition, many individuals who were successfully treated by CBT for anxiety and depressive disorders, for instance, have

significant residual symptoms (Goodman et al., 1989). Therefore, despite the effectiveness of CBT in some psychological conditions, there are many people for whom CBT is not optimally effective as an intervention (Boschen & Casey, 2008)

A new front runner on the mental health landscape is positive psychology. Its premise is set on expanding the scope of psychology beyond its focus on mental illness to optimizing well-being (Schiffirin, 2014). Research has found that positive emotions do indeed counteract or buffer against negative emotions (Fredrickson, Cohn, Coffey, Pek, & Finkel, 2008; Tugade & Fredrickson, 2004). Furthermore, early results indicate that individuals with mild to moderate severity mental illnesses have benefited from positive psychology treatment (Fava & Tomba, 2009; Sin & Lyubomirsky, 2009). As well, interventions that focus on strengths and building positive affect may lead to a longer and sustained period between relapses than could be achieved with other traditional forms of psychotherapy (Meyer, Johnson, Parks, Iwanski, & Penn, 2012).

While researchers have recently demonstrated mobile phones as a promising adjunct to traditional psychotherapy due to the cell phones' ubiquitous nature and penetration throughout society (Cole-Lewis & Kershaw, 2010), much of the research has centered on CBT interventions and mental illness (Boschen & Casey, 2008). Little research has been done to investigate optimizing mental health utilizing mobile technology in the general population. Moreover, this new burgeoning field of mHealth remains largely unexplored. Therefore, taking into account the paucity of research surrounding mobile technology and other forms of psychotherapy interventions, this study aims to incorporate Short Message Service (SMS) text messaging and positive psychology to research their combined effect on well-being.

## **Literature Review**

**Mobile technology.** Technology is rapidly having a powerful influence in the advent of the digital age. Computers and new media have entirely shifted the way people dialogue with one another (Morrill, Jones, & Vaterlaus, 2013). New media has enabled family and friends to communicate from all over the world (Bacigalupe & Lambe, 2011). Over the last twenty years, the cellular phone has become one of the most prevalent technological devices on the market. "Like the television in the 1950s and Internet in the 1990s, mobile telephony has emerged as one of the defining technologies of our time" (Campbell & Park, 2008). Although mobile technology was adopted earlier by European and Asian countries, the U.S. has quickly caught up in the last decade (Morrill et al., 2013). Close to 34 million people owned a cell phone in the U.S. in 1995 (U.S. Census Bureau, 2008) which has grown to mobile phone ownership of U.S. adults age 18+ from 65% in 2004 to 92% in 2015 (Anderson, Rainie, & Page, 2015). Globally, there are over 7 billion mobile phones (Central Intelligence Agency, 2016), and that number continues to increase. Not surprisingly, in the United States alone, the wireless subscriptions of 321.7 million outweigh the 311 million people who inhabit the states combined with Puerto Rico, Guam, and the U.S. Virgin Islands (Brown, O'Connor, & Savaiano, 2014). Due to wireless infrastructure costing less than fixed line infrastructure to install, mobile phone subscriptions of developing countries are now approaching developed countries (Banjanovic, 2010). Therefore, the ease in which technology facilitates communication has grown exponentially.

**Short Message Service (SMS).** Moreover, while mobile technology has developed as a global phenomenon, in many countries a large percentage of these phones

are used for Short Message Service (SMS) text messaging (Radwanick, 2011). In the U.S. alone, 75% of the 286 million cell phones subscribers use their phones for text messaging (Central Intelligence Agency, 2016; Smith, 2011) and this estimate is consistent across ethnicity (e.g., 83% Hispanic, 76% Black, 70% White/Anglo) (Smith, 2011). Since over 95% of mobile phones are SMS capable, more text messages are being sent and received than cellular phone calls (Muench, Weiss, Kuerbis, & Morgenstern, 2013). In 2011, 1.138 trillion text messages were sent; when divided by the total 311 million people in the country, over 3,600 text messages were sent per person per year (Brown et al., 2014). According to the Pew Research Center, in 2015 text messaging was the most widely-used smartphone feature above voice/video calling and email features (Smith & Page, 2015). It was also found in Smith's (2011) nationally representative sample, that 96% of U.S. 18-29-year-olds owned a cell phone and that teens and young adults use SMS more, and less for voice-to-voice communication than any other group (Horrigan, 2008; Rainie & Keeter, 2006; Reid & Reid, 2007). Although text messaging is commonly associated with youth, as almost 100% of college students carry mobile phones (Salaway & Caruso, 2008), texting is done by a wide age range (Mackay & Weidlich, 2009). In fact, according to Cardoso et al. (2007), 84.2% of children aged 9-12 years in Portugal own a mobile phone and 88% use it to type messages.

Initial studies of cell phone technology occurred abroad, as these countries were the early adopters. Research from Norway, Korea, and China investigated the social and psychological ramifications of cell phone usage (Morrill et al., 2013). Researchers Leung and Wei (2000) conducted telephone surveys of 18+ year-olds (N=834) in Hong Kong in order to understand young adults mobile phone use motivations. The researchers found



that sociability, instrumentality, reassurance, entertainment, acquisition, and time management were the same factors that motivate landline use. Two other factors unique to mobile phone use were mobility and immediate accessibility (Morrill et al., 2013). In the Ling (2001) study, conducted in Norway, 13 to 20-year-old teens (N=2007) were interviewed and the researchers found that an adolescent's freedom began when social coordination could occur via cell phone ownership. Most teens received a cell phone between the ages of 15-18 (Ling, 2001; Morrill et al., 2013). Gender differences in how females utilized text messaging differed significantly from males. Ling (2001) found that females used text messaging to deepen existing relationships, and to be encouraging to others. Males stated that text messaging was a way to broaden relationships and to meet new people, potentially as a result of planning mutual activities.

*Advantages to text messaging.* While there is a substantial discrepancy between high and low-income households and ethnicities to home Internet access, there is no accessibility difference with mobile phone use (Smith, 2010), which indicates that SMS can reach a diverse audience as an intervention medium (Muench et al., 2013). Text messaging can also reach a large population as the average person is already subscribed to a wireless network and a text message is not considered interfering or invasive (Brown et al., 2014). The particular advantages of text messaging include its low cost, accessibility, availability, and flexibility. SMS' convenience, interactivity, and wide dissemination are also distinct benefits (Shapiro et al., 2010). In a systematic review, Militello, Kelly, and Melnyk (2012) agree with previous literature suggesting that cellular phones reach across demographics and are uniquely positioned to bridge gaps in health disparities.

An example of how mobile phone technology can bridge gaps is in the field of HIV prevention. Men who have sex with men (MSM) are one sector of the population where HIV infections have continued to increase steadily since the early 1990s (Reback et al., 2012). Face-to-face interventions are often difficult to adhere to for methamphetamine-using MSM. The convenience and confidentiality of an HIV prevention technology-based intervention that could be carried out in real time would be advantageous to this population. Reback et al. (2012) found significant improvement in self-reported medication adherence when the participants received tailored medication reminders among those who began the study as non-adherent participants. As well, the participants' overall health improved. The ability to reach patients when they are at greatest risk and are in need of health-promoting and supportive messaging is optimal for health prevention (Reback et al., 2012). Therefore, SMS may be a more agreeable adjunct to clinical care compared to traditional methods. With the development of mobile technology, timely, tailored interventions may be a more adaptive alternative to current lifestyles than more traditional treatments (Heron & Smyth, 2010).

*Messaging as adjunct to therapy.* Traditional psychological interventions and therapy have room for improvement. Poor engagement, discontinuation of treatment, and homework compliance are issues that prevent efficient delivery of psychological interventions (Addis & Jacobson, 2000; Burns & Nolen-Hoeksema, 1991; Detweiler-Bedell & Whisman, 2005; Kluger & Karras, 1983). Relapse rates are high (Boschen, Neumann, & Waters, 2009; Halmi et al., 2002) despite successful completion of treatment courses, and patients often still have lingering symptoms after therapy (Robinson et al., 2006; Taylor, Walters, Vittengl, Krebaum, & Jarrett, 2010). In their

review of the literature, Clough and Casey (2011a, 2011b) found that studies demonstrated the feasibility of mobile phones in clinical assessment and intervention. They found that mobile phones may enhance patient engagement in therapy sessions and adherence to therapeutic principles between therapy sessions through appointment reminders, increased client interaction, and enjoyment with therapeutic tasks. (Clough & Casey, 2011a, 2011b; Coyle et al., 2005). These factors may account for the effectiveness of technological adjuncts in enhancing current face-to-face psychotherapy practices (Clough & Casey, 2011a, 2011b).

For instance, psychiatric symptoms comorbid with substance use often increases the level of impairment, which makes it harder to attain care, leading to exacerbation rates and relapse (Carey, Carey, & Meisler, 1991; Drake, Alterman, & Rosenberg, 1993). To help prevent relapse, text messaging could be used as a stepped care approach to maintain ongoing contact with patients after they discharge from partial hospitalization or inpatient care (Shapiro et al., 2010). A form of "hovering" over people in their daily lives, in the context of their environment, may be one way to supplement the care of higher-risk patients (Asch, Muller, & Volpp, 2012). Frequent phone-assisted contact could potentially help identify any problems promptly before poor medication adherence, missed appointments, or symptom exacerbation, for instance, cascade into more difficult challenges (Ben-Zeev, Kaiser, & Krzos, 2014).

**Self-Regulated Learning (SRL) theory.** Bandura's Self-Regulated Learning Theory helps us to better understand how mobile technology has changed how people can use a cellular phone for learning. The theory of self-regulated learning was developed by

Bandura's social cognitive theory of reciprocal determinism (Bandura, 1986; Zimmerman & Schunk, 2001). Carver & Scheier (1998) that human behavior is born from an inherently organized internal guidance system; thus, self-regulation is the mechanism that drives human behavior. Personal cognition (e.g. cognition, affect, and achievement) is reciprocally determined by behavioral (e.g. logging into a computer-based-learning system) and environmental (e.g. instructional design, professor's feedback) factors (Sha, Looi, Chen, & Zhang, 2012). Bandura's theory holds people as self-organizing, proactive, and self-regulating instead of being solely shaped by external environments or reacting only out of inner genetic impulses (Bandura, 2001; Martin, 2004). Bandura's theory thus implies that any advantageous learning environment predicates on personal factors such as goals, prior knowledge, and self-perception of the task at hand (Sha et al., 2012).

Three basic assumptions that self-regulated learners share are (a) the ability to learn through selective use of metacognitive and motivational strategies; (b) proactively choosing, organizing, and creating effective learning environments; and (c) engage in a substantial role in selecting the form and level of instruction desired (Zimmerman & Schunk, 2001). Human agency is what these suppositions about the nature of self-regulated learners produce (Bandura, 2001; Martin, 2004). It is through this notion of agency that people can choose to control their cognitions, emotions, and behaviors (Bandura, 2001). Additionally, agency refers to the on-going developing ability of individuals to make choices (i.e., setting goals) and based on interactions between executive brain functioning and sociocultural contexts, to execute action towards those decisions (Bandura, 2001; Martin, 2004). Both the environment creates and is

determined by agency, which constitutes two main components of self-regulated learning: motivation and metacognition (Sha et al., 2012).

Motivation has many conceptual elements; from a cognitive standpoint, "motivation is the process whereby goal-directed activity is instigated and sustained" (Schunk, Pintrich, & Meece, 2008). The study of motivation centers on the question of why people initiate, terminate, and persist in specific actions in particular circumstances (Atkinson, 1958; Mook, 1987). Achievement motivation refers to striving to be competent in effortful activities, thus motivation to act presumably results from a desire to satisfy needs (Schunk et al., 2008). Therefore, the study of achievement motivation is central to learning.

Metacognition refers to the awareness and understanding of one's thought and memory processes, and how the individual uses the metacognition to regulate their information processing and behavior (Koriat, 2006). Also known as "cognition of cognition", metacognition is in other words, knowledge of one's cognitive processes and the regulation of cognition (Nelson, 1999). This knowledge of self in how one thinks encourages agency towards learning. These components of self-regulated learning – motivation and metacognition – provide a lens to understanding characteristics that influence mobile learning, that is, learning that is done on a mobile phone.

Mobile learning can capitalize from one's motivation to learn and one's self-understanding on how one learns. For instance, active mobile learning is assumed to be dependent on individuals' abilities to discern what, when, where and how to learn and also their desire to learn whenever and wherever the need arises (Sha et al., 2012).

Therefore, active mobile learning may result from the opportunities that mobile phones

afford to a participatory learner who is engaged in their phone usage. Thus, mobile learning environments (MLEs) allow individuals to exercise their agency to engage cognitively and behaviorally as they wish (Sha et al., 2011). Vogel, Kennedy, & Kwok (2009) stated that motivation, as well as the learners' appreciation of deep learning and skills in time management, play compelling roles in attracting the individual to use mobile devices for purposeful learning. Mobile learning has provided the ability for traditional learning to come out of the classroom setting, anywhere a mobile signal is available (Sharples, Taylor, & Vavoula, 2005, 2007). Yet despite the popularity of this technology in the field of education, the theorization about the nature, process, and results of mobile learning are sparse. However, what is evident is that mobile learning is directed by learners' goals (Sharples et al., 2005, 2007). Thus, when designing MLEs, the learners' personal factors, and behavioral patterns should be incorporated (Sha et al., 2012). Therefore, mobile learning requires self-regulated learning and is the vehicle through which learning can be capitalized (Sha et al., 2012).

**mHealth.** Since the cellular phone can deliver intelligent, adaptive, and personal health information anywhere in real time, the mobile phone is seen as the next frontier in health behavior change (Patrick, Griswold, Raab, & Intille, 2008; Riley et al., 2011). As Europe and Asia have adopted mobile technology earlier than the United States (Campbell & Park, 2008), much of the social and psychological influences of mobile phones have come from research studies abroad (Morrill et al., 2013). However, the pervasive and widespread usage of cellular phones is beginning to prompt investigation of how people are using mobile technology in the United States (Castells, Ardevol, Qiu, & Sey, 2007). The National Institute of Health (NIH) defines mobile health, or

"mHealth" as "the use of mobile and wireless devices to improve health outcomes, healthcare services, and health research". mHealth can include external hardware or software components for mobile or wireless devices and can be delivered via text messaging, phone-based applications, medical devices, or telemedicine (Ranney & Suffoletto, 2014). The advent of wearable and sensing technology such as portable dialysis machines or conducting an interview over live video are new creative ways in which mHealth has much potential to reduce the cost of health care and improve health outcomes (Kumar et al., 2013). Using mHealth may circumvent some limitations of traditional health care formats (Atienza & Patrick, 2011) as interventions can be delivered at the desired choosing of the participants (Fjeldsoe, Marshall, & Miller, 2009; Heron & Smyth, 2010). As previously stated, mHealth may be a particularly promising format for delivering preventive care for high-risk populations who have low accessibility to face-to-face interventions but have high rates of cellular phone ownership (Kumar et al., 2013).

Correspondingly, Wei et al. (2011) reviewed 16 randomized controlled trials that utilized text messaging as the principal mechanism of intervention delivery. These studies showed text messaging offered as an effective tool for behavioral data acquisition, sending and receiving medical test results, and reminding patients of scheduled appointments. Four studies focused on medication adherence, six studies tested clinical management of an illness and six studies were aimed at illness prevention. In total, the researchers found that of these 16 randomized controlled trials, ten studies reported significant improvement in their outcome measures while the other six showed positive trends.

Among the studies aimed at the prevention of illness or preventive behavior modification, two evaluated the effectiveness of text messaging on smoking cessation, one discussed sunscreen use, and three focused on weight loss control. The two smoking cessation trials used text messaging to deliver cessation information and self-report smoking status was measured as outcome. Haug, Meyer, Schorr, Bauer, and John (2009) also identified target behaviors and provided feedback via text messaging. Their program had the highest participation and retention rate. Rodgers et al. (2005) found that significantly more participants had quit smoking after six weeks in the intervention compared to the control group.

Interventions delivered through text messaging showed improvements in healthy behaviors related to weight loss and control. Shapiro et al. (2010) found significantly higher adherence to three targets in children who monitored their own behavior by text messaging than those who did not monitor or used paper diaries. Haapala, Barengo, Biggs, Surakka, and Manninen (2009) on overweight adults reported long-term (12 months) effectiveness of text message delivered intervention on the reduction of waist circumference and weight. Patrick et al. (2008) demonstrated a weight loss program with participants receiving text messaging lost significantly more weight than those receiving print materials. Armstrong, Watson, Makredes, M; Frangos, & Kimball (2016) sunscreen intervention study demonstrates that text messaging can be successfully used in a broader spectrum of preventive behavior modifications.

In addition, Cole-Lewis and Kershaw (2010) reviewed another nine studies focusing solely on health behavior change interventions and reported eight of the nine



studies reported outcomes that conclude that text messaging can deliver content that affects behavioral change.

***Ecological Momentary Interventions (EMI).*** One way mobile phones have improved health outcomes, services, and research is by its usage in Ecological Momentary Interventions (EMI). Momentary Interventions (EMI) are interventions that are administered to people in real time during their everyday lives in their natural environment (Heron & Smyth, 2010). EMI can be executed on their own or be used in conjunction with existing interventions or ongoing treatments (Heron & Smyth, 2010). In psychotherapy, patients have been encouraged by clinicians for decades to participate in activities, practice skills, and complete assignments between therapy sessions (Kazantzis & L'Abate, 2007). These homework assignments commonly associated with cognitive and behavior therapies, are a form of EMI and are a way to practice, generalize, and maintain therapeutic skills (Kazantzis, Deane, & Ronan, 2000).

***EMI for health problems.*** A body of research is developing on SMS for multiple health concerns such as alcohol use (Heron & Smyth, 2010), asthma (Krishna et al., 2009), diabetes (Fjeldsoe et al., 2009; Heron & Smyth, 2010; Krishna et al., 2009), weight loss and obesity (Buchholz, Wilbur, Ingram, & Fogg, 2013; Heron & Smyth, 2010; Joo & Kim, 2007; Krishna et al., 2009), epilepsy (Lua & Neni, 2013), smoking cessation (Fjeldsoe et al., 2009; Heron & Smyth, 2010; Krishna et al., 2009), HIV (Lewis et al., 2012; Reback et al., 2012), bulimia (Heron & Smyth, 2010; Shapiro et al., 2010), anxiety (Clough & Casey, 2014; Heron & Smyth, 2010), depression (Aguilera & Munoz, 2011; Proudfoot et al., 2013), schizophrenia (Pijnenborg et al., 2010), disease prevention and management (Cole-Lewis & Kershaw, 2010), and even suicide recidivism (Chen,

Mishara, & Liu, 2010). Although conducted as an uncontrolled study, Joo and Kim (2007) found that the participants reduced their waist circumference by 1.7 inches and lost 3.3 pounds on average over three months when the researchers encouraged healthy eating and exercise to the participants with a weekly SMS EMI. Text messages have also been used successfully to remind patients to follow through with immunizations (Stockwell et al., 2012) and have been useful for patients with medical compliance issues (Adler, 2007; Castaño, Bynum, Andrés, Lara, & Westhoff, 2012; Foreman et al., 2012). Pharmaceutical care via text messages have also been sent to the mobile phones of patients, reminders about medication, practical information about medicines, and information about drug reactions (Mao, Zhang, & Zhai, 2008). In Singapore, an SNS-based mobile epilepsy education system was created to facilitate healthcare. The system had three components: (1) epilepsy education module, (2) drug-taking reminder and (3) clinic appointment reminder (Lua & Neni, 2013). In their literature review, Vervloet et al. (2012) concluded that electronic reminders showed positive effects on medication compliance for those who were unable to remember to take their medication as prescribed.

On another front, Kim and Glanz (2013) examined if a six week program of motivational text messaging would increase physical activity among older African Americans in an urban setting. Of the thirty-six African Americans participants aged 60-85 years old, those who were in the intervention group received motivational text messages three times daily, three days a week, for six weeks. Those who received the text messages had greater improvements in step count (679 vs. 398) and perceived activity levels than those who did not. As well, Chen et al., (2010) sent four SMS

messages to suicidal patients after ER discharge for four weeks to assess whether it would decrease recidivism. The messages conveyed general support and encouraged compliance with discharge recommendations. Participants were also invited to stay in contact with the medical team.

Twelve of the fifteen participants responded favorably, stating that they found the text messages an acceptable form of help and wanted to receive them for a longer duration of time. This finding suggests that when more intensive follow-up is not possible, text messaging contact is accessible, feasible, and acceptable to suicide attempters.

*EMI for psychological problems.* SMS is also a useful medium for marginalized or disenfranchised population groups such as the mentally ill or substance users (Ben-Zeev et al., 2014; Muench et al., 2013). Emerging evidence indicates that people with psychosis are not exempt from benefiting from mobile phone usage; that their use of the Internet resembles that of individuals not affected by mental illness (Haker, Lauber, & Rossler, 2005; Schrank, Sibitz, Unger, & Amering, 2010). Research has found that 72% to 97% of U.S. adults with mental health conditions own cell phones (Ben-Zeev et al., 2014; Carras, Mojtabai, Furr-Holden, Eaton, & Cullen, 2014; Torous, Friedman, & Keshvan, 2014). Not only has this statistic been found in America, but also abroad. Adoption rates of cellular phones by people with mental health conditions have also been similar in the U.K. (Ennis, Rose, Denis, Pandit, & Wykes, 2012) and Australia (Proudfoot et al., 2010).

Even those with severe cognitive impairments can benefit from mobile learning (Pijnenborg et al., 2010). Cognitive impairment is very common in schizophrenia; only

20-30% of schizophrenic patients perform in the normal ranges on neuropsychological assessments (Harvey & Keefe, 1997; Holthausen et al., 2002). Many people with schizophrenia have severe cognitive challenges even after the successful application of pharmacological and behavioral interventions. External memory aids have been utilized effectively with the patients with traumatic brain injury and hold promise for remediating cognitive impairments related to schizophrenia. Pijnenborg et al. (2010) tested the efficacy of short message service (SMS) text messages to compensate for the daily effects of cognitive disabilities in schizophrenia. Sixty-two people with schizophrenia or related psychotic disorders with goal-directed behavior impairments in day-to-day life situations participated in the study. The patients were given prompts to improve their everyday functioning. Each individual chose goals for the cognitive functioning in which they sought improvement. For each goal the participants chose, two prompts were sent. The first prompt was sent an hour before the goal behavior was to take place and the second prompt was sent ten minutes prior to the goal being due. The outcome measure focused on the percentage of goals achieved. What resulted was the overall percentage of targets achieved increased with prompting, but when the prompts were withdrawn, performance dropped to baseline levels. With prompting, the patients kept appointments with mental health workers and carried out leisure activities, but medical compliance and attendance at training sessions did not change. Thus, it was demonstrated that prompting can significantly improve the achievement of desired goals, whereas, other objectives may need prompting in combination with interventions that enhance motivation.

Pijnenborg goes on to suggest there may be an even stronger prognosis for patients with traumatic brain injury as a hypothesis from their findings with

schizophrenic patients. Schizophrenic patients are not only affected by cognitive impairments, but other negative symptoms such as delusions and hallucinations also hinder behavior which may explain why prompting is more modest in overall improvement (about 10% less) with schizophrenic patients than in traumatic brain injury patients (Wilson, Emslie, Quirk, & Evans, 2001). Alternatively, for those who are less severely cognitively impacted, there has been evidence indicating those who use high levels of communication technology may have inclinations of addiction tendencies (Ehrenberg, Juckes, White, & Walsh, 2008). Ehrenberg et al. (2008) found that individuals who have a more disagreeable nature reported greater mobile use and stronger cell phone addictive tendencies conceivably because they may find it easier to communicate remotely than face-to-face. As well, individuals high on neuroticism reported strong mobile phone addictive tendencies and more SMS use potentially due to having more time to review message content and extroverts report more SMS use possibly due to a propensity towards social interaction (Ehrenberg et al., 2008).

As the use of mobile technology has expanded in the past few years (Radwanick, 2011), the possibilities of different mobile technology methods are likely to increase the variety of ways that healthcare providers can communicate with their patients. Online methods of communication are emerging in relationships between patients and health care professionals and Moore (2011) found many patients expect quicker responses when they have greater access via email or text to their health care providers. As such, it is critical that more research is done to explore the many usages that this new technology brings (Buchholz et al., 2013).

**CBT and compliance issues.** Between-session therapy homework assignments are a critical component of many current depression treatments and involve skill acquisition and development (Aguilera & Munoz, 2011). Homework improves outcomes by extending treatment past the once-weekly psychotherapy session. In a national survey, Kazantzis, Lampropoulos, and Deane (2005) found that 68% of therapists "often" or "always" give homework, however, patients are often inconsistent in completing the assignments. Homework adherence rates reported in studies of psychotherapy efficacy show usual rates of less than 50% (Aguilera & Munoz, 2011). Bryant, Simons, and Thase (1999) found 52% of patients completed homework for cognitive-behavioral therapy (CBT) for depression while Carroll, Nich, and Ball (2005) found a 24% homework compliance rate for CBT for cocaine dependence. Therefore, as with most treatments, poor adherence to treatment protocols presents a major barrier to effectiveness in real-world settings (Melfi et al., 1998).

A cost effective method for increasing adherence, text messaging can enhance CBT for those who do not have regular access to treatment providers, need more frequent contact, are not responsive to treatment, or drop out (Shapiro et al., 2010). Aguilera and Munoz (2011) implemented a daily text message adjunct to CBT for depression to study its feasibility. The group of 12 patients who were participating in group CBT, received daily messages relating to thought monitoring, mood tracking, and pleasant event scheduling. The researchers found high engagement with the text messaging intervention and patient acceptability. Clough and Casey (2014) also found high patient satisfaction and acceptability for a daily SMS intervention for anxiety disorders as an adjunct to CBT group therapy. Similarly, Proudfoot and colleagues (2013) researched the efficacy of

MyCompass, a mobile-and computer-based intervention for depression, anxiety, and stress. CBT modules were completed online, and the participants received feedback, reminders, and motivational messages on their mobile phones. Participants in the intervention showed a greater reduction in anxiety, depression, and stress than those in the control and waitlist conditions. Furthermore, in a randomized controlled study, Burnett et al. (1985) found that participants who received CBT alone did not keep the weight off as well as those who received CBT along with EMI. Dramatic differences resulted in the CBT with EMI intervention: immediately post treatment (8 vs. 3 pounds), and at six months (16 vs. 4 pounds), and ten months (18 vs. 2 pounds) were lost after the intervention. Comparatively, Agras et al. (1990) did a similar weight loss study but found no differences between the CBT with EMI group and the EMI only group; all participants lost five pounds. More recently, another study showed participants lost more weight after four months with EMI than when only psychoeducation materials were given (6 vs. 2 pounds) (Patrick et al., 2009). Thus, these studies lend credibility that EMI can be used as another option to, or in conjunction to augment, CBT and psychoeducation (Heron & Smyth, 2010).

**Fredrickson's Broaden and Build Theory.** Fredrickson's Broaden and Build Theory explains how the cellular phone's ability to deliver intelligent, adaptive, personal health information anywhere in real time can lead to positive behavioral change. Fredrickson's (1998) broaden-and-build model offers the foundational framework for the link between positive affect and positive outcomes. Whereas negative emotions move an individual towards a specific set of narrow action tendencies (e.g., fight- or- flight), the opposite is true of positive emotions (Fredrickson, 1998). Positive emotions broaden the

individual's way of information processing and enlarge one's pursuit of desired activities (Fredrickson & Branigan, 2005). The promotion of one's survival occurs when broadened thoughts and actions allow an individual to build physical, cognitive, social, and psychological resources (Fredrickson, 1998, 2001). Positive affect has also been found to have a broadening effect on attention, perception, and higher level cognitive processing (Schiffrin, 2014). Fredrickson and Branigan (2005) also found that positive emotions create action tendencies such as increased social interaction and willingness to try new experiences. Therefore, positive affect strengthens social relationships which may be called upon during times of need (Fredrickson, 1998).

Beyond positive emotions' social and cognitive benefits, accordingly, in a meta-analysis of 150 studies, Howell et al. (2007) makes the case that both short-and long-term health outcomes as well the control of disease symptoms both relate to positive well-being. Negative emotions and their harmful effects (e.g., increased blood pressure, heart rate, and vasoconstriction) may be negated by positive emotions positively impacting physiological functioning (Fredrickson & Levenson, 1998; Fredrickson, Mancuso, Branigan, & Tugade, 2000). Laboratory experiments have shown that positive emotions can quell autonomic arousal and have shown that cardiovascular effects of negative emotions can be undone (Fredrickson & Levenson, 1998; Fredrickson et al., 2000). Consequently, the trait of resiliency, a reserve of physical, cognitive, social, and psychological resources can be built by positive affect, which in turn allows individuals to thrive in difficult circumstances (Fredrickson, Tugade, Waugh, & Larkin, 2003). Subsequently, Seligman (2006) argued that optimism is a protective factor against



depression. In addition, Lyubomirsky et al. (2011) propose that positive affect breaks the rumination cycle, which may culminate in better long-term outcomes.

**Positive psychology.** Frederick's Broaden and Build Theory of positive affect leading to positive outcomes sets a theoretical underpinning for Seligman's Positive psychology. Positive psychology is the study of positive character attributes, positive experiences, and the institutions that help cultivate them (Seligman, 2011). As stated by Seligman (2011), positive psychology teaches individuals effective ways to improve well-being and functioning. The field of positive psychology research has enlarged the scope of psychology which traditionally focuses on mental illness to include the factors that propagate well-being and happiness (Schiffrin, 2014). There is longitudinal, correlational, and experimental evidence that happiness is related to and can predict or cause success in the cognitive, physical, social, and psychological realms (Lyubomirsky, King, & Diener, 2005). Despite what Diener and Diener (1996) found, that most individuals are happy, in the United States, less than 20% of adults report that they are flourishing, that is, experiencing positive features of the human condition (Keyes, 2002). It would seem that many are not fairing well, feeling as if they are "wanting more" or "stuck in a rut", yet they do not meet criteria for a mental disorder (Fredrickson, 2008). Since happiness is the cause and consequence of many desired life outcomes, it is critical to understand how to lift individuals to a more optimal functioning state (Sin & Lyubomirsky, 2009). More and more, psychological well-being is seen as not only the absence of mental illness but also the presence of positive psychological resources (Sin & Lyubomirsky, 2009). Apart from the absence of mental illness, psychological well-being is comprised of two components. Hedonic well-being (e.g., life satisfaction, positive

affect, happiness) (Diener, 1984) is seen as a subjective path to pleasure. Eudaimonic well-being (e.g., self-acceptance, autonomy, life purpose, positive relationships) (Ryan & Deci, 2001; Ryff, 1989) is derived from the doctrine that happiness is found in conducting right actions within moral obligations. Both hedonic and eudaimonic well-being exist in psychological well-being (Sin & Lyubomirsky, 2009).

**Lyubomirsky's model of happiness.** After reviewing four decades of research, Lyubomirsky, King, and Diener (2005) found that better friendships, greater sociability, stronger conflict resolution skills, and enhanced marital satisfaction contributed to - and was likely developed by - having frequent positive feelings. Happier people have more intimate marriages, harder immune systems, stronger incomes, and more creative thoughts than their less happy peers (Lyubomirsky, King, et al., 2005). Longitudinal, cross-sectional, and experimental studies have demonstrated that long-term positive affect or well-being is not only a correlate or consequence of success but a cause of it (Lyubomirsky, King, et al., 2005). Lyubomirsky et al. state that the circumstances of life (e.g., finances, health, marital status, and religiosity) only account for 8-15% of the variance in happiness levels. They argue that another 50% is attributed to a dispositional set point that tends to be stable over circumstances and time. The balance of 40% of the remaining happiness level is thought to be due to the cognitive and behavioral activities in which a person chooses.

Examples of these practices include engaging in goals that are self-determined and enjoyable (Sheldon & Elliot, 1999), being present and savoring moments (Hurley & Kwon, 2012), and avoiding social comparisons (Lyubomirsky & Ross, 1997). Although evidence suggests that individual differences in well-being are heavily influenced by

genetics (Lykken & Tellegen, 1996), researchers theorize that much of an individual's happiness is under their control (Lyubomirsky, Sheldon, & Schkade, 2005). A meta-analysis that combined outcomes from fifty-one randomized controlled interventions found that people prompted to engage in positive intentional activities, such as thinking mindfully, optimistically, and gratefully became significantly happier (Sin & Lyubomirsky, 2009). Dispositionally happy people have tendencies to be optimistic in thinking, are grateful, and engage in prosocial behavior (Lyubomirsky, 2001). In studying happy people, researchers have posited activities that might increase happiness levels if people deliberately practiced them (Lyubomirsky & Layous, 2013).

**Positive Psychology Interventions (PPIs).** Positive Psychology Interventions (PPIs) such as treatment methods or intentional activities that intend to cultivate positive affect, cognitions, or behaviors are the practical pathways to increasing well-being (Sin & Lyubomirsky, 2009). PPIs range from practicing optimistic thinking, savoring experiences, replaying positive experiences, to writing gratitude letters have shown well-being increase in nonclinical samples (Fordyce, 1977; Lyubomirsky et al., 2011; Ruini, Belaise, Brombin, Caffo, & Fava, 2006).

Over the last few years, research on treating depression with PPIs has burgeoned. While PPIs are useful for treating mental disorders (e.g., anxiety disorders) (Fava et al., 2005), they are most effective in treating a scarcity of positive feelings, engagement, and life meaning that resembles depression (Forbes & Dahl, 2005; Seligman, Rashid, & Parks, 2006). For instance, increased positive emotions would likely assist depressed individuals; positive emotions have shown to aid recovery from the physiological effects of negative emotions (Fredrickson & Levenson, 1998; Tugade & Fredrickson, 2004),

improve coping skills (Fredrickson & Joiner, 2002), and prevent relapses (Fava & Ruini, 2003) which are all means to benefit a depressed individual.

Sin and Lyubomirsky's (2009) meta-analysis of the literature challenged the notion that depressed people might benefit less from PPIs because their affective, cognitive, and behavioral deficits prevent them from fully engaging in the positive activities. It was noted that instead, the depressed individuals experienced enhanced well-being and reduced depressive symptoms relative to nondepressed individuals. Therefore, clinicians are encouraged to utilize PPIs with both clinically depressed and nondepressed clients as both are likely to benefit. As well, PPIs are particularly effective at treating residual symptoms (Fava, Rafanelli, Cazzaro, Conti, & Grandi, 1998) and preventing relapses for previously depressed patients (Seligman et al., 2006). Sin (2009) also found that the duration of PPIs also regulated the benefits, in that greater gains in well-being were likely to occur with lengthier intervention periods. Longer durations allow participants to form habits from doing the positive activities (Sin & Lyubomirsky, 2009).

An especially promising PPI is positive psychotherapy (PPT) (Seligman et al., 2006). PPT focuses exclusively on multiplying positive emotion and pleasure, engagement, and meaning in life to increase well-being (Meyer et al., 2012). Positive activities are simple, intentional, and regular practices meant to copy the multiple healthy thoughts and behaviors associated with naturally happy people. Numerous positive exercises have been empirically tested for improving well-being. PPT includes a series of behaviorally based exercises such as writing a gratitude letter (Boehm, Lyubomirsky, & Sheldon, 2011; Lyubomirsky et al., 2011; Seligman, Steen, & Peterson, 2005),

counting blessings (Emmons & McCullough, 2003; Lyubomirsky, Sheldon, et al., 2005; Seligman et al., 2005), performing kindness (Lyubomirsky, King, et al., 2005; Porta, Bao, & Lyubomirsky, 2012; Sheldon, Boehm, & Lyubomirsky, 2013), using and cultivating one's personal strength (Seligman et al., 2005), visualizing their ideal future selves (Boehm et al., 2011; King, 2001; Layous, Nelson, & Lyubomirsky, 2013), and meditating (Fredrickson et al., 2008). All of these exercises are self-administered, brief, and cost-efficient (Lyubomirsky & Layous, 2013). In fact, PPT exercises completed over the internet in nonclinical samples was associated with greater happiness and less depression (Seligman et al., 2005).

### **Rationale**

Individuals who know how to care for their well-being are more resilient, fulfilled, successful and happier (Lyubomirsky et al., 2005). The ability to propagate happiness and well-being has been linked to greater prosocial tendencies resulting in better friendships, stronger conflict resolution skills and improved marital relationships. Apart from relational benefits, happier people have stronger immune systems, hardier incomes, and more creative thoughts than their less positive peers (Lyubomirsky et al., 2005). Therefore, the promotion of psychoeducation and intervention in human well-being represents an innovative research endeavor that has broad implications for public health.

Thus far in the field of mHealth, the mobile psychological interventions utilized have concentrated on CBT interventions prescribed for mentally ill conditions. Positive psychology is also useful for those with mental illnesses as well as the general population who want to optimize their health. However, homework adherence remains a challenge for any population, regardless of cognition. Affect regulation and cognitive strategies are

best learned when they are practiced, and the effects of treatment rely on the daily application of these new skills. With positive psychology, as seen with CBT interventions, a necessary factor to successful treatment in many forms of therapy is homework compliance (Gonzalez, Schmitz, & DeLaune, 2006). Compliance may be enhanced through structured and guided technology (Celio, Winzelberg, Dev, & Taylor, 2002), contain task reminders (Celio et al., 2002), with tailored material (Bull, Gaglio, McKay, & Glasgow, 2005).

SMS health applications are experiencing rapid growth, however, applications to mental health have not been adequately researched, and rigorous testing has been limited (Aguilera & Munoz, 2011). Further, no empirical study is available which assesses the effectiveness of positive psychology-based interventions supported by text messaging. Because mobile phone technology shows great potential for use in clinical psychology as an adjunct, utilizing SMS text messaging may encourage favorable behavior and positive affect. Therefore, this researcher proposes to investigate the effect of SMS text messaging as a means to increase compliance in a positive psychology intervention.

### **Hypotheses**

The present study aims to further explore the potential utility of mobile technology in mental health services by combining it with positive psychology. An Ecological Momentary Intervention (EMI), which is an intervention administered to people in real time in their natural environment – in this instance, a brief positive psychology intervention via text messaging - will be examined for its effect on homework compliance. The impact of text messaging plus an intervention on sense of

well-being and depressive symptomatology will be compared to the effect of an intervention alone. The following hypotheses will be tested:

H1: Daily text message prompts administered over a two-week period will increase compliance with daily positive psychology intervention homework.

H2: Daily text message prompts administered will predict higher life satisfaction compared to positive psychology intervention alone.

H3: Daily text message prompts administered will predict lower depressive symptoms compared to positive psychology intervention alone.

H4: Treatment compliance will predict significantly greater increases in well-being as measured by life satisfaction.

H5: Treatment compliance will predict significantly lower depressive symptoms.

## Chapter 2

This study examined the effects of text messaging a positive psychology intervention and its resulting impact on well-being. A true experimental design using random assignment was implemented using pre- and post-testing assessments.

### Participants

Of the 256 participants who completed baseline questionnaires, 112 (44%) completed the post study assessments. Only those participants who completed all follow-up questionnaires were included in the analyses. Therefore, participants in this study consisted of a convenience sample of 112 individuals living in United States. Both genders represented the sample population with an age range between 18 to 78 years old. Participants were recruited as a convenience sample through a Facebook invitation. All participants had access to the internet, an email account, and a cellular phone and were over the age of 18. Participants were recruited over Facebook Invite as well as through word of mouth. To minimize the likelihood that participants were friends of the researcher, the researcher's Facebook friends were asked to send the invitation on to their Facebook friends. Compensation included being entered into an Amazon \$25 gift card drawing at the end of the study.

### Sample characteristics

Table 1 shows descriptive characteristics of the sample along variables related to age, gender, ethnicity, income, education level, text messaging plan, message reading latency, time zone, mental health diagnosis, and treatment group type.



Table 1  
*Sample characteristics.*

		<b>N</b>	<b>%</b>	<b>M</b>	<b>SD</b>
Total participants		112			
Age		112		40.5	13.4
Gender	Female	88	78.6%		
	Male	24	21.4%		
Ethnicity	Asian or Pacific Islander	11	9.8%		
	Black or African American	4	3.6%		
	Hispanic or Latino	2	1.8%		
	White / Caucasian	77	68.8%		
	Other	18	16.1%		
Income	\$0-\$24,999	14	12.5%		
	\$25,000-\$49,999	21	18.8%		
	\$50,000-\$74,999	29	25.9%		
	\$75,000-\$99,999	20	17.9%		
	\$100,000-\$124,999	10	8.9%		
	\$125,000-\$149,999	2	1.8%		
	\$175,000-\$199,999	5	4.5%		
	\$200,000 and up	6	5.4%		
	Unknown	5	4.5%		
Education	Less than high school degree	0	0.0%		
	High school degree or equivalent (e.g., GED)	1	0.9%		
	Some college but no degree	5	4.5%		
	Associate degree	7	6.3%		
	Bachelor degree	54	48.2%		
	Graduate degree	44	39.3%		
	Unknown	1	0.9%		
Have text message plan	No	2	1.8%		
	Yes	110	98.2%		
Have unlimited text message plan	No	13	12.3%		
	Yes	99	87.7%		
Length of time to read text message	Within seconds of its delivery	10	8.9%		

	Within minutes of its delivery	65	58.0%
	Within hours of its delivery	32	28.6%
	Within days of its delivery	2	1.8%
	Unknown	3	2.7%
Time zone	Pacific Standard Time (PST)	80	71.4%
	Mountain Standard Time (MST)	6	5.4%
	Central Standard Time (CST)	8	7.1%
	Eastern Standard Time (EST)	17	15.2%
	Unknown	1	0.9%
Previous mental health diagnosis	No	88	78.6%
	Yes	24	21.4%
Mental health diagnosis type	Anxiety	4	16.7%
	Depression	10	41.7%
	Anxiety and depression	5	20.8%
	Asperger syndrome	1	4.2%
	Eating disorder	1	4.2%
	PTSD and depression	1	4.2%
	Obsessive compulsive personality disorder	1	4.2%
	Unknown	1	4.2%
Treatment group type	Group 1 - No text	43	38.4%
	Group 2 - Text	69	61.6%

The mean age of the participants was 40.5 years with a standard deviation of 13.4. Out of the 112 participants who completed the study, 78.6% were female, and 21.4% were male. Out of the sample, 87.5% had a bachelor degree or higher education level. Notably, only 0.9% of the participants did not have an education or vocational training after high school. Most participants, 98.2% had a text plan, and 87.7% had unlimited texting plans. Anxiety, depression or a combination of anxiety and depression accounted for 79.2% of the 21.4% who reported having a mental health condition.

**Materials**

For this study, surveys were utilized to obtain information about an individual's pre-and post- test measurements on life satisfaction, mood, and depression symptoms. Materials included a consent form (Appendix B), a demographic survey (Appendix C), the Satisfaction With Life Scale (SWLS) (Diener, Emmons, Larsen, & Griffin, 1985) (Appendix D), the Positive Affect and Negative Affect Scale (PANAS) (Appendix E), and the Patient Health Questionnaire 9 (PHQ-9) (Appendix F).

**The Satisfaction With Life Scale (SWLS).** The Satisfaction With Life Scale (SWLS) is a short 5-item instrument designed to measure global cognitive judgments of satisfaction with one's life. The scale does not assess satisfaction with specific life domains such as health or finances, but allows subjects to integrate and weigh these domains in whatever way they choose. Normative data are presented for the scale, which shows good convergent validity with other scales and with other types of assessments of subjective well-being (Diener et al., 1985).

Life satisfaction as assessed by the SWLS shows a degree of temporal stability, yet the SWLS has shown sufficient sensitivity to be potentially valuable to detect change in life satisfaction during the course of clinical intervention (Pavot, Diener, Colvin, & Sandvik, 1991). Further, the scale shows discriminant validity from emotional well-being measures. Scores on the SWLS have been shown to correlate with measures of mental health, and be predictive of future behaviors such as suicide attempts. In the area of health psychology, the SWLS has been used to measure the subjective quality of life of people experiencing serious health concerns. The SWLS is recommended as a complement to scales that focus on psychopathology or emotional well-being because it

assesses an individual's conscious evaluative judgment of his or her life by using the person's own criteria (Pavot & Diener, 1993).

The SWLS is shown to have favorable psychometric properties, including high internal consistency and high temporal reliability (Diener et al., 1985). Among the various components of subjective well-being, the SWLS is narrowly focused to assess global life satisfaction and does not tap related constructs such as positive affect or loneliness (Diener et al., 1985).

The SWLS is a 7-point Likert style response scale. The possible range of scores is 5-35, with a score of 20 representing a neutral point on the scale. Scores between 5-9 indicate the respondent is extremely dissatisfied with life, whereas scores between 31-35 indicate the respondent is extremely satisfied. The coefficient alpha for the scale has ranged from .79 to .89, indicating that the scale has high internal consistency. The scale was also found to have good test-retest correlations (.84, .80 over a month interval) (Pavot & Diener, 2008).

**The Positive and Negative Affect Schedule (PANAS).** The Positive and Negative Affect Schedule (PANAS) is a 20-item test comprising of two mood scales, one that measures positive affect, such as joy or pleasure, and the other which measures negative affect, such as anxiety or sadness. There are 10 adjectives for each dimension. The participants are asked to rate their affect on a scale ranging from 1 to 5, resulting in scores ranging from 1 to 50. Two scores, one for each scale, are yielded, with higher scores representing greater affect on the respective subscale. Reliability and validity reported by Watson, Clark, and Tellegen (1988) was moderately good. For the Positive Affect Scale, the Cronbach alpha coefficient was 0.86 to 0.90; for the Negative Affect

Scale, 0.84 to 0.87. The PANAS has strong reported validity with such measures as general distress and dysfunction, depression, and state anxiety. The PANAS was used in this study because of its brevity and adequate psychometric properties.

**The Patient Health Questionnaire 9 (PHQ-9).** The Patient Health Questionnaire 9 (PHQ-9) is the depression module of the Patient Health Questionnaire (PHQ) which is a self-administered version of the PRIME-MD diagnostic instrument for common mental disorders. The PHQ-9 scores each of the 9 DSM-IV criteria as “0” (not at all) to “3” (nearly every day). The PHQ-9 was completed by 6000 patients in 8 primary care clinics and 7 obstetrics-gynecology clinics. Construct validity was assessed using the self-reported sick days, clinic visits, the 20-item Short-Form General Health Survey, and symptom-related difficulty. Criterion validity was assessed against an independent structured mental health professional (MHP) interview in a sample of 580 patients. Using the MHP reinterview as the criterion standard, a PHQ-9 score greater than 10 had a sensitivity of 88% and a specificity of 88% for major depression. PHQ-9 scores of 5, 10, 15, and 20 represented mild, moderate, moderately severe, and severe depression, respectively. The PHQ-9 is a reliable and valid measure of depression severity and its brevity are the reasons why this measure is used in this study.

In addition, participants were given a demographic survey to gather information about age, gender, ethnicity, income, level of education, texting plan and habits, time zone, and any existing mental health diagnosis (Appendix C).

### **Procedures**

The independent variables are the presence or absence of text messaging, age, gender, and as well, treatment compliance. The dependent variables are level of life

satisfaction, feelings of depressive symptoms, and compliance with the positive psychology intervention. Therefore, treatment compliance is utilized as a dependent variable in Hypothesis 1 and as an independent variable in Hypotheses 4 and 5. Homework compliance was measured by self-report – a daily log/check-in through Survey Monkey, an online survey platform by the number of days homework was completed during the study.

**Study design.** The study is a true experimental design with random assignment in which the effectiveness of a text messaging prompt added to a positive psychology intervention was tested. Effectiveness of the intervention and added text message component was assessed using pre- and post-testing assessments conducted via Survey Monkey. Survey responses of those receiving text message prompts accompanying the intervention was compared with those in the control group that did not get the daily text-message reminders. Treatment compliance was tracked and related to degree of improvement in well-being. This research employed a quantitative method utilizing multiple regression analyses to measure effects between text messaging, self-reported treatment compliance and well-being.

The treatment methodology consisted of all participants being instructed to do the Positive psychology “Three Good Things in life” intervention. The “Three Good Things in life” intervention was utilized because people have a tendency to dwell on the negative events and not enough about the good events in our lives (Seligman et al., 2005). When we spend more time thinking about what is bad in life it sets us up for anxiety and depression (Seligman et al., 2005). One way to keep from focusing on the negative is to develop our ability to think about the good in life. All the participants were asked to

write down three things that went well each day and what caused these good things to occur every night for two weeks. Once they completed the intervention each night, they logged into Survey Monkey and indicated that they completed the intervention for the day.

While all participants were sent weekly emails advising of the “Three Good Things in life” intervention and instructions on what they need to do, only the participants assigned to the experimental group were sent the following daily text message at eight pm PST/MST/CST/EST according to their time zone:

Hello (Insert first name),  
What are three good things that happened today?  
What caused those good things to happen?  
Have a great rest of today!!

Text messaging was delivered through a software platform called Twilio. Twilio employs security encryption for its services. In order to keep confidentiality of the participants, no identifying information was provided to Twilio. Only the participant’s phone number and first name was provided to Twilio in order for the text messaging to be carried out.

**Data collection.** Participants were recruited as a convenience sample through a Facebook invitation to join the study. Brief details were provided through the Facebook invitation (see Appendix A), and participants were directed to a link to the website Survey Monkey. Data collection via Survey Monkey followed all Survey Monkey IRB guidelines and procedures: [http://help.surveymonkey.com/articles/en\\_US/kb/How-does-SurveyMonkey-adhere-to-IRB-guidelines](http://help.surveymonkey.com/articles/en_US/kb/How-does-SurveyMonkey-adhere-to-IRB-guidelines).

This site contained an informed consent form, a description of the surveys, and the surveys themselves. The informed consent form (see Appendix B) provided

participants with information about the study and an opportunity to ask questions of the researcher. Participants were directed to click on the “I Agree” button at the bottom of the informed consent page if they understood the statements in the consent and freely consented to participate. Participants were randomly assigned to the control or experimental group via a randomizer software program.

Following provision of consent, participants were given a demographic survey (see Appendix C). The participants were then be asked to do a pre-test measurement with the Satisfaction with Life Scale (see Appendix D), the Positive Affect and Negative Affect Scale (see Appendix E), and the Patient Health Questionnaire - 9 (see Appendix F).

Participants in both groups were-mailed an instructive e-mail on a preannounced Monday (Day 1 of the study). This e-mail (see Appendix G) advised all participants of the “Three Good Things in life” well-being intervention (Mongrain & Anselmo-Matthews, 2012; Seligman et al., 2005) and gave instructions on what to do daily for the upcoming week.

The following Monday (Day 8), the e-mail (see Appendix H) sent included the same information regarding the “Three Good Things in life” intervention as well as informed participants that they would receive a follow up email on Sunday (Day 14).

On Sunday (Day 14), an email (see Appendix I) was sent asking the participant to finish the study by logging into Survey Monkey and completing the Satisfaction with Life Scale (see Appendix D), the Positive Affect and Negative Affect Scale (see Appendix E), and the Patient Health Questionnaire 9 (see Appendix F) again.



**Protection of Human Subjects**

In order to maintain confidentiality, the participants were protected through a coding system, participants used first names only, and identification numbers were utilized with encrypted email. Further, participants were protected by the researcher gathering approval from Northwest University's institutional review board.

**Summary**

This study examined the effects of text messaging coupled with a Positive psychology intervention on well-being. Participants were a convenience sample (N=112) comprised of both males and females of varying ages. This study was a true experiment wherein all participants were asked to do the intervention but the experimental group was prompted by a daily text message. Levels of life satisfaction, mood, and depression were measured pre- and post-study. Statistical analyses consisted of multiple regression models testing the effect of text messaging on intervention compliance, well-being, and depressive symptomatology.

### Chapter 3

In this chapter, I describe descriptive statistics for the measures of life satisfaction, affect, and depressive symptomatology. The analytic strategy for testing each of the research hypotheses is outlined. Findings related to the effect of group on treatment compliance will be described followed by the tests of group and treatment compliance on the outcome measures.

#### Reported Life Satisfaction, Affect, and Depressive Symptomatology

Table 1 shows the descriptive statistics for the three scales that were administered, namely: the Satisfaction with Life Scale (SWLS), the Positive and Negative Affect Scale (PANAS), and the Patient Health Questionnaire 9 (PHQ-9). Means and standard deviations at baseline and following the intervention along with their delta for each measure are presented.

The sample mean for life satisfaction at baseline was 25.7, with a post-intervention mean of 26.5. Both means fell in the satisfied range. The average positive affect at baseline was 30.9, with an increase to 33.5 following the treatment. The mean negative affect was 16.9 at baseline and 14.8 post-intervention. The depressive symptomatology scores showed a baseline mean of 4.9 which decreased to 3.7 post-intervention, indicating both measures fell in the minimum depression range.

Table 1

*Assessments Pre-Intervention and Post-Intervention, Based on Self-Report.*

#### **Satisfaction with Life Scale**

Group	Baseline M	Baseline SD	Final M	Final SD	Delta M	Delta SD
1	25.8	5.76	26.7	6.65	0.9	3.64
2	25.6	5.21	26.4	6.34	0.9	3.95
All	25.7	5.40	26.5	6.43	0.9	3.81

#### **PANAS - Positive Affect Scale**

Group	Baseline M	Baseline SD	Final M	Final SD	Delta M	Delta SD
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1	31.1	8.14	34.6	8.98	3.5	6.05
2	30.8	8.81	32.8	9.71	2.0	7.28
All	30.9	8.53	33.5	9.44	2.5	6.84

**PANAS - Negative Affect Scale**

Group	Baseline M	Baseline SD	Final M	Final SD	Delta M	Delta SD
1	17.2	6.26	14.9	5.90	-2.3	4.51
2	16.7	6.18	14.7	5.21	-2.0	5.53
All	16.9	6.19	14.8	5.46	-2.2	5.14

**PHQ-9**

Group	Baseline M	Baseline SD	Final M	Final SD	Delta M	Delta SD
1	4.5	4.49	3.3	3.86	-1.2	3.37
2	5.1	4.43	3.9	3.33	-1.2	3.92
All	4.9	4.44	3.7	3.54	-1.2	3.71

**Analytic Strategy**

For each hypothesis, I tested three multiple regression models, where each step added additional variables. Regression models are a common analysis that can account for both continuous and categorical variables (and their interactions) when predicting a continuous outcome variable (Freedman, 2005).

To test the effect of Group on Treatment Compliance (Hypothesis 1), variables were added as follows:

Step 1: Group

Step 2: Age and Gender

Step 3: Age x Group and Gender x Group

For Hypotheses 2 through 5 to predict the outcome measures, the progression of variables added in each step was as follows:

Step 1: Constant + Baseline + Group (or Compliance)

Step 2: Age + Gender

Step 3: Age x Group (or Compliance) + Gender x Group (or Compliance)

Wherever baseline measures were taken (Hypotheses 2-5), these variables were entered into the regression model as a covariate to account for well-being and depressive symptoms prior to the intervention.

None of the interactions with age and gender were statistically significant across all regression models. Thus, Model 2 was reported as the most appropriate model testing each hypothesis, as (a) some of the analyses yielded significant results for age and gender, and (b) non-significant findings for gender and age alone are somewhat informative.

In the results below, I also report that measure of the strength of the phenomena investigated (i.e., effect sizes). For the coefficients in the multiple regression below, I report standardized beta coefficients, which represent the change (in standard deviations) of Y per standard deviation change in X (Kelley & Preacher, 2012).

### **Treatment Compliance and Acceptability**

Table 2 shows the level of compliance as measured by participants' number of check-ins after having completed their daily Three Good Things exercise. Of all the participants, 23.2% completed the full 14 days of check-ins. Of the full 14 days of intervention, 9.3% of the control (no texting) condition completed all the check-ins whereas 31.9% of the experimental (texting) condition completed all the check-ins (see Figure 1).

Table 2

*Compliance, Based on Log of Check-Ins.*

---

<b>Number of Check-ins</b>	<b>N</b>	<b>%</b>
<b>All Participants</b>	<b>112</b>	
<b>(group 1 and group 2)</b>		
0	6	5.4%
1	3	2.7%
2	5	4.5%
3	6	5.4%
4	3	2.7%
5	6	5.4%
6	4	3.6%
7	6	5.4%
8	5	4.5%
9	7	6.3%
10	7	6.3%
11	7	6.3%
12	12	10.7%
13	9	8.0%
14	26	23.2%

<b>Number of Check-ins</b>	<b>N</b>	<b>%</b>
<b>Group 1</b>	<b>43</b>	
0	2	4.7%
1	2	4.7%
2	2	4.7%
3	5	11.6%
4	3	7.0%
5	3	7.0%
6	3	7.0%
7	3	7.0%
8	3	7.0%
9	3	7.0%
10	3	7.0%
11	3	7.0%
12	3	7.0%
13	1	2.3%
14	4	9.3%

<b>Number of Check-ins</b>	<b>N</b>	<b>%</b>
<b>Group 2</b>	<b>69</b>	
0	4	5.8%
1	1	1.4%
2	3	4.3%
3	1	1.4%
4	0	0.0%
5	3	4.3%

6	1	1.4%
7	3	4.3%
8	2	2.9%
9	4	5.8%
10	4	5.8%
11	4	5.8%
12	9	13.0%
13	8	11.6%
14	22	31.9%

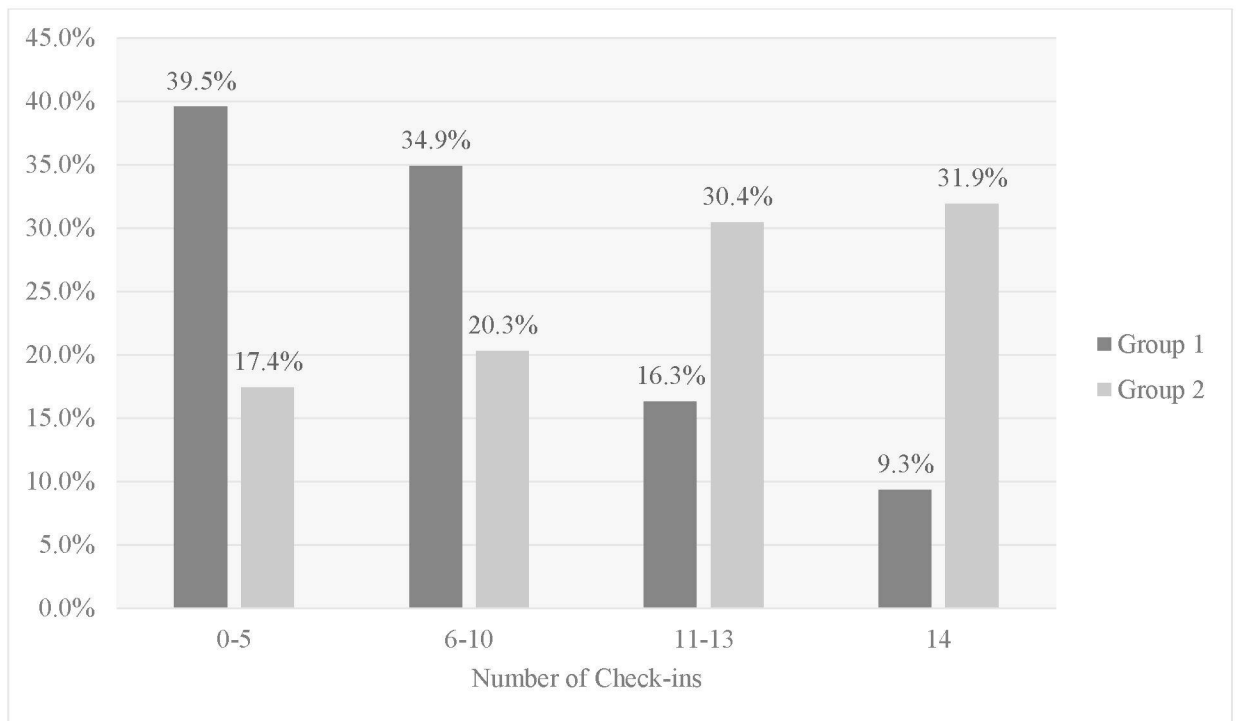


Figure 1. Comparison of Percentage Compliance by Group

**Tests of Research Hypotheses**

Statistical results from each of the analyses are reported in Table 3, 4, and 5. The results along with meaningful observations will be discussed below.

**Predicting treatment compliance.** The final regression model predicting treatment compliance yielded a statistically significant finding for the effect of treatment group,  $B = 3.348$ ,  $SE = .812$ , 95% CI: [1.739, 4.957],  $p < .001$ , (Hypothesis 1). Therefore, the experimental manipulation was successful in producing more check-ins from

participants. Furthermore, age significantly predicted check-ins, such that older individuals were more likely to check in,  $B = .068$ ,  $SE = .030$ , 95% CI: [.009, .126],  $p = .025$ , and men were less likely to check-in than women,  $B = -2.542$ ,  $SE = .951$ , 95% CI: [-4.427, -.657],  $p = .009$ .

Table 3  
*Regression model predicting treatment compliance.*

Predictor / Parameter	<i>B/ Estimate</i>	<i>SE B</i>	$\beta$	95% <i>CI</i> <sub>(lower)</sub>	95% <i>CI</i> <sub>(upper)</sub>	<i>P</i>
<i>Hypothesis 1 – Check-ins</i>						
Constant	1.229	2.032		-2.799	5.257	.547
Group	3.348	.812	.358	1.739	4.957	<.00
Age	.068	.030	.198	.009	.126	.025
Gender	-2.542	.951	-.230	-4.427	-.657	.009
<i>Adjusted R</i> <sup>2</sup>	.182					
<i>F</i>	9.23					<.001

*Note.* For all hypotheses,  $N = 112$ .

#### **Effect of group on life satisfaction, affect, and depressive symptomatology.**

The effect of experimental condition, namely, the use of text message prompts, on well-being was tested in Hypotheses 2 and 3. While both overall regression models investigating life satisfaction and positive affect were statistically significant, group did not significantly predict either of the well-being measures (life satisfaction, positive affect,  $ps > .05$ ). Similarly, both overall regression models investigating negative affect and depression were statistically significant, however, group did not predict either of the depressive symptomatology measures (negative affect and the Patient Health Questionnaire - 9,  $ps > .05$ ).

Table 4

*Regression models predicting well-being from group.*

Predictor / Parameter	<i>B/ Estimate</i>	<i>SE B</i>	$\beta$	95% <i>CI</i> <sub>(lower)</sub>	95% <i>CI</i> <sub>(upper)</sub>	<i>P</i>
<i>Hypothesis 2 – Life Satisfaction</i>						
Constant	.426	2.453		-	5.290	.862
Baseline Score	.946	.068	.795	.811	1.082	<.00
Group	.177	.754	.013	-	1.673	.815
Age	.031	.028	.064	-.025	.086	.275
Gender	.958	.884	.061	-.794	2.711	.281
<i>Adjusted R</i> <sup>2</sup>	.644					
<i>F</i>	51.20					<.001
<i>Hypothesis 2 – Positive Affect</i>						
Constant	7.739	3.705		.393	15.08	.039
Baseline Score	.758	.075	.685	.609	.907	<.00
Group	-1.171	1.291	-.061	-	1.389	.367
Age	.095	.048	.134	-.001	.190	.052
Gender	.164	1.521	.007	-	3.178	.914
<i>Adjusted R</i> <sup>2</sup>	.516					
<i>F</i>	30.59					<.001
<i>Hypothesis 3 - Negative Affect</i>						
Constant	5.899	2.658		.629	11.16	.029
Baseline Score	.541	.068	.613	.405	.676	<.00
Group	.031	.859	.003	-	1.734	.971
Age	-.003	.032	-.007	-.066	.061	.927
Gender	-.973	1.004	-.074	-	1.017	.335
<i>Adjusted R</i> <sup>2</sup>	.363					
<i>F</i>	16.78					<.001
<i>Hypothesis 3 - PHQ-9</i>						
Constant	2.527	1.480		-.408	5.461	.091
Baseline Score	.447	.063	.561	.322	.573	<.00
Group	.231	.567	.032	-.892	1.354	.684
Age	-.029	.021	-.111	-.071	.012	.163
Gender	-.457	.676	-.053	-	.884	.501
<i>Adjusted R</i> <sup>2</sup>	.340					
<i>F</i>	15.30					<.001

*Note.* For all hypotheses, N = 112.



**Effect of treatment compliance on life satisfaction, affect, and depressive symptoms.** I next tested whether compliance with implementation of the exercises significantly predicted well-being and depressive symptoms (Hypotheses 4 and 5). Results showed that compliance was non-significant in predicting life satisfaction, positive affect, and the Patient Health Questionnaire - 9, but was significantly related to lower negative affect,  $B = -.031$ ,  $SE = .013$ , 95% CI:  $[-.056, -.005]$ ,  $p = .019$ . Interestingly, older participants reported significantly more positive affect,  $B = .104$ ,  $SE = .048$ , 95% CI:  $[.009, .199]$ ,  $p = .033$ .

Table 5  
*Regression models predicting well-being from compliance.*

Predictor / Parameter	<i>B/ Estimate</i>	<i>SE B</i>	$\beta$	<i>95% CI<sub>(lower)</sub></i>	<i>95% CI<sub>(upper)</sub></i>	<i>P</i>
<i>Hypothesis 4 – Life Satisfaction</i>						
Constant	.297	2.049		-3.764	4.358	.885
Baseline Score	.939	.068	.789	.803	1.074	<.00
Compliance %	.012	.012	.060	-.011	.035	.311
Age	.026	.028	.054	-.029	.081	.351
Gender	1.180	.908	.076	-.620	2.980	.196
<i>Adjusted R<sup>2</sup></i>	.647					
<i>F</i>	51.92					<.001
<i>Hypothesis 4 – Positive Affect</i>						
Constant	5.967	2.942		.135	11.79	.045
Baseline Score	.764	.077	.691	.612	.917	<.00
Compliance %	-.011	.020	-.037	-.051	.030	.599
Age	.104	.048	.147	.009	.199	.033
Gender	-.007	1.580	.000	-3.139	3.125	.996
<i>Adjusted R<sup>2</sup></i>	.514					
<i>F</i>	30.31					<.001
<i>Hypothesis 5 - Negative Affect</i>						
Constant	7.947	2.152		3.681	12.21	<.00

Baseline Score	.524	.067	.595	.392	.657	<.00
Compliance %	-.031	.013	-.184	-.056	-.005	.019
Age	.006	.031	.015	-.055	.068	.844
Gender	-1.569	1.009	-.119	-3.570	.432	.123
<i>Adjusted R<sup>2</sup></i>	.394					
<i>F</i>	19.08					<.001
<i>Hypothesis 5 - PHQ-9</i>						
Constant	3.572	1.165		1.262	5.882	.003
Baseline Score	.442	.063	.553	.316	.567	<.00
Compliance %	-.011	.009	-.098	-.028	.007	.222
Age	-.027	.021	-.102	-.068	.014	.194
Gender	-.683	.695	-.079	-2.061	.695	.328
<i>Adjusted R<sup>2</sup></i>	.348					
<i>F</i>	15.83					<.001

*Note.* For all hypotheses, N = 112.

### Summary

In sum, a statistically significant finding for the effect of treatment group on compliance was found (Hypothesis 1). On average, participants who were in the experimental (texting) group checked in over three times more than those in the control (no texting) condition, when controlling for the effects of age and gender. In addition, age and gender were both significant predictors of the number of check-ins, with women complying approximately 2.5 instances more than men and older adults complying more than younger adults.

No significant influence of experimental condition on life satisfaction, affect, or depressive symptoms was found (Hypothesis 2 & 3). Thus, the addition of the text messaging prompt to the intervention was not associated with better outcomes. Moreover, counter to hypothesis, intervention compliance did not significantly predict well-being (Hypothesis 4). However, intervention compliance did predict one of the depressive

measures, namely, negative affect (Hypothesis 5). The greater the participation in the treatment protocol, the lower the negative affect participants reported.

## Chapter 4

The purpose of this study was to examine how text messaging and positive psychology would affect well-being, considering the specific role of treatment compliance. Participants completed the Satisfaction with Life Scale (Diener et al., 1985), the Positive and Negative Affect Scale (Watson et al., 1988), and the Patient Health Questionnaire - 9 (Spitzer, Kroenke, & Williams, 1999), and daily compliance logs over the 14 day study. It was found that daily text messaging increased compliance with the daily positive psychology exercise (Hypothesis 1). On average, participants who were in the experimental (texting) group checked in more than three times than those in the control (no texting) condition, when controlling for the effects of age and gender. Additionally, there was no significant influence of experimental condition on life satisfaction, affect, or depressive symptoms (Hypothesis 2 & 3). However, treatment group was significantly predictive of treatment compliance. Contrary to my hypothesis, intervention compliance did not significantly predict well-being (Hypothesis 4), but it did predict one of the depressive measures, namely, negative affect (Hypothesis 5). While group was not associated with better well-being, compliance predicted lower negative affect.

Below, I discuss the study findings and how they relate to treatment compliance and the potential of text messaging as a component of positive psychology interventions. In addition, the gender differences and age-related effects found will be addressed. Finally, study limitations will be discussed along with future directions for treatment research in the area of positive psychology.

### **The Promise of Text Messaging Technology**

The text message prompt as an additional treatment component was successful at increasing compliance with the positive psychology exercise. In fact, the texted group on average checked in about 3.3 times more than the non-texted group, which is a rather substantial difference. It was also noted that participants showed strong acceptability for the intervention (Wei et al., 2011).

As mobile device ownership numbers expand beyond the number of people in the population, it is not surprising SMS prompts are being investigated for their efficacy in effecting change. However, most research has focused on medical compliance; mHealth innovations have been developed such as monitoring chronic conditions, medication adherence, appointment keeping, health information communication, and data collection (Cole-Lewis & Kershaw, 2010; Haapala et al., 2009; Haug et al., 2009; Patrick et al., 2008; Rodgers et al., 2005). Mostly, mobile use has been used to promote physical health and prevent disease and has crossed into the realm of improving compliance with “at home” treatment exercises. For example, a chiropractic treatment study found subjects were six times more likely to complete their chiropractic at home exercises when they received SMS messages as compared to those who did not (Newell & Mchiro, 2012). Overall, patients have strongly denied any annoyance in, and instead have reported positive experiences with receiving SMS messages (Aguilera & Munoz, 2011; Newell & Mchiro, 2012). Indeed, research on text messaging used for mHealth is growing in the psychological arena (Alvarez-Jimenez et al., 2014; Ben-Zeev et al., 2014; Shapiro et al., 2010; Wei et al., 2011). This present study is one more study to begin to highlight the importance of utilizing text messaging, an under researched resource, coupled with

psychological interventions to improve psychological health. Similarly, positive results were found in this study that texting increased compliance.

As well, of those who received the messages, they strongly denied any annoyance in receiving the texts. Overall, participants reported positive experiences with SMS and responded at a rate of 65% to text messages (Aguilera & Munoz, 2011). Positive results were similarly found in this study that texting increased compliance.

### **Importance of Treatment Compliance**

The addition of text messaging to the positive psychology intervention did not significantly affect well-being. When compliance with the intervention was tested, however, negative affect was found to be diminished following the two-week treatment protocol. Compliance with the intervention itself was therefore associated with mitigated negative affect. The text messaging prompt did not offer an added benefit to the intervention in its effect on well-being. What impacted well-being was a participant's rate of compliance (Kazantzis, Georgios, & Lampropoulos, 2002; Novick et al., 2009).

Nonetheless, several outcomes measures did not show evidence of change as a result of intervention compliance, namely, life satisfaction, positive affect, and depressive symptoms. One explanation is the apparent floor effects of the PHQ-9, as baseline scores fell in the minimal depression range. Thus change may have been difficult to achieve on this measure. The inclusion of the Positive and Negative Affect Scale was fortunate and may represent an important aspect of well-being to include as it may be more sensitive to short-term effects of positive psychological interventions.

**Optimal Intervention Strength**

Participation in and of itself in the positive psychology intervention was not sufficient to demonstrate an effect for well-being. A possible reason for non-significant effects may be that the program itself lacked sufficient duration. If, instead of 14 check-ins, the treatment protocol included a total of 30, 50, or 100 daily check-ins, then increased treatment “dosage” may have been sufficient to increase well-being. Another possible reason may be that the Three Good Things exercise lacked the strength to increase well-being. The exercises themselves may have lacked the potency to significantly boost positive affective components of well-being (for example, excitement and inspiration), however, they are capable of relieving some depressive symptoms. This effect is not altogether surprising; while the negative aspects of people’s day-to-day struggles may be mitigated by recalling positive moments where one felt grateful, this specific exercise coupled with the duration of two weeks might be too benign of a manipulation to alter positive affect (Sheldon & Lyubomirsky, 2006; Sin & Lyubomirsky, 2009). However, the present study found that the Three Good Things exercise was significantly capable of diminishing some negative affect; that is, how often participants completed the daily intervention influenced the degree of relief they experienced, such as distress or fear. Researchers exploring the effect of technology on the efficacy of psychosocial interventions should consider the potential influence of texting and other means to boost treatment strength.

In previous research testing the Three Good Things exercise, the treatment protocol was found to increase happiness and decrease depressive symptoms for six months as participants continued to do the exercise past the one week study (Seligman et

al., 2005). However, in Seligman et al.'s (2005) study, although some immediate effects for the Three Good Things condition were found after the one-week study, the one-month follow-up evidenced greater changes with participants happier and less depressed compared to baseline. And they continued being happier and less depressed at the three-month and six-month follow-ups. In the present study, the two-week treatment protocol was likely not long enough a duration to result in measurable changes to well-being.

The lack of an association between compliance with life satisfaction and positive affect was surprising, however, it was also expected that there would be measurable changes in well-being due to text messaging prompts. Although it was found that texting itself did not increase well-being in this study, there are a few reasons why this may have been the case. As previously hypothesized, the number of texts may not have been tied to a program of sufficient duration or strength to effect an increase in well-being. The SMS frequency used in a small CBT study involved ten patients receiving two to three messages daily for two months (Aguilera & Munoz, 2011). These patients were sent messages asking about their mood, number of positive thoughts, and number of pleasant activities. Although the patients were told that the messages were automated and were not a direct form of communication to their clinician, they were still asked to respond to the text messages with their scaled numeric answers as data. The researchers found that 40% of the patients wanted more text messages, 60% reported that they received the right amount of messages with no one reporting fewer messages was desired. Taking cues from Aguilera & Munoz's (2011) study, perhaps a higher frequency of the message prompts may be needed to bring about significant changes in well-being.



### **Gender Differences**

In this study, women were found to be more compliant with doing their daily positive psychology intervention. Other studies have explored gender-related differences in treatment compliance. It was found that older patients and female patients were distinguishably more compliant in a hypertension study of 7000 UK participants, with the findings attributed to influences on health beliefs (Ross, Walker, & MacLeod, 2004). Health beliefs such as whether a condition is serious, personal control is of consequence, or that medication is necessary can be strongly related to compliance. Perception of consequences can influence one's behavior towards compliance and non-compliance.

Noncompliance was attributed to gender differences in a study about tuberculosis treatment in Vietnam (Johansson, Long, Diwan, & Winkvist, 1999). The researchers found that noncompliance for men often occurred from patient compliance (e.g., lack of understanding or choosing to work instead of complying with treatment protocols). Noncompliance for women was related to doctor/staff compliance and system compliance, (e.g., poor interactions with staff and stigma in society).

However, a study investigating gender differences in technological usage behavior found that men's technological usage decisions were more influenced by their perceptions of usefulness whereas women's decisions were more influenced by perceptions of ease of use (Venkatesh, Smith, & Morris, 2000). Thus, the finding of men being less compliant in this study than women may be explained by the men's belief about why they were participating. If compliance with doing the Three Good Things exercise was perceived as not being useful, perhaps the male participants thought their time was better spent doing something else. The gender effect found also suggests that

demographic factors may be important predictors of compliance and should be carefully considered in treatment research with positive psychology interventions.

### **Age-Related Effects**

In addition to gender, age was found to be a factor in the effectiveness of the positive psychology exercise investigated in this study. Although they were perhaps less fluent with technology, older adults adhered more to the program than did younger adults.

Noncompliance has generally been found to affect all ages, but older patients have more barriers against effective medication use (Murray et al., 2004; Vik et al., 2006). Some age-related barriers are cognitive impairment and problems with vision. With medication regimens, noncompliance rates in people aged 60 years or older varies from 26-59% (van Eijken, Tsang, Wensing, de Smet, & Grol, 2003).

Older adults may also exhibit noncompliance related to technology. Patients who did not participate in a CBT intervention study using texting as a prompt tended to be older (typically in their 60s) and had the common problem of not being able to see the text on their phones because of eyesight problems (Aguilera & Munoz, 2011).

In contrast, this study showed older adults were higher in compliance. This may be due to the participatory nature of the study in which those who participated were motivated to do so. As well, this sample was highly educated and may not have been technologically inhibited as those who are less educated may be. Inexperience with modern technologies and attitudes towards technology have shown to influence technology usage with older people (K. Chen & Chan, 2011; Eisma et al., 2004).

Moreover, older individuals in this study tended to experience more well-being than younger individuals. Studies have suggested that emotional well-being improves

from early adulthood to old age (Carstensen, Pasupathi, Mayr, & Nesselroade, 2000; Carstensen et al., 2011; Charles, Reynolds, & Gatz, 2001; Riediger, Schmierek, Wagner, & Lindenberger, 2009). Although a modest finding, Seligman's (2005) positive psychology study, it was found that older people were happier ( $r = .18, p < .001$ ) and less depressed ( $r = -.17, p < .001$ ). Likewise, it was also found in this study that people experienced higher levels of positive affect with age. Sin & Lyubomirsky (2009) found that older people benefit from practicing a range of positive activities relatively more than younger people, perhaps because they have more time to seriously commit to the activities and engage in them more effortfully. Therefore, barriers such as inexperience with and physical barriers to using modern technology may be overcome as cell usage becomes universal and essential for daily life.

### **Study Limitations**

A few limitations to this study are evident. Firstly, the use of a convenience sample, despite randomization to group, prevents certainty that the SMS intervention alone was the explanatory factor for the improved outcome. It is therefore possible that confounding variables such as socioeconomic status, educational level, motivation, and participation goals may have been present, potentially impacting the results. The sample may be biased towards those who are interested in positive psychology and focus on well-being, facile with cell phone technology, or simply amenable to participating in research.

Secondly, the current study involved a relatively small sample so feedback based on this group may not accurately reflect the larger population. Although 256 participants began the study, only 112 completed the post study assessments, limiting the number of

participants. The highly educated demographic of the group may be another limit on the generalizability of my findings. A larger sample size would mitigate this skew.

Thirdly, methodological issues were apparent related to the study procedures. Email instructions regarding the intervention protocol were not read in time or at all. Additionally, self-reported compliance may not have been wholly accurate with participants having done the exercise but forgot to log in or had trouble with logging in. Perhaps if a single platform had been used for recruitment, intervention, and data collection, more people would have been able to follow through to the post-measurement phase.

Another methodological issue concerns the timing of the text message prompts. Assumptions were made that each person's day started in the morning and ended at night. The study was predicated on text message prompts that went out at the latter end of a person's day (e.g., 8 pm PST/MST/CST/EST) to accommodate the exercise that required reviewing what happened in the day. The reality is that many people operate with daily schedules that end at different times (e.g., shift workers, people on vacation overseas, "night owls"). A customized option for when the texting messaging may have been received at an ideal time may have circumvented this limitation. In Aguilera and Munoz's (2011) study, patients most frequently reported feedback was that they received messages at inopportune times.

Finally, lack of a text message-only group limits the ability to test the potential effect of the text messages alone. A text message-only group would be required to tease out possible effects of the text prompt themselves as an intervention. While a minority of participants completed minimal or no check-ins, I was unable to ascertain whether the

differences in assessment scores were potentially due to simply receiving a daily text message. It is a particularly interesting finding of another study researching SMS messages, that Spanish-speaking patients often stated that participating in the study that sent text messages to them made them feel as though someone cared (Aguilera & Munoz, 2011).

### **Future Directions**

Since there may not have been enough statistical power, or maybe the manipulation was not strong enough, it stands to reason that future research should concentrate on increasing sample size and the duration of the intervention. In the present study, the effect of compliance with a positive psychology intervention on negative affect was significant. Moreover, the effect of intervention compliance on depressive symptoms approached significance. A study design with increased statistical power, such as a larger sample size, may offer evidence of broader improvements.

Additionally, post-hoc analyses indicated that participants who completed the study significantly differed from those who discontinued at baseline. The participants who did not complete the study reported less life satisfaction and greater negative emotionality at baseline. Hence, it is possible that self-selection in study participation may have affected the test of the text messaging condition. Future research exploring the effect of text messaging should aim at including samples that are more equivalent on the independent variables.

Furthermore, the strength or “potency” of the Three Good Things exercise on well-being may be highly dependent on the duration of the continuous daily intervention or on when the measurement of well-being is taken. When designing this study, I

believed by increasing Seligman et al. one-week study by one more week would bring about significant results. However, two weeks of completing the exercise in my study did not attain the broad effects found in the Seligman et al. one-week study. Seligman's findings showed significance when the participants continued to do the exercise after the study on their own and were then measured at one, three, and six-month intervals.

Therefore, future studies should have an increased emphasis on assessing longitudinal outcomes. A longer duration of doing the Three Good Things exercise, and follow-up assessment in a month's time and three month's time would be helpful to assess whether the Three Good Things exercise is effective in influencing well-being (Duckworth, Steen, & Seligman, 2005; Seligman et al., 2005; Sheldon & Lyubomirsky, 2006).

Moreover, in an effort to evaluate positive psychology exercises and to increase potency of the intervention, a batch including the Three Good Things or a variation of several positive psychology exercises done together would be another means to gather more research on the benefits of positive psychology (Schueller & Parks, 2012; Seligman, Ernst, Gillham, Reivich, & Linkins, 2009; Seligman et al., 2005).

It would be important for future studies to consider the inclusion of a control group of those who were texted but did not do any interventions to conclude whether texting on its own had its own psychological benefits. Research designs are needed that differentiate text messaging as the delivery mechanism from the intervention (Ybarra, Holtrop, Bosi, & Emri, 2012). As text messaging becomes more common in research and intervention delivery, documentation of content and protocol development procedures will help further the empirical base supporting mHealth.

Additionally, program development would carefully consider the strategy and intervention that drives behavior changes while the design of the program would include how the text messages are tailored and the number of messages received. Methodological considerations such as whether to utilize unidirectional versus bidirectional messaging or to include supplementary intervention resources (e.g. personal contact) may change the outcome of participant compliance. As well, decisions on how many messages to be sent per day or per week may have influenced the outcome of compliance. It is necessary to deliver a sufficient level of messages to affect behavior change, while not overwhelming participants where they stop reading the texts (Ybarra et al., 2012). I chose one daily prompt to coincide with the exercise. Increasing the number of text message prompts may be necessary to strengthen the effect on treatment compliance. However, a word of caution, there were those in this study who stated that either 1) the exercise was administered too often, or 2) the text messaging was too frequent so there is a need to further investigate optimal texting frequency.

### **Conclusion**

Using text messaging for improving mental health is a relatively new endeavor with little outcome research as yet. Thus, this study was developed to investigate the combined effects of text messaging with a positive psychology intervention. Both text messaging and positive psychology interventions are two growing areas in which psychological treatment and outcome could be greatly enhanced for the benefit of the patient. The present study revealed that texting considerably improved rates of compliance with a positive psychology treatment. Further, this study demonstrated that the Three Good Things exercise significantly alleviated negative affect. Moreover, the

greater the “dosage” of the Three Good Things exercise (that is, the higher the frequency) over a two-week course, the less negative affect an individual experienced. Positive trends in the data further suggest that extending the duration of the intervention may increase positive affect and well-being. Greater compliance with the positive psychology intervention in general was found for women and the older adults sampled (age 40 and over).

Initial effectiveness of the intervention and participant appreciation of the delivery method are promising. Further research is warranted with a larger and more representative sample, as the present sample included well-educated, mostly Caucasian (68%) sample with generally high life satisfaction and minimal depression. In addition, further empirical work is needed to assess the optimal “dose” of prompts to boost treatment compliance. This preliminary study suggests positive psychology intervention approaches may be of substantial benefit when accompanied by text messaging efforts to encourage patient involvement in their own care and well-being.

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Appendix A

Positive Psychology and Well-Being

Facebook Invitation

**APPENDIX A****Positive Psychology and Well-Being**

Facebook Invitation

PSYC 8943 Doctoral Dissertation, **Northwest University**

Mellissa Tong

Two week Positive Intervention Study for Increased Well-Being

Open to all adults who would like to participate, age 18 and older, who have access to e-mail and a mobile phone with text messaging capacity, and are living in the United States.

Certain simple daily activities may help to improve individual well-being. This study is designed to test the effect that positive psychology exercises can have on increasing well-being. The study begins with a few brief questionnaires that will take 10-15 minutes to complete, and you will receive instructions about participating in the exercises over the next two weeks. The simple positive psychology exercise will only take a few minutes each evening. The final phase of the study will involve follow up questionnaires. Please click on the Survey Monkey link below to learn more and begin the study.

As a bonus - All participants will be entered into an Amazon \$25 gift card drawing at the end of the study!

Appendix B

Positive Psychology and Well-Being

Consent Form



**APPENDIX B****Positive Psychology and Well-Being**

Consent Form

PSYC 8943 Doctoral Dissertation, **Northwest University**

Mellissa Tong

You are invited to participate in a dissertation study conducted by Mellissa Tong, a student in the doctoral program in counseling psychology at Northwest University. The study is being conducted as a graduation requirement. The purpose of this study is to investigate positive psychology exercises and their contributions to well-being.

Your first name, email address, and phone number will need to be provided for participation. If you agree to participate in the study, you will be involved in a two-week experiment and answer a series of brief questionnaires: a demographic survey, a life satisfaction questionnaire, and two mood scales. The same life satisfaction questionnaire and mood scales will be filled out again at the end of the study. The questionnaires will take approximately 10-15 minutes in total. The positive psychology exercise will take approximately 5 minutes each night to complete. You will be randomly assigned to one of two groups, each entailing a positive psychology exercise. You will not be informed as to which group you have been assigned. There are minimal risks associated with participation. Some individuals may be uncomfortable or embarrassed answering personal questions or participating in the positive psychology exercises. Some questions asked may also raise uncomfortable feelings from the past and present. The benefits of taking part in this study include the opportunity to participate in the research process and the potential positive results of the exercises.

Participation in this study is voluntary. You may choose not to participate in this study at any time and for any reason. There will not be any negative consequences for you if you refuse to participate. You may refuse to answer any questions asked. Your identity will remain confidential and the data from the questionnaires will not be shown to anyone other than the researcher. By participating in this experiment and answering the questionnaires, you are giving permission to use your responses in this research study. The aggregated results from this study will be presented in an academic dissertation as well as a professional presentation. Results may also be published in a psychological journal or other scholarly publication. All data forms will be destroyed June 1, 2025.

If you have any questions about this study, contact Mellissa Tong at (864) 869-8664 or [mellissa.tong12@northwestu.edu](mailto:mellissa.tong12@northwestu.edu). If you have further questions, please contact my dissertation chair Dr. Leihua Edstrom at 425-889-5367 or [leihua.edstrom@northwestu.edu](mailto:leihua.edstrom@northwestu.edu). You may also contact the Chair of the Northwest University Institutional Review Board, Dr. Molly Quick at [molly.quick@northwestu.edu](mailto:molly.quick@northwestu.edu) or 425-889-5237. You may seek further help by calling toll free the live help line at the National Institute of Mental Health 1-866-615-6464, or the toll-free 24-hour hotline of the National Suicide Prevention Lifeline at 1-800-273-TALK to be connected to a trained counselor at a suicide crisis center nearest you.

Thank you for your consideration of this request.

Mellissa Tong, [mellissa.tong12@northwestu.edu](mailto:mellissa.tong12@northwestu.edu).

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*Please print a copy of this consent form for your future reference.*

If you are 18 years of age or older, understand the statements above, and freely consent to participate in the study, please sign below and click on the "I Agree" button to begin the surveys.

Appendix C

Positive Psychology and Well-Being

Demographic Form

**APPENDIX C**

**Positive Psychology and Well-Being**  
Demographic Form  
PSYC 8943 Doctoral Dissertation, Northwest University  
Mellissa Tong

1. I am a: (A) Male (B) Female
2. My age is: \_\_\_\_\_ years old
3. What is your ethnicity? \_\_\_\_\_
4. What is your annual household income? Under \$20K\_\_\_ \$20-40K\_\_\_ \$40-60K\_\_\_  
\$60-80K\_\_\_ \$80-100K\_\_\_ Over \$100K\_\_\_
5. What is your highest grade or level completed?  
Attended Highschool\_\_\_ College\_\_\_ Graduate studies\_\_\_
6. Do you have a text messaging plan? Yes\_\_\_ No\_\_\_
7. If so, is it an unlimited text messaging plan? Yes\_\_\_ No\_\_\_
8. Do you read your text messages within?  
Seconds\_\_\_ Minutes\_\_\_ Hours\_\_\_ Days\_\_\_
9. What time zone do you live in? PST\_\_\_ MST\_\_\_ CST\_\_\_ EST\_\_\_
10. Have you ever been diagnosed with a mental health diagnosis? Yes\_\_\_ No\_\_\_
11. If yes, what have you been diagnosed with? \_\_\_\_\_

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Appendix D

Satisfaction with Life Scale

**APPENDIX D**

**Satisfaction with Life Scale (Diener, 1985)**  
PSYC 8943 Doctoral Dissertation, **Northwest University**  
Mellissa Tong

Below are five statements that you may agree or disagree with. Using the 1 - 7 scale below, indicate your agreement with each item by placing the appropriate number on the line preceding that item. Please be open and honest in your responding.

- 7 - Strongly agree
- 6 - Agree
- 5 - Slightly agree
- 4 - Neither agree nor disagree
- 3 - Slightly disagree
- 2 - Disagree
- 1 - Strongly disagree

\_\_\_\_ In most ways my life is close to my ideal.

\_\_\_\_ The conditions of my life are excellent.

\_\_\_\_ I am satisfied with my life.

\_\_\_\_ So far I have gotten the important things I want in life.

\_\_\_\_ If I could live my life over, I would change almost nothing.

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Appendix E

The Positive Affect and Negative Affect Scale

**APPENDIX E****The Positive Affect and Negative Affect Scale (PANAS) (Watson et al., 1988)**PSYC 8943 Doctoral Dissertation, **Northwest University**

Mellissa Tong

## PANAS Questionnaire

This scale consists of a number of words that describe different feelings and emotions. Read each item and then list the number from the scale below next to each word. Indicate to what extent you feel this way right now, that is, at the present moment **OR** indicate the extent you have felt this way over the past week (circle the instructions you followed when taking this measure)

1. Very Slightly or Not at All
2. A Little
3. Moderately
4. Quite a Bit
5. Extremely

- |                       |                      |
|-----------------------|----------------------|
| _____ 1. Interested   | _____ 11. Irritable  |
| _____ 2. Distressed   | _____ 12. Alert      |
| _____ 3. Excited      | _____ 13. Ashamed    |
| _____ 4. Upset        | _____ 14. Inspired   |
| _____ 5. Strong       | _____ 15. Nervous    |
| _____ 6. Guilty       | _____ 16. Determined |
| _____ 7. Scared       | _____ 17. Attentive  |
| _____ 8. Hostile      | _____ 18. Jittery    |
| _____ 9. Enthusiastic | _____ 19. Active     |
| _____ 10. Proud       | _____ 20. Afraid     |

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Appendix F

The Patient Health Questionnaire

**APPENDIX F**

**The Patient Health Questionnaire (PHQ-9)**  
 PSYC 8943 Doctoral Dissertation, Northwest University  
 Mellissa Tong

Over the last 2 weeks, how often have you been bothered by any of the following problems?

Not at all (0) Several days (1) More than half the days (2) Nearly every day (3) (please circle the number to indicate your answer)

- |   |         |
|---|---------|
| 1. Little interest or pleasure in doing things  | 0 1 2 3 |
| 2. Feeling down, depressed, or hopeless   | 0 1 2 3 |
| 3. Trouble falling or staying asleep, or sleeping too much  | 0 1 2 3 |
| 4. Feeling tired or having little energy  | 0 1 2 3 |
| 5. Poor appetite or overeating  | 0 1 2 3 |
| 6. Feeling bad about yourself or that you are a failure or have let yourself or your family down  | 0 1 2 3 |
| 7. Trouble concentrating on things, such as reading the newspaper or watching television  | 0 1 2 3 |
| 8. Moving or speaking so slowly that other people could have noticed. Or the opposite being so fidgety or restless that you have been moving around more than usual | 0 1 2 3 |
| 9. Thoughts that you would be better off dead, or of hurting yourself   | 0 1 2 3 |

10. If you checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people? (please check one)

Not difficult at all

Somewhat difficult

Very difficult

Extremely difficult

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Appendix G

Positive Psychology and Well-Being

**APPENDIX G**

**Positive Psychology and Well-Being**  
Weekly E-mail (Day 1)  
PSYC 8943 Doctoral Dissertation, **Northwest University**  
Mellissa Tong

**Day 1**

Congratulations! You have enrolled to participate in two weeks of daily positive psychology exercises that will only take a few minutes each day. Thank you for your interest and your participation in the study. You are on Monday (Day 1) of the study and in a week, I will send you another e-mail on the following Monday (Day 8) to instruct you through to the end of the study (Sunday Day 14).

Here's how the study works:

You are to answer the following two questions each day and once you've answered the two questions, you need to log into Survey Monkey (include link here) to show that you've done the exercise for the day.

It's a very simple exercise –

Just write down towards the end of each day,

1. What are 3 good things that happened today?
2. What caused each of these good things to happen?

Once you've answered the two questions, log into Survey Monkey every day (include link) and let us know that you've done it!

\* Please remember to log into Survey Monkey DAILY and let us know that you've answered the two questions for each individual day.

Appendix H

Positive Psychology and Well-Being

Weekly E-mail

**APPENDIX H**

**Positive Psychology and Well-Being**  
Weekly E-mail (Day 8)  
PSYC 8943 Doctoral Dissertation, **Northwest University**  
Mellissa Tong

Day 8

Congratulations! You have completed half of the study! I hope you have enjoyed the exercise and the process so far. You are on Monday (Day 8) of the study and in a week (Day 14), I will send you a final e-mail with a link to finish the study by completing the final three questionnaires.

So please continue to do the very simple exercise –

Just write down towards the end of each day,

1. What are 3 good things that happened today?
2. What caused these good things happen?

Once you've answered the two questions, log into Survey Monkey every day (include link) and let us know that you've done it!

\* Please remember to log into Survey Monkey DAILY and let us know that you've answered the two questions for each individual day.

Thank you for your continued interest and participation in the study!

Appendix I

Positive Psychology and Well-Being

Weekly E-mail



**APPENDIX I****Positive Psychology and Well-Being**

Weekly E-mail (Day 14)

PSYC 8943 Doctoral Dissertation, **Northwest University**

Mellissa Tong

Day 14

Congratulations! I hope you have enjoyed the exercise and the process. Here is the link (insert link) to finish the study by completing the final three surveys. After completing the short surveys, you have completed the study – Congratulations!!

Thank you for your participation in the study! I hope that you have enjoyed your experience and if you have any questions please contact me at [mellissa.tong12@northwestu.edu](mailto:mellissa.tong12@northwestu.edu)

May your well-being flourish!

\*You will be contacted this week if you've won the drawing for the \$25 Amazon gift card!