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Exercise Adherence Among Active Working Women

Roxane Evonne Hearn
Walden University

Walden University

College of Social and Behavioral Sciences

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Roxane Hearn

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Review Committee
Dr. Amy Sickel, Committee Chairperson, Psychology Faculty
Dr. William Disch, Committee Member, Psychology Faculty
Dr. Rachel Piferi, University Reviewer, Psychology Faculty

Chief Academic Officer
Eric Riedel, Ph.D.

Walden University
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Abstract

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MHA, University of Phoenix, 2006

BS, Seton Hall University, 1994

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Low levels of exercise adherence has contributed to the increased prevalence of heart disease, cancer, and diabetes in American women. These low levels, coupled with high exercise program dropout rates, point to a need for strategies to increase exercise frequency in women who exercise, but not enough to improve their health and reduce risks. Real-time interventions, such as text messaging, could be useful in improving the cognitions that regulate adherence. Using a snowball sampling strategy, a cross-sectional sample of working women (N =130), ages 18-64, in the volitional stage of exercise behavior, completed a 60-item survey on exercise behavior. Social Cognitive Theory SCT and the Health Action Process Approach HAPA served as the guiding theories to test the first hypothesis that the mean strength of maintenance-self efficacy, action and coping planning skills, and limitation of real-life demands between women who adhered to exercise frequency recommendations and women who did not, would differ. Findings from an independent t test revealed significant differences in each of the variables of interest between adherers and nonadherers. A Pearson correlation test of the second hypothesis, which was guided by the SCT and the Technology Acceptance Model, revealed a significant positive relationship between the perceived usefulness of texting and the limitation of real-life demands reported by participants. This study highlights a need for further research into these differences so interventions can be more effectively aimed at addressing the factors that most affect an active working woman's ability to maintain adequate exercise frequency levels. Doing so could improve their quality of life, reduce mortality rates, and the societal burden of healthcare costs.

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Dedication

I dedicate every second spent researching and writing, and every tear of joy and frustration to my pride and joy. My daughter Nevaeh Nicole. She sacrificed a great amount of her childhood years watching me spend countless hours working to achieve what at times felt like an unattainable goal. Despite her inability to understand the magnitude of this undertaking, she was untiring in her support, self-less with her patience and loving during every rewarding and painful step of this journey.

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Chapter 1: Introduction to the Study

Introduction

In the United States, more than 62% of adults over age 20 are overweight or obese (Schiller, Lucas, Ward, & Peregoy, 2012). The excessive levels of unhealthy weight are largely attributed to the dangerously low levels of exercise adherence. Only an estimated 20% of adults over age 20 meet the recommended guidelines for aerobic and muscle-strengthening activities (National Center for Health Statistics [NCHS], 2016; Schiller et al., 2012). Low levels of exercise adherence are a problem for society due to its correlation with the increase in heart disease, type 2 diabetes, arthritis, hypertension, breathing problems, certain cancers and other comorbid diseases that are largely preventable (Baer et al., 2011; Danaei et al., 2009; U. S. Department of Health and Human Services (DHHS), 2008; WHO, 2010).

The onset of these conditions is not only more frequent, but also diagnosed prematurely for most Americans. As a result, health care costs are skyrocketing as evidenced in the 50% increase in health-related expenditures during 2000-2011 (NCHS, 2013). More specifically, women have a higher incidence of mortality from heart disease, stroke, and Alzheimer's disease; moreover, they have higher occurrences of arthritis, depression, and are significantly less physically active (Blackwell, Lucas, Clarke, 2014; Eyler et al., 2003; Iwasaki, MacKay, & Mactavish, 2005).

The numerous roles women must fulfill leave little time for self-care (Gilligan, 1982; Henderson, & Allen, 1991; Hendry et al., 2010; Mattingly & Sayer, 2006). This neglect has partially contributed to the conditions listed above and to the low levels of exercise adherence (Brittain, Dinger, Classen, Sage, & Han, 2012; King, Castro, Wilcox,

Eyler, Sallis, & Brownson, 2000). Developing and implementing low-cost, practical interventions to help women adopt and maintain the recommended amount of exercise, while upholding their many roles may help reverse reduce mortality rates, improve the quality of life, and ultimately reduce healthcare costs for these working women and men.

The subsequent sections will discuss the gap in literature and the problem addressed by the study will address. The next section will cover the focus of the study, research questions and hypotheses, theoretical foundation, research design, operational definitions, assumptions, scope and delimitations and limitations. Lastly, discussion of the significance of the study to positive social change will emphasize the underlying principles that fueled the need for the study (Annesi, 2004, Brittain, Dinger, Classen, Sage, & Han, 2012).

Background

There have been decades of research and evidence of the psychological factors that motivate people to engage in healthy behaviors, such as exercise, in the preintention phase of behavior change. However, interest and investigation into the postintention volitional phase is not as abundant (Conner & Norman, 2005; Rothman 2000) and research exploring this phase has not translated into effective interventions. Given the success of research employing appropriate theory and health behavior models as a guide, many argue the need for theoretical grounded-behavior change techniques to yield effective results (Annesi & Whitaker, 2010; Michie & Johnston, 2012). Since there appears to have been less attention given to the postintention volitional phase of heath behavior, there may have been a wide spread notion that the factors that play a role in the

postintention motivational phase mirror those in the postintention volitional phase of behavior maintenance. This assumption has been difficult to uphold (Rothman, 2000).

Recent investigation indicates the factors that motivate individuals to initiate exercise behavior, do not necessarily facilitate a sustainable exercise behavior change into the postintention volitional phase of behavior maintenance (Connor 2008; Rothman, 2000; Schwarzer, 2008a; Schwarzer & Luszczynska, 2008). Evidence suggests exercise adherence in women is difficult due to self-regulatory deficits in maintenance self-efficacy, action planning, coping planning, along with the perception real-life demands as barriers (Annesi, 2004; Bandura, 1977,1991; Barg et al., 2012; Gollwitzer, 1996; Hendry et al., 2010;; Renner, Hankonen, Ghisletta, & Absetz, 2012; Webb & Sheeran, 2006;; Schüz, Wurm, Ziegelmann, Wolff, Warner, Schwarzer, & Tesch-Römer, 2012). For this reason, there is a significant need to develop strategies for working women to improve the self-regulative cognitions and minimize the perception of real-life demands as barriers that obstruct exercise adherence (Bloomquist, Gyurcsik, Brawley, Spink, & Bray, 2008; Conner, Sandberg, & Norman, 2010; Lovell & Butler, 2015; Marcus et al., 2000).

The growing trend to develop interventions to increase exercise and physical activity has led to the use of modern technological methods such as the email and cellular text messaging to improve health behaviors (Kerr et al., 2012; Prestwich, Perugini, & Hurling, 2010; Soureti, Murray, Cobain, Chinapaw, van Mechelen, & Hurling, 2011; Webb, Joseph, Yardley, & Michie, 2010). However, the majority of interventions that target exercise behavior focus on the preintention motivational phase; the phase before exercise intentions have been put into action. Health care practitioners are in need of strategies to enhance self-regulation of exercise behavior by increasing self-regulatory

factors in the postintention volitional phase when maintaining the newly adopted exercise behavior can be equally as challenging. Effective self-regulatory strategies will facilitate enhanced maintenance self-efficacy, improve action planning skills and coping planning skills and minimize the influence of real-life demand barriers faced by women who have bridged the intention-behavior gap, but need to sustain their exercise behavior (Brittain et al., 2012; Huberty et al., 2008; Teixeira et al., 2010).

This quantitative study will contribute to the gap in literature (Conner, 2008) by presenting research in the underexplored postintention volitional phase of exercise behavior and the differences between the self-regulatory factors and real-life demand barriers as related to exercise frequency in working women (Brittain et al., 2012; Conner & Norman, 2005; Rothman 2000). Furthermore, the presents findings which suggests there is a perceived usefulness of text messaging as a tool to increase exercise frequency. The results will provide valuable insight for the development of future, more practical and real-time exercise behavior interventions targeting working women.

Problem Statement

Despite research validating the negative impact sedentary lifestyles can have on an increased risk for morbidity and premature death, levels of exercise adherence are extremely low (NHCHS, 2011; 2013). The 2011 report on the health status of Americans from the DHHS, estimates that more than 80% of adults over age 20 do not adhere to the recommended guidelines for aerobic and muscle-strengthening exercises (Schiller et al., 2012). Furthermore, for those who do start a routine exercise regimen, approximately 50-60% dropout within the first 6 months (Annesi & Unruh, 2004; Dacey, Baltzell, & Zaichkowsky, 2003; Huberty et al., 2008; Marcus & Forsyth, 2003; Pridgeon & Grogan,

2012; Wilson & Brookfield, 2009). Exercise interventions have been primarily aimed at getting individuals to start exercising. Few interventions aimed at helping individuals who have started exercising on their own, attain the adequate level of frequency so they can reduce their health risks (Conner & Norman, 2005; Rothman 2000). Given the growing use of text messaging in health behavior change interventions (Park & Kim, 2012; Prestwich, et al., 2010; Shapiro et al., 2012), the application of text messaging aimed at improving exercise adherence could prove beneficial at helping individuals increase their levels of exercise frequency.

Low levels of exercise frequency is a problem because collective data have ranked overweight/obesity as the third highest risk factor for death, and low levels of physical activity as the fourth highest risk (Danaei, Ding, Mozaffarian, Taylor, Rehm, Murray et al., 2009). With 75% of American women ages 20-44 overweight and obese and only 14-19% adherent to exercise recommendations (NCHS, 2011; 2013; 2016), women are at an increased risk for the leading causes of death in the United States (Baer et al., 2011; Dacey et al., 2003; Heron 2012).

Disproportionate Body Weight and Exercise Adherence in Women

When examining the health status of our past, versus the current status of our health, American women ages 18-44 are 20% heavier than they were thirty years ago, and 35% are less physically active than they were twenty years ago (NCHS, 2011; 2013; 2016). Findings from the 2013 DHHS report on the health status of the nation reveals the disparity in exercise adherence in women ages 18-54 (14-19% adherence) and their male counterparts (25.5% adherence). These low levels of exercise adherence in women, coupled with the extreme rates of overweight and obesity, highlight an urgency for the

development of interventions to increase exercise frequency in American women (NCHS, 2011; 2013; 2016).

Poor Health Outcomes

The low levels of female participation in routine exercise are associated with health disparities in specific chronic diseases (Baer et al., 2011; Dacey et al., 2003). For example, in the CDCs' report ranking the 10 leading causes of deaths in women from 2008, stroke and AD claimed the lives of more women than that of men. In addition, heart disease and cancer are the top two leading causes of death for women of all ages across all American races and ethnicities. Collectively heart disease and cancer accounted for 47%% of deaths in all American women (Heron, 2012). Diabetes only accounted for 3% of the deaths, but according the CDC more than 10.8% of all American women over age 20 have been diagnosed with diabetes (CDC, 2011).

As related to other health conditions, women also have a higher occurrence of kidney disease, arthritis, migraines, and lower back pain than their male counter parts (Schiller et al., 2012). In addition to the increased prevalence of chronic physiological diseases and conditions, women are 70% more likely to experience depression than men (Kessler, Chiu, Demler, &Walters, 2005) and are twice as likely to suffer from panic disorder and generalized anxiety disorder (Church & Lucey, 2009; McLean, Asnaani, Litz, & Hofmann, 2011; Pigott, 2003).

Health Benefits of Exercise Adherence

Accompanied by the wealth of research demonstrating the direct link between sedentary lifestyles and negative health status, is a considerable amount of research substantiating the positive impact routine exercise behavior can have on improving ones

physical and psychological health (DHHS, 1996; Kruk, 2007; Martinsen, 2008; Pedersen & Saltin, 2006). Exercise adherence has been linked to lowering rates of obesity, heart disease, hypertension, type 2 diabetes, metabolic syndrome, certain cancers; and lessening the symptoms associated with arthritis, mood disorders, and stress (Brown, Burton, Rowan, 2007; Church, 2012; Kaptein, Backman, Badley, Lacaille, Beaton, Hofstetter, & Gignac, 2013; Happell, Platania-Phung, & Scott, 2011; Myers, 2008).

Over more recent years, an increase in studies on exercise and cognitive decline have supported the beneficial role regular exercise can play in the prevention, delayed onset, and progression of Alzheimer's disease (AD) (Aarsland, Sardahaee, Andersen,& Ballard, 2010; Buchman, Boyle, Yu, Shah, Wilson, & Bennett, 2012; Hooghiemstra, Eggermont, Scheltens, van der Flier, & Scherder, 2012).

Specific to the top causes of mortality in women, there is substantial research validating the efficacy of routine exercise in decreasing the prevalence of the heart disease, cancer (Heron, 2012) and type 2 diabetes (Teixeira-Lemos, Nunes, Teixeira, & Reis, 2011; Walker, O'Dea, Gomez, Girgis, & Colagiuri, 2010; Brown, Burton, Rowan, 2007; Ryan, Ge, Blumenthal, Serra, Prior & Goldberg, 2014). Reducing the risk of heart disease in women is especially important because heart disease is the leading cause of death for American women across all races and ethnicities (CDC, 2015). In women, cancer is the second leading cause and diabetes the seventh leading cause of death (CDC, 2011). Furthermore, research demonstrating the efficacy of exercise in the treatment and management of menopausal symptoms, (Daley, Stokes-Lamoard, & MacArthur, 2009; Sternfeld, Guthrie, Ensrud, LaCroix, Larson, Dunn, et al., 2014), osteoporosis (Ardawi,

Rouzi, & Qari, 2012; Schmitt, Schmitt, & Dören, 2009 and mood disorders (Saeed, Antonacci, & Bloch, 2010) is growing.

Purpose of the Study

The purpose of this quantitative study was to assess the difference in mean strength of maintenance self-efficacy, action planning skills, coping planning skills and the limitation of real-life demands in women who adhere to exercise frequency recommendations and women who also exercise, but do not adhere to exercise frequency recommendations (Schwarzer, 2008a; White & Ransdell, 2005; Mendes, Sousa, & Barata, 2011). The secondary purpose was to identify if texting frequency is related to the perceived usefulness of text messaging as a tool in improving the self-regulation of exercise frequency (Davis, 1989; Fjeldsoe, Miller, & Marshall, 2010).

The study's' purpose of exploring the factors that regulate the volitional phase of exercise behavior will address the problem of low NCHS levels of exercise adherence (NCHS, 2011; 2013; 2016). In turn, the findings will contribute to the development of interventions to increase exercise and reduce the occurrence and mortality rates of the leading causes of death of women in the United States (Baer et al., 2011; Dacey et al., 2003; Heron 2012).

Quantitative Research Questions, Hypotheses and Measurement

Based on a theoretical framework consisting of the SCT (Bandura, 1977), the HAPA (Schwarzer, 1992) and the TAM (Davis, 1989) the following research questions and hypotheses will be addressed:

RQ 1: Is there a significant difference in mean scores on MSE, action-planning skills, coping planning skills and the limitation of real-life demands between adherers and nonadherers?

*H*o$_1$: There is no significant difference in mean scores on MSE, action-planning skills, coping planning skills and the limitation of real-life between adherers and nonadherers.

*H*a$_1$**:** There is a significant difference in mean scores on MSE, action-planning skills, coping planning skills and the limitation of real-life between adherers and nonadherers.

RQ #2: Is texting frequency related to the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency?

Ho$_2$: Texting frequency is not related the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency.

Ha$_2$: Texting frequency is related to the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency.

Table 1

Summary of Measurement Instruments by Variables of Interest

Variable	Data type	Research question	Measurement instrument
MSE	Interval	Is there a significant difference in mean scores on MSE between adherers and nonadherers?	MSE scale physical exercise (MSES-PE) Four item 4-point Likert scale (Luszczynska & Sutton, 2006)
Action planning skills (APS) and Coping planning skills (CPS)	Interval	Is there a significant difference in mean scores on action-planning skills between adherers and nonadherers? Is there a significant difference in mean scores on coping planning skills between adherers and nonadherers?	Action planning & coping planning scale-physical exercise (APCPS-PE) 10 item, 4-point Likert scale (5 questions per variable) (Sniehotta, Schwarzer, Scholz, & Schüz, 2005b*)*
Limitation of real-life demands (LRLD)	Interval	Is there a significant difference in mean scores the limitation of real-life demands between adherers and nonadherers?	Perceived limitation of barriers 22 Item 10 –point Likert scale (Brittain, Dinger, Classen, Sage, & Han, 2012)
Group status related exercise frequency (EF)	Nominal .	See research questions for MSE, APS, CPS, LRLD and PUTM	International physical activity questionnaire-part 5 recreation, sport, and leisure-time physical activity. 6 questions (IPAQ, 2002)
Perceived usefulness of text messages(PUTM)	Interval	Is texting frequency related to the PUTM as a tool in improving MSE, APS, CPS and EF?	Four item 7-Point Likert scale (MSE, AP, CP, EF) Modifying the TAM (Venkatesh, Morris, Davis, & Davis, 2003)

Theoretical Framework

The SCT (Bandura, 1977) served as the theoretical framework for understanding and predicting exercise behavior in this study. SCT has guided many exercise behavior studies within various populations (Annesi, 2004; Hortz & Petosa, 2008; Keller, Fleury,

Gregor-Holt, & Thompson, 1999; Petosa, Suminski, & Hortz, 2003; Plotnikoff, Lippke, Courneya, Birkett, & Sigal, 2008; Wolfe, 2008). The SCT hypothesizes that behavior is determined by the interactions between (a) personal cognitions and dispositions, (b) social & physical environment, and (c) the behavior itself (Bandura 1977). The focus of the SCT on factors in both the motivational and volitional stages of behavior change make the theory a practical and valid foundation for studies exploring health behavior change. Additionally, SCT's strong emphasis on the role self-efficacy plays in the successful facilitation of behavior change further support use of the theory in this study (Bandura 1977, 1991, 1998, 2000, 2004, 2005).

More specific to the models for the research design, the social-cognitive prediction model known as the HAPA (Schwarzer, 1992) will allow for the deductive examination of the self-regulatory factors within the postintention volitional phase of exercise behavior. Subsequently, the TAM (Venkatesh, Morris, Davis, & Davis, 2003) will provide a secondary framework from which the perceived usefulness of text messaging in improving these self-regulatory factors will be examined. The HAPA postulates that there are two discrete phases of health behavior change. The first is the preintention motivational phase wherein health behavior change is contemplated and planned. The second phase is the postintention volitional phase wherein health behavior intentions are put into action. The volitional phase involves self-regulation of the new behavior. The HAPA suggests that the cognitions, which help individuals' self-regulate behavior, are maintenance self-efficacy, action planning skills and coping planning skills to overcome barrier limitation (Chiu, Lynch, Chan, & Berven, 2011; Hankonen, Absetz, Ghisletta, Renner, & Uutela, 2010; Luszczynska, & Sutton, 2006; Prestwich, Perugini, &

Hurling, 2009; Prestwich, Perugini, & Hurling, 2010; Sniehotta et al, 2005a; Schwarzer, 1992; Schwarzer, 2008).

The TAM provides a model by which an individuals' use of technology is predicted and explained by ones' perceptions and attitudes (Davis, 1989). The model was guided by the behavioral model the TRA (Fishbein & Ajzen, 1975; Fishbein, 1980). Similar to the HAPA, the TAM provides a framework for the examination of human behavior with a theoretical foundation. With several dozens of empirical studies on health care and technology, employing the use of the TAM, (Holden & Karsh, 2010) its applicability to the current study design is clear.

The application of the SCT as the guiding theory of investigation and the HAPA as the framework for deductive examination into the social-cognitive factors which regulate of exercise behavior in the postintention volitional phase, have demonstrated their utility and validity as the foundation for the current study (Parschau, Barz, Richert, Knoll, Lippke, & Schwarzer, 2014; Parschau, Richert, Koring, Ernsting, Lippke, & Schwarzer, 2012). Furthermore, the connection between behavioral theory and the TAM provide a theory-based model by which the perceived usefulness of text messaging in improving exercise behavior can be explored (Chung-Hung, 2014). The strengths in the highlighted studies throughout this document lie in their application of the SCT, HAPA and TAM to longitudinal intervention-based approaches, naturalistic settings, varied populations of interest, test variables such as phase specific self-efficacy, research design, use of reliable measures, variety of assessments, array of intervention methods, and the application of appropriate statistical analyses to examine the research questions of interest.

Nature of the Study

The nature of the study was to quantitatively assess the difference in mean strength of maintenance self-efficacy, action planning skills, coping planning skills and the limitation of real-life demands between women who adhere to exercise frequency recommendations and women who also exercise, but do not adhere to exercise frequency recommendations (Schwarzer, 2008a; White & Ransdell, 2005; Mendes, Sousa, & Barata, 2011). A secondary quantitative assessment set out to identify if texting frequency is related to the perceived usefulness of text messaging as a tool in improving the maintenance self-efficacy, action-planning skills, coping planning skills and exercise frequency (Davis, 1989; Fjeldsoe, Miller, & Marshall, 2010). Use of the HAPA model allowed for quantitative assessment of the first research question. Unlike other health behavior models which only allow for examination of preintention motivational factors (Annesi, 2004; Anshel, 2007; Connor, 2008; Rothman, 2000; Schwarzer 2008), the HAPA allows for examination of the postintention volitional factors as well (Schwarzer, 1992; 2001). The TAM provided insight into the potential for the usage of texting as a tool in regulating exercise behavior. Therefore, the HAPA and the TAM were the most suitable models for a valid research design.

Due to the low percentage of women in the volitional phase of exercise behavior (NCHS, 2016), a snowball sampling strategy increased the odds of obtaining an adequate sampling size for data collection (Emerson, 2015; Goodman, 2011) from working women ages 18-64 in the volitional phase of exercise behavior. Likert-scale–based measurements formed a web-based, cross-sectional survey to collect data on each variable of interest. An independent *t* test tested the first hypothesis and a Pearson's correlation assessed the

second hypothesis. Chapter 3 will present further details of the research design, methods, threats to validity and ethical procedures.

Definition of Key Terms

Action planning skills: Action planning skills will be operationally defined as the level of concrete ideas related to where, when and how to act for implementing the intention to exercise. (Schwarzer, 2008).

Adherers: Study participants who do adhere to the definition of exercise adherence.

Barrier Perception: The identification of situational and dispositional factors that prevent engagement in exercise or hinder one's ability to perform such (Sallis & Owen, 1999).

Coping planning skills: Coping planning skills are the degree to which one has developed the appropriate strategies to cope with barriers to exercise that might arise in the volitional stage of behavior change (Schwarzer, 2008).

Exercise adherence: The term exercise adherence is frequently used in literature to describe the degree to which one engages in a consistent exercise. However, there are inconsistencies as to what exclusively defines the term exercise. While some researchers accept broad definitions of exercise (i.e. all physical activities including that performed on the job and general housework), others adopt more precise and well-defined meanings (i.e. leisure time physical activity or intentional physical activity performed for a structured period of time). This discrepancy creates a challenge in defining exercise adherence (Anshel, M.H., 2007; Buckworth & Dishman, 2002; Caspersen, Powell, &

Christenson, 1985; O'Donovan, Blazevich, Boreham, Cooper, Crank, Ekelund et al., 2010).

For the purpose of this study, exercise adherence was defined as the engagement of planned, purpose-driven, structured, routine, moderate-intensity cardiorespiratory or strength training activity for 150 minutes per week or 75 minutes of vigorous-intensity cardiorespiratory or strength training per week. As per the American College of Sports Medicine recommendations, exercise requirements are met through "30-60 minutes of moderate-intensity exercise (five days per week) or 20-60 minutes of vigorous-intensity exercise (three days per week). One continuous session and multiple shorter sessions (of at least 10 minutes)" (Garber et al, 2011, p.1334, CDC 2014; Duncan, Hall, Wilson, & Jenny, 2010; Mendes, Sousa, & Barata, 2011). This definition has also been adopted by the WHO (WHO, 2011). These recommendations operationally defined the group status in this study labeled as adherers. Those who did not meet these recommendations fell into the group status labeled nonadherers. (O'Donovan, et al., 2010).

Exercise behavior: Exercise behavior is intentional, planned, structured, repetitive physical activity with the goal of improving or maintaining one's cardiovascular endurance, strength, flexibility and overall health *(*Caspersen et al., 1985).

Exercise frequency: The amount of time dedicated to exercise behavior as defined above *(*Caspersen et al., 1985). .

Maintenance self-efficacy: A confident, subjective prediction of one's ability to adhere to one's exercise routine despite perceived barriers (Schwarzer, 2008).

Nonadherers: Study participants who do not adhere to the definition of exercise adherence.

Physical activity: In line with definitions adopted by the WHO (2011) and CDC (2014), physical activity is any bodily movement produced by skeletal muscles that requires energy expenditure (Caspersen et al., 1985).

Real-life demands: Real-life demands are responsibilities, such as work, family caregiving, errands, school, parenting, etc. Specific to the current study, real-life demands faced by women can inhibit participation in exercise (Brittain et al., 2012; Huberty et al, 2008; Jackson, 1988; Kirchhoff et al., 2008; Kowal & Fortier, 2007; Mattingly & Sayer, 2006).

Texting frequency: The rate of occurrence at which an individual sends and receives text messages on a cell phone to communicate with others (Brynko 2013; Lefebvre, 2009; Smith, 2011; Wei, 2013).

Assumptions

I assumed survey respondents answered the questions honestly and accurately depicted their frequency of exercise and beliefs about the variables of interest. The low levels of exercise adherence led to the assumption that recruitment of an adequate sample size that meet the exercise frequency criteria would be challenging (NCHS, 2016). However, I was optimistic that the use of a diverse direct sampling and a snowball sampling strategy would increase the likelihood an adequate sample size would be obtained. Given the popularity and frequency of text messaging in the target population, I assumed the text messaging inclusion criteria would not significantly contribute to participant exclusion (Brynko 2013; Wei, 2013).

Scope and Delimitations

Given the lack of research and availability of practical interventions to help women who have turned their exercise intentions into action, maintain their newly adopted exercise routines despite the real-life demands they face, this study examined the self-regulatory factors that regulate exercise behavior in a sample of women in the volitional phase (Brittain et al., 2012; Kwasnicka, Presseau, White, & Sniehotta, 2013; Mitche & Johnston, 2012). Women in the motivational phase and those who had been exercising for less than 1 day per week for less than 4 weeks were excluded.

Due to the disproportionate research between the two distinct phases of health behavior change (Conner & Norman, 2005; Rothman 2000), there were several health behavior theories and models to choose from to address factors regulating exercise in the preintention motivational phase. However, only one model has provided a framework for examining both the motivational and the volitional phases; the HAPA Model () (Schwarzer, 1992). As discussed earlier, HAPA provides an ideal framework for investigating maintenance self-efficacy, action planning, coping planning, barrier limitation an exercise behavior between women who adhere to exercise frequency recommendations and women who do not adhere to the recommened frequency levels.

More commonly used theories in exercise behavior research focus on the motivational phase, for example, the theory of reasoned action (TRA; Fishbein & Ajzen, 1975; Fishbein, 1980), the theory of planned behavior (TPB; Ajzen, 1991), and the transtheoretical model of health behavior change (TTM; Prochaska, & Velicer, 1997). Therefore, these models did not provide adequate models for investigating the variables

of interest for the study. Chapter 2 will provide a more in depth discussion about the deficiencies of these popular research models as related to exercise adherence.

Limitations

Due to the inherent subjectivity of self-report measures, concerns regarding survey respondents' accuracy in recalling their exercise frequency during the past 7 days presented a limitation. However, the test-retest reliability of the IPAQ, which measures exercise frequency, is acceptable. The IPAQ and the reliability of the other self-report measures are more thoroughly discussed in Chapter 3. Another drawback stems from the use of a snowball sampling strategy, which presents a threat to population validity and selection bias (Babbie, 1990; Fowler, 2002; 2013).

These threats limit the generalizability of the findings. However, direct recruiting from diverse subgroups helped to minimize such biases and increased the ability of the findings to reflect the target population. Despite the subjectivity of the data collection instruments and sampling strategy limitations, the data collected from this minority population can provide a significant contribution to the gap in literature, which has not fully investigated exercise behavior in women in the postintention volitional phase (Annesi & Whitaker, 2010; Hendry, Solmon, Choate, Autrey, & Landry, 2010).

Significance

Expanding understanding of the social-cognitive factors in the postintention volitional phases of exercise health behavior change between adherers and nonadherers is key to the advancement of research in health behavior theory (Anshel, 2007; Michie & Johnston, 2012). By applying innovative strategies to improve the self-regulatory processes and minimize barrier perception and barrier limitation, program developers,

health educators, health psychologists, and other practitioners will find increased utility and efficacy in the development of exercise behavior interventions to help individuals who have bridged the intention-behavior gap, but need support in helping them to sustain their newly adopted exercise regimen and meet exercise frequency recommendations for optimal health (David, Pennell, Foraker, Katz, Buckworth, & Paskett, 2014; Tappe & Glanz, 2013).

The identification and use of effective support strategies is expected to increase rates of exercise, thereby creating a cascade of beneficial effects, including a decreased relevance of obesity and associated diseases such as type 2 diabetes, heart disease, cancer, depression. and ultimately an increase in overall health status and a decrease in national health care costs (Abraham, Nyman, Feldman, & Barleen, 2012; Benavides & David, 2010; Rom, Persson, Ekdahl, & Gard 2014).

Beyond the health improvements, findings from this research can also help to shift social and cultural attitudes toward exercise (Spotswood & Tapp, 2010). Instead of viewing exercise as a luxury or an inessential time-consuming task, shifting cultural views and negative self-efficacy towards exercise may allow people to see the importance of regular exercise in light of their quality of life. Offering practical, low cost, real-time interventions may increase adherence to a regular exercise program. Shifting cultural mindsets regarding exercise will no longer be identified as a social-class specific behavior, but instead as a cultural norm, thereby further expanding the reach of this study by an increasing its universal application (Cugelman, Thelwall, & Dawes, 2011).

Summary

Low levels of exercise adherence are a problem (NCHS, 2011, 2013, 2016; Schiller et al., 2012). The attention given to the motivational phase of exercise has allowed for the development of interventions to help individuals form exercise intentions and start an exercise program (Conner & Norman, 2005; 2010; Rothman, 2000; Schwarzer 2008). However, high dropout rates and low levels of exercise adherence (Annesi & Unruh, 2004; Dacey et al., 2003; Huberty et al, 2008; Marcus & Forsyth, 2003; Pridgeon & Grogan, 2012; Wilson & Brookfield, 2009) point to a need for an increased focus on providing interventions to help those who start exercising, who adopt or continue at the frequency recommended for health benefits and the reduction of health risks.

There has been a significant increase in awareness surrounding the consequences of physical inactivity, as evidenced in the national health statistics, endorsements and call to action statements from government health agencies and leading health, science, and medical associations. However, the increased use of FDA-approved weight loss prescription drugs (e.g., Qsymia, Belviq, Xenical, Phen/fen) and unregulated weight loss supplements (e.g., Slim Quick, Trim Spa), gives the impression that Americans have found it more worthwhile to pop a pill than to take a walk (Bendich, A. 2013; Pillitteri, Shiffman, Rohay, Harkins, Burton, & Wadden, 2012). Unfortunately, threats of long-term complications from heart disease, diabetes and cancer are not compelling enough to move most Americans from a state of contemplation to one of consistent action towards changing their sedentary lifestyles.

Therefore, this study can inarguably provide insight and data to help enhance understanding of the cognitions involved in the volitional phase of exercise and contribute to the development of modern and practical exercise behavior interventions to help women overcome real-life demands by which they face when trying to maintain an adequate level of exercise (Bloomquist et al., 2008; Heron & Smyth, 2010). This, in turn, can help to reverse the ill effects sedentary lifestyles (NCHS, 2016; Heron, 2012).

The following chapter, Chapter 2, will provide an in-depth discussion of the theoretical underpinnings and a review of literature of the variables of interest. Thoroughly examined are the importance of, and relationships between, maintenance self-efficacy, action planning skills, coping planning skills, and real-life demand barriers specific to women. Additionally, the utility and feasibility of text messaging in creating practical, real-time interventions to help women adhere to exercise frequency recommendations is presented.

Chapter 3 provides the blueprint for the research design and methods by which the study was executed. Chapter 4 provides the quantitative findings from the study. Chapter 5 offers an interpretation of the findings, conclusions, limitations, highlights, applicability to positive social change and recommendations for future research.

Chapter 2: Literature Review

Introduction

According to the latest data from the NCHS (2016), 35% of adult Americans over age 20 are overweight and 30.4% are obese. This number has increased each year since 1997, starting with 19.4%. Additionally, levels of exercise adherence are extremely low, with only an estimated 20% of adults over age 20 meeting the recommended guidelines for aerobic and muscle-strengthening activities (Schiller, Lucas, Ward, & Peregoy, 2012). This is a problem because the sedentary lifestyles of the American adult population have led to a significant increase in the prevalence of type 2 diabetes, heart disease, depression, and other co-morbid diseases (Baer et al., 2011; Danaei et al., 2009; DHHS, 2008; WHO, 2010). Furthermore, rates of overweight and obesity, inactivity, and associated medical conditions in the female population are greater than that in the male population (NCHS, 2016).

Purpose of Study

The purpose of this quantitative study was to assess the difference in mean strength of maintenance self-efficacy, action planning skills, coping planning skills and the limitation of real-life demands in between women who adhere to exercise frequency recommendations and women who also exercise, but do not adhere to exercise frequency recommendations (Schwarzer, 2008a; White & Ransdell, 2005; Mendes, Sousa, & Barata, 2011). The secondary purpose was to identify whether texting frequency is related to the perceived usefulness of text messaging as a tool in improving maintenance self-efficacy, action-planning skills, coping planning skills, and exercise frequency (Davis, 1989; Fjeldsoe, Miller, & Marshall, 2010).

The study's purpose of exploring the self-regulatory factors that mediate the volitional phase of exercise behavior will address the problem of low levels of exercise adherence (NCHS, 2011; 2013; 2016). In turn, the findings from the assessment of perceived usefulness of texting will contribute to the development of real-time interventions to increase exercise frequency and reduce the occurrence and mortality rates of the leading causes of death of women in the United States (Baer et al., 2011; Dacey et al., 2003; Heron 2012).

Organization of the Chapter

The opening of this literature review will highlight the application of the SCT (Bandura, 1986, 1991) and the utility of the HAPA model (Schwarzer, 1992, 2008) to the study of exercise adherence. The greater part of the review will explore the self-regulation of exercise behavior with the primary investigation focused on the role of the following self-regulatory cognitions: maintenance self-efficacy, action planning skills, and coping planning skills. This examination will include a discussion of the effects that real-life demands on exercise frequency in women. Toward the end of the review, a discussion on the role text messaging can play in improving exercise frequency in women will be highlighted.

Lastly, an analysis and critique of current text message interventions used to influence the aforementioned cognitions for the benefit of improving exercise behavior will conclude the review (Gerber, Stolley, Thompson, Sharp, & Fitzgibbon, 2009). This review and critique of current interventions will call attention to the need for experimental research using ecological text-messaging interventions targeting the self-

regulatory cognitions in the volitional phase to support women in their ability to adhere to exercise frequency recommendations (Conner & Norman, 2005; Renner et al., 2012).

Literature Search Strategy

The exploration of literature consisted of three distinct research strategies (a) the research variables, (b) the population of interest, and (c) the various interventions that have been applied to address the issue of exercise adherence. Each strategy began with a computerized search for resources primary between the years of 2000 through the present. The database sources, which consistently provided literature relevant to the focus of this study were as follows: Academic Search Premier, Computers and Applied Sciences, CINAHL Plus, Health Technology Assessments, Medline, ProQuest, PsycARTICLES, PsycINFO, SocINDEX, and Dissertation Abstracts International.

To complement the findings from the journal articles, philosophical and behavioral textbooks from the 1990s enhanced understanding of the variables that mediate the volitional phase of exercise behavior, and government reports provided statistics to call attention to the poor outcomes associated low levels of exercise participation by women. Surveys from research centers and technology-based journal articles on mobile technology, text messaging, and the acceptability, use, feasibility, and efficacy of text messaging in health care are also included. The databases were frequently examined throughout the research process to ensure the inclusion of the most current and relevant findings.

With respect to exercise, the following keywords were used in the searches" , *exercise, physical activity, exercise adherence, exercise maintenance, self-efficacy, self-regulation, action planning skills, coping planning, barriers, barrier limitation, real-life*

demands, health action process approach, volitional phase of health behavior, and *SCT*. Using database search functions when creating key phrases, such as inserting the word "OR" between the terms "exercise" and "physical activity", allowed for the inclusion of literature, which may not have been located.

The same was completed for the words *adherence* and *maintenance*. This strategy was applied due to the lack of agreement in the field on operational definitions for the terms *physical activity* and *exercise* (Anshel, 2007). Additionally, the absence of criteria delineating what represents "exercise adherence" further complicates this issue. In addition to the database search of peer-reviewed journal articles, philosophical books by leading health behavior theorists were also included to provide a strong theoretical foundation upon which to build the study.

Specific to the population of interest for this study, key search phrases included the terms above along with adding the word *women* and *exercise barriers*. Specific to the use of text messaging in exercise behavior experiments key phrases included text message frequency, text message feasibility, text messaging and exercise interventions, text messaging and exercise self-efficacy, text messaging in addition to the words used in the search related to exercise and physical activity. Use of the database search function by inserting "OR" between the words as used in the first search, was applied throughout.

The results for this final search were not as abundant as the results populated by the preceding searches. In fact, the literature selected from this search revealed a distinct gap in the literature by highlighting the need for innovative, yet real time interventions such as text messaging to help support women in the volitional phase of exercise (Annesi & Whitaker, 2010; Anshel, 2007; Bloomquist, Gyurcsik, Brawley, Spink, & Bray, 2008;

Connor, Sandberg, & Norman, 2010; Renner, 2010; Vallance, Murray, Johnson, & Elavsky, 2011).

Theoretical Framework

Exercise behavior research is guided by several theories with varying explanations of what predicts and explains individual engagement and exercise adherence. The most commonly employed theories in exercise behavior research are the TRA (Fishbein & Ajzen, 1975; Fishbein, 1980), TPB (Ajzen, 1991), and TTM (Prochaska, & Velicer, 1997). The TRA (Fishbein & Ajzen, 1975; Fishbein, 1980) suggests that intention, which is caused by our attitudes and subjective norms, is the greatest predictor of behavior. One limitation with the TRA is that it assumes behavior is mindful, voluntary, controllable, and void of impediment.

As established by several behavior theories, not all behavior is mindful and voluntary (e.g., habits), controllable (e.g., addiction), and as most strongly related to this study, void of impediments (e.g. personal and environmental barriers). The presence of a behavioral intention does not create immunity to barriers that can inhibit the adoption of the intended behavior (Armitage, 2005; Bandura, 2004; Conner, 2008; Renner et al, 2012; Rothman 2000; Schwarzer, 2008a). The TRA does not dispute this postulation. However, the failure to recognize the influence of barriers on behavior, limits the predictive power of the TRA.

To expand upon the TRA and improve its utility in predicting behavior, the concept of *perceived behavioral control*, which stems from Bandura's (1977) Self-Efficacy Theory, was added to form a stronger prediction model, known as the TPB (Ajzen, 1991). The TPB has demonstrated usefulness in predicting behavior across many

health behaviors including exercise (Blue, 1995; Vallance, Murray, Johnson, & Elavsky, 2011). Despite its efficacy in predicting behavior initiation, the one-size-fits-all constructs of the TPB do not address other predictors of behavior besides intention. This limits the predictability of the theory to the pre-intention, motivational phase of behavior change only.

The TPB, like its originating theory the TRA and other health behavior prediction models, fails to recognize the post-intention, volitional phase of behavior. The lack of acknowledgment for this phase of behavior change is an unfortunate oversight given the natural progression from a state of preintention to a postintention phase where the newly adopted behavior must be sustained in order for the behavior change to be successful (Schwarzer, 2008a); addressing only the factors which mediate the pre-intentional phase is neglectful.

Another widely used health behavior theory is the TTM (Prochaska & DiClemente, 1984; Prochaska & Velicer, 1997). The TTM has proven its utility in explaining numerous health behaviors through its five stages framework. The TTM postulates that individuals' transition through five progressive stages when adopting a new health behavior (pre-contemplation, contemplation, preparation, action, and maintenance). This stage specific approach has been extremely useful in creating stage specific interventions to prompt self-change since progression through the stages is expected when there are shifts in one’s intentions, attitudes, and behaviors (Armitage, 2009). However, the change process is not solely influenced by personal factors; it is also manipulated by environmental and behavioral factors not accounted for by the TTM such as more advanced psychological processes specific to the post-intention, volitional phase

that are not operative or as significant in the pre-intention, motivational phase of exercise behavior (Bloomquist, Gyurcsik, Brawley, Spink, & Bray, 2008; Conner, 2008; Luszczynska & Schwarzer, 2003; Renner et al., 2012; Wiedemann, Lippke, Reuter, Ziegelmann, & Schwarzer, 2011; Williams et al., 2008).

While the use of the aforementioned dominant theoretical approaches has significantly enhanced our understanding of the psychosocial mediators involved in exercise behavior, research guided by these theories has largely focused on the pre-intentional predictors that determine exercise initiation such as intentions, beliefs, attitudes, perceptions of risks and benefits, task self-efficacy, outcome expectancies, and environmental factors; and less on the postintentional processes such as planning, maintenance self-efficacy, and barrier perception and management that regulate exercise maintenance (Annesi, 2004; Connor, 2008; Bandura, 1998; Rothman, 2000; Schwarzer, 2008a; Sniehotta, 2009). Given the postintentional nature of exercise adherence, the TRA, TPB, nor the TTM will provide an appropriate theoretical foundation for this study.

Social Cognitive Theory

Bandura's (1986 1991) SCT can provide a more comprehensive approach to understanding the psychosocial factors involved in both the pre-intention, motivational and post-intention, volitional phases of exercise behavior. This is because the SCT is not only useful in predicting behavior in the pre-intentional phase as the other models of health behavior have been designed for, but the SCT is also applicable to the maintenance of behavior in the postintentional phase (Bandura,1990). This extended focus provides researchers with a foundation upon which interventions can be developed to help people maintain health behaviors when they transition into the post-intention, volitional phase; a

phase which requires an enhanced level of self-regulation in order for individuals to overcome the personal, behavioral and environmental factors which threaten the maintenance of the newly adopted behavior (Bandura, 1977, 1986, 1997, 1990, 2004).

To complement the use of the SCT, a more recent theory-driven approach to exploring both the pre and postintentional phases of exercise behavior, Schwarzer's (1992) HAPA, provides a well-defined social-cognitive prediction model for investigating the self-regulatory mediators of exercise behavior. The following discussion will demonstrate how the scope and utility of the SCT, coupled with the explanatory and predictive validity of the HAPA provide the most suitable foundation and framework for the focus of this study.

Although rooted in the Social Learning Theory (SLT), Bandura's SCT has long been recognized as a strong foundation for understanding exercise-related behaviors and designing interventions for both the preintention (motivational) and postintention (volitional) phases of exercise behavior change (Keller, Fleury, Gregor-Holt, & Thompson, 1999; Schwarzer, 1992; Schwarzer et al., 2007; Sniehotta, Scholz, & Schwarzer, 2005a). As illustrated in Figure 1, the SCT postulates that one's behavior is determined by the bi-directional interactions between a) personal cognitions and dispositions, b) social & physical environment, and c) the behavior itself.

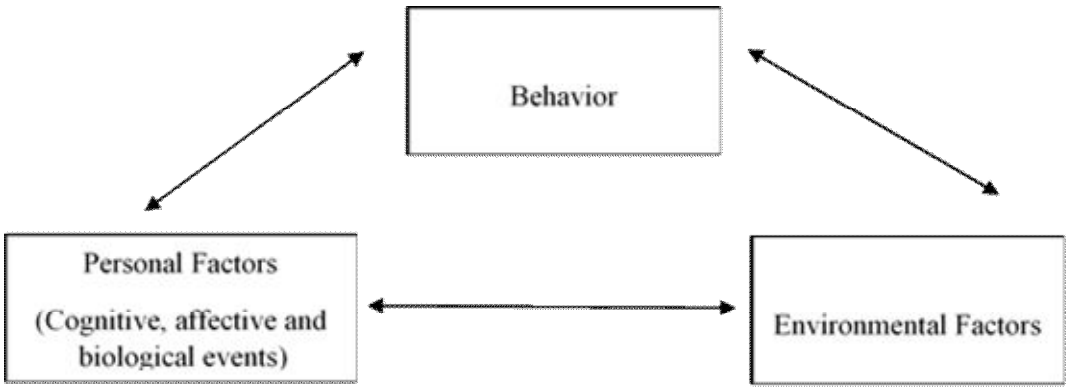

Figure 1. From *Overview of the social cognitive theory and of self-efficacy*, by F. Parajes , 2002. Reprinted with permission.

The dynamic relationship is mediated by several constructs, which include one's perception of their environment, the distinct social and physical conditions of one's environment, behavioral capability, outcome expectations, self-control, emotional coping and self-efficacy (Bandura, 1977). According to Bandura (1991), of the abovementioned constructs self-efficacy is the most influential within the self-regulatory system. Self-efficacy is a situation-specific self-confidence of one's expectations about their ability to perform, and their expectation of the outcome of this performance. Given its powerful influence on the amount of effort put into the behavior and the level of performance that will be achieved, Bandura consistently theorizes that self-efficacy is the driving force behind behavior change and behavior maintenance (Bandura, 1977, 1986, 1991, 1998).

Research applying the SCT as its theoretical foundation and exploring the role of self-efficacy in predicting behavior change and maintenance has supported this claim (Keller, Fleury, Gregor-Holt, & Thompson, 1999; Schwarzer, et al, 2008; Wolfe, 2008).

More specific to this study, health behavior change research has found the usefulness and reliability of the SCT primarily in constituting self-efficacy and planning as mediators in both the motivational and volitional phases of the health behavior change process (Gillies, 1993; McAuley, Pena, & Jerome, 2001; Schwarzer, 1992; Schwarzer et al., 2007; Schwarzer et al., 2008; Sniehotta et al., 2005a).

Although self-efficacy is a central construct in most health behavior change theories and models such as the TRA and TPB as discussed above, these theories are limited in their ability to predict behavior in both the motivational and volitional phases of exercise behavior change (Annesi, 2004; Anshel, 2007; Connor, 2008; Rothman, 2000; Schwarzer 2008). The SCT is not confined by the same inadequacies as others because the primary determinants of the SCT – environmental, behavioral, and personal- constantly interact with each another. The dynamic relationship between the SCT determinants provides researchers with a stronger more wide-ranging foundation for investigating not only the preintention motivational phase of behavior change, but the postintention volitional phase as well (Bandura, 1998, 2000, 2005; Conner, 2008; Keller et al., 1999; Rothman 2000; Schwarzer 2001; 2008a).

Application to exercise behavior research. The SCT has been applied in numerous studies on exercise behavior with various populations (Annesi, 2004; Hortz & Petosa, 2008; Keller, Fleury, Gregor-Holt, & Thompson, 1999; Petosa, Suminski, & Hortz, 2003; Plotnikoff, Lippke, Courneya, Birkett, & Sigal, 2008; Wolfe, 2008). Akin to other behavioral theories, its competence in predicting exercise behavior is both supported and countered. The countering studies demonstrating low rates of predictability with the SCT and those studies that refute the application of the SCT to exercise behavior

research may be faulted in their application of the SCT to their study purpose and research design and not with the predictability of the SCT itself. .

For example, self-efficacy is one of the most commonly researched personal determinants of the SCT. In exercise behavior research, there are countless studies, which use the SCT as the theoretical foundation to explore the relationship between self-efficacy (a personal determinant) of the SCT) and exercise (a behavioral determinant) but discount the role the other key SCT determinant (environmental factors) (Bandura, 1998; 2000; Rogers et al., 2012). Some findings lacking the examination of environmental factors support the utility and predictability of SCT, while others do not (Hays, Pressler, Damush, Rawl, & Clark, 2010). As pointed out by Bandura (1998), self-efficacy is only one of the many constructs within the larger subsets of determinants which influence behavior. The omission of a determinant does the utility of the SCT a disservice and can cause inaccuracies in its predictability; especially given the power of the bi-directional effects the SCT determinants have on one another.

In other words, to sufficiently evaluate the utility and predictability of the SCT, all of the theories variables, environmental, behavioral, and personal determinants, must be included as well. The purpose and research design of this study was to investigate constructs within each of the SCT determinants; therefore the subsequent section demonstrating the applicability of the SCT will exclude studies lacking an examination of, or disregard for, each of the SCT determinants.

In a 6-month study of 100 mostly White, college-educated endometrial cancer survivors, (M = 57) years old, researchers used telephonic counseling for exercise adherence to support the predictability of the SCT in exercise behavior through the use of

ecological momentary assessment (EMA). EMA is the real-time assessment of the individual's behavior and is seldom used in exercise behavior research (Basen-Engquist et al., 2013). The telephonic counseling sessions taught behavioral skills to help participants make progress towards their exercise goals and overcome perceived barriers to exercise such as time, health problems, and social support. To complement the counseling component, newsletters detailing cognitive or behavioral techniques, along with the inclusion of personal stories of other endometrial cancer survivors who were successful exercise adherers were mailed to study participants before the scheduled counseling session.

A variety of quantitative measures were used to capture data. For example, a handheld computer given to each participant to be used daily to complete the EMA three times per day (upon waking, immediately following exercise, and in the evening). The EMA measured the SCT constructs self-efficacy, outcome expectations, and daily exercise. An accelerometer device worn by the participants throughout the day captured real-time data on exercise. To support the home-based assessments, a laboratory assessment in the form of a questionnaire was used to measure exercise self-efficacy, barrier self-efficacy, and outcome expectancies.

Although the goal of the study was to measure the predictability of self-efficacy and outcome expectancies (personal determinants) on daily exercise (behavior determinant), the intervention did not disregard the influence of barriers (environmental determinant). By including strategies to help participants overcome barriers in the telephonic counseling sessions and assessing participant confidence in overcoming barriers in the laboratory assessment, researchers demonstrated their appreciation and

understanding of the dynamic and influential relationship between the personal, behavioral, and environmental determinants of the SCT. The results support the bi-directional interaction of personal, environmental, and behavioral determinants as posited by the SCT (Basen-Engquist et al., 2013).

In another intervention-based quantitative study, 240 high school adolescents (58% male, 42% female, 98% White) were sampled to investigate the power of constructs representing each of the SCT determinants in mediating increased leisure-time exercise (Hortz & Petosa, 2008). The 8-week program assessed self-efficacy, self-regulation, social situation, and outcome expectancies in an intervention and control group. While both groups received similar physical education courses, the intervention group was also taught behavioral skills to improve the study's' targeted SCT constructs. The intervention groups curriculum focused on strengthening the following behavioral constructs: self-efficacy (strategies for boosting confidence, identifying and conquering barriers specific to increasing exercise), self-regulation (goal setting, planning, self-monitoring, and self-reflection), social situation (securing, developing, evaluating, and management of an environment to support their exercise goals), and outcome expectancies (physical and social experiences of increased exercise).

To examine the differences between the two adolescent groups, researchers employed a 2X2 mixed factorial ANOVA. The intervention group experienced statistically significant main effects in the frequency of leisure-time exercise, enhanced self-regulation skills and improved management of their social situation. Results exhibited no main effects for heightened self-efficacy or an influence on outcome expectancies by the intervention (Hortz & Petosa, 2008). These analyses established self-

regulation and the management of social situations as the constructs most influenced by the 8-week intervention. To test the degree to which self-regulation and the management of social situations predicted an increase in leisure-time exercise, separate regression analyses were performed. Results of the regression analysis verified self-regulation as a significant predictor for increased leisure-time exercise as well as the participants' management of their social situations as a significant predictor.

As a third and final example of the applicability of the SCT to exercise behavior research, a 12-month qualitative study of breast cancer survivors in a physical activity intervention demonstrated efficacy in exploring interactions between all of the SCT determinants in both the preintention motivational and postintention volitional phases (Rogers et al. 2012). The study of 192 women targeted numerous SCT constructs within the larger subsets of determinants: physical activity (walking), goal setting, self-monitoring, self-control, observational learning, enjoyment, emotional coping, outcome expectancies, barrier self-efficacy, perceived barriers, and the persuasion of social support environment.

The primary strength of the Rogers et al. (2012) study lies in the various intervention methods applied to manipulate the targeted constructs. For example, supervised exercise sessions, home based exercise, and face-to-face counseling targeted situational and perceived barriers, barrier self-efficacy, goal setting, and self-monitoring. Discussion group sessions targeted emotional coping, perceived barriers, social support, goal setting, outcome expectancies, self-monitoring, and enjoyment. Researchers conducted assessments at baseline and monthly intervals of 3, 6, and 11 month. The use of accelerometers to measure physical activity and various Likert type scales and

functional assessments to measure the other constructs. Mixed-model ANOVA analyses revealed efficacy in the intervention to progressively increased total time spent exercising and exercise intensity in the sample.

HAPA

The HAPA is a social-cognitive prediction model that suggests there are two distinct behavior change phases: 1) the motivational phase wherein health behavior change is contemplated and planned, and 2) the volitional phase wherein health behavior change intentions progress into action and are then maintained (Schwarzer, 1992; 2001). The first phase of the HAPA builds upon prior health behavior change theories by similarly placing emphasis on the role self-efficacy, outcome expectancies, risk perception, intentions, and planning play in motivating one to move from states of contemplation and intention into a state of action.

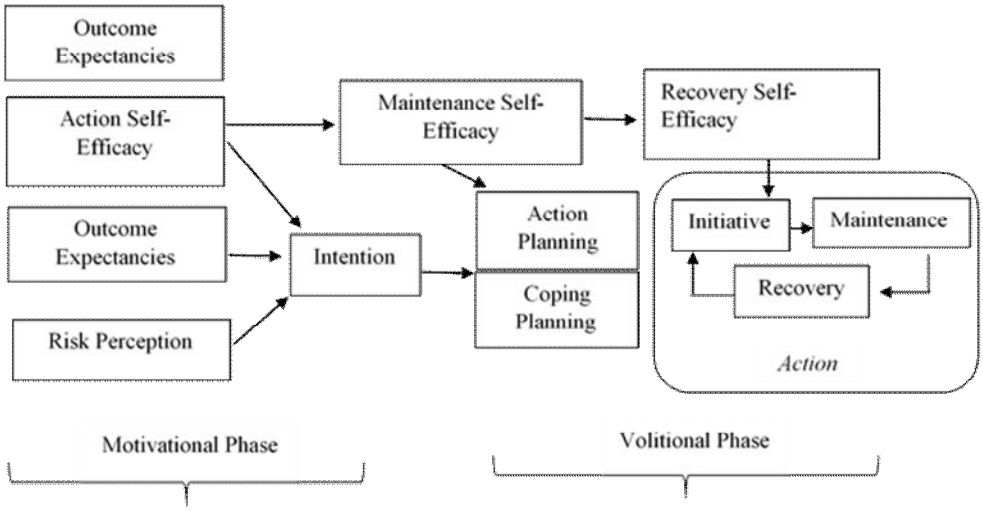

Figure 2. The Health Action Process Approach Model. From "Modeling Health Behavior Change: How to predict and modify the adoption and maintenance of health behaviors," by R. Schwarzer, 2008, *Applied Psychology*, *57*, p.6. Copyright [2008] by the American Psychological Association. Reprinted with permission.

However, the HAPA differs in the distinction it gives to the variables that influence health behavior in the volitional phase; a phase most social-cognitive prediction models have discounted. In the volitional phase, the HAPA highlights the importance of three different types of self-efficacy (action, maintenance, and recovery) and two types of planning skills (action and coping) on one's ability to convert intentions into action, maintenance of the behavior change, and persevere despite postintentional barriers that may arise. The application of the HAPA model has demonstrated efficacy in the prediction of health behavior adoption and adherence in a variety of populations and settings, using diverse measures and research time lines.

The utility of the HAPA model in health behavior modifications has demonstrated efficacy in flu vaccinations (Payaprom, Bennett, Alabaster, & Tantipong, 2011), dietary habits in adults (Chiu, Lynch, Chan, & Berven, 2011; Scholz, Ochsner, Hornung, & Knoll, 2013) and adolescents (Szczepanska, Scholz, Liszewska, & Luszczynska, 2013); exercise in pregnant women (Gaston & Prapavessis, 2012); condom use (Teng & Mak, 2011); sports participation in people with disabilities (Perrier, Sweet, Strachan, & Latimer-Cheung, 2012); physical activity in retired individuals (Caudroit, Stephan, & Le Scanff, 2011, women (Barg, et al., 2012), individuals with type II diabetes (Lippke & Plotnikoff, 2012), and cardiac rehabilitation patients (Dohnke, Nowossadeck, & Muller-Fahrnow, 2010; Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke, 2008).

Regardless of the demonstrated utility and predictability of the HAPA in the motivational and volitional phases, like its associated theories and models, the HAPA does not come without its own set of criticisms. One criticism by Leventhal & Mora (2008) is related to the motivational phase of the model. The critics suggest that similar

the Theory of Planned Behavior (TPB), the HAPA's motivational phase assumes that intentions produce action; when in fact, research has provided contradictory evidence that intentions do not always predict a successful transition into behavior change, but like the behavior itself, one's intentions are influenced by a host of other personal and environmental factors (Armitage, 2005; Bandura, 1991; Bloomquist, Gyurcsik, Brawley, 2008; Rothman, 2000; Spink, & Bray, S, 2008; Sheeran, 2002; Sniehotta, Scholz, & Schwarzer, 2005a; Schwarzer, 2001; Webb & Sheeran, 2008). Fortunately, this issue does not affect the predictive validity of the HAPA for the current study since the focus is not on one's intentions to exercise in the motivational phase, but rather on the variables (self-efficacy, planning skills, and barriers) involved in the volitional phase when exercise intentions have already been enacted. Another concern raised by Leventhal & Mora (2008) is the absence of the role personal experiences have on behavior in the volitional phase. An important concern given the role outcome expectancies play in one's commitment to adhere to the newly adopted behavior (Bandura, 1991). However, recent studies have found the influence of outcome expectancies on behavior and the other variables in the volitional phase to have no statistical significance and lower, sometimes non-existent correlations than the other volitional health behavior change variables postulated by the HAPA (Barg et al., 2012; Lippke & Plotnikoff ; 2012).

Despite the criticisms, the extension into the postintention volitional phase of health behavior change postulated by the HAPA model has provided researchers with testable variables that can allow for a more precise prediction of health behavior adherence. It is for this stated reason that Leventhal & Mora (2008) applaud the contributions the HAPA has made to the study of health behavior. They call attention to

its gaps in efforts of encouraging more experimental research to test the model and use findings to build upon the HAPA constructs towards the formation of a more intricate model and ultimately the development of successful intervention programs (Leventhal & Mora).

Unfortunately, there is still a disproportionate amount of research with a primary focus on the variables in the preintention motivational phase of the model (Chiu, Lynch, Chan, & Berven, 2011; Chow & Mullan, 2010). The obvious disregard for the promising efficacy the variables of the volitional phase can provide to the study of health behavior change signifies a need for further investigation; not only for the formation of an elaborated HAPA model, but for the advancement of the field of health behavior. The purpose of the current study is to contribute to this distinct gap in the research by examining the variables in the volitional phase of exercise behavior.

Predictive Validity of the HAPA in Exercise Behavior. Although disparate, the utility of the HAPA in predicting exercise behavior change in both the motivational and volitional phases has been confirmed by several studies. For example, Schwarzer et al (2007) examined four separate longitudinal studies on different types of health behaviors-dental flossing, seat belt use, dietary behavior, and physical activity in various population, assess the efficacy of the HAPA in predicting behavior in both the motivational and volitional phases. Data revealed that the variables of the HAPA models were consistently and favorably predictable in each study. Given the interest of the current study on the volitional phase, the following section will examine the predictive validity of the HAPA in studies that focus on the variables which mediate the volitional phase of exercise.

In a review by Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke (2008) of three different longitudinal studies exploring the predictability of HAPA on exercise frequency in samples of cardiac rehabilitation and orthopedic rehabilitation patients. The studies include a 4 month German study of 484 cardiac rehab patients (M=58.8 years old), an 8 month Poland study of 130 cardiac rehab patients (M=54.3 years old), and a 12 month German study of 368 patients with various orthopedic conditions (M=47.4 years old). Data supported the HAPA model as appropriate for the research design and data analysis in each study. In line with the HAPA prediction, the self-regulatory constructs of recovery self-efficacy and planning emerged as statistically significant mediators of exercise adherence in the volitional phase in each study. Findings from each of these studies underscore the importance of self-efficacy and planning skills in the volitional phase of exercise as posited by the HAPA. In other words, in order for individuals to adhere to their exercise routine, they need to have confidence in their ability to overcome setbacks and barriers; in addition to unending planning skills to outline the what, where, when, and how they will execute the exercise intentions.

In a 6-month quantitative study by Lippke & Plotnikoff (2012) to test the predictability of the motivational and volitional phases of the HAPA, researchers divided a sample of 1,193 adults *(M* = 63.9) years old. Canadians with Type II diabetes were divided into 3 subsample groups based on their stage of change (299 pre-intenders, 205 intenders, 672 actors) relevant to physical activity. The constructs assessed were goals, self-efficacy, outcome expectancies, risk perception, action planning, and physical activity. The means of the constructs were analyzed across each of 3 stage -specific groups using an ANOVA and regression analyses were performed to identify

relationships between the test constructs. Data revealed significant positive relationships between self-efficacy and outcome expectancies in each stage-specific group (pre-intenders, intenders, and actors); goals and action planning were also positively correlated in each group (Lippke & Plotnikoff, 2012). More specific to the factors which represent the stage in the volitional phase of interest of the current study, data revealed statistically significant relationships between (a) self-efficacy and goals, (b) self-efficacy and action planning, and (c) action planning and behavior. The findings emphasize the important role self-efficacy plays in facilitating the self-regulation of behavior in the volitional phases of exercise behavior.

As a final example of the appropriateness and predictability of the HAPA model in the study of exercise adherence, a study investigating exercise behavior in a sample similar to that of interest for the current study substantiated the HAPA as an effective tool. Researchers set out to test the predictability of the HAPA constructs in both the motivational and volitional phases of physical activity in a sample of 175 inactive healthy women ages 45-60 (M = 51.97), (Barg et al., 2012). The study was a secondary analysis of data collected from a larger intervention-based physical activity study. Social-cognitive constructs of interest for this secondary analysis were risk perception, outcome expectancies, action self-efficacy, intention, planning, maintenance self-efficacy, and physical activity.

Data revealed statistically significant positive correlations between physical activity and action self-efficacy, $p < .05$, and maintenance self-efficacy, $p < .05$. Intentions and planning were also positively correlated to physical activity but not statistically significant. However, planning had superior statistically significant positive

correlations: action-self efficacy, $p < .01$, maintenance self-efficacy, $p < .01$, outcome expectancies, $p < .01$, and intentions, $p < .01$. As related to the variables of interest for the current study, it is important to highlight that the positive correlation between planning and MSE was the greatest amongst all of the test variables. Additional analyses established MSE as the strongest predictor of planning and higher rates of physical activity in the sample (Barg et al., 2012). The findings from this study accentuate the mediating power of self-efficacy and planning in both the motivational and volitional phases of physical activity behavior. They also provide further support for the predictive validity of the HAPA and its usefulness in carrying out the current study.

Technology Acceptance Model (TAM)

The TAM was developed to predict and explain computer usage and the acceptance of information technology (Davis, 1985; 1989). It was based on Fishbein and Ajzen's Theory of Reasoned Action (TRA) (1975), which suggests that a person's behavioral intention (BI) depends on a person's attitude (A) and subjective norms (SN). In more recent years, researchers have begun to incorporate behavioral theory models into technology models to examine the role human thought, motivation, self-efficacy, perceptions and other behavioral factors play in an individuals use of technology (Chung-Hung, 2014). Several dozens of health care and health behavior studies have employed the TAM as a model for predicting use of technologies to improve health status and convenience (Holden & Karsh, for 2010). As posited in the SCT (Bandura, 1989), a strong relationship exists between self-efficacy and behavioral intention. The emphasis on the role self-efficacy plays in the successful facilitation of behavior change has been incorporated into a modified version of the TAM.

The System Self-Efficacy and the Technology Acceptance Model, developed by Chung-Hung (2014), has demonstrated successful use of the applicability of behavioral theories. As related to this study, the there is a direct relationship between the SCT in perceived usefulness and usage intention. As displayed in Figure 3, one's self-efficacy is directly correlated to their perceived usefulness, which in turn directly influences their intentions. As related to the current study, the System Self-Efficacy and the Technology Acceptance Model supports the study's second hypothesis that one's texting frequency is related to their level of perceived usefulness of such mobile technology.

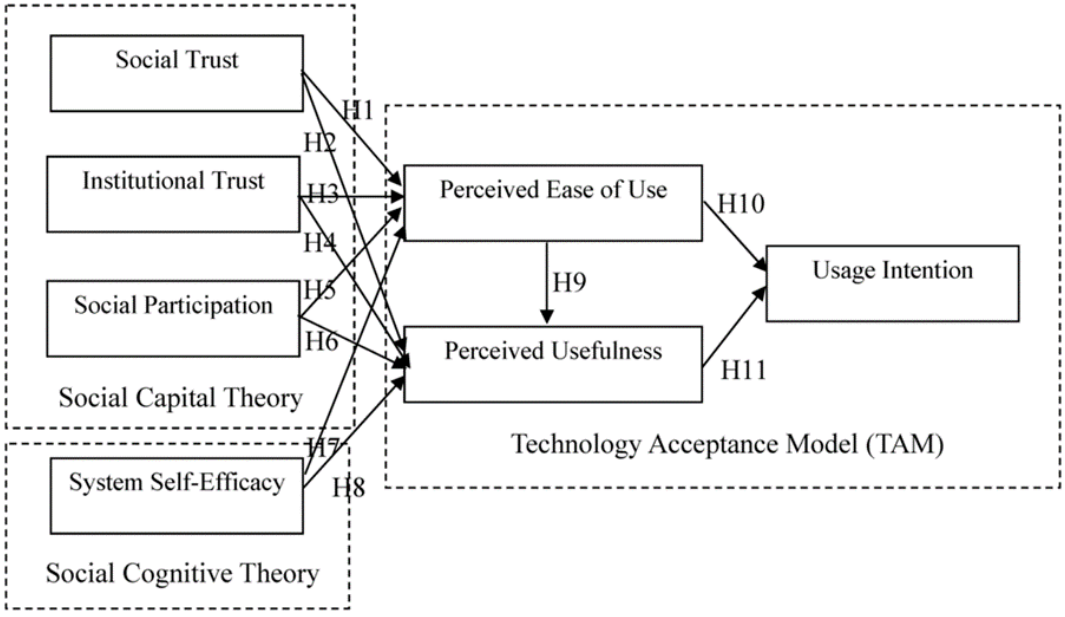

Figure 3. From "Integrating Social Capital Theory, Social Cognitive Theory and the Technology Acceptance Model to Explore a Behavioral Model of Telehealth Systems," by T. Chung-Hung, 2014*, Journal of Environmental Research and Public Health, 11*, p. 4913. Copyright [2014] by the MDPI Company. Reprinted with permission.

Perceived usefulness and intentions. Several studies and theories such as the SCT suggest that perceived usefulness drives intentions (Bandura, 1982; Chung-Hung, 2014; Davis, 1985, 1993; Goh, 2011, Park & Chen, 2007: Swanson, 1982; Venkatesh et

al., 2003). The link between perceived usefulness and behavior intentions, coupled with findings from the secondary aim of current study could provide useful data to justify further investigation into participant use of text messaging in future exercise intervention based studies (Holden & Karsh, 2010). If the participants in the study perceive text messaging to be useful in increasing their exercise frequency and improving the factors which regulate such, theoretically they will be more inclined to use texting as a support tool (Davis, 1989).

The Self-Regulation of Exercise Adherence

The low levels of exercise adherence in Americans are an indication of how challenging the moving from a sedentary state to a routine exercise regimen is to achieve and sustain. This is partially due to our lack of motivation to move from a state of inaction to one of action and the confidence to maintain our exercise behavior, employ planning skills, overcome barriers, and limit external influences which affect the preintention motivational phase and postintention volitional phase of health behavior change (Schwarzer et al., 2008, Sheeran, 2002). Although the factors of the preintention motivational phase play a significant role in transitioning one's intentions into exercise, research has proven that motivation and intentions alone do not guarantee successful adherence to exercise behavior (Renner, Hankonen, Ghisletta, & Absetz, 2012)

Health behavior adherence, such as exercise, is not simplistic or infrequent. Most health behaviors are habitual health improvement activities whose successful execution is relentlessly challenged by both environmental and personal factors (see figure 1). These factors can positively or negatively influence our self-regulatory cognitions of self-efficacy, planning skills, and barrier perception which all play vital roles in facilitating

adherence to health behavior change in the postintention volitional phase (Bloomquist et al., 2008; Hagger, Wood, Stiff, & Chatzisarantis, 2009; Renner et al., 2012; Schwarzer et al., 2008). Given focus of the current study on the postintention volitional phase of exercise behavior, the influence of maintenance self-efficacy, planning skills and barrier perception on the self-regulation of exercise adherence will be more thoroughly explored in the following sections.

Self-Efficacy

As defined by Bandura, self-efficacy is "a belief in one's capabilities to organize and execute courses of action required to produce given levels of attainment" (Bandura, 2000, p.300). Since self-efficacy beliefs directly influence outcome expectations and the perception of barriers, it plays the role of a key motivational facilitator of exercise behavior (Bandura, 2004; see Figure 4). Exercise behavior, like other health behaviors, develops along a behavior change continuum of phases that are mediated by various psychosocial variables that can affect ones' degree of self-efficacy at varying points of time along the change continuum which creates phase specific self-efficacy beliefs (Bandura, 1997; Marlatt, Baer & Quigley, 1995).

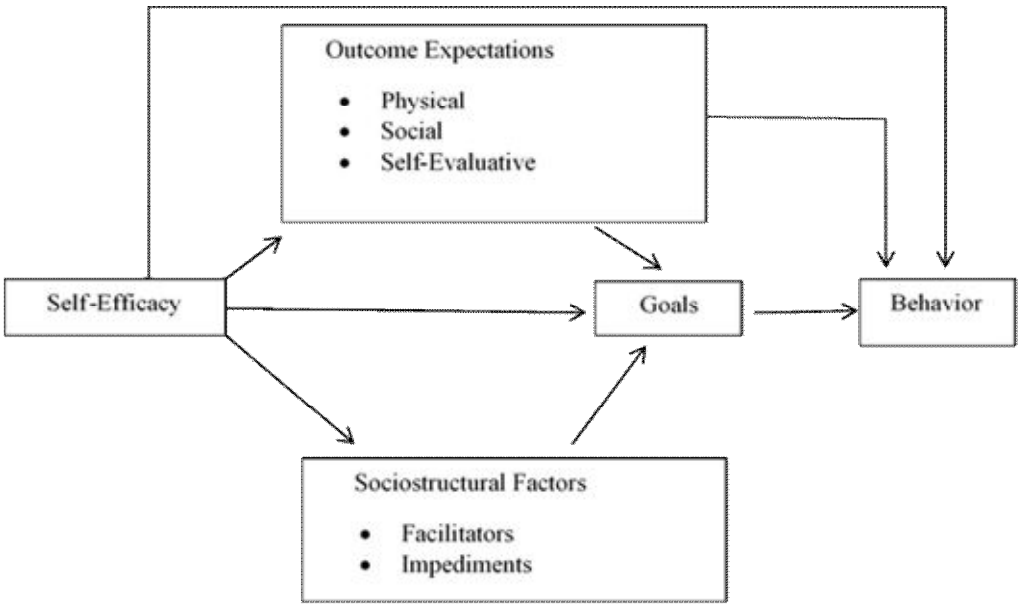

Figure 4. From "Health Promotion by Social Cognitive Means," by A. Bandura, 2004, *Health Education & Behavior, 31*, p. 146. Copyright [2004] by SAGE Publishing. Reprinted with permission.

For example, in the motivational phase, an individual may have a strong belief in their ability to start a new exercise regimen ("action self-efficacy"; Schwarzer & Renner, 2000), but less confident in their ability to maintain their new exercise behavior when faced with obstacles in the volitional phase ("coping self-efficacy"; Renner & Schwarzer, 2003 or "maintenance self-efficacy"; Schwarzer, 2008; "self-regulatory self-efficacy"; Bandura, 1997). The functional differences in phase specific self-efficacy have been studied in numerous health behaviors including exercise (Rodgers, et al., 2002; Rodgers & Sullivan, 2001; Rodgers, Wilson, Hall, Fraser, & Murray, 2008; Schwarzeret al., 2007). Furthermore, the distinction between phase specific self-efficacy beliefs has proven useful to advancing our understanding of the self-regulatory challenges individuals face in the process of health behavior change (Renner et al., 2012).

As related to the influence of self-efficacy on health behavior, research employing various health behavior change theories and models including the SCT, TPB, TRA, TTM, and HAPA, and have established the predictive validity of self-efficacy in both the motivational and volitional phases of behavior change in the study of numerous health behaviors such as smoking cessation, dental flossing, alcohol consumption, dietary decisions, breast cancer self-examination, cancer screening, condom use, medication adherence, and diabetes self-management, and most specific to this study, exercise adoption and maintenance (Schwarzer, Luszczynska, Ziegelmann, Scholz, & Lippke, 2008; Schwarzer, Schüz, Ziegelmann, Lippke, Luszczynska, & Scholz, 2007). The firm connection between increased levels of self-efficacy and successful adherence to exercise behavior and increases in physical activity has been demonstrated in many studies on exercise behavior (Annesi & Whitaker, 2010; Hankonen, Absetz, Ghisletta, Renner, & Uutela, 2010; Jung & Brawley, 2011; Martin Ginis & Bray, 2010; Murray, Rodgers, & Fraser, 2009; White & Ransdell, 2005).

Take for example, a longitudinal physical activity study comparing the psychosocial predictors of the adoption and maintenance phases in a sample of 205 initially sedentary adults (Williams, Dunsiger, Papandonatos, Napolitano, & Ciccolo, 2008). The results confirmed self-efficacy as a significant predictor of physical activity ($p < .01$), physical inactivity ($p < .01$), and physical activity maintenance ($p < .05$). In fact, the significance of physical activity maintenance represented a 139% increase in odds of being physically active 11 month from the adoption phase. In a quantitative, longitudinal study by Renner et al. (2012) exploring the correlation of phase specific self-efficacy to exercise behavior initiation and maintenance, six intensive group counseling sessions

aimed at enhancing the participants action self-efficacy, coping (maintenance) self-efficacy and planning skills for exercise were delivered to 327 participants, mostly women, ages 50-65 with an elevated Type 2 diabetes risk.

Researchers found increases in action self-efficacy and action planning were significantly related to increases in exercise behavior. Additionally, as related to the volitional phase of behavior change that is of interest for this study data from the Renner et al. (2012) study revealed a positive correlation between increases in coping (maintenance) self-efficacy and adherence to exercise, $p < .001$. Participants who were able to successfully maintain exercise behavior increased their baseline coping (maintenance) self-efficacy to a statistically significant higher degree than the participants who relapsed. Maintainers also significantly increased their barrier self-efficacy, $p = .03$, while relapsers did not experience a significant change.

Influence of MSE on exercise adherence. MSE, the type of self-efficacy present in the volitional phase of health behavior change, also referred to in research as self-regulatory self-efficacy, is one's belief in their ability to maintain a particular behavior despite perceived barriers (Schwarzer, 1992, 2008a). Similar to the role action self-efficacy plays in the motivational phase of behavior change by facilitating the initiation and adoption of a new behavior, MSE, as its name implies, facilitates one's ability to sustain and adhere to a new behavior over a course of time in the volitional phase. There are several studies which demonstrate the positive correlation between MSE and exercise adherence.

For example, a quantitative, intervention-based study evaluating (1) self-efficacy, (2) body satisfaction, (3) mood, and (4) exercise session attendance found positive

correlations between MSE and exercise adherence (Annesi & Whitaker, 2010). The aim of the study was to examine the predictability of the SCT constructs in weight loss success. The 6-month intervention involved exercise participation and a nutrition education program in a sample of seventy-seven obese (BMI = 30 to 45) women (M = 44.2) years old with an ethnic representation mostly split between White (52%) and Black (41%). The statistical analysis revealed a positive correlation between body satisfaction and weight loss success and self-regulatory (maintenance) efficacy and weight loss success. As pertinent to the measure of interest for the current study on exercise adherence, there was a statistically significant difference in exercise session attendance between the successful weight loss group and the unsuccessful weight loss group $p < .001$. It is also worthy to mention the recommendations made by the researchers emphasized the need for weight-loss interventions to place more focus on the interaction of the psychological factors that facilitate health behaviors associated with weight-loss (Annesi & Whitaker, 2010).

In a mixed method study by Dacey, Baltzell, & Zaichkowsky (2003), researchers employed the SCT as the theoretical foundation to explore levels of physical activity self-efficacy in women in the volitional stage of exercise behavior. The quantitative survey-completion phase of the study consisted of 92 mostly white working women with an average age of 47 years old who attended drop-in fitness classes in suburban towns of which 67% reported maintaining exercise and routine physical activity for longer than 5 years. For the purpose of analysis, participants were divided into two groups categorized by activity level - 54 vigorous exercisers and 38 moderate exercisers.

Researchers used the Physical Activity Self-Efficacy Questionnaire (SEQ: Marcus, Selby, Niaura, & Rossi, 1992) to measure the degrees of self-efficacy. The SEQ measures an individual's confidence in oneself to adhere to exercise plans despite barriers such as bad weather, lack of time, vacation, moodiness, and fatigue using a five-point Likert scale (Marcus et al., 1992). Survey results revealed high degrees of self-efficacy in both groups, (M = 3.69, SD = .79, but significantly higher in the vigorous exercisers (M = 3.87) than in the moderate exercisers (M = 3.44).

The qualitative, interview-based phase of the Dacey et al. (2003) study involved 8 women randomly selected from survey phase of the study. The interview data strengthened the quantitative findings by linking participant's ability to manage obstacles to high levels of self-efficacy. The qualitative findings also revealed that women with higher levels self-efficacy did not perceive real-life demands, such as juggling family responsibilities, running errands, or caring for elderly parents as barriers to their exercise plans. In fact, the women in the study believed that integrating exercise into their lifestyles better equipped them "mentally" to perform their day-to-day obligations and activities. The Dacey et al. (2003) study substantiates the positive influence high levels of MSE can have on exercise behavior maintenance in women (David, Pennell, Foraker, Katz, Buckworth, & Paskett, 2014).

As a final example, a longitudinal, quantitative study of 72 women from a Canadian university ages from 19-53 years (M = 30.5) investigated the effects of implementation intentions on three phase-specific self-efficacy beliefs on adherence to resistance training (Murray, Rodgers, & Fraser, 2009). Researchers assessed task, coping and scheduling self-efficacy using a 9-item confidence scale. The data revealed a

statistically significant, $p < .05$, difference in the levels of scheduling self-efficacy and adherence to the resistance training program between those with implementation intentions (experimental group) and those who did not form implementation intentions (control group). Although scheduling self-efficacy remained high at each of the 4 time points, descriptive data revealed a statistically significant increase in both task and coping self-efficacy between time point 1 and time point 4. The findings from this study support the growing consensus that high levels of self-efficacy are positively associated with successful self-regulation of exercise behavior in the volitional phase.

Planning Skills

In addition to self-efficacy, planning skills also play a key role in the self-regulation of exercise behavior in both the motivational and volitional phases (Gollwitzer, 1996; Reuter, Ziegelmann, Wiedemann, Lippke, Schuz, & Aiken, 2010; Schwarzer, 2008; Sniehotta, 2009). Planning, as postulated by Gollwitzer (1996), is a psychological strategy that directs the course of action from the inception of goal intentions during the motivational phase of behavior change, into the actual implementation of the goal intentions into the proceeding volitional phase.

Planning skills bridge the gap between goal intentions and action by providing a roadmap to the steps necessary for goal attainment (Barz, Parschau, Warner, Lange, Fleig, Knoll, & Schwarzer, 2014; Gollwitzer, 1996; Sniehotta, Scholz, & Schwarzer, 2005a). However, this road to goal attainment is not a smooth one; it is complicated by environmental distractions, real-life demands, and deficits in cognitions such as MSE and motivation (Gollwitzer, 1999; Sniehotta, Schwarzer, Scholz, & Schüz, 2005b). Individuals who lack sufficient planning skills further complicate and hinder their

progress towards their goal because they do not define the specific steps necessary to facilitate performance of the intended behavior (Gollwitzer, 1996; Luszczynska & Schwarzer, 2003; Ziegelmann & Lippke, 2007). This is why planning skills are necessary in both the motivational and volitional phases of health behavior.

In the motivational phase of exercise behavior, individuals with a desire to adopt or increase exercise must have sufficient planning skills to implement their intentions. These "skills" are known as action planning skills (Leventhal, Singer, & Jones, 1965; Gollwitzer, 1996). Action planning skills consist of the what, when, where, and how the exercise behavior will be executed. Once an individual implements his or her exercise plans, they must then maintain and further develop their planning skills to overcome the countless deterrents that threaten to hinder the maintenance of their exercise behavior in the volitional phase; it is this phase wherein the complex levels of planning skills lie. While the use of action planning skills remains essential in the volitional phase, the deployment of coping planning skills to anticipate and combat perceived situational and dispositional barriers that threaten to terminate a successful plan of action are crucial to exercise adherence (Gollwitzer, 1996; Reuter, Ziegelmann, Wiedemann, Lippke, Schuz, & Aiken, 2010; Sniehotta et al., 2005a; Sniehotta et al., 2005b; Ziegelmann, Lippke, & Schwarzer, 2006).

The effects of action planning and coping planning skills on behavior has been researched across numerous health behaviors such as dental flossing (Astrøm, 2008; Schüz, Sniehotta, & Schwarzer, 2007), fruit and vegetable intake (Wiedemann, Lippke, Reuter, Ziegelmann, & Schwarzer, 2011), physical activity (Lippke, & Schwarzer, 2008; Luszczynska, Schwarzer, Lippke, & Mazurkiewicz, 2011; Scholz, Schüz, Ziegelmann,

Lippke, & Schwarzer, 2008), weight-reduction (Luszczynska, Sobczyk, & Abraham, 2007), breast self-examination (Luszczynska & Schwarzer, 2003), and exercise (Martin Ginis, & Bray, 2010; Reuter et al., 2010). Findings from these studies support the influential effects of action planning and coping planning skills on the adoption and maintenance of health behaviors.

Influence of planning skills on exercise adherence. The significance of planning skills in the maintenance of exercise behavior has been evidenced in several studies. For example, in a longitudinal study by Ziegelmann, Lippke, & Schwarzer (2006), the effects of a planning intervention on the improvement of action planning skills and coping planning skills targeted to the self-regulation of physical activity and exercise behavior were successful. Additionally, the effects of the planning skills on the maintenance of physical activity and exercise behavior were also efficacious. In the Ziegelmann et al. (2006) study, 373 participants (ages 18-80) were recruited during intake in a 3 week outpatient orthopaedic rehabilitation program and then followed for 6 months after discharge to measure maintenance of physical activity (locomotion, daily living activities) and exercise behavior (strength training, walking, cycling, endurance training, hiking, competitive and non-competitive game sports). Researchers used interview-assisted and self-adminsitered planning interventions to aid the participants in the development of individual plans to adopt and maintain physical activity and exercise behavior.

In the analyses of the data, researchers Ziegelmann et al. (2006) performed a hierarchical regression analyses to evaluate the relationships between predictors. Results proved the planning intervention to be a significant predictor of action planning, $p < .05$,

and action planning a significant predictor of physical activity, $p < .01$. As related to the previously discussed section on MSE, it is important to point out that results from the Ziegelmann et al. (2006) study also revealed a positive, statistically significant relationship, $p < .05$, between self-efficacy and action planning.

Specific to the relationship between planning skills and exercise behavior (not inclusive of physical activity as described above), data from the Ziegelmann et al. (2006) study revealed action planning as a significant predictor of exercise behavior, $p < .001$, uring each follow-up measurement point during the duration of the study (T3, T4, & T5). Interestingly, coping planning proved to be an even stronger predictor of exercise behavior, $p < .05$, in the latter follow-ups (T4 & T5); proving the indispensable value of coping planning in the volitional phase. This study provides strong evidence of the predictive validity and self-regulatory benefits of action planning and coping planning skills in exercise behavior.

In an experimental study on the effects of action planning on exercise behavior in a sample of 777 young adults ($M = 20.5$), hierarchical regression analyses revelaed planning as a significant $p < .001$, direct predictor of exercise behavior, $p < .001$. Additionally, when intentions to exercise were strong, the influence of planning on exercise behavior was even more statistically significant (Connor, Sandberg, & Norman, 2010). These findings mirror those in a study of a German adult sample of 309 participants ages 65 years and older ($M = 72.61$) with at least two comorbid health conditions. In this study, Schüz et al. (2012) assessed the predictive value of action planning and coping planning on physical activity, which in this study was described as exercise in the form of sports, aerobics, swimming, riding a bike, and other leisure time

physical activities. Multilevel analyses found both action planning and coping planning to be statistically significant, $p < .01$, predictors of physical activity/exercise behavior.

The studies highlighted above emphasize that in order for one's intentions to exercise to be successfully translated into actual exercise performance, planning skills must be applied to bridge the gap (Schwarzer, 1992). Both action planning and coping planning skills provide tools to improve one's ability to adhere to exercise behavior in the face the real-life demands, distractions, and environmental and situational barriers (Brittain et al., 2002; Sniehotta et al., 2005b).

Barrier Perception & Barrier Limitations

Several barriers can interfere with one's intentions and plans to exercise. Since barriers can serve as a source of demotivation (Bandura, 1997), which leads to non-adherence, identifying and understanding barriers is critical when designing interventions to enhance exercise adherence (Anshel, 2007; Simonavice & Wiggins, 2008). The Midlife Women's Attitudes Towards Physical Activity Theory (MAPA) has identified five situation-specific determinants of physical activity participation by midlife women: (1) demographics, (2) health and menopausal status, (3) self-efficacy, (4) social influence, and (5) perceived barriers (Im, Stuifbergen, & Walker, 2010). While each of the named determinants of physical activity engagement by women are supported by numerous studies (Hendry, Solmon, Choate, Autrey, & Landry, 2010), a review of the literature revealed perceived barriers as the most significant obstacle faced by women of various socio-demographic characteristics (Brittain, Dinger, Classen, Sage, & Han, 2012; Hendry et al., 2010; Kirchhoff, Elliott, Schlichting, & Chiun, 2008; Kosteva, et al., 2012; Simonavice & Wiggins, 2008; Tavares & Plotnikoff, 2008).

In a longitudinal weight loss intervention for 225 women ages 25-50 years old exploring the influence of psychosocial predictors of weight loss by Teixeira et al., 2010, findings established a significant relationship between the perception of exercise barriers and weight change. The intervention produced a significant effect size within group differences for perceived exercise barriers, $p < .001$. The correlation between the perception of exercise barriers and weight changes in the intervention group over a 12-month period was also significant, $p < .01$. However, the correlation did not remain significant after a 24-month follow-up. In spite of this, perceived exercise barriers were one of the three most highly correlated variables to the long-term weight outcomes of participants at the 24-month follow-up. Notable to this current study, the other two most highly correlated variables were self-efficacy and exercise motivation.

Real-life demands. Women have traditionally been assigned multiple female gender roles which can often result in the neglect of their own self-care and happiness (Eyler et al., 2003; Gilligan, 1982; Henderson, & Allen, 1991; Iwasaki, MacKay, & Mactavish, 2005; King et al., 2000; Mattingly & Sayer, 2006). From caring for young children and elderly parents, fulfilling wifely duties, cooking, cleaning, doing laundry, grocery shopping, scheduling doctors' appointments, running errands, volunteering, and shuttling older kids to after-school extracurricular activities, the "to do" list of most middle-aged women is exhausting and time consuming. For women who have also chosen to work outside of the home, the burden is doubled. These real-life demands can make leisure time activities, such as exercise appear as a luxury only single women with no children can afford (Brittain et al.,2012; Hendry et al., 2010; O'Dougherty et al.,2008).

In a qualitative investigation by Huberty et al. (2008) into the factors related to successful exercise adherence in women, the most commonly reported barrier perceived by women who were not able to adhere to exercise was linked to work and family responsibilities which in turn limited the amount of time they could dedicate to exercise. Although the priorities of the women who were successful at adhering to exercise were similar, they classified exercise as one of their priorities and made the necessary lifestyle changes to accommodate such and therefore did not perceive priorities and lack of time as challenging of a barrier as did the nonadherers. In other words, the perceived barriers did not impose the same degree of limitation on their exercise plans. These findings are mirrored by several studies on barriers women encounter to exercise and physical activity across various socio-demographic groups (Brittain et al., 2012; Hendry et al., 2010; Kirchhoff et al., 2008; Lee & Im, 2010; Tavares & Plotnikoff, 2008). It is for this reason that the perceived barriers of focus for this study will fall into the category of real-life demands.

In a study exploring the role of barriers to physical activity amongst women ages 39-68, 40% of participants reported real-life demands as the primary barrier to physical activity. When comparing the reported barriers by age group alone, although older women reported fewer barriers, real-life demands still ranked as the foremost barrier to physical activity participation across all age groups (Kowal & Fortier, 2007). In another study exploring physical activity barriers of working women ages 20-55, women of varied demographic groups (single, partnered, and with children) each ranked time constraints and demands /responsibilities as the leading factors that make it difficult for them to be physically active (Tavares & Plotnikoff, 2008).

As suggested by The Midlife Women's Attitudes Towards Physical Activity Theory (MAPA), many real-life demands are the basis upon which most women commonly cite lack of time as a barrier to exercise. However, as evidenced by the Huberty et al. (2008) study and the Kirchoff et al. (2008) study, the perception of real-life demands as barriers is different from what actually obstructs exercise adherence (Bandura, 1997; Carron, Hausenblas, & Eastabrookes, 2003; Jackson, 1988). In other words, the lack of time excuse given by many women may be a legitimate barrier, but the limitation on exercise caused by the barrier can vary.

The perception of barriers as insurmountable or inadaptable, make its influence to limit exercise engagement more powerful that it actually is (Bloomquist et al., 2008).Women who have been able to maintain exercise have proven that real-life demands on time can make exercise adherence more challenging, but not unmanageable. Research has found that women with higher levels of MSE and women who apply planning skills to the management of their exercise plans are better equipped to self-regulate their exercise behavior in the volitional phase of health behavior change (Barg et al., 2012; Brittain, Dinger, Classen, Sage, & Han, 2012).

Effect of MSE on the perception real-life demands. The perception and interpretation of barriers are significantly influenced by ones MSE (Schwarzer & Luszczynska, 2008; Simonavice & Wiggins, 2008). According to the SCT, highly efficacious individuals are expected to report fewer perceived barriers and demonstrate greater competence in the management of barriers in order to achieve their desired goals such adhering to exercise plans (Bandura, 1986,1990). Bandura (1997) suggests this is due to the buffer MSE creates between the negative influence actual and perceived

barriers can have on one's behavioral intentions. MSE signifies one's beliefs in their ability to overcome the challenges lifestyle inconveniences, last minute "to do's", environmental barriers, and personal dispositions can impose (e.g. I am confident I will be able to exercise after work even if I've had a stressful day or If it rains today, I will stick with my plans to exercise by choosing to complete an exercise DVD instead of going on an outdoor run).

In a mixed methods study of first year college students (116 females, 44 males) by Bloomquist et al., (2008), MSE, referred to in this study as "self-regulatory efficacy", was significantly higher, $p < .05$, in those who adhered to their exercise plans (3.37 days vs.1.5 days per week). These participants with higher MSE also reported fewer perceived barriers, $p < .01$, and employed more coping strategies to overcome the perceived barriers. It is worthy to mention that of the perceived barriers reported, studying, lack of time, lack of energy, and illness were the most frequently cited. More pertinent to the effects of MSE on barrier perception in this study, was the use of cognitive strategies such as reframing, ignoring, and thoughts about the health benefits of exercise to combat the sabotaging influence of perceived barriers on their exercise plans.

In an exercise behavior study examining the effects of MSE in a sample of working women ($M = 35.69$) years old with children, in the volitional phase of exercise behavior, mirrored the results of the aforementioned Bloomquist et al. (2008) study. This study, by Jung & Brawley (2011), found a statistically significant difference between levels of MSE and levels of anticipated exercise persistence. Participants were divided into two groups based upon the degree of self-reported barriers. One group represented those whose lives were occupied with numerous exercise barriers (NEB) and the second

group represented minimal exercise barriers (MEB). In both groups, the women with higher levels of MSE anticipated greater exercise persistence despite their work and family obligations, lack of time, fatigue, and lack of exercise motivation, compared to their less efficacious counterparts.

The primary limitation of the Jung & Brawley (2011) study was the subjectivity of the data because exercise persistence was based upon anticipatory self-report measures and a written brainstorming task instead of observation of exercise behavior in a naturalistic setting. Despite this limitation, these findings are consistent with Bandura's self-efficacy theory (Bandura, 1997) by demonstrating that regardless of the number of barriers, numerous or minimal, higher levels of MSE translate into greater goal persistence in the face of challenges. As related to the perception of barriers, women with higher levels of MSE viewed their real-life demands as positive challenges, rather than impeding barriers, as viewed by those with lower levels of MSE (Jung & Brawley, 2011).

Effect of planning skills on the management of real-life demands. The responsibilities of the many societal roles women undertake requires sufficient management in order to ensure the demands of each role are met and executed successfully. Since planning skills are a key aspect of management, which women instinctively apply to their daily routines, teaching women how to apply and further develop these inherent skills could improve their levels of adherence to exercise. For example, findings from a longitudinal study of 385 participants (73.2% women) ages 50-65 examining gender differences in the predictability of planning skills in exercise behavior, revealed planning skills were a more significant predictor of exercise adherence for women rather than for men (Hankonen, Absetz, Ghisletta, Renner, & Uutela, 2010).

Given the gender differences in social roles and lifestyles between men and women, researchers speculate that the use of planning skills allows women to allocate their time more effectively; thereby making room in their busy schedules for exercise. Interventions targeted at improving planning skills can play a crucial role in helping women to incorporate and maintain exercise behavior in their already demanding lifestyles (Ziegelmann & Lippke, 2007).

In the Bloomquist et al. (2008) study previously discussed, secondary findings related to the coping strategies used by participants to overcome perceived exercise barriers revealed time management, activity modification, and reorganization of responsibilities as the top three behavioral strategies used by those who were successful at adhering to their exercise plans. These coping strategies represent use of both action planning and coping planning skills. Time management is an action-planning tool which can aid women in scheduling exercise into their hectic routines. Activity modification and the reorganization of responsibilities are coping planning tools which can serve as backup plans if and when family responsibilities, work obligations, bad weather, fatigue, lack of motivation or other obstacles threaten to thwart their exercise plans.

While the use of both action planning and coping planning skills can be valuable, the time-constrained schedules of most women, coupled with countless situational barriers associated with their lifestyles, make the effective use of coping planning skills especially vital to the maintenance of exercise behavior (Gollwitzer, 1996; Sniehotta, Scholz, & Schwarzer, 2006). A mixed-methods study of leisure-time physical activity in women by Brittain, Dinger, Classen, Sage, & Han (2012) supports this claim.

The study of 109 mostly White, middle aged and older women (50-75 years old) were divided into two groups based on activity level to explore differences in types of barriers, barrier limitation, coping strategies, and MSE. Numerous barriers were reported in both inactive participants (31 barriers) and active participants (28 barriers) (Brittain et al., 2012). The barriers most frequently reported by both groups were: (a) non-work related priorities such as errands, housework, phone calls, and volunteer work, (b) job responsibilities such as working late or long hours, (c) obligations to family and friends, and (d) fatigue/lack of energy (Brittain et al., 2012). However, given the correlation between MSE and barrier perception, it is important to note that the low rates of MSE reported in both groups the inactive group (M = 5.94) and the active group (M = 6.54) based on a scale of 1-10, could be the cause for such high rates of barrier perception (Schwarzer & Luszczynska, 2008; Simonavice & Wiggins, 2008).

Although rates of barrier perception were high in both groups, perception of the limitation the barriers would impose on their exercise plans was different. On a scale of 1 to 10, inactive participants reported high levels of barrier limitation (M =5.59) and active participants reported statistically significant, $p < .001$, lower levels (M =3.33). These findings illustrate that the active participants were more effective than their inactive counterparts at managing their barriers and limiting the power of the barriers to thwart their exercise plans. As related to coping strategies to overcome the reported barriers in the Brittain et al. (2012) study, planning/scheduling was the most frequently reported coping strategy used in both groups. The planning/scheduling strategy primarily used by the women was the modification of day-to-day schedules. The women also reported moving physical activity to earlier or later in the day, and altering work-related tasks as

planning/scheduling strategies frequently utilized. When comparing self-efficacy related to the use of coping strategies, the active group consistently reported higher levels of self-efficacy in the use of all coping strategies as compared to the lower rates of self-efficacy in the use of coping strategies reported in the inactive group. However, ANOVA analyses found no statistically significant difference between the groups, $p < .05$).

Summary

Research has demonstrated that impairments in the self-regulative cognitions of MSE and planning skills can hinder adherence to exercise behavior in women. Additionally, perceived barriers originate from the real-life demands women are forced to consistently juggle. These real-life demands often result in feelings of being overextended and can negatively affect both the emotional and physical health of women. Teaching women how to apply action planning and coping planning skills can increase long-term adherence to exercise by providing them with the tools necessary to adapt their daily routines and manage the real-life demands that serve as situational barriers to engagement in routine exercise behavior (Kwasnicka, Presseau, White, & Sniehotta, 2013; Mitche & Johnston, 2012).

The Role of Text Messaging

Mobile technology, whether in the form of an ultra-lite laptop, basic cell phone, smart phone, tablet, e-reader, PDA, or another handheld device, has given our society the luxury of communicating, working, and being entertained on the go (Chang, Gossa, Sharp, Rowe, Kohatsu, Cobb, & Heisler, 2014; Sevetson & Boucek, 2013). Our rapid advancement in mobile technology has created a more productive and communicative society. Of the multiple ways we are able to communicate via our mobile devices (voice

call, email, text, photo, micro-blogging, social networking posts, etc.) text messaging has become the most popular (Brynko 2013; Lefebvre, 2009; Smith, 2011; Wei, 2013). According to the 2008 Nielsen report, Americans increased their use of text messaging by an astonishing 450% between the years of 2006-2008 (Reardon, 2008). More recently, data from a survey taken in 2011 of (n = 2,277) adults conducted by the Pew Research Center revealed that 83% of American adults own cell phones, 73% of which send and receive text messages. Interestingly, 31% prefer to be contacted by text message instead of by a voice call (Smith, 2011). More specific to the population of interest for the current study, the survey data found that women send an average of 42 text messages per day versus the average of 11 voice calls per day (Smith, 2011).

Feasibility, Acceptability and Efficacy in Healthcare

The frequency of text messaging as the second leading form of mobile communication (Wei, 2013) has made its usefulness in disease management and behavior modification appealing to primary care providers, psychologists, and other healthcare workers around the world (Blake, 2008; Hampton, 2012; Heron & Smyth, 2010; Lefebvre, 2009; Morris & Aguilera, 2012). The practical and inexpensive approach text messaging provides has been used to access hard-to-reach populations, increase attendance to medical appointments, boost immunization rates, and improve medication adherence (Ahlers-Schmidt, 2010; While 2013). More specific to research in health behavior modification, text messaging has demonstrated feasibility and acceptability in exploring smoking cessation in college students (Riley, Obermayer, & Jean-Mary, 2008), weight-loss in adults (Gerber, Stolley, Thompson, Sharp, & Fitzgibbon, 2009; Patrick et al., 2009), self-monitoring of sugar sweetened beverages, physical activity, and screen

time in children ages 5-13 (Shapiro et al., 2012), fruit and vegetable intake (Soureti et al., 2011;Spring et al., 2010), implementation intentions to brisk walking (Prestwich, Perugini, & Hurling, 2010), eating and exercise behaviors in children (Bauer, Niet, Timman, & Kordy, 2010), postnatal women (Fjeldsoe, Miller, & Marshall, 2010), menopausal women (Pearce,Thøgersen-Ntoumani, & Duda, 2014), post-menopausal women (Park & Kim, 2012), and in the perception of barriers to exercise in adults (Hurling et al., 2007). Findings from these studies indicate that the strength of text messaging in health care lies in its ability to influence the health behaviors and self-regulatory cognitions of individuals in their natural environments while going about their day-to-day activities.

The application of text messaging to measure and/or influence the behavior in real-life settings is representative of an ecological momentary assessment (EMA) method or as an ecological momentary intervention (EMI) method. EMA describes research methods that repeatedly measure one's behavior and experiences in real-time while in their natural environments (Shiffman, Stone, & Hufford, 2008). EMI represents intervention-based research methods to modify an individual's behavior during their "everyday lives" in a naturalistic setting (Heron & Smyth, 2010, p.2). Conventional methods of measuring and influencing behavior are delivered in clinics and research facilities. However, the study of behavior in naturalistic settings when environmental and personal determinants are influencing behavior in real-time as one goes about their day-to-day activities, has rarely been studied until the emergence of text messaging (Heron & Smyth, 2010).

The use of text messaging as an efficacious EMA method and/or EMI method has been demonstrated in numerous health behavior change studies around the world for the past several years. For example, participants of a Japanese study of (n = 136) which used text messaging as a dietary education tool, experienced more weight loss than the control group (Kubota, Fujita, & Hatano, 2004). A United Kingdom study of 155 participants explored the effects of text messaging on increasing exercise behavior in those with strong motivational phased-based intentions to exercise by improving their planning skills via a text messaging intervention. There was a statistically significant increase in the frequency of exercise in the participants who received text message reminders of their exercise intentions (Prestwich, Perugini, & Hurling, 2009). A Norway text messaging intervention based study of 30 parents and 15 diabetic children (ages 9-15) revealed increased parent-child communication in the self-monitoring of blood glucose levels (Gammon et al., 2005) and data from a New Zealand study of 1705 smokers found that text messaging was effective in the recruitment of participants and in increasing short-term quit rates (Brawley et al., 2005).

A South African study employed text messaging to send stage-specific information to pregnant women which reduced maternal and infant mortality rates (Hampton, 2012) and an Australian text messaging study of (n=22,658) significantly increased pediatric appointment attendance (Sanghara, Kravariti, Jakobsen, & Okocha, 2010). As a final example more specific to the topic of interest of this study, a study in the United States of text messaging in weight loss maintenance of (N=95) obese African American women ages 30-65, forty-two women chose to accept text messages of nutrition and exercise tips and motivational affirmations to aid in the maintenance of their

weight loss (Gerber, Stolley, Thompson, Sharp, & Fitzgibbon, 2009). During the first 4 months, 96% of the participants reported having read the text messages and 79% reported that the text messages helped them with their weight loss goals. Collectively, these studies provide evidence of the acceptability, feasibility, and effectiveness of text messaging in various populations around the world.

Utility and Efficacy in Exercise Interventions

In more recent years, text messaging has become an innovative yet feasible method for interventions to increase exercise initiation and exercise adherence by targeting the self-regulatory cognitions which regulate exercise behavior (Gerber, Stolley, Thompson, Sharp, & Fitzgibbon, 2009; Fjeldsoe, Miller, & Marshall, 2010; Hurling, Catt, De Boni, Fairley, Hurst, Murray, Richardson, & Sodhi, 2007; Kim & Glanz, 2013; Scholz, et al., 2008). The following discussion will highlight studies which have reported favorable findings supporting the utility and efficacy of text messaging interventions aimed at increasing exercise behavior and physical activity levels by improving MSE(MSE) and planning skills.

A recent exercise intervention-based study (n = 36) examined the feasibility of motivational text messages to increase walking and leisure time exercise in 60-85 year old, mostly female (80%), African Americans (Kim & Glanz, 2013). One-way direct text messages (messages to participants with no replies) were sent 3 times per day for 3 days per week over the course of 6-weeks. Overall, study participants who received motivational text messages increased their walking and leisure time exercise to a more significant level that those who did not receive text messages. Although the findings support the efficacy of text messaging in increasing exercise behavior, this study lacked a

substantial sample size and its research design did not purposely target MSE or planning skills or the explicitly measure the effects of the intervention on such. Nonetheless, numerous research studies have utilized motivational strategies to enhance one's self-efficacy in both the preintention motivational phase and the postintention volitional phase of behavior to aid in the initiation and maintenance of exercise (Fjeldsoe, Miller, & Marshall, 2010; Gerber, Stolley, Thompson, Sharp, & Fitzgibbon, 2009; Kerr et al., 2012; Prestwich, Perugini, & Hurling, 2010; 2009). Given the positive correlation between self-efficacy and behavior, the increase in exercise evidenced by the use of motivational text messages in the Kim & Glanz (2013) study demonstrates the positive influence motivational text messages can have on enhancing one's self-efficacy for exercise behavior.

In a 12-week exercise intervention known as MobileMums (Fjeldsoe, Miller, & Marshall, 2010), researchers employed the SCT and a mixed-methods approach to explore the effectiveness of text messaging in increasing levels of moderate to vigorous physical activity in low-income, postnatal women (M = 30) years old. As pertinent to this proposal, the text messages were designed to target self-efficacy, outcome expectancies, goal setting, social support and environmental opportunity; all constructs within the SCT (Fjeldsoe et al., 2010). In line with the SCT presumptions, text message content was timed based on the stage of change. For example, during the first 6 weeks of the study when participants were assumed to be in a preintention motivational phase, content of the text messages targeted all of the theoretical constructs listed above along with special emphasis on outcome expectancies and environmental opportunities to help

the women bridge the intention-behavior gap (Bandura, 1977; Sniehotta, Scholz, & Schwarzer, 2005a).

Data analysis revealed that 84% of women who received text-messaging support were successfully adhering to their exercise plans at both the week 6 and week 13 assessment points. Postintervention interviews revealed positive participant perception of the text messages as useful in helping the women to adhere to their exercise plans. This qualitative finding confirmed the quantitative data, which revealed that 51% of the women rating the text message intervention as "extremely useful" and 42% reporting the intervention as "somewhat useful" (Fjeldsoe et al., 2010).

Although the MobileMums study provides promising findings to support the growing amount of research in the use of text messaging in exercise behavior, the study was deficient in a of couple areas. As asserted by Fjeldsoe et al. (2010) the sample size (N =88) was small, and the attrition rate was slightly higher than similar studies of physical activity in post-natal women. Nonetheless, the primary strengths of the MobileMums study lied in the use of the SCT as its foundation and guiding theory, the mixed methods research approach, focus on specific self-regulatory constructs, which included MSE and planning skills, and the multiple points of assessment throughout the intervention.

Summary of text messaging efficacy and utility. Research employing the use of text messaging has reported promising findings regarding the feasibility, utility and efficacy of this innovative approach in numerous health behavior modifications. Studies such as these have contributed to recognition and endorsement from the medical community at large and world health leaders as evidenced in the United Nations

Secretary General's use of text messaging as a tool a in the "Every Woman, Every Child" initiative to prevent mother-to-child HIV transmission (Hampton, 2012). Specific to exercise behavior, research appears to support text messaging as an effective EMI approach and optimal when the intervention targets self-regulatory constructs specific to the stage of behavior change. The frequency, the time of day, and the content of the text messages also appear to be related to successful interventions.

Despite the demonstrated effectiveness of text messaging in exercise research targeted at the motivational phase, studies employing text messaging in the volitional phase of exercise behavior are scarce. Additional research exploring the acceptability, perceived usefulness, and guidelines for the delivery of text messages to help individuals maintain adherence to exercise over the long term, will lessen the gap in current literature by enhancing the understanding of how text messaging EMI methods can be best applied to improve the self-regulatory cognitions of MSE and planning skills in various populations.

Review of Quantitative Methodology

The following section will highlight the quantitative data collection methods for examination of the research variables of interest. Although a mixed methods approach could provide more insight into the real-life demands which obstruct exercise adherence in working women, given the primary purpose of the study, use of a quantitative approach is the most functional to address the research questions and best suited for the application of the HAPA model to the first hypothesis and the TAM to the second hypothesis (Barg et al., 2012; Davis, 1989; Gaston & Prapavessis, 2012; Schwarzer, 1992, 2008; Schwarzer et al., 2007).

Web-Based Surveys

A Web-based survey via Survey Monkey will be used to collect the data. Web-based surveys have become increasingly popular in a variety of research fields including social science and health care (Bethlehem & Biffignandi, 2012; McPeake, Bateson, & O'Neill, 2014; Newland, Jensen, Budhathoki & Lorenz, 2015; Paxton, Nayak, Taylor, Chang, Courneya, Schover, et al., 2014; Shropshire, Hawdon, & Witte; 2009). Advantages to the use of web-based surveys include reduced cost and time, speed and uncomplicated exportation of data for analysis (Evans & Mather, 2005; McPeake et al., 2014; Sheehan, 2001). Despite the advantages for researchers in the use of web-based surveys, researchers have found that strategies to address the issue of low response rates (McPeake et al., 2014) and survey attrition (Shropshire et al.,2009) are necessary to ensure an adequate response rate to reduce the risk of bias (Groves & Peytcheva, 2008; Vehovar & Lozar Manfreda, 2008).

To address the potential for low response rates, recruiters for survey participants will be asked to send up to 2 reminder emails (Appendix P), embed the link to the web-based survey in the email and the token of appreciation that will be provided for participation (Appendix C) (Ganassali, 2008; McPeake et al., 2014). Additionally, the data collection period will be extended if necessary to avoid the issue of selection bias and increase generalizability of the findings. The issue of attrition will be addressed by including the approximate length of time it will take to complete the survey in the introductory and reminder emails. The approximate time to complete the survey will also be included on all flyers and recruitment materials. In doing so, participants will know

what to expect and can decide if they have time to participate before starting the survey and exiting before its completion.

Likert Scales

Each data collection measure included in the cross-sectional web-based survey, with the exception of the exercise adherence measure, will contain a Likert scale based measurement to investigate the predictive strength of each of the variables by assessing the degree to which respondents agree or disagree with statements related to the research questions. There have been over 60 years of extensive debates regarding the appropriate use of Likert scales. The debate is primary over the treatment of data obtained from Likert scales as ordinal-level data (Stevens, 1946) as opposed to interval-level data. In addition to the debate concerning the predictive validity of the measurement instrument based on the number of scale points (i.e. 4 points, 5 points, 7 points, 10 points) (Leung, 2011). This stems from the measurement trait of the Likert scale yielding rank ordered data (Likert, 1932).

As related to the use of Likert data as ordinal level or interval level, Cohen et al. (2000) supports the assumption that the strength of one's agreement with a statement, such as 'strongly agree' versus 'disagree', cannot be treated as ordinal data since there is a distinct difference in the "intensity of feeling" between the levels (Jamieson, 2004, p.1217). The assessment of the differing levels of agreement, justify the treatment of the Likert data as interval based for the current study (Carifio & Perla, 2008; Hartley, 2014; Norman, 2010). As related to the analysis of the data, treating Likert data in the current study as ordinal will not allow for a precise measurement of the research questions, the

use of parametric statistics, nor will it allow for the use of more sophisticated statistical analysis methods, which will yield meaningful results (Carifio & Perla, 2008).

It is important to point out the use of Likert data treated on an interval level has become widely acceptable in the field of health behavior research (Ashton, Lawn, & Hosking, 2010; Bossen, Veenhof, Dekker, & Bakker, 2013; Brittain et al., 2012; Dedeli, & Fadiloglu, 2011; Flaskerud, 2012; Luszczynska & Sutton,2006; Schüz et al., 2012; Schwarzer et al., 2008; Storer, Cychosz, & Anderson, 1997). Additionally, the use of collected Likert data on an interval level is not only a common practice in research investigating the variables the HAPA Model, but also the analysis recommended by the theorist of the HAPA (Schwarzer, 1992; 2008a). Lastly, Likert data treated on an interval level has also proven to be reliable when employing statistical analyses to calculate means and standard deviations, performing analysis of variance (ANOVA), Pearson's correlations and multiple regression (Carifio & Perla, 2008; Chueh, Ding, Yao, Huang, & Hung, 2013; Haun, Luther, Dodd, & Donaldson, 2012; Lenčovš & Duškovš, 2013, Schüz,et al, 2012; Schwarzer et al, 2008). Having said this, treating the collection of Likert data from the current study on an interval level will be the most suitable.

Summary

The use of the aforementioned cross-sectional web-based survey in the form of Likert scales will provide the most appropriate quantitative research approach for assessing the mean strength of MSE, action planning (APS) and coping planning (CPS) skills and the limitation of real-life demands (LRD) between women who adhere to exercise frequency recommendations and women who also exercise, but do not adhere to exercise frequency recommendations (Sniehotta et al., 2005; Brittain et al., 2012; Paxton

et al, 2014; Schwarzer, 1992, 2008a). This approach will also be useful in employing the snowball sampling strategy to recruit participants and to assess whether there is a relationship between texting frequency and the perceived usefulness of texting as a useful tool in increasing exercise frequency. The intent of the secondary analysis on text messaging is to provide practical data on the receptivity of texting for use in future exercise behavior interventions targeted towards working women.

Final Summary and Conclusions

Low levels of exercise engagement and disproportionately high levels of obesity and overweight in women have been evidenced in several national and world health reports (NCHS, 2011; Schiller et al., 2012; WHO, 2010). The host of diseases, conditions, and illness associated with low levels exercise and unhealthy weight make the need to develop interventions to increase exercise adherence essential in the reduction of comorbidity and mortality in women (Baer et al., 2011; Danaei et al., 2009; DHHS, 2008).

Research examining the preintention motivational factors which regulate exercise initiation have been studied extensively, but research examining the postintention volitional factors that regulate exercise adherence has not been given equal or consistent attentiveness (Conner & Norman, 2005; Renner et al., 2012). Research suggests the primary self-regulatory constructs that influence exercise behavior are MSE, action planning, coping planning, and barrier limitation (Annesi, 2004; Bandura, 1977,1990,1991; Brittain et al., 2012; Connor, 2008; Gollwitzer, 1996; Luszcynska & Schwarzer, 2005; Renner et al., 2012; Rothman, 2000; Schwarzer, 1998, 2008; Sheeran, 2002; Webb & Sheeran, 2006; Simkin, & Gross, 1994; Schüz et al., 2012).

The current literature review not only examines research on exercise behavior and the aforementioned cognitions within the self-regulation of exercise, but also reveals a consistent gap in research aimed at investigating and creating interventions to improve the self-regulatory factors that regulate exercise frequency in the volitional phase (Conner & Norman, 2005; Rothman 2000; Schwarzer, 1992; 2001; 2008a). This disparity reveals a need to continue investigating the postintention adherence factors and develop interventions to help women enhance their levels of MSE, improve action planning and coping planning skills which can help women in the volitional phase protect their exercise plans (Brittain et al., 2012; Huberty et al., 2008; Teixeira et al., 2010).

Given the countless real-life demands women face, developing innovative ways to reduce the limitation such demands can place on exercise adherence is also as crucial (Brittain et al., 2012; Huberty et al., 2008; Teixeira et al., 2010). Real-life demands threaten to deter women from adhering to their exercise plans several times throughout their day-to-day activities. The use of an intervention method which could be delivered in a naturalistic setting, such as text messaging, could provide an efficacious tool to more effectively help women manage the barriers real-life demands can create. Such intervention could also enhance self-efficacy, improve action and coping planning skills. Although in its infancy, research highlighted in this review demonstrates how the portability, automation, low-cost and convenience of text messaging can become an efficacious EMI method for increasing exercise frequency in female populations. However, more research is needed enhance the understanding of how text messaging EMI methods can be best received and applied to improve exercise adherence.

The subsequent chapter will detail the research design of the current study by 1) presenting the research questions and hypotheses, 2) defining the population of interest, sample size requirements, recruitment strategies, and participant protections, 3) describing the research design, procedures, quantitative measures, and the statistical analyses by which the hypotheses will be tested.

Chapter 3: Research Design

Introduction

The primary purpose of this quantitative study was to assess the difference in mean strength of maintenance self-efficacy (MSE), action planning skills, coping planning skills and the limitation of real-life demands between women who adhere to exercise frequency recommendations and women who also exercise, but do not adhere to the frequency recommendations (Schwarzer, 2008a; White & Ransdell, 2005; Mendes, Sousa, & Barata, 2011). The secondary purpose was to identify whether texting frequency is related to the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency (Davis, 1989; Fjeldsoe, Miller, & Marshall, 2010). The findings highlighted problems related to low levels of exercise frequency (NCHS, 2011; 2013), which, in turn, can contribute to the development of real-time interventions to increase exercise frequency and reduce the occurrence for the leading causes of death of women in the United States (Baer et al., 2011; Dacey et al., 2003; Heron, 2012).

Once the research questions and hypotheses are restated, along with providing a rationale for the interest in the variables and research design choice (Bandura, 1997; 2005; Schwarzer, 1992; 2001; 2008a), the greater part of the chapter will detail the quantitative research methods applied to the study, including a discussion of the population of interest, an explanation of the sampling techniques and recruitment strategies, participant procedures and related data collection. This discussion will include a thorough description of the measurement instruments and the statistical analyses.

Behavioral research inherently involves both internal and external threats to the validity of the study, which can diminish its legitimacy and quality, and can limit the extent to which the current study can be successfully replicated and the findings generalized to the population of interest (Creswell, 2009). Certain threats can also weaken or invalidate the statistical conclusions. Acknowledgement and discussion of such threats and the plans for how they will be overcome will be presented. Finally, before a summary of the chapter is provided, the following will be reviewed: ethical procedures to guide each phase of study, protect the participants and the data, uphold the aims of the research, and the codes of conduct within the field of psychology.

Research Design and Rationale

The study had two purposes. The first purpose was to assess the difference in mean strength scores of maintenance self-efficacy, action-planning skills, coping planning skills and the limitation of real-life demands between women who adhere to exercise frequency recommendations and women who also exercise, but do not adhere to exercise frequency recommendations (Schwarzer, Schüz, Ziegelmann, Lippke, Luszczynska, & Scholz, 2007). The secondary purpose was to identify whether texting frequency is related to the perceived usefulness of text messaging as a tool in improving maintenance self-efficacy, action-planning skills, coping planning skills and exercise frequency (Fjeldsoe et al., 2010). A survey design of interval- and nominal-based quantitative instruments was used to test the following research questions.

Quantitative Research Questions

Based on a theoretical framework consisting of SCT (Bandura, 1977), the HAPA (Schwarzer, 1992) and the (TAM) (Davis, 1989), the following research questions and hypotheses were addressed. Also, see Figure 5.

RQ1: Is there a significant difference in mean scores on MSE, action-planning skills, coping planning skills and the limitation of real-life demands between adherers and nonadherers?

*H*o$_1$: There is no significant difference in mean scores on maintenance self-efficacy, action-planning skills, coping planning skills and the limitation of real-life between adherers and nonadherers.

*H*a$_1$**:** There is a significant difference in mean scores on MSE, action-planning skills, coping planning skills and the limitation of real-life between adherers and nonadherers

RQ 2: Is texting frequency related to the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency?

*H*o$_2$: Texting frequency is not related the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency.

*H*a$_2$: Texting frequency is related to the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency.

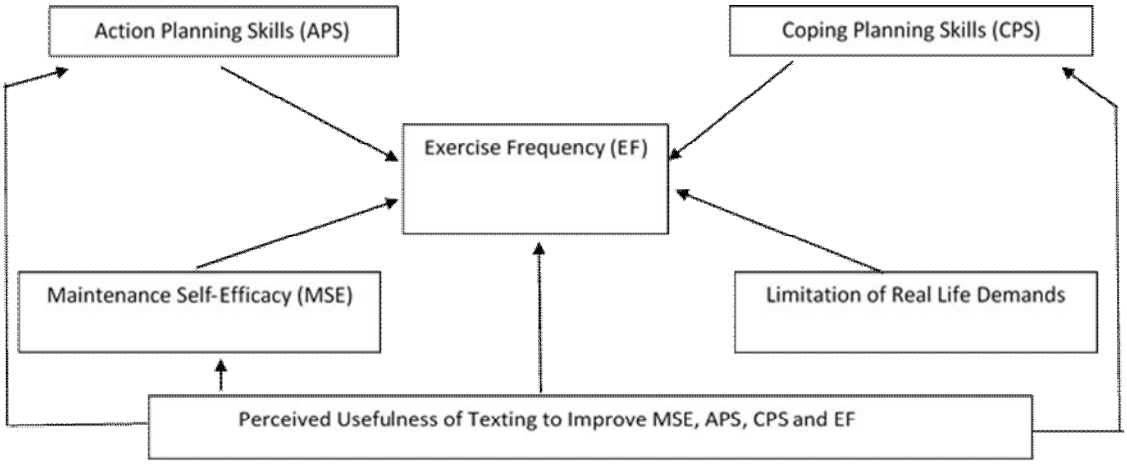

Figure 5. Research model for the proposed study examining the strength of the volitional factors which regulate exercise behavior and the perceived usefulness of texting as a tool to increase exercise frequency.

Rationale

The ability to adhere to exercise recommendations can become challenging when self-regulatory cognitions such as maintenance self-efficacy, action planning skills and coping planning skills begin to diminish (Brittain et al., 2012; Gollwitzer, 1996; Hagger et al., 2009; Luszczynska et al., 2011; Renner et al., 2012; Schüz et al., 2012; Sniethotta, et al., 2005a; Schwarzer, 2008a). Additionally, the limitations of real-life demands, such as work and home responsibilities faced by women, can make exercise adherence more difficult due to the barriers these real-life demands may pose or are perceived to impose (Bloomquist et al., 2008; Brittain et al., 2012; Hendry et al., 2010; Huberty et al., 2008).

The primary aim of the current study was to assess the difference in mean strength of MSE, action planning skills, coping planning skills and the limitation of real-life demands between women who adhere to exercise frequency recommendations and women who also exercise, but do not adhere to such recommendations. To fill a gap in the literature, the application of the HAPA model served as the foundation for the

selection of quantitative assessments. This allowed for a deductive examination of the self-regulatory constructs involved in the postintention volitional phase of health behavior change; as opposed to the more extensively studied preintention motivational phase (Conner & Norman, 2005, Renner, Hankonen, Ghisletta, & Absetz, 2012; Rothman, 2000). .

As discussed in Chapter 2, the HAPA addresses both the motivational and volitional phases of exercise behavior change (see Figure 5). The HAPA model provides a foundation for the examination of (a) the preintention motivational phase when intentions to engage in exercise behavior are formed, and (b) the postintention volitional phase when intentions develop into the initiation and ultimately the maintenance of exercise behavior. However, models such as the (HBM), (TRA), (TPB), primarily allow for examination of the factors which regulate the preintention motivational phase of health behavior change. These models are most often applied to studies of inactive individuals and those with implementation intentions (Gollwitzer, 1999). In other words, the phase where individuals develop plans to exercise, but such plans have not yet been converted into the actual enactment of exercise behavior. The use of such prediction models in the examination of factors in the postintention volitional phase presents a clear drawback and could have invalidated the findings of the study. Therefore, use of the HAPA model was the best fit for this study.

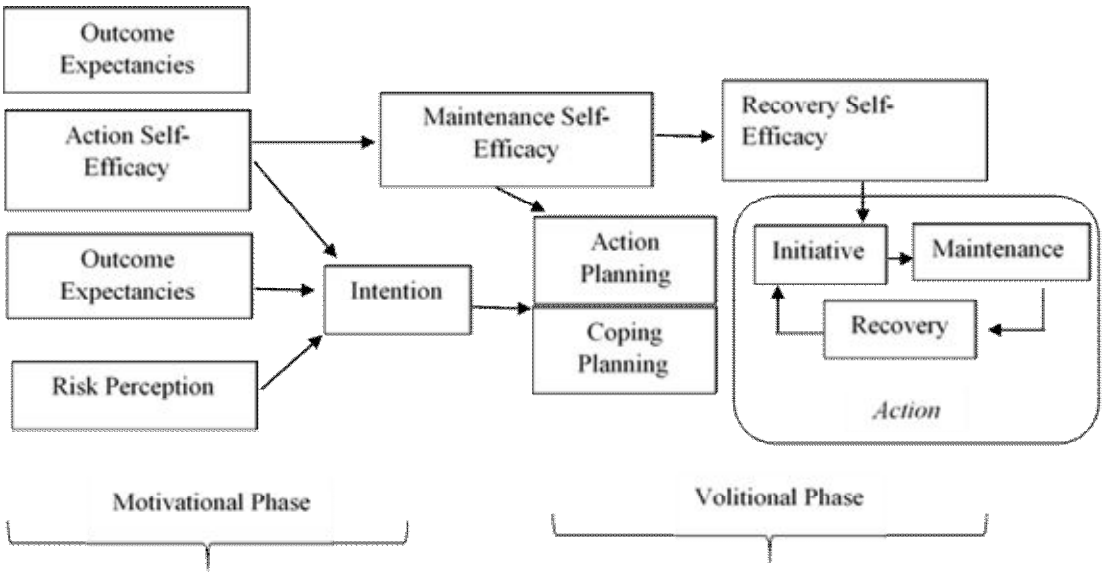

Figure 6. The Health Action Process Approach Model. From "Modeling Health Behavior Change: How to predict and modify the adoption and maintenance of health behaviors," by R. Schwarzer, 2008, *Applied Psychology, 57*, p.6. Copyright [2008] by the American Psychological Association. Reprinted with permission.

The secondary aim of the study was to assess if texting frequency is related to perceived usefulness of text messaging as a tool in the self-regulation of exercise. Text messaging is reported as the second most popular form of mobile technology use (Brynko 2013; Lefebvre, 2009; Smith, 2011; Sevetson & Boucek, 2013; Wei, 2013). Use of the TAM (Davis, 1989; Chung-Hung, 2014) provided a theoretically grounded framework for an examination of the relationship between texting frequency and perceived usefulness of text messaging in exercise behavior regulation. Theoretically, if participants use texting on a more frequent basis, they already perceive it to be "easy" (perceived ease of use). Based on the TAM displayed in Figure 7, this ease of use directly influences the perceived usefulness, which in turn predicts one's intention to use. Assessing the perceived usefulness of texting in influencing the cognitions involved in exercise

behavior may provide data to support the inclusion of texting in interventions designed to increase exercise frequency in similar populations; thereby further contributing to the gap in the study of exercise behavior in the postintention volitional phase.

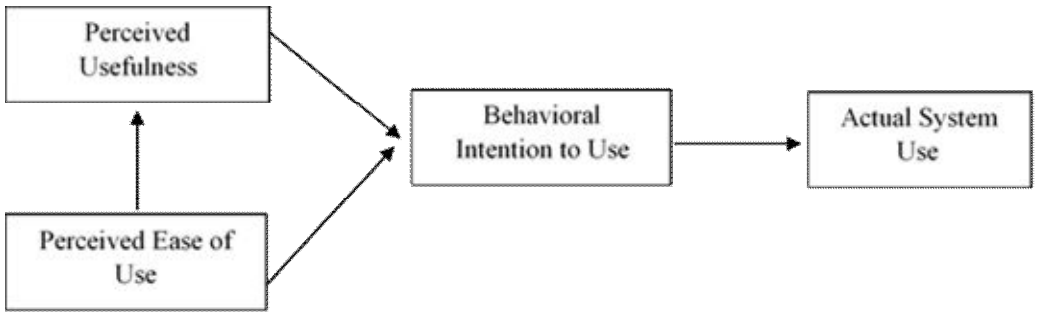

Figure 7. Conceptual Model for Technology Acceptance. From "Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology," by F. Davis, 1989, *MIS Quarterly, 13*, p.321.Copyright [1989] by JSTOR. Adapted with permission.

As discussed thoroughly in Chapter 2, several studies in the field of health behavior change have demonstrated feasibility, acceptability and efficacy in the use of text messaging in a variety of populations (Riley et al., 2008; Gerber et al., 2009; Patrick et al., 2009, Shapiro et al., 2012; Soureti, et al., 2011; Spring et al., 2010; Prestwich, et al., 2010; Bauer et al., 2010; Fjeldsoe, et al., 2010; Park & Kim, 2012; and Hurling et al., 2007). Given the ability of text messaging to influence the health behaviors and self-regulatory cognitions of individuals while going about their day-to-day activities (Heron & Smyth, 2010), the usefulness of texting to physically active working women could help them maintain their levels of exercise frequency and lessen the limitations real-life demands could impose by boosting their maintenance self-efficacy. This in turn could improve their action planning and coping skills, and adherence to exercise frequency recommendations.

Methodology

Target Population

The populations of interest for the study were working women ages 18-64. As evident in the mortality and disease prevalence statistics provided in chapter one, there is a direct link between overweight, obesity, and low levels of physical activity with heart disease, hypertension, several cancers and diabetes (Dacey et al., 2003; Danaei, Ding, Mozaffarian, Taylor, Rehm, Murray et al., 2009). More specific to women, 75% percent of American women ages 18-64 are overweight or obese and only 20.25% of women ages 18-64 adhere to the 2008 federal physical activity guidelines for leisure time aerobic activity and muscle strengthening activities (NCHS, 2016). As related to barriers faced by working women, research has demonstrated that real-life demands of women ages 18-64 obstruct their ability to follow through with their exercise plans on a routine basis (Bloomquist et al., 2008; Brittain et al., 2012; Dacey et al., 2003; Hankonen et al., 2010; Tavares & Plotnikoff, 2008). Investigating the factors that help women in the postintention volitional phase self-regulate their exercise behavior can provide valuable insight and data to aid in the development of exercise adherence interventions.

Sampling

Given the low levels of exercise adherence in women, this study employed a direct and snowball sampling strategy to access an adequate sampling size (Emerson, 2015; Goodman, 2011; Heckathorn, 1997). In a study on physical activity by Perez, Nie, Ardern, Radhu, & Ritvo (2013) exploring the effects of snowball sampling strategies on survey response rates, researchers obtained 248 surveys from direct sampling and 166

from snowball sampling. Employing the snowball sampling strategy increased the sample size by 33%. The population of interest (working women 18-64) and the data collection method (web based survey) for the study appears to have provided an advantage in sampling because 1) females have higher survey response rates in research studies (Green, 1996), 2) approximately 70% of females ages 18-64 use social networking cites – primarily Facebook (Duggan & Brenner, 2013) and 3) working women have more expansive social networks (Bartholomew, Schoppe, Sullivan, Glassman, Kamp, Dush, Sullivan, 2012; Umberson & Montez, 2010).

Factors such as these, coupled with the snowball sampling strategy, can help to counter the disadvantages snowball sampling can exact upon the generalizability of the findings (Biernacki & Waldorf, 1981; Emerson, 2015; Goodman, 1961). Furthermore, the employment of direct recruitment sampling of various subgroups (i.e., the Internet, Walden University Participant Pool, Weight Loss Centers, Fitness Centers, gyms, township recreation departments, clients of personal trainers and health coaches etc.) may have reduced selection bias and increased generalizability (McPeake, Bateson, & O'Neill, 2014).

Statistical Power and Sample Size

Sample size analysis is important to reduce the risk of type I and type II errors, which in turn improves the researchers' ability to support or not support the research hypotheses, improve both the reliability and the validity of the study and generalize the findings across similar populations (Cohen, 1988; 1992; Green,1991; Fowler, 2013). In line with the recommendations by Cohen (1988; 1992) and behavioral research (Gravetter & Wallnau, 2009; Green, 1991; Fowler, 2013) on conducting a power analysis

and calculating effect sizes, the study minimized type I error by setting the alpha level at .05 so there was only a 5% chance of reaching an erroneous conclusion. To increase the probability that the analysis will uncover the same results if the study were to be duplicated, the power was set to .80 to minimize a type II error (Cohen, 1988; Green, 1991).

A power analysis was conducted using the G*Power statistical power analyses software (Faul, Erdfelder, Buchner & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007) to establish a suitable sample size for the study. Based on the alpha level and power noted above, coupled with the average effect size = .15 derived from four similar studies (Im et al., 2011; Jung & Brawley, 2001; Sniehotta et al., 2005; Sniehotta et al., 2009), the sample size was calculated at 86 for the MANOVA with 2 groups and 4 response variables and 84 for the Pearson's correlation. Based on Cohen's Power Primer (1992), this calculation is acceptable. However, to increase the ability to generalize findings, the target sample size for the study was set to 120 participants.

Sampling Frame. All ethnicities and socioeconomic backgrounds were eligible as long as participants had a cell phone and used text messaging. The introductory sections of the web-based survey (Appendix C) assessed the frequency of text messaging use. Due to the research variables of interest, participants were required to be in the postintention volitional phase of exercise behavior. Participants were also required to be working women who had consistently engaged in exercise for at least one day per week for at least 1 month prior to recruitment. For the study, the current recommendations by the American College of Sports Medicine, (Garber et al, 2011), CDC and AMA (CDC,

2013) and the WHO), (2011) served as the level of exercise frequency which categorized participants as adherers or nonadherers.

Recruitment, Participation Procedures and Data Collection

Once approval of the proposal from the IRB committee was obtained, the online survey was opened and recruitment commenced via the use of posted flyers and advertisements in gym and fitness centers, Craigslist, Facebook social network advertisements, Facebook social network messages posted by partnering organizations, online message boards, online forums, offices of obstetrics and gynecology doctors and primary care physicians, local newsletters and publications targeted to females (Sarmugam, Worsley, & Wei, 2013) and the Walden University Participant Pool.

The researcher also used a personal professional network of contacts to pass along a direct Internet link to the web based survey and/or flyers to their contacts (see Appendix A). The professional network consisted of fellow personal trainers, health coaches, group fitness instructors and clients of the researcher. The sources were given a script to use when asking those in their own personal and professional networks to participate (Appendix B).

Participants accessed all the informed consent and the survey via an Internet link to the SurveyMonkey.com portal, which was included on all recruitment materials. Data analysis followed the end of an 8-week data collection period (Bethlehem & Biffignandi, 2012; Cohen, 2004; Sarmugam, Worsley, & Wei, 2013). All participants who consented to participate and start the survey received a list containing 5 workout playlists, each with 10-15 hand-selected songs for over 50 workout song recommendations.

Informed Consent

In adherence with the United States Code of Federal Regulations Title 45, Part 46 on the Protection of Human Subjects(U.S. Department of Health & Human Services, 2009), a valid informed consent was obtained from each survey respondent via its inclusion at the beginning of the survey (see Appendix C). The consent form opened with a statement explaining that participation was voluntary and could be terminated at any time during the survey. Use of everyday language explained the nature of the research, purpose of the respondents' participation, time commitment, associated costs, risks, benefits, and the token of appreciation provided for participation (American Psychological Association, 2010).

Additionally, a brief description of data used both during and after the study and the protections put into place to ensure confidentiality, anonymity, and privacy (American Psychological Association, 2010; Leigh, 1998). This included informing respondents that data may be retained for use beyond the 5-year federal regulation 45 CFR 46 for potential use in future studies. In the event that the respondent had questions regarding participation before or after the survey, the informed consent included contact information for the researcher and the Walden University Institutional Review Board. Lastly, respondents were made aware that continuing past the statement of consent onto the beginning of the survey served as their consent to participate.

Data Collection

The study used a quantitative, cross-sectional, self-administered, web-based survey consisting of six sections and a total of 60 questions. SurveyMonkey.com, an online survey software, allowed for seamless collection and exportation of data into the

SPSS statistical software for analysis. The SurveyMonkey.com software has been widely used in various disciplines including healthcare and behavioral research (McPeake, Bateson, & O'Neill, 2014). Permissions for each measurement instrument were obtained. (American Psychological Association, 2010). Each measurement instrument was entered into the SurveyMonkey.com software exactly as it has been constructed by the developers (Appendices G-K). The Internet link to the survey, included in all recruitment materials and correspondence, opened an introductory page to the survey, which welcomed the respondent, briefly explained the purpose of the study, the estimated time for completion, provided the researcher contact information and the informed consent statement (Appendix C). Respondents were encouraged to print or screenshot the informed consent statement in the event that they had questions during or after the survey.

If the respondent chose to continue, they were prompted to continue onto the next page, which contained questions to assess participation eligibility (Appendix D). If respondents did not agree with the informed consent or failed to meet the inclusion criteria, the software automatically directed them to a survey exit page which thanked them for their participation and provide details to access the token of appreciation (Appendix E). The token of appreciation for all participants was a list containing 5 workout playlists, each with 10-15 hand-selected songs for over 50 workout song recommendations. Participants were able to print and/or screenshot a copy of the playlist recommendations upon exiting or completing the survey.

In order for respondents to have met the inclusion criteria they were required to 1) be a female between the ages of 18-64; 2) be actively employed full-time or part-time, 3)

have maintained an exercise frequency of 1 day per week, for at least 1 month prior to recruitment; 4) utilize text messaging via cell phone and 5) be unrestricted by physician limitations to exercise. If the respondent met the inclusion criteria, the software automatically directed them to the demographics page (Appendix F). The final five sections of the survey containing a total of 46 questions each assessed the specific research variables of MSE (Appendix G), action planning skills and coping planning skills (Appendix H), limitation of real-life demands (Appendix I), exercise frequency (Appendix J) and perceived usefulness of text messaging (Appendix K). Survey respondents needed approximately 2 minutes to read the informed consent and complete the introductory questions, along with an additional 8-10 minutes to complete the actual measurements. Total time to complete the survey was approximately 10-12 minutes.

Protection of Data

To ensure anonymity and participant privacy, each survey respondent was assigned a personal code by the Survey Monkey software. Respondents were not required to provide identifying information such as their name, address, phone number or email address. To lessen the risk of compromising the confidentiality of the collected data, all research related data was stored on a personal computer protected by passwords to access each file and active Norton Security antivirus software (Redsell & Cheater, 2001; Yakowitz, 2011). Additionally, back up of all files to the personal computer Carbonite Secure Cloud back up system and a USB drive prevented loss. Throughout the duration of the study, data was accessible to the researcher and academic representatives on a need to know basis. After the completion of the dissertation defense, the data will be solely accessible to the researcher (Thiele & Kaczmirek, 2010).

Measures and Materials

Table 1 below summarizes the variables, research questions, and the measurement tools that tested each hypothesis. Further discussion regarding each measurement instrument and its operationalization will follow.

Table 1

Summary of Measurement Instruments by Variables of Interest

Variable	Data type	Research question	Measurement instrument
MSE	Interval	Is there a significant difference in mean scores on MSE between adherers and nonadherers?	MSE scale physical exercise (MSES-PE) Four item 4-point Likert scale (Luszczynska & Sutton, 2006)
Action planning skills (APS) and Coping planning skills (CPS)	Interval	Is there a significant difference in mean scores on APS between adherers and nonadherers? Is there a significant difference in mean scores on CPS between adherers and nonadherers?	Action planning & coping planning scale-physical exercise (APCPS-PE) 10 item, 4-point Likert scale (5 questions per variable) (Sniehotta, Schwarzer, Scholz, & Schüz, 2005b)
Limitation of real-life demands (LRLD)	Interval	Is there a significant difference in mean scores for LRLD between adherers and nonadherers?	Perceived limitation of barriers 22 Item 10 –point Likert scale (Brittain, Dinger, Classen, Sage, & Han, 2012)
Group status related exercise frequency (EF)	Nominal .	See research questions for MSE, APS, CPS, LRLD and PUTM	International physical activity questionnaire-part 5 recreation, sport, and leisure-time physical activity. 6 questions (IPAQ, 2002)
Perceived usefulness of text messages(PUTM)	Interval	Is texting frequency related to the PUTM as a tool in improving MSE, APS, CPS and EF?	Four item 7-Point Likert scale (MSE, AP, CP, EF) Modifying the TAM (Venkatesh, Morris, Davis, & Davis, 2003)

MSE. MSE is operationally defined as the degree of confidence in one's ability maintain exercise, despite barriers that arise during the maintenance period, referred to in this study as the post intention volitional phase of exercise. (Luszczynska, & Sutton 2006; Schwarzer, 2008a; Sniehotta et al., 2005). The MSE Scale for Physical Exercise (MSES-PE), developed and published in Luszczynska, & Sutton (2006) measured the same variables of interest for the study (maintenance self-efficacy); therefore, the instrument assessed if the mean strength of MSE in adherers and nonadherers was different.

The respondents answered whether they were confident they can maintain their exercise behavior when they did not see positive benefits, were faced with time

constraints, experienced low motivation and if they had a desire to do something else. For example, survey respondents read a statement, "I am confident I can maintain my exercise regularly even if I am tempted to do something else." The survey respondents then rated their level of agreement using a four-point Likert scale with choices ranging from 1 (*definitely not true*) to 4 (*exactly true*). There were four statements the respondents read and rated. The total score range was 4-16. The higher the score, the higher the level of maintenance self-efficacy. The MSES-PE measurement took approximately 1-1.5 minutes to complete (Appendix G).

Internal reliability and validity. The Luszczynska, & Sutton, (2006) study was a predictive study of physical exercise maintenance and relapse in cardiac rehab patients. The study focused on the some of the same variables found in the HAPA (Schwarzer, 1992; 2001); therefore the commonality with the current study make review of the study and use of the MSES-PE measurement instrument useful in establishing reliability and validity. When tested for reliability the scale demonstrated high internal consistency, α =.81. Additionally, data revealed that each item on the scale was within an acceptable range of reliability. The pattern coefficients were: .79, .80, .79. and .80. (Luszczynska, & Sutton, 2006). In terms of validity, although the population of interest was different from that of interest in this study, the focus on exercise behavior in the volitional (maintenance phase) and the focus on the MSE construct are shared between both. Furthermore, findings revealed that those with higher MSE significantly predicted higher levels of physical exercise maintenance, $p > .001$). These findings are consistent with the theory posited by the HAPA (Schwarzer, 1992; 2001) and the SCT (Bandura, 1977); both of which represent the theoretical foundation of the current study.

The MSES-PE has also been used to assess MSE for exercise in studies of individuals with spondylosis (Luszczynska, Gregajtys, & Abraham 2007) and multiple sclerosis (Chiu, Lynch, Chan, & Berven, 2011). The Chiu et al (2011) study set out to test the goodness of for the HAPA as a model for assessing the motivational variables related to physical activity in people with multiple sclerosis. The MSES-PE scale was used to assess the MSE of participants to engage in exercise behavior on a routine basis. For this study, the Cronbach's alpha was .92, indicating good test-retest reliability. The application of the HAPA as the theoretical foundation for the examination of MSE provides validity to the use of the MSES-PE. This is because one of the HAPA constructs is maintenance self-efficacy. Furthermore, the use of multiple regression as the statistical analysis was appropriate for research goal of testing the predictability of the HAPA.

As related to the population of interest for this study, working women ages 18-64, research employing the use of the MSES-PE in the same population were not available. However, MSE scales assessing confidence in exercise behavior are present in many studies of exercise behavior in women (Annesi & Whitaker, 2010; Barg et al., 2012;Dacey et al.,2003; David, Pennell, Foraker, Katz, Buckworth, & Paskett, 2014; Jung & Brawley, 2011). In the Barg et al. (2012) study, researchers used a MSE scale to assess MSE for exercise in a sample of middle-aged women. Their scale was adapted from Sniehotta et al (2005), whose scale is based on the MSE scale by Luszczynska & Schwarzer (2003), upon which the MSES-PE by Luszczynska & Schwarzer (2006) was developed.

Action Planning (APS) and Coping Planning Skills (CPS). Based on the HAPA (Schwarzer, 2008), APS was operationally defined as the level of concrete ideas

related to where, when and how to act for implementing the intention to exercise. Also in line with the HAPA model, CPS was operationally defined as the degree to which one has developed the appropriate strategies to cope with barriers to exercise that might arise in the volitional stage of behavior change. Both APS and CPS were assessed with the Action Planning & Coping Planning Scale for Physical Exercise (APCPS-PE) (Appendix H) developed and published by Sniehotta, Schwarzer, Scholz, & Schüz, (2005b). The scale was not modified. Like the MSES-PE scale, the APCPS-PE Likert scale also has four measurement points with choices ranging from one (completely disagree) to four (totally agree). There are five questions specific to assessing action planning skills and five separate questions specific to assessing coping planning skills. Each of the 10 questions begins with, "I have made a detailed plan regarding…" The measurement then lists five items related to action planning skills and five items related to coping planning skills. For example, one of five the action planning questions will read, "I have made a detailed plan regarding when to exercise." One of the five coping planning questions will read, "I have made a detailed plan regarding how to cope with possible setbacks." The survey respondents rated their level of agreement for each of the 10 items. Total scores for APCPS-PE can range from 5-20 for action planning skills and 5-20 for coping planning skills (Appendix H). The 10-item measurement took approximately 2.5 minutes or less to complete.

Internal reliability and validity. In the Sniehotta, Schwarzer, Scholz, & Schüz (2005b) study investigating the reliability of the APCPS-PE scale, researchers explored the relationship and predictability of action planning and coping planning on exercise frequency in a sample of cardiac patients. The APCPS-PE scale was found to be highly

reliable for both action planning skills and for coping planning skills (α = .94; α =.91). The high levels of internal consistency satisfied the assumptions for a multiple regression analysis to assess the predictive strength of APS and CPS on exercise frequency. The statistical findings support the study's hypotheses of APS and CPS as strong predictors, $p < .01$, of exercise frequency. The multivariate analysis of variance (MANAOVA) and Pearson's correlation validate the research design for the aim of the study.

As in the application of the HAPA to explore the mean strength of MSE on exercise frequency, the same will be done for the constructs of APS and CPS on exercise frequency. The APCPS-PE scale was used in a sample of individuals with multiple sclerosis. For this study, the Cronbach's alpha was .91 for action planning skills and .97 for coping planning skills, which provides very good reliability for the APCPS-PE scale. This application of the HAPA model provides validity to the use of the APCPS-PE scale for the goal of the study.

As related to the population of interest for this study, study's employing the exact APCPS-PE scale were not available. However, studies employing similar scales examining the same what, when, where and how questions involved in both action planning and coping planning skills have been used in other studies. For example, in a study by Hankonen et al. (2010) exploring the planning of exercise behavior in men and women, the same questions assessing action planning skills in the APCPS-PE were used to assess action planning in the Hankonen et al (2012) sample. Both scales originate from Sniehotta, Schwarzer, Scholz, & Schüz, (2005). An adaptation of the same scale was also used in the Barg et al (2012) study of exercise in middle-aged women.

Limitation of Real-Life Demands. The limitation of real-life demands is defined as the degree to which real-life demands , such work / home responsibility's, family caregiving, errands, school, parenting, inhibit participation in exercise (Brittain et al., 2012; Huberty et al, 2008; Jackson, 1988; Kirchhoff et al., 2008; Kowal & Fortier, 2007; Mattingly & Sayer, 2006). The findings and measurement instrument used in the Brittain et al (2012) study were used to measure the limitation of real-life demands on exercise engagement in this study. The Brittain et al. (2012) study used a mixed methods approach to investigate perceived barriers to exercise, barrier limitation and coping strategies of active and inactive middle aged working women; a population quite similar to that of interest for the current study.

The instrument is a single question on a 10 point Likert scale as used in the Brittain et al. (2012) study (Appendix I) to assess the degree to which 18 different real-life demand barriers limit the survey respondents' ability to carry out their exercise plans. Survey respondents answered, "To what extent do the real-life demands listed below inhibit your ability to carry out your exercise plans during the last 7 days?" Respondents used scaled choices for each of the 18 real-life demands ranging from 0 (did not limit me) to 10 (fully limited me). Examples of real-life demands that were included were: Errands, housework, working long hours, family/friend obligations, lack of energy, health conditions/pain, lack of motivation/lazy, inclement weather, time management. The total time to complete the 18-item measurement was approximately 5-6 minutes.

This study used the same scoring methods used by the researchers to improve reliability. The total score range was 0-180. Lower scores represented the belief that real-life demands did not significantly inhibit the survey respondent's ability to carry out their

exercise plans, while higher scores represented the belief that real-life demands had a stronger ability to inhibit the survey respondent's execution of their exercise plans. Although additional studies using this measure are not available, the barriers identified mirror those identified and measured in several studies on barriers to exercise behavior in women (Hendry et al., 2010; Huberty et al., 2008; Kowal & Fortier, 2007; Lee & Im, 2010; O'Dougherty et al., 2008; Tavares & Plotnikoff, 2008; Teixeira et al., 2010).

Exercise Frequency. The amount of time dedicated to intentional, planned, structured, repetitive physical activity with the goal of improving or maintaining one's cardiovascular endurance, strength, flexibility and overall health exercise behavior as defined above *(*Caspersen et al.,1985). Exercise frequency recommendations which categorized the participants as adherers were operationally defined as participation in at least 150 minutes of moderate-intensity cardiorespiratory exercise or 75 minutes of vigorous-intensity cardiorespiratory per week (CDC, 2013; Garber et al, 2011; WHO, 2011). The International Physical Activity Questionnaire (IPAQ, 2002) will measure exercise frequency. The IPAQ was developed in 1998 by an International Consensus Group as a cross-country universal instrument to measure levels of physical activity and inactivity in populations around the world (Booth, 2000; Craig, Marshall, Sjostrom, Bauman, Booth, Ainsworth et al., 2003). There are four long form versions and four short form versions of the IPAQ that can be delivered via telephone interview or self-administration (Booth, 2000). The forms assess physical activity of the survey respondent based on their "usual week" or their "last 7 days".

The short form versions of the IPAQ, the IPAQ-SF, were not used in the study because they count everyday physical activity, such as lifting heavy objects, along with

purposeful physical activity, such as exercise, in the total weekly physical activity score. Since the focus of the current study was to examine exercise, Part 5 of the long version 7-Day Recall Self-Administered IPAQ was used instead. Part 5 of the IPAQ is a six-question section specific to recreation, sport, and leisure-time physical activity; it excludes everyday activities and focuses on purposeful physical activity such as exercise (Appendix J). The first two questions assessed walking activity and Q3-6 assessed moderate-intensity and vigorous-intensity physical activities such as jogging, running, aerobics, bicycling, and swimming. For example, Q3 asks, "*Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do vigorous physical activities like aerobics, running, fast bicycling, or fast swimming in your leisure time?* ". Question #4 follows up by asking the survey respondent, "*How much time did you spend on one of those days doing vigorous physical activities in your leisure time?* ".Q5 and Q6 pose the same questions in the same format, but instead assess moderate levels of physical activity. By using the protocol for scoring provided by the IPAQ developers, the total minutes of exercise for the week established exercise frequency levels in the sample. The four-item measurement took 2-3 minutes to complete.

Reliability and validity. Acceptable levels of internal reliability and validity of the IPAQ has been demonstrated in hundreds of studies, across many countries, and in a wide variety of populations; including the population of interest for this study (Barg et al., 2012; Craig et al, 2003;Hallal & Victora, 2004;Lee, Macfarlane, Lam & Stewart, 2011; Medina, Barquera, & Janssen, 2013; Perez, Nie, Ardern, Radhu, & Ritvo,

2013;Prestwich, Perugini, & Hurling, 2009; Scholz, Keller, & Perren, 2009; Schüz, et al., 2012; Tang Nguyen, van der Ploeg, Hardy, & Dibley, 2012; Tappe & Glanz, 2013)

In Craig et al. (2003), researchers reviewed the data from a 12-country study on the reliability and validity study of the IPAQ. The demographics of the collective sample was closely even between male and females all were middle-aged. The findings revealed an adequate test-retest reliability for each of the eight IPAQ forms in all countries in the with most correlation correlations demonstrating sound reliability 0.80 (Craig et al, 2003). Specific to the IPAQ form of choice for this survey, the Spearman correlation coefficient for the United States of America was .96. As related to the population of interest and IPAQ version for the study, Part 5 of the long version 7-Day Recall Self-Administered IPAQ was also used in the Barg et al. (2012) study to assess exercise behavior in middle-aged women. It is important to point out that the IPAQ has been used as an effective instrument to assess physical activity in studies that have tested or have used the HAPA as its research model (Barg et al., 2003; Scholz et al., 2009). This provides added validity to the use of the IPAQ in this study, which also used the HAPA as the model to examine the variables of interest.

Texting Frequency. The participant demographics section (Appendix F) gathered data on the texting frequency of the participants. The question asked, "*How often do you use text messaging on your cell phone?"* Participants will choose one of the following answers: (a)*) hardly ever, (b) occasionally or (c)) frequently*. These answers allowed for participants to be categorized for the analysis of the relationship between texting frequency and perceived usefulness of text messaging as a tool in improving maintenance self-efficacy, action-planning skills, coping planning skills and exercise frequency.

Perceived Usefulness of Text Messages. As defined by Davis (1989), perceived usefulness (PU) is "the degree to which an individual believes that using a particular system would enhance his or her performance." (p. 320). Perceived usefulness of text messages to improve maintenance self-efficacy, action-planning skills, coping planning skills and exercise frequency was measured using a modified version of the TAM (Venkatesh, Morris, Davis, & Davis, 2003). Since its initial development, the TAM has been cited and modified in hundreds of studies in both men and women, adolescents and adults to measure the perceived usefulness in a myriad of technological systems including email, fax, voicemail, computer software programs, telemedicine technology and text messaging (Chung-Hung, 2014; Chutter 2009, Goh, 2011; Mahatanankoon & O'Sullivan, 2008; Or, Karsh, Severtson, Burke, Brown, & Brennan, 2011; Park & Chen, 2007; Wilson, & Lankton, 2004)

Internal reliability. In a test of internal consistency of the TAM assessing perceived usefulness (PU) of two different computer graphics system, Davis (1989) found statistically significant reliability $\alpha = .97$ for the first graphics system $\alpha = .98$ for the second. Both measures employed 7-point Likert scales ranging from 1 (extremely unlikely) to 7 (extremely likely). A study by Goh (2011) employed the TAM to examine the perceived usefulness and intention of a text messaging library search system and differences in the perceived usefulness between the genders. The modified TAM used a 7-point Likert scale (Davis, 1989) with responses ranging from 1 (very unlikely) to 7 (very likely). Statistical analyses revealed high internal reliability of the TAM in assessing perceived usefulness for both the male and female participants, $\alpha = .93$, for males, $\alpha = .93$, and for females, $\alpha = .94$.

In further support of the acceptable reliability in the measurement of perceived usefulness in a modified TAM, Park & Chen (2007) explored the various constructs of the TAM in the acceptance and adoption of the use of smartphones in healthcare in a sample of doctors and nurses with a cross-sectional survey. A measure of internal consistency, statistical analysis revealed high reliability of the TAM in assessing perceived usefulness, $\alpha = .97$.

Validity. As related to the validity of the TAM in assessing perceived usefulness, the aforementioned theories support the model along with the hundreds of technology-based studies that have successfully modified the TAM to assess the same variable. These factors provided an acceptable rationale for its use in the current study. Furthermore, as examples of empirical evidence, a longitudinal study evaluating eight technology acceptance models found the TAM, above all other models, to have a statistically significant higher predictive validity, $p < .001$, of perceived usefulness on user intentions (Venkatesh et al. (2003). In the Park & Chen (2007) study, a regression analysis also revealed a statistically significant predictive validity of perceived usefulness on intentions, $\beta = .90$, $p < .001$.

Given the extensive use of modified versions of the TAM and its high levels of internal consistency, adapting the TAM for the purpose of this study was justified (Chutter, 2009; King & He, 2006; Mahatanankoon & O'Sullivan, 2008; Silva, 2007). The modified TAM (Appendix K) used the same 7 point Likert scale as the original TAM (Davis,1989) with varying degrees of agreement with the statements ranging from 1 (strongly agree) to 7 (strongly disagree) to assess the perceived usefulness of text messaging. Questions in the four item modified TAM include*: (a)) motivational text*

messages would be useful in helping to improve the confidence in my ability to carry out my exercise plans; (b) motivational text messages would be useful in encouraging me to make a detailed plan of when, where, how often, and with whom I will exercise; (c) motivational text messages would be useful in helping me to cope with possible setbacks that may get in the way of carrying out my exercise plans; *and (d) motivational text messages would be useful in helping me to improve my exercise frequency.*

The score range for each measure was 1-7 with a total score range for the entire measurement 4-28. The higher the score, the more useful the survey respondent perceived text messaging to be in improving exercise frequency. The four-item measurement took 1.5 to 2 minutes to complete. To minimize the risk of confusion based on terminology throughout the survey, the modified TAM (Appendix K) used similar or identical language from the scales already used to assess the same variables in the study; the MSE for Exercise scale (see Appendix G, Luszczynska, & Sutton, 2006) and the APCPS-PE scale (see Appendix H, Sniehotta, Schwarzer, Scholz, & Schüz, 2005b).

As related to the use of the TAM in women, studies employing the TAM in exercise behavior research could not be located. However, use of the TAM in the female population is common. A study by Goh (2011) used the TAM to explore gender differences in the perceived usefulness of text messaging as a tool in a library search system. Another study by Wang & Wang (20100) used the TAM to explore gender differences in the acceptance of mobile internet. In the van Schaik, Radford, & Hogg (2010) study, the TAM was used to assess the perceived acceptance of internet based domestic violence help information in female participants both domestic violence survivors and non-victims.

Data Analyses

All data was entered and analyzed using version 23.0 of the IBM SPSS statistics software. Preliminary analysis included basic data screening as a reliability and validity check to ensure there were missing data or errors in data entry. To further clean the data, testing key assumptions for running a multivariate analysis of variance (MANOVA) and key assumptions for a Pearson's correlation reduced the risk of type I and type II errors before the main analyses were performed (Cohen & Cohen, 1983; Tabachnick, & Fidell, 2001).

Analysis No. 1:

$H0_1$: There is no significant difference in mean scores on maintenance self-efficacy, action-planning skills, coping planning skills and the limitation of real-life between adherers and nonadherers.

Ha_1: There is a significant difference in mean scores on maintenance self-efficacy, action-planning skills, coping planning skills and the limitation of real-life between adherers and nonadherers.

To test the first hypotheses that there a significant difference in mean scores on maintenance self-efficacy, action-planning skills, coping planning skills and the limitation of real-life demands between adherers and nonadherers a multivariate analysis of variance (MANOVA) was to be performed, however, because the group of participants categorized as nonadherers was too small (n = 18) for sufficient statistical power (Tabachnick & Fidell, 2013). Instead, independent-groups t tests, corrected for family-wise error, were performed. The measurement instruments were Likert scales whose data will be interval based. For the purposes of analysis, the data was treated as continuous.

After the assumptions for an independent *t* test were met, analysis continued to determine if there were statistically significant interaction effects (Huberty & Smith, 1982; Tabachnick, & Fidell, 2001). The independent *t* test was then followed up with the appropriate post hoc tests to confirm the significance and better interpret the findings (Enders, 2003; Hasse & Ellis, 1987; Warne, 2014).

Analysis No. 2:

$H0_2$: Texting frequency is not related the perceived usefulness of text messaging as a tool in improving MSE action-planning skills, coping planning skills and exercise frequency.

Ha_2: Texting frequency is related to the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency.

To test the second hypothesis, a Pearson's product-moment correlation coefficient was to be used to measure the strength of the linear relationship between texting frequency and the perceived usefulness for each variable (MSE, AP, CPS and EF). However, due to ceiling effects, the texting frequency variable could not be used for the proposed analysis (Tabachnick & Fidell, 2013). As a proxy for the texting frequency variable, the perceived usefulness of texting variable was used instead. The relationship between the perceived usefulness of texting and maintenance self-efficacy, action-planning skills, coping planning skills, real-life demands and exercise frequency was investigated using a Pearson product-moment correlation coefficient. As with the first hypotheses, the measurement instrument was a Likert scale whose data was interval based, but the variables were treated as continuous. After meeting the assumptions for the

Pearson correlation, the analysis was performed to determine if there were any statistically significant positive correlations.

Threats to Validity

Threats to the generalizability, findings and ability for other researchers to replicate the a study can be affected by the treatment of the study's subjects, attributes of the sample, attrition levels, research design, data collection instruments, statistical analysis, interpretation of the data and the conclusions drawn (Adcock, 2001; Campbell & Stanley, 1963; Onwuegbuzie & McLean, 2003). Recognizing and creating a plan for how to address threats to research is crucial in the planning of a research study Morse, Barrett, Mayan, Olson, Spiers (2002).The proceeding discussion will highlight the external and internal threats specific to this study.

External Threats

External threats can jeopardize the extent to which the findings of research can be generalized to the same target population (Creswell, 2009). Specific to this research study, the external threat was population validity. Since snowball sampling is a nonprobability sampling strategy, the findings will not be accurately representative of the general population of interest (Emerson, 2015). However, to improve validity, recruitment of various subgroups via direct sampling helped to derive a more diverse sample (Goodman, 2011).

Internal Threats

Internal threats can diminish the accuracy of conclusions drawn by the researchers of the study (Creswell 2009). There was one internal threat to the study. The threat was selection bias. Selection bias occurs when the sample is not representative of the

population of interest for the study, which in turn threatens the ability of the findings to be generalized. The threat of selection bias was minimized by obtaining an adequate sample size from various subgroups (Babbie, 1990; Fowler, 2002, 2013; Groves & Peytcheva, 2008; McPeake, Bateson, & O'Neill, 2014). The use of the snowball strategy increased access to the population of interest; thereby increasing chances of obtaining an adequate sample size. Additionally, the direct sampling recruitment strategy of diverse subgroups also helped to minimize selection bias.

Threats to Statistical Conclusions

The research design minimized threats to statistical conclusions through three key areas: statistical power, instrument reliability and violations to assumptions. The threat of low statistical power was addressed through the sampling strategy which calculated an adequate sample size through the review of similar studies, Cohen's recommendations (1988) and the use of the G*Power statistical power analyses software (Faul, Erdfelder, Buchner & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007). The reliability for each of the chosen measurement instruments was not a threat as evidenced in the acceptable rates of coefficient for reliability as discussed in the methodology section. Lastly, to account for violations to the assumptions of the selected statistical analysis, data screening and preliminary analyses was conducted as discussed in the preceding section to improve reliability and validity of the conclusions drawn (Hasse & Ellis, 1987; Warne, 2014).

Ethical Procedures

All procedures reflected the basic ethical principles of respect for persons, beneficence and justice as outlined in the DHHS Belmont Report of 1979 (DHHS, 1979).

After approval by the doctoral committee, the proposal was submitted to the Walden University Institutional Review Board (IRB) for review and the ethical approval of the procedures summarized herein. Recruitment and data collection commenced upon approval from the IRB.

During the recruitment process, approval from fitness centers, weight loss clinics, and other organizations was gained to post flyers, make announcements, or send emails to gain access to clients interested in participation in the study. Recruitment materials described inclusion criteria, the length of the study, the incentive provided and researcher contact information in case the prospective participants had questions (Creswell 2009).

As described in the previously discussed data collection section, all data collected was stored on a personal computer with antivirus software and backed up to secure cloud service and a USB flash drive to prevent loss. Additionally, all individual computer files were password protected. Data was accessible to the researcher, doctoral committee, and academic representatives on a need to know basis for the completion of this study. As per federal regulation, 45 CFR 46, after the completion of this research study, data will be kept for a minimum of five years. Since current regulation does not stipulate when data must be destroyed, data will be maintained securely as described above until the data collected no longer holds value for use in future studies the researcher may conduct or articles that may be written. Participants were made aware of the data storage methods and retention period in the informed consent.

Summary

The HAPA Model the Technology Acceptance Model support the variables of interest, sampling strategy, use of existing measures with acceptable rates of reliability,

chosen statistical analysis and plan for addressing potential threats to validity. The use of both models provided a blueprint for the appropriate examination of the research questions of interest and successful replication by future researchers. Additionally, the procedures put in to place to protect participants' rights, privacy and confidentiality ensure both the Walden University IRB requirements were satisfied and the Federal code governing the research of human subjects were not violated.

The research design addressed the lack of attention given to the volitional phase of exercise behavior. As previously emphasized, this study can contribute to the field of exercise behavior by addressing the factors that regulate volitional exercise behavior in the postintentional phase, instead of the more thoroughly investigated preintention motivational phase (More importantly, this knowledge can be applied to the creation of practical, cost efficient, ecological momentary interventions (Heron & Smyth, 2010), such as text messaging, to help women sustain a routine exercise program despite the myriad of real-life demands with which they are faced.

Chapter 4: Results

Introduction

The purpose of this quantitative study was to assess the differences in the self-regulatory factors that mediate exercise behavior between groups of women with different levels of exercise frequency and intensity, which represents adherence or nonadherence to current exercise recommendations (Schwarzer, 2008a; White & Ransdell, 2005; Mendes, Sousa, & Barata, 2011). The secondary aim of this study was to assess the perceived usefulness of text messaging as a tool to improve MSE, action-planning skills, coping planning skills, and exercise frequency (Davis, 1989; Fjeldsoe, Miller, & Marshall, 2010).

Research Questions and Hypotheses

Based on the SCT framework (Bandura, 1977), HAPA (Schwarzer, 1992) and TAM (Davis, 1989), the following research questions and hypotheses were addressed.

RQ1: Is there a significant difference in mean scores on MSE, action-planning skills, coping planning skills and the limitation of real-life demands between adherers and nonadherers?

$H0_1$: There is no significant difference in mean scores on MSE, action-planning skills, coping planning skills and the limitation of real-life between adherers and nonadherers.

Ha_1**:** There is a significant difference in mean scores on MSE, action-planning skills, coping planning skills and the limitation of real-life between adherers and nonadherers.

RQ2: Is texting frequency related to the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency?

$H0_2$: Texting frequency is not related the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency.

Ha_2: Texting frequency is related to the perceived usefulness of text messaging as a tool in improving MSE, action-planning skills, coping planning skills and exercise frequency.

This chapter I will (a) review the data collection process, (b) summarize the recruitment and response rates, and (c) report the characteristics of the descriptive and demographic samples, (d) discuss the preliminary analyses to screen and clean the data,(e) present the results from the primary analysis of the research questions, and (f) summarize the answers to the research questions. In Chapter 5 I will discuss the findings in the context of the study's theoretical foundation.

Data Collection

There were no discrepancies from the proposed data collection procedures in Chapter 3. Walden University IRB approval (No. 06-15-16-0055653) was obtained and quantitative data collection via a 60-question web-based survey was delivered by Survey Monkey. Participants were recruited using posted flyers (see Appendix A), announcements via the Walden University Participant Pool, Facebook, fitness centers, weight loss clinics, and grocery stores. Additionally, the snowball sampling recruitment strategy was used and the selected recruiters who agreed to send the approved

recruitment e-mail (see Appendix B) were given instruction to proceed. Data collection remained open for 4 weeks, during which recruiters sent one reminder e-mail to each of their contacts. To obtain the required sample size, the survey window was extended by an additional 4 weeks. During this time, recruiters shared the approved Facebook post on their personal pages and encouraged their contacts to do the same.

Based on a power analysis conducted using the G*Power statistical power analyses software (Faul, Erdfelder, Buchner & Lang, 2009; Faul, Erdfelder, Lang, & Buchner, 2007) with an alpha level set to .05 and power set to .80, 84 participants would have been a suitable sample size (Cohen, 1992). However, to increase the generalizability of the findings, the target sample size was set to 120. This requirement was met.

At the end of the 8 weeks, 168 individuals started the survey. Of the 168, 144 (86%) were eligible and able to proceed with the study. Of the 24 ineligible participants, most (80%) were disqualified for not meeting the prior exercise requirement. Of the 144 who did meet the eligibility requirements and proceeded with the study, 14 participants (9.7%) dropped out before completing the survey in its entirety. There was a 77% response rate with a total of 130 completed surveys.

Participants

Demographic variables included age, relationship status, having a parent or guardian for children under 17 in the household, being a caretaker for adults 18 or over, education level, employment, prior exercise engagement, racial ethnicity, text messaging frequency and type of community residing in. The sample was representative of the population of interest for this study. As required for inclusion in this study, all

participants were women between the ages of 18-64, employed, exercising for at least one month prior to taking the survey and used text messaging.

The majority of the sample (*N* = 90, 69.2%) was between the ages of 25-45. The majority of participants were in committed relationships and there was a relatively even divide between those who were a parent or guardian of a child/children under the age of 17 living in their household with those without. As related to education level, all participants possessed a high school degree or the equivalent and more than half of the sample obtained a bachelor's degree or higher. As required for eligibility, all participants were employed. The majority of participants *(N* = 93, 71.5%) engaged in exercise for 9 months or more and used text messaging frequently *(N* = 123, 94.6%). Lastly, the racial makeup was primarily White and Black with smaller percentages representing other ethnicities. Overall, 89.3% of the sample represented the Northeast, South, and West regions of the United States of America with a few participants from Midwest and abroad.

Table 2

Frequencies and Percentages for Demographic Descriptors

	N	%
Age		
18-24	7	5.4
25-35	46	35.4
36-44	44	33.8
46-55	22	16.9
56-64	11	8.5
Relationship Status		
Married	69	53.1
In a relationship, but not married	28	21.5
Separated	1	0.8
Divorced	5	3.8
Single	27	20.8
Parent/Guardian to Child Under 17 in Household		
No Children	63	48.5
1 Child	33	25.4
2 Children	24	18.5
3 Children	6	4.6
4 or More Children	4	3.1
Caretaker to Adults 18 & Over in Household		
None over 18	96	73.8
One over 18	18	13.8
Two over 18	12	9.2
Three over 18	4	3.1
Highest Level of Education		
High School degree or equivalent	17	13.1
Some college, but no degree	17	13.1
Associate degree	10	7.7
Bachelor degree	36	27.7
Masters degree	43	33.1
Doctoral degree	7	5.4

Table 3

Frequencies and Percentages for Demographic Descriptors

	N	%
Employment Status		
Employed Full-Time	111	85.4
Employed Part-Time	19	14.6
Engagement in Exercise Before Survey		
1-4 months	30	23.1
5-8 months	7	5.4
9 months or more	93	71.5
Race		
White	59	45.4
Black or African American	43	33.1
Hispanic	18	13.8
Asian	5	3.8
Multiple Races	5	3.8
Texting Frequency		
Hardly Ever	1	0.8
Occasionally	6	4.6
Frequently	123	94.6
Type of Residing Community		
City or urban	51	39.2
Suburban	65	50.0
Rural	14	10.8
Region		
Northeast	50	38.5
Midwest	7	5.4
South	29	22.3
West	37	28.5
International	7	5.4

Preliminary Data Analyses

Data were exported from Survey Monkey and analyzed using IBM SPSS Statistics Version 23 for Windows. Fields unrelated to the variables of interest such as time stamps and web links were removed. Data were then screened to ensure there were no outliers, missing data or errors in data entry (DeSimone, Harms, & DeSimone, 2015; Pallant, 2013; Tabachnick & Fidell, 2013). There were two respondents with out of range values self-reported on the International Physical Activity Questionnaire (IPAQ) - Short Form for Leisure Time Physical Activity (Appendix J) in the open-ended questions of the survey which assessed exercise frequency.

One respondent #4815795289 reported 8 hours of walking per day for 7 days and 10 minutes of moderate physical activity 1 day per week. The second respondent #4899852020 reported 5-6 hours of walking 5 days per week, in addition to 2 hours of vigorous exercise 5 days per week and 1 hour of moderate exercise 5 days per week. The 8 hours of walking for 7 days per week reported by respondent #4815795289 and the 5-6 hours of walking for 5 days per week reported by respondent #4899852020 were removed from the data set. Previous studies have found that some respondents who complete the IPAQ, will count walking they do as a part of their jobs, as part of the leisure-time walking assessed in the questionnaire which results in an overestimation of physical activity (Booth et al. 2003).

Microsoft Excel was used to tabulate scores for all scales. The new scoring variables which represented the totals for each scale were added to the working data file in SPSS and scores from Microsoft Excel were then transferred back into the working data set in SPSS, using a copy and paste feature to ensure accuracy.

Since Type I error and power can be negatively affected when data are not normally distributed, the characteristics of each scale were examined for normality. Although the Kolmogorov-Smirov Sig. values for each measure were less than .05, which suggests a violation of the assumption of normality common in samples over 100, examination of the normal probability plots revealed reasonably straight lines; suggesting a normal distribution (Pallant, 2013). See Figures 8-12.

Figure 8. Normal probability plot for MSE scores.

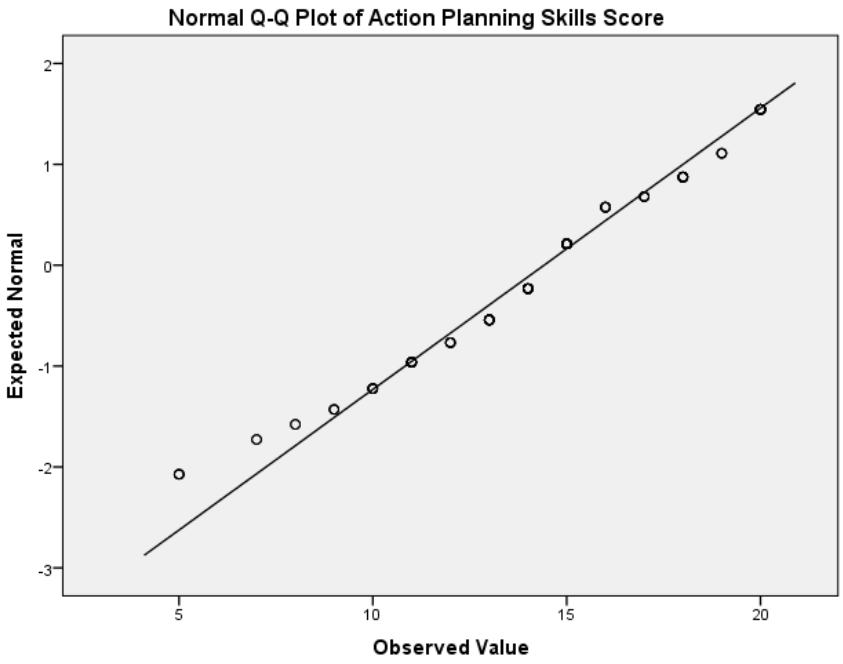

Figure 9. Normal probability plot for action planning scores.

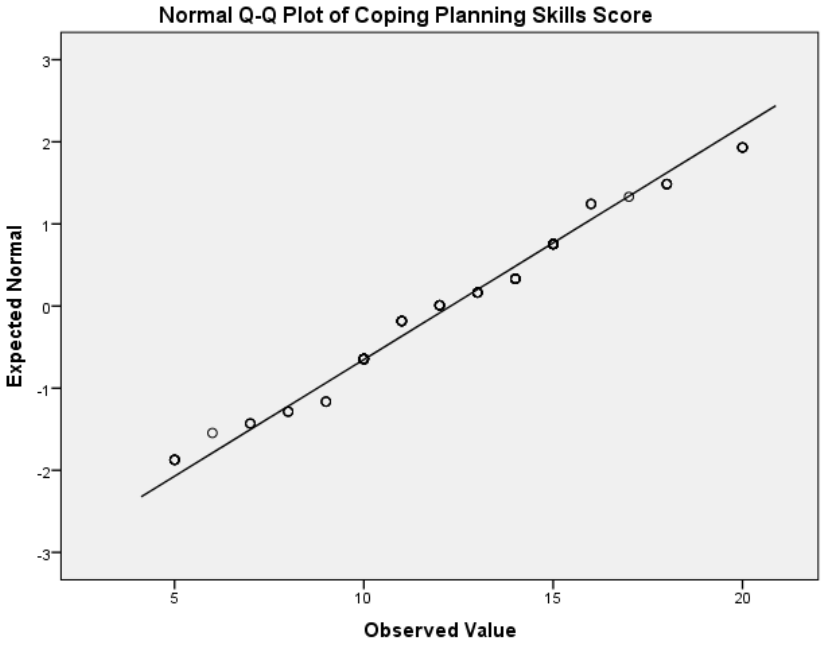

Figure 10. Normal probability plot for coping planning skills scores.

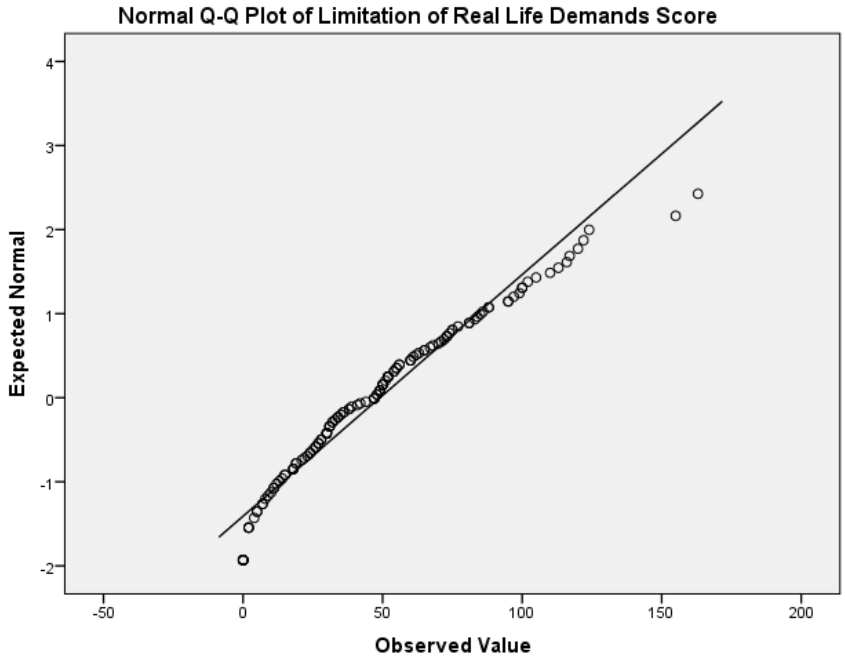

Figure 11. Normal probability plot for limitation of real-life demand scores.

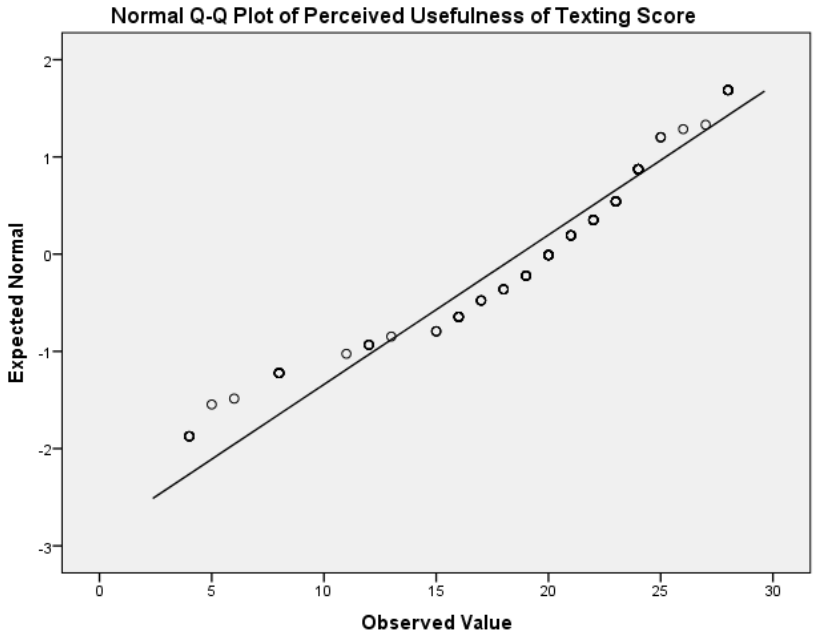

Figure 12. Normal probability plot for perceived usefulness of texting scores.

Further analysis revealed that the distribution of the scores was within acceptable ranges for skewness (< 1) and kurtosis (< 2) for sample sizes over 100 (Blanca, Arnau, López-Montiel, Bono, & Bendayan, 2013; Tabachnick & Fidell, 2013). Skewness for scales ranged from -.79 through .77 and kurtosis for scales ranged from -.12 through .35. See Table 4.

Table 4

Central Tendency, Standard Deviation, Skewness, Kurtosis and Reliability

Scale	*M*	*SD*	Median	Skewness	Kurtosis	Reliability
Maintenance self-efficacy	12.22	2.56	12.00	-.27	.26	.89
Action planning	14.42	3.59	15.00	-.43	.21	.89
Coping planning	12.29	3.52	12.00	.06	-.15	.92
Limitation of real-life demands	49.03	34.80	47.00	.77	.35	.91
Perceived usefulness of texting	18.72	6.50	20.00	-.79	-.12	.95

To ensure equal variances in the sample for testing for the first hypothesis, a Levene's test for equality of variances was performed on the scales of interest. Results indicated the assumption of equal variances was only violated in the measure for the Limitation of Real-life Demands. Due to this violation, the t-value in the row of the SPSS data output labeled "equal variances not assumed" was used in the proceeding analysis (Pallant, 2013). See Table 5.

Table 5

Levene's Test for the Equality of Variances

Scale	*F*	*Sig*
Maintenance self-efficacy	.007	.934*
Action planning skills	.179	.673*
Coping planning skills	3.706	.056*
Limitation of real-life demands	4.619	.033

Note. *Sig > 0.05 = Equal variances assumed.

Results

Results H_1

To test the hypothesis that there would be significant difference in mean scores on maintenance self-efficacy, action-planning skills, coping planning skills and the limitation of real-life between adherers and nonadherers, one-way between groups multivariate analysis of variance (MANOVA) could not be performed because the group of participants categorized as nonadherers was too small (n = 18) for sufficient statistical power (Tabachnick & Fidell, 2013). Instead, independent-groups t tests, corrected for family-wise error, were performed to explore differences in mean scores on maintenance self-efficacy, action-planning skills, coping planning skills and the limitation of real-life demands between adherers (n = 112) to exercise recommendations and nonadherers *(*n = 18). As presented above in Figures 1-5 and Table 5, assumptions of normal distribution and homogeneity of variance of were met. Results showed that there were statistically significant differences in mean scores between adherers and nonadherers in each of the

four tested variables when interpreted with a Bonferroni correction for family-wise error of $p < .0125$ (0.05/4) (Tabachnick & Fidell, 2013). See Table 6.

Table 6

Independent t *Tests*

Scale Score	*t(128)*	*p*	Mean Difference	*CI*
Maintenance self-efficacy	-5.49	< . 001	-3.23	-4.39 to -2.06
Action planning skills	-2.57	.011	-2.29	-4.05 to -.52
Coping planning skills	-2.91	.004	-2.53	-4.25 to -.81
Limitation of real-life demands	3.30	.004	34.97	12.86 to 57.08

Note. Interpreted with a Bonferroni correction for family-wise error of $p < .0125$

In follow-up analyses, one-way between groups analyses of variance (ANOVA), corrected for family-wise error, were performed to assess exercise adherence broken into three levels of adherence based on exercise intensity as defined by the IPAQ. Of the 112 adherers, 74 were moderate exercisers and 38 were vigorous exercisers. The nonadherers were grouped as low exercisers (n = 18). There was a statistically significant difference in mean scores in each of the four variables when interpreted with a Bonferroni correction for family-wise error of $p < .0125$ (0.05/4). Additionally, calculated effect sizes ranged from medium to large (Cohen, 1988). Mean scores and standard deviations are presented in Table 7 and results of the one-way ANOVA are presented in Table 8. Findings revealed statistically significant differences in maintenance self-efficacy, action-planning skills, coping planning skills and the limitation of real-life demands between the

participants when the two exercise adherence groups were split into three levels of adherence based on exercise intensity.

Table 7

Mean Scores, Standard Deviations & Confidence Intervals for Low, Moderate & Vigorous Exercisers

Scale	Intensity	*N*	*M*	*SD*	*Lower CI*	*Upper CI*
MSE	Low	18	9.44	2.55	8.18	10.71
	Moderate	74	12.22	2.08	11.73	12.70
	Vigorous	38	13.55	2.41	12.76	14.34
APS	Low	18	12.44	3.74	10.59	14.30
	Moderate	74	14.34	3.06	13.63	15.05
	Vigorous	38	15.50	4.10	14.15	16.85
CPS	Low	18	10.11	2.93	8.65	11.57
	Moderate	74	12.08	3.22	11.33	12.83
	Vigorous	38	13.74	3.77	12.50	14.98
LRLD	Low	18	79.17	43.22	57.67	100.66
	Moderate	74	48.34	30.54	41.26	55.41
	Vigorous	38	49.04	30.16	26.21	46.04

Note. MSE = Maintenance Self-Efficacy, APS = Action Planning Skills, CPS = Coping Planning Skills, LRLD = Limitation of Real-life Demands

Table 8

One-Way Analysis of Variance (ANOVA) for Low, Moderate and Vigorous Exercisers

Score		Sum of Sq	df	Mean Square	*F*	*p*
MSE	Between Groups	206.151	2	103.076	20.44	< .01
	Within Groups	640.380	127	5.042		
	Total	846.531	129			
APS	Between Groups	115.071	2	57.535	4.73	.01
	Within Groups	1544.498	127	1544.498		
	Total	1659.569	129			
CPS	Between Groups	168.233	2	84.116	7.48	< .01
	Within Groups	1428.660	127	11.249		
	Total	1596.892	129			
LRLD	Between Groups	22705.412	2	11352.706	10.80	< .01
	Within Groups	133515.396	127	1051.302		
	Total	156220.808	129			

Note. Interpreted with a Bonferroni correction for family-wise error of $p < .0125$.

To investigate where the significant differences in mean scores between exercise groups existed, post hoc tests using the Scheffe were performed (Scheffe, 1999; Tabachnick & Fidell, 2013). In the first measure of maintenance self-efficacy, the mean score between the each of the groups was statistically significant. With each exercise group comparison ($p < .05$). Specific to the measure of action planning skills, the mean score between the low exercisers and vigorous exercisers were the only statistically significant ($p = .011$) group difference. In the measure of coping planning skills, the mean score between the low exercisers and vigorous exercisers were the only statistically significant ($p = .001$) group difference. Lastly, in the measure of limitation of real-life demands, there was a statistically significant difference between the mean score for low exercisers and moderate exercisers ($p = .002$), and the vigorous exercisers ($p = .000$).

Results H_2

To test the second hypothesis that texting frequency is related to the perceived usefulness of text messaging as a tool in improving maintenance self-efficacy, action-planning skills, coping planning skills and exercise frequency, Pearson Product-Moment correlations were performed. Due to ceiling effects, the texting frequency variable could not be used for the proposed analysis (Tabachnick & Fidell, 2013). Of the 130 participants, 123 self-reported their texting frequency as “frequently”, six participants self-reported their texting as “occasionally” and one participant self-reported as “hardly ever”. Instead, the relationship between the perceived usefulness of texting and maintenance self-efficacy, action-planning skills, coping planning skills, real-life demands and exercise frequency was investigated using a Pearson product-moment

correlation coefficient. There were no violations of assumptions of normality, linearity and homoscedasticity (Tabachnick & Fidell, 2013).

Results produced a positive relationship, $r = .177$, $N = 130$, $p < .05$, between participants perceived usefulness of text messaging as a tool to improve their adherence to exercise and their perception of how much their "real-life" demands limited their ability to carry out their exercise plans. High levels of perceived usefulness of texting were positively associated with higher scores of limitation of real-life demands reported. None of the other variables (maintenance self-efficacy, action-planning skills, coping planning skills, and exercise frequency) were statistically significantly related to the perceived usefulness of texting. Findings are presented in Table 9.

Table 9

Correlations Between Perceived Usefulness of Texting and Maintenance Self-Efficacy, Action-Planning Skills, Coping Planning Skills, Limitation of Real-life Demands and Exercise Frequency

		MSE	APS	CPS	LRLD	EF
PUT	Pearson Correlation	-.073	-.019	-.057	.177*	-.064
	Sig. (2-tailed)	.407	.832	.517	.045	.467

Note. PUT= Perceived Usefulness of Texting, MSE = Maintenance Self-Efficacy, APS = Action Planning Skills, CPS = Coping Planning Skills, LRLD = Limitation of Real-life Demands, EF = Exercise Frequency.
*Significant at $p < 0.05$

Summary of Findings

Overall, the sample *(N* = 130) for this study was representative of the population of interest for this research study. All participants were women who were employed, used

text messaging, and engaged in exercise at least 1 day per week. The sample primarily represented American women, mostly college-educated, White and Black racial ethnicities representing the Northeast, Southern and Western regions of the United States and met the guidelines for exercise adherence as recommended by the DHHS, American College of Sports Medicine, (Garber et al, 2011), CDC and American Medical Association (CDC, 2013) and the WHO, (2011).

Independent *t* test results from the first null hypothesis, "there is no significant difference in mean scores on maintenance self-efficacy, action-planning skills, coping planning skills and the limitation of real-life between adherers and nonadherers", revealed statistically significant differences in the mean scores of each variable; therefore, the null hypothesis was rejected. Follow-up analyses from an ANOVA revealed statistically significant differences in the same four variables between the participants when the two exercise adherence groups were split into three levels of adherence based on exercise intensity.

Due to ceiling effects (Tabachnick & Fidell, 2013), the texting frequency variable could not be used to test the second null hypothesis, texting frequency is not related to the perceived usefulness of text messaging as a tool in improving maintenance self-efficacy, action-planning skills, coping planning skills and exercise frequency. Instead, the relationship between the perceived usefulness of texting and the other variables was investigated instead. Findings from a Pearson product-moment correlation coefficient revealed a statistically significant relationship between the perceived usefulness of texting and the limitation of real-life demands.

In Chapter 5, I discuss the findings in the context of the study's theoretical foundation, highlight similarities to and/or differences from previous findings in exercise behavior research in women, make recommendations for future research, and discuss the implications for social change.

Chapter 5: Conclusion

Introduction

The primary purpose of this quantitative study, based on SCT, was first, to assess the difference in mean strength of maintenance self-efficacy, action planning skills, coping planning skills and the limitation of real-life demands between women who adhere to exercise frequency recommendations and women who also exercise, but do not adhere to exercise frequency recommendations (Schwarzer, 2008a; White & Ransdell, 2005; Mendes, Sousa, & Barata, 2011). The secondary purpose was to identify whether texting frequency was associated with the perceived usefulness of text messaging as a tool in improving the self-regulation of exercise frequency (Davis, 1989; Fjeldsoe, Miller, & Marshall, 2010). As related to the first purpose, the HAPA (Schwarzer, 1992; 2001) model provided additional theoretical support because it allowed for a quantitative assessment of the first research question. Unlike other health behavior models, which only allow for examination of the preintention motivational factors (Annesi, 2004; Anshel, 2007; Connor, 2008; Rothman, 2000; Schwarzer 2008), HAPA also allows for examination of the postintention volitional factors (Schwarzer, 1992; 2001). TAM (Venkatesh, Morris, Davis, & Davis, 2003) provided additional support for the second research question offering insight into the potential for the use of texting as a tool in regulating exercise behavior.

Due to the low percentage of women in the volitional phase of exercise behavior (NCHS, 2016), a snowball sampling strategy increased the odds of obtaining an adequate sampling size for data collection from working women between the ages of 18 and 64 who were in the volitional phase of exercise behavior (Emerson, 2015; Goodman, 2011).

A 60-question web-based, cross-sectional Likert-scale survey was used to collect data on each variable of interest. An independent *t* test tested the first hypothesis and a Pearson's correlation assessed the second hypothesis.

The final data set included 130 completed surveys. Independent *t* test results from the first null hypothesis, there is no significant difference in mean scores on maintenance self-efficacy, action-planning skills, coping planning skills and the limitation of real-life demands between adherers and nonadherers, revealed statistically significant differences in the mean scores of each variable. Follow-up analyses from an ANOVA also revealed statistically significant differences in the same four variables between participants when the two exercise adherence groups were split into three levels of adherence—low, moderate, vigorous—based on exercise intensity.

Because of ceiling effects (Tabachnick & Fidell, 2013), the texting frequency variable could not be used to test the second null hypothesis. Instead, the relationship between the perceived usefulness of texting and the other variables was investigated using a Pearson product-moment correlation coefficient. Results revealed a statistically significant relationship between the perceived usefulness of texting and the limitation of real-life demands.

Interpretation of Findings

Overall, results support the grounding theories for this study and findings in current and past literature (Bandura, Annesi, & Whitaker, 2010; Barg et al., 2012; Brittain et al., 2012; Dacey et al., 2003; Renner et al., 2012; Schwarzer, 1992). As discussed in previous chapters, much of the research in the field has given more attention to the preintention motivational phase of exercise behavior than to the postintention volitional phase

(Annesi, 2004; Anshel, 2007; Connor, 2008; Rothman, 2000; Schwarzer 2008). Furthermore, research studies that have explored the volitional phase often focus on comparing differences between samples in the two phases as opposed to differences that may lie between individuals in the same phase. The present study focused solely on the volitional phase and created subgroups of adherence and subgroups of exercise intensity to explore further differences. Therefore, the findings presented from the current study not only reinforce past and current research findings, but also extend knowledge in the field of exercise behavior. The proceeding section will compare the findings of the study with research discussed in Chapter 2 as related to each variable of interest for this study.

Maintenance self-efficacy. MSE, the type of self-efficacy present in the volitional phase of health behavior change, is one's belief in their ability to maintain a particular behavior despite perceived barriers (Schwarzer, 1992, 2008a). Similar to the role action self-efficacy plays in the motivational phase of behavior change by facilitating the initiation and adoption of a new behavior, MSE, as its name implies, facilitates one's ability to sustain and adhere to a new behavior over a course of time in the volitional phase. Research has found strong correlations between high levels of MSE and exercise behavior (Annesi & Whitaker, 2010; Hankonen, Absetz, Ghisletta, Renner, & Uutela, 2010; Jung & Brawley, 2011; Martin Ginis & Bray, 2010; Murray, Rodgers, & Fraser, 2009; White & Ransdell, 2005).

As related to the same phase of exercise behavior change of interest for this study, a quantitative, longitudinal study by Renner et al. (2012) exploring the correlation of phase specific self-efficacy to exercise behavior initiation and maintenance, revealed a positive correlation between increases in MSE and adherence to exercise, $p < .001$. As

related to the findings of the current study, participants who reported higher levels of MSE also reported higher levels of exercise adherence. In fact, post hoc analyses grouping the adherers and nonadherers into subgroups of exercise intensity levels revealed statistically significant differences in MSE between the low, moderate and vigorous exercisers.

In a mixed methods study by Dacey et al., (2003) which, like the current study, employed the SCT as the theoretical foundation, researchers explored levels of physical activity self-efficacy in women in the volitional stage of exercise behavior. Similar to the grouping used in post hoc analysis for the current study, Dacey et al., 2003 also grouped their participants based on exercise intensity levels (moderate and vigorous). Quantitative findings revealed high degrees of self-efficacy in both groups, (M = 3.69, SD = .79), but significantly higher in the vigorous exercisers (M = 3.87) than in the moderate exercisers (M = 3.44). Findings from the current study mirror these results and support the claims made by the SCT (Bandura, 1977) and HAPA (Schwarzer, 1992; 2001) which both suggest that the lower the confidence level in one's ability to carry out the intended exercise (maintenance self-efficacy), the less likely they are to covert that intention into actual exercise behavior. The higher ones confidence in their ability to carry out their exercise plans, the more likely they are to execute such. Findings in the analysis of MSE in this study support past research and the viewpoints set forth by the grounding theories for this study (Annesi & Whitaker, 2010; Dacey et al., 2003; David, et al., 2014).

Action planning and coping planning skills. Planning, as put forward by Gollwitzer (1996) is a psychological strategy that directs the course of action from the inception of goal intentions during the motivational phase of behavior change, into the

actual implementation of the goal intentions into the proceeding volitional phase. In the motivational phase of exercise behavior, individuals with a desire to adopt or increase exercise must have sufficient planning skills to carry out their exercise plans. These "skills" are known as action planning skills (Leventhal, Singer, & Jones, 1965; Gollwitzer, 1996). Once an individual implements his or her exercise plans, they must then maintain and further develop their planning skills to overcome the countless deterrents that threaten to hinder the maintenance of their exercise behavior in the volitional phase. It is this phase wherein the deployment of coping planning skills to anticipate and combat perceived barriers becomes crucial to exercise adherence (Gollwitzer, 1996; Reuter, Ziegelmann, Wiedemann, Lippke, Schuz, & Aiken, 2010; Sniehotta et al., 2005a; Sniehotta et al., 2005b; Ziegelmann, Lippke, & Schwarzer, 2006).

The significance of planning skills in the maintenance of exercise behavior has been evidenced in several studies (Connor, Sandberg, & Norman, 2010; Martin et al., 2010; Reuter et al., 2010; Schüz et al., 2012). In a longitudinal planning intervention study evaluating planning as a predictor of exercise behavior, findings revealed action planning as a significant predictor of exercise behavior, $p < .001$, during each follow-up measurement point during the duration of the study (T3, T4, & T5, Ziegelmann et al., 2006). Interestingly, coping planning proved to be an even stronger predictor of exercise behavior, $p < .05$, in the latter follow-ups (T4 & T5); proving the crucial role of coping planning in the volitional phase.

As related to findings from the current study, the independent *t* test which compared adherers to non adherers revealed statistically signficant differences between the groups in both action planning and coping planning. These results suggest that

women with stronger planning skills were more successful in carrying out their exercise plans than those with lower scores in planning skillls. However, when further grouped by exercise intensity (low, moderate and vigorous) in post hoc analysis, statistical significance was only found between the low and vigorous exercisers. There were no stastically significant differences between the moderate & low exercisers or the moderate and vigorous exercisers. These findings support the HAPA (Schwarzer, 1992; 2001) and the vast majority of past studies on the predictibility of both action planning and coping planning in exercise behavior (Lippke et al., 2004; Reuter et al., 2010; Scholz et al., 2008; Sniehotta, et al., 2005b; Sniehotta, et al., 2006,).

Limitation of real-life demands. Several barriers can interfere with one's intentions and plans to exercise (Bandura, 1997). A review of the literature in Chapter 2 revealed perceived barriers as the most significant obstacle faced by women of various socio-demographic characteristics (Brittain, Dinger, Classen, Sage, & Han, 2012; Hendry et al., 2010; Kirchhoff, Elliott, Schlichting, & Chiun, 2008; Kosteva, et al., 2012; Simonavice & Wiggins, 2008; Tavares & Plotnikoff, 2008; Teixeira et al., 2010). The most commonly reported barrier perceived by women who were not able to adhere to exercise was linked to real-life demands (Huberty et al., 2008; Kowal & Fortier, 2007).

However, as evidenced by the Huberty et al. (2008) study and the Kirchoff et al. (2008) study, the perception of real-life demands as barriers is different from what actually obstructs exercise adherence (Bandura, 1997; Carron, Hausenblas, & Eastabrookes, 2003; Jackson, 1988). Unfortunately, the perception of real-life demands as barriers make their influence to limit exercise engagement more powerful that it actually is (Bloomquist et al., 2008).Women who have been able to maintain exercise for

longer periods of time, have proven that real-life demands on time can make exercise adherence more challenging, but not unadaptable. Findings from the current study support this literature as well.

The independent *t* test which compared adherers to non adherers revealed statistically signficant differences between the groups in the number of real-life demands they reported as barriers to being able to carryout their exercise plans. Women who adhered to exercise recommendations reported fewer real-life demand barriers than those who did not adhere. However, when further grouped by exercise intensity (low, moderate and vigorous) in post hoc analysis, statistical significance was only found between the low and vigorous exercisers and the low and moderate exercisers. There were no statistically significant differences in the reporting of barriers between the moderate and vigorous exercisers. It is important to note that both the moderate and vigorous groups of exercisers were in the group of sample that adhered to exercise recommendations. These findings suggest that while exercise frequency is related to the the perception of real-life demands as barriers, exercise intensity may not be as strongly, if at all correlated. Since the perception of real-life demands in women in the volitional phase has not been as thoroughly studied as women in the motivational phase, I could not locate literature exploring the relationship betweeen exercise intensity and the perception of real-life demands as barriers. This highlights a gap in the literature and need for further investigation.

Perceived usefulness of text messages. Several studies and theories such as the SCT suggest that perceived usefulness drives intentions (Bandura, 1982; Chung-Hung, 2014; Davis, 1985, 1993; Goh, 2011, Park & Chen, 2007: Swanson, 1982; Venkatesh et

al., 2003). It was proposed that the link between perceived usefulness and behavior intentions, coupled with findings from the secondary purpose of the current study could provide useful data to justify further investigation into use of text messaging in future exercise intervention based studies (Holden & Karsh, for 2010). The women in the study who perceived text messaging to be useful in increasing their exercise frequency and their maintenance self-efficacy, action-planning skills, coping planning skills and perception of real-life demands limitation, would be more inclined to use texting as a support tool (Davis, 1989).

However, as discussed in Chapter 4, due to ceiling effects, the texting frequency variable could not be used for the proposed analysis (Tabachnick & Fidell, 2013). Instead, the relationship between the perceived usefulness of texting and maintenance self-efficacy, action-planning skills, coping planning skills, real-life demands and exercise frequency was investigated using a Pearson product-moment correlation coefficient. The analysis revealed a positive relationship, between the participants' perceived usefulness of text messaging as a tool to improve their adherence to exercise and their perception of how much their real-life demands limited their ability to carry out their exercise plans. High levels of perceived usefulness of texting were positively associated with higher scores of limitation of real-life demands reported. None of the other variables had a statistically significant relationship to the perceived usefulness of text messaging. These findings suggest that text messaging, as a tool in exercise adherence, would be most beneficial to those women who report more barriers to successfully carrying out their exercise plans.

Limitations of the Study

The first limitation, ceiling effects, prevented analysis of the second hypothesis which sought out to assess the relationship between texting frequency and the perceived usefulness of text messaging as a tool in improving the primary variables of interest (maintenance self-efficacy, action-planning skills, coping planning skills and exercise frequency). Of the 130 participants, 123 self-reported their texting frequency on the texting measure as "frequently", six participants self-reported their texting as "occasionally" and one participant self-reported as "hardly ever". With so many participants scoring at the higher end of the scale, the participants could not be grouped for analysis due to ceiling effects (Hessling, Traxel, & Schmidt, 2004; Tabachnick & Fidell, 2013). As discussed above and in Chapter 4, as a proxy for the texting frequency variable, perceived usefulness was analyzed instead.

A second limitation lied in the data collection method. There is an inherent subjectivity in self-report measures, which directly effects the accuracy of survey respondents' answers (Baranowski, 1988; Dyrstad, Hansen, Holme & Anderssen, 2014; Prince, Adamo, Hamel, Hardt, Gorber, & Tremblay, 2008). More specifically, retrospective self-reporting, as with the recalling of exercise frequency during the past 7 days in the International Physical Activity Questionnaire (IPAQ, presents an even greater limitation in accuracy such as overestimation (Lee, Macfarlane, Lam, & Stewart, 2011; Sallis & Saelens, 2000). However, as pointed out in Chapter 3, the test-retest reliability of the IPAQ and the other self-report measures were acceptable and therefore the results from these measures are considered reliable.

A third limitation stems from the primary recruitment strategy; snowball sampling. Snowball sampling is a nonprobability sampling strategy, which presents a threat to population validity and selection bias; therefore, the findings from this study will not provide a completely accurate representative of the general population of interest (Babbie, 1990; Emerson, 2015; Fowler, 2002; 2013). However, to improve validity, recruitment from various subgroups via direct sampling helped to derive a more diverse sample (Goodman, 2011). As revealed in the demographics, 89.3% of the sample represented the Northeast, South, and West regions of the United States of America with a few participants from Midwest and abroad representing a geographically diverse American sample. Racially the sample was an even mix of White and Black women with smaller percentages representing other ethnicities. Marriage status was also mixed with approximately half (*N*= 69, 53%) married and the other half (*N* = 61, 47%) not married. Participants were also evenly divided in parental status with approximately half (*N*=63, 48.5%) without children and the other half with at least one child (*N*=67, 51.5%). However, length of time in the volitional phase of exercise was not as varied. The majority of participants *(N* = 93, 72%) engaged in exercise for 9 months or more. Although this sub group within the volitional phase was not an area of interest for the study, it may have slightly biased the findings.

Recommendations

Expanding our understanding of the social-cognitive factors in the postintention volitional phases of exercise health behavior change between adherers and nonadherers in the volitional phase is key to the advancement of research in health behavior theory because it provides a more complete understanding of exercise behavior along the entire

behavior change continuum (Anshel, 2007; Michie & Johnston, 2012). This research, if grounded in theoretical foundations of behavioral science, can provide program developers, health educators, health psychologists, and other practitioners with the knowledge needed to create innovative, yet cost efficient strategies to improve self-regulatory processes and minimize barrier perception and barrier limitation in exercise behavior. This in turn will improve the long term efficacy of exercise behavior interventions aimed at helping women who have bridged the intention-behavior gap, but need support in helping to sustain their newly adopted exercise regimen and meet the industry exercise frequency recommendations for optimal health (David, Pennell, Foraker, Katz, Buckworth & Paskett, 2014; Tappe & Glanz, 2013).

Since the findings from the current study revealed statistically significant differences in the regulation of volitional exercise behavior between the women when grouped by exercise adherence levels and exercise intensity levels, future research can build on this study by continuing to focus on the differences between these volitional groups (adherers vs nonadherers). As supported in past research, women in the volitional phase also need support in protecting their exercise plans (Brittain et al., 2012; Huberty et al., 2008; Teixeira et al., 2010). Interventions addressing all of variables of interest of this study are necessary.

As evidenced in post-hoc analysis from the first hypothesis, women who were low intensity exercisers had: (a) significantly lower levels of confidence in their ability to carry out their exercise plans (maintenance self-efficacy); (b) limited ability in planning the who, what, when, where and how's of exercise (action-planning skills); (c) inadequate planning for potential hindrances to their exercise plans (coping planning

skills); and (d) a perception of their real-life demands as more obstructive to their exercise plans (limitation of real-life demands).

Another recommendation for future research is in the use of text messaging as a real-time intervention. Data from the current study revealed that women who perceived their real-life demands to impede more greatly on their exercise plans would be more likely to participate in a text messaging intervention designed to improve their exercise adherence levels. As suggested by the TAM and the SCT, perceived usefulness drives intentions (Bandura, 1982; Chung-Hung, 2014; Davis, 1985, 1993; Goh, 2011, Park & Chen, 2007: Swanson, 1982; Venkatesh et al., 2003). Research using the SCT as its grounding theory and the TAM as its model could investigate this postulation in a sample of women who are in the volitional phase of exercise, but do not meet frequency or intensity recommendations due to self-reported limitation of their real-life demands as barriers.

Findings would further contribute to the gap in research regarding the volitional phase of exercise behavior. Findings also build upon the growing literature examining use of technology to improve health behaviors by way of ecological momentary interventions (EMI) which are designed to modify an individual's behavior in naturalistic settings when environmental and personal determinants are influencing behavior in real-time as one goes about their day-to-day activities (Heron & Smyth, 2010).

Implications for Social Change

Twenty percent of women, aged 18-64, meet the federal physical activity guidelines for aerobic and muscle strengthening activities. Even more concerning, is that over 30% of American women ages 20 are obese (NCHS, 2016). The list of health

complications directly or indirectly caused by inadequate exercise and obesity is extensive, covering both physiological and psychological areas of wellness (Heron, 2012). As discussed in Chapter 2, there is an increased prevalence of heart disease, type 2 diabetes, some cancers and Alzheimer's in women. As related to other health conditions, women also have a higher occurrence of kidney disease, arthritis, migraines, and lower back pain than their male counter parts (Schiller et al., 2012). In addition to the increased prevalence of chronic physiological diseases and conditions, women are 70% more likely to experience depression than men (Kessler, Chiu, Demler, Walters, 2005) and are twice as likely to suffer from panic disorder and generalized anxiety disorder (Church & Lucey, 2009; McLean, Asnaani, Litz, & Hofmann, 2011; Pigott, 2003).

Each of the aforementioned conditions has been directly or indirectly linked to a lack of exercise (Baer et al., 2011; Blackwell, Lucas, Clarke, 2014; Eyler et al., 2003; Dacey et al., 2003; Iwasaki, MacKay, & Mactavish, 2005). As highlighted in Chapter 1, the low levels of exercise adherence is a societal problem because collective data has ranked overweight/obesity as the third highest risk factor for death, and low levels of physical activity as the fourth highest risk (Danaei, Ding, Mozaffarian, Taylor, Rehm, Murray et al.,2009). Given the crucial role women play in the management of the families and communities of our society, we have an obligation to help them live healthier lives and reduce the growing rates of mortality from preventable diseases. The effects of unhealthy women not only affect an individual's life, but also burden our society as well (Hill, 2009; Sassi, 2010).

With most American women juggling both family and careers, poor health outcomes become a liability not only for the family, but for the businesses that provide

their income, and often times their health insurance as well. Developing and implementing low cost, real-time, practical interventions to help women maintain the recommended amount of exercise, while upholding their many roles will aid in reducing mortality rates, improve the quality of life and ultimately reduce healthcare costs in working women. (Kwasnicka, Presseau, White, & Sniehotta, 2013; Mitche & Johnston, 2012). Additionally, the benefits from increased exercise frequency in American women will also help to alleviate the stress associated with the challenging and time consuming lives they lead.

Beyond the improvements to health status and health care costs, findings from research that builds upon the current study can also help to shift social and cultural attitudes towards exercise and women (Spotswood & Tapp, 2010). Instead of viewing exercise as a luxury or an unessential time-consuming task, shifting cultural views and negative self-efficacy towards exercise may allow people to view the importance of regular exercise to their quality of life, especially in women. As supported by past research, the SCT and this current study, interventions must focus on helping working women to incorporate routine exercise into their already hectic schedule by (a)boosting their confidence, (b) improving their planning skills and (c) shifting their perception of real-life demands as barriers. As exercise adherence levels increase, cultural mindsets regarding exercise will no longer be identified as a socio-class specific behavior or a gender-specific luxury, thereby further expanding the reach of this study by increasing its societal application (Cugelman, Thelwall, & Dawes, 2011).

Conclusion

Bridging the intention behavior gap in exercise is not as simple as the ease with which the decision to start exercising is asserted. In fact, the declaration of "I'm going to start working out," can be considered quite simple when compared to the complexity associated with actually executing these intentions and maintaining them. As discussed in Chapters 1 and 2, exercise behavior and routine adherence to such is facilitated by complex cognitive processes such as taking initiative, which stems from self-efficacy, planning (action and coping), maintaining, and coping with hindrances (Bandura, 1991; Luszcynska & Schwarzer, 2005). Despite the long held belief that it takes 21 days to successfully adopt a new behavior (Ronis & Yates, 1988), a study by Lally, van Jaarsveld, Potts, & Wardle (2010) assessing the adoption of healthier drinking, eating and exercise habits revealed that it can take anywhere between 18-254 days for the successful transition of an unhealthy habit into a healthy habit. These findings are supported by the 50%-60% dropout rate individuals who start an exercise program are likely to experience within the first 6 months (Annesi & Unruh, 2007; Dacey et al., 2003; Huberty et al, 2008; Marcus & Forsyth, 2003; Pridgeon & Grogan, 2012; Wilson & Brookfield, 2009).

Given the behavior complexity affected in the broad span of habit formation, more specifically exercise; behavioral science can play a valuable role in addressing the need for interventions aimed at helping individuals sustain their newly adopted exercise regimens. As evidenced in the use of the SCT (Bandura, 1977) as the grounding theory and the HAPA (Schwarzer, 1992; 2001)) as the guiding model for this study, use of behavioral theories can provide the scientific framework necessary to expand our understanding of exercise behavior in the volitional phase and in turn, lead to the

development of efficacious interventions. Findings from this study support past literature, but also highlight a need for further investigation into the volitional phase where exercise is maintained. Current literature lacks an understanding of the differences between women who have bridged the intention behavior gap in exercise behavior, but vary in their levels of exercise frequency. In other words, we have a solid understanding of what gets women exercising, but we need to expand this understanding in to what keeps them exercising.

As adamantly stated by Bandura, the founding theorist of the SCT, "identifying cognitive predictive factors of health behavior without effective guides on how to change them will not do much to improve human health" (Bandura, 2005, p. 250). As educators and researchers, it is not enough to be knowledgeable, it is our societal duty to apply what we know to advocate for, develop, and implement interventions to help women make exercise a part of their lifestyles, not temporary resolutions. Successfully increasing exercise frequency in American women could in fact help the "job" of exercise appear less burdensome and more rewarding. Ultimately, it could lead to a cultural shift in our societal beliefs and behaviors. Just consider what it would be like if Americans found it more worthwhile to take a walk for good health, instead of popping a pill.

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Appendix A: Recruitment Flyer

Do you exercise? Are you a woman? Your input is needed!

RESEARCH STUDY ON EXERCISE

If you can answer "yes" to all of the questions below, your participation is needed in a voluntary, confidential, anonymous academic research study on exercise adherence.

- *Are you a working woman ages 18-64?*
- *Have you been exercising at least 1 day per week for at least 4 weeks?*
- *Do you use text messaging on your cell phone?*

If you have answered "yes" to each of the questions above, you are invited to complete a 6-8 minute survey. As a token of appreciation, you will receive a list containing 5 workout playlists, each with 10-15 hand selected songs to give your workouts an extra boost. Over 50 workout song recommendations!

Tear-offs with the web address to the research survey will go here.

The web-based survey on exercise adherence will take approximately 6-8 minutes to complete.

All answers will be confidential and anonymous.

Questions?

Contact the researcher

via email at

Roxane.Hearn@Waldenu.edu

Appendix B: Script for Recruiters

Hello! I am writing to request your participation in a voluntary research study on exercise adherence in working women ages 18-64 being conducted by my (friend, fellow health coach, colleague) Roxane E. Hearn. This research study is being conducted for the fulfillment of her doctoral degree in Health Psychology at Walden University. Roxane has worked as a Health Promotion Strategist, Certified Health Coach & Fitness Trainer for 18 years.

The web-based survey on exercise adherence will take approximately 6-8 minutes to complete and all answers will be confidential and anonymous. Roxane and her dissertation committee of three Walden University representatives will be the only individuals to have access to your answers.

Below are a few examples of the type of questions the survey will contain:

Example 1: I have made a detailed plan regarding when to exercise.

- ☐ completely disagree
- ☐ disagree
- ☐ agree
- ☐ totally agree

Example 2: During the last 7 days, on how many days did you walk for at least 10 minutes at a time in your leisure time?

_____ days per week

Example 3: I am confident I can maintain exercise regularly if I am faced with time constraints.

- ☐ definitely not true
- ☐ not true
- ☐ true
- ☐ definitely true

Example 4: Motivational text messages would be useful in helping to improve the confidence in my ability to carry out my exercise plans.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neither agree or disagree
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

As a token of appreciation for your participation in this study, you will receive a list containing 5 workout playlists, each with 10-15 hand selected songs to give your workouts an extra boost. This is over 50 workout song recommendations! You will be able to print or screenshot a copy of the playlist recommendations upon completion of the survey.

In order to participate in the study you must: 1) be a female of at least 18 -64 years old; 2) be actively employed full-time or part-time; 3) have maintained an exercise frequency of at least 1 day per week, for at least 1 month prior to participating in this study; 4) utilize text messaging via cell phone; and 5) be unrestricted by physician limitations to exercise.

Whether you are able or unable to participate in this study, I encourage you to invite other working women who are colleagues, friends or family to participate. Thank you in advance for your time and support!

The confidential survey can be accessed at the link below. Please allow 6-8 minutes for completion. https://www.surveymonkey.com/r/womenexercising Should you have direct questions about the study, please contact the researcher, Roxane Hearn, at Roxane.Hearn@Waldenu.edu.

Appendix C: Intro to Study & Informed Consent

Greetings in good health!

My name is Roxane E. Hearn and I am asking for your support in investigating the factors that play a role in improving exercise adherence in working women. I am conducting this study as a researcher for Walden University. The study has **NO** ties to my work as a Health Promotion Strategist, Certified Health Coach or Fitness Trainer.

The following will provide information about the study and your rights. This information will help you best decide if you would like to participate.

Background Information:
The purpose of this study is to examine the influence of maintenance self-efficacy, action planning skills, coping planning skills and the limitation of real-life demands on exercise adherence in working women ages 18-64 who have exercised for at least 1 day per week, for at least 1 month.

The secondary purpose is to examine the perceived usefulness of text messaging as a tool in helping working women increase their exercise frequency.

To participate in the study you must: 1) be a female of at least 18 -64 years old; 2) be actively employed full-time or part-time; 3) have maintained an exercise frequency of at least 1 day per week, for at least 1 month prior to participating in this study; 4) utilize text messaging via cell phone; and 5) be unrestricted by physician limitations to exercise.

Procedures:
If you agree to participate in this study, you will be asked to allot approximately 6-8 minutes of your time to complete the survey.

Token of Appreciation:
Research has shown that the music can increase the effort and intensity one puts into their workout by up to 30%. As a token of appreciation for your participation in this study, you will receive a list containing 5 workout playlists, each with 10-15 hand selected songs to give your workouts an extra boost. You will be able to print and/or screenshot a copy of the playlists of over 50 song recommendations upon completion of the survey.

Voluntary Nature of the Study:
Your participation for this study is voluntary. You can chose to exit the survey at any point.

Risks and Benefits of Participating in the Study:
There are minimal risks for participating in this study. Your complete participation will advance our understanding of factors that can help working women adhere to their exercise plans. This in turn, will contribute to the development of creative, modern day strategies to working women get fit, live fit and stay fit!

Confidentiality:
All information you provide will be completely anonymous. All survey data will be stored on a personal computer with antivirus software. Additionally, all computer files containing personal data from the study will be password protected.

Data will be accessible to Walden University academic representatives and I on a need to know basis for the completion of this study. As per Walden University research policy, after the completion of the research study, your data will be kept for a minimum of five years. Your data will be maintained securely as described above until the data collected no longer holds value for use in future studies I may conduct or articles that may be written.

Contact and Questions:
You may ask any questions you have via email. My email address is roxane.hearn@waldenu.edu. If you wish to talk privately about your rights as a participant, you may call Dr. Leilani Endicott at 612-312-1210. Upon completion of this study, a summary of the research findings will be posted on the Health Coach Rox Facebook page.

Statement of Consent:
By clicking the "NEXT" button below to access the survey you are agreeing to participate in this research. However, before doing so you are encouraged to screen shot or print a copy of this consent form. If you agree to proceed, please complete the survey in its entirety.

Thank you in advance for your support and participation!

Inspiring wellness,

Roxane E. Hearn, MHA, CHC
Walden University Doctoral Student

Appendix D: Participant Eligibility Questions

1. What is your gender?
   - ☐ Male
   - ☐ Female

2. What is your age?
   - ☐ 17 or younger
   - ☐ 18-24
   - ☐ 25-35
   - ☐ 36-45
   - ☐ 46-55
   - ☐ 56-64
   - ☐ 65 or older

3. Which of the following categories best describes your employment status?
   - ☐ Employed, working full-time
   - ☐ Employed, working part-time
   - ☐ Not employed, looking for employment
   - ☐ Not employed, NOT looking for employment
   - ☐ Retired
   - ☐ Disabled, not able to work

4. How often do you use a mobile/cell phone to send or receive text messages?
   - ☐ Very often
   - ☐ Fairly often
   - ☐ Sometimes
   - ☐ Almost never
   - ☐ Never

5. Has your doctor restricted you from exercise for MORE than 1 day per week?
   - ☐ Yes
   - ☐ No

6. Have you engaged in exercise for at least 1 day per week for the last 4 weeks?
   - ☐ Yes
   - ☐ No

7. Are you pregnant?
   - ☐ Yes
   - ☐ No

Appendix E: Survey Exit Pages

Exit Page for Ineligible Participants

Thank you for your time.

Unfortunately you are ineligible to complete the remaining portion of the study.

Since the confidential survey is part of a behavioral health research study, I am required to provide behavioral support resources for all participants.

Behavioral Health Resources

National Domestic Violence Hotline 1-800-799-7233

National Suicide Prevention Lifeline 1-800-273-8255

Substance Abuse and Mental Health Treatment Referral Helpline 1-800-662-4357

Exit Page for Eligible Participants

Thank you very much your participation in this study!

Behavioral Health Resources

The behavioral support resources below may or may not be helpful to you. Even though they may or may not be linked to your engagement in exercise, I am required to provide them since the survey is part of a behavioral research study.

National Domestic Violence Hotline 1-800-799-7233

National Suicide Prevention Lifeline 1-800-273-8255

Substance Abuse and Mental Health Treatment Referral Helpline 1-800-662-4357

Appendix F: Participant Demographics Questions

1. What is your ethnic/racial background?
   - ☐ White
   - ☐ Black or African American
   - ☐ Hispanic
   - ☐ American Indian or Alaskan Native
   - ☐ Asian
   - ☐ Native Hawaiian or other Pacific Islander
   - ☐ From multiple races
   - ☐ Some other race (please specify)

2. Which of the following best described your current relationship status?
   - ☐ Married
   - ☐ In a relationship, but not married
   - ☐ Single
   - ☐ Separated
   - ☐ Divorced
   - ☐ Single

3. What is the highest level of school you have completed or the highest degree you have received?
   - ☐ Less than a high school degree
   - ☐ High school degree or equivalent (e.g. GED)
   - ☐ Some college but no degree
   - ☐ Associated degree
   - ☐ Bachelor Degree
   - ☐ Master's Degree
   - ☐ Doctoral Degree

4. How many children are you parent or guardian for and live in your household (aged 17 or younger only)?
   - ☐ None
   - ☐ 1
   - ☐ 2
   - ☐ 3
   - ☐ 4
   - ☐ More than 4

5. How many adults (age 18 or over) living in your household are you the primary caregiver for?
   - ☐ None
   - ☐ 1
   - ☐ 2
   - ☐ 3
   - ☐ 4
   - ☐ More than 4

6. What city and state do you currently live in?

7. In what type of community do you live?

8. How did you hear about this study?
   - ☐ Friend/Family Member
   - ☐ Flyer
   - ☐ Gym/Fitness Center
   - ☐ Healthcare Provider
   - ☐ Social Media
   - ☐ Other (please specify)

9. How often do you use text messaging on your cell phone?
   - ☐ Hardly ever
   - ☐ Occasionally
   - ☐ Frequently

Appendix G: Maintenance Self-Efficacy for Exercise Measure

During the next 2 weeks…

I am confident I can maintain exercise regularly if I do not see positive benefits.

- □ Definitely not true
- □ Not true
- □ True
- □ Definitely true

I am confident I can maintain exercise regularly if I am faced with time constraints.

- □ Definitely not true
- □ Not true
- □ True
- □ Definitely true

I am confident I can maintain exercise regularly if I experience low levels of motivation.

- □ Definitely not true
- □ Not true
- □ True
- □ Definitely true

I am confident I can maintain exercise regularly if I have a desire or interest in doing something else.

- □ Definitely not true
- □ Not true
- □ True
- □ Definitely true

Appendix H: Action Planning and Coping Planning for Physical Exercise

I have made a detailed plan regarding…

When to exercise…

- ☐ completely disagree
- ☐ disagree
- ☐ agree
- ☐ totally agree

Where to exercise…

- ☐ completely disagree
- ☐ disagree
- ☐ agree
- ☐ totally agree

How to exercise…

- ☐ completely disagree
- ☐ disagree
- ☐ agree
- ☐ totally agree

How often to exercise…

- ☐ completely disagree
- ☐ disagree
- ☐ agree
- ☐ totally agree

With whom to exercise…

- ☐ completely disagree
- ☐ disagree
- ☐ agree
- ☐ totally agree

What to do if something interferes with my plans…

- ☐ completely disagree
- ☐ disagree
- ☐ agree
- ☐ totally agree

How to cope with possible setbacks…

- completely disagree
- disagree
- agree
- totally agree

What to do in difficult situations in order to act according to my intentions…

- completely disagree
- disagree
- agree
- totally agree

Which good opportunities for action to take…

- completely disagree
- disagree
- agree
- totally agree

When I have to pay extra attention to prevent lapses…

- completely disagree
- disagree
- agree
- totally agree

Appendix I: Limitations of Real Life Demands Measure

Indicate the degree to which each barrier limited your ability to carryout your exercise plans during the past week. 0 (didn't limit me) to 10 (fully limited me)

Vacation/out of town

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Errands

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Housework/yardwork

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Volunteer work

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Phone calls (making and receiving)

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Other non-work related priorities

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Work commitments

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Working late/long hours

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Other work related priorities

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Family/friend obligations

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Fatigue/lack of energy

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Health conditions/pains

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Lack of motivation/lazy

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Inclement weather

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Unspecified reasons for lack of time

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Lack of a workout partner

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Inconvenient exercise facility issues

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Poor time management

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Fear of violence

(Didn't Limit Me) 0 1 2 3 4 5 6 7 8 9 10 (Fully Limited Me)

Appendix J: Exercise Adherence Measure

This section is about all the physical activities that you did in the **last 7 days** solely for recreation, sport, exercise or leisure.

1. During the **last 7 days**, on how many days did you **walk** for at least 10 minutes at a time **in your leisure time**?

   _____ **days per week**

   ☐ No walking in leisure time → ***Skip to question 3***

2. How much time did you usually spend on one of those days **walking** in your leisure time?

   _____ **hours per day**
   _____ **minutes per day**

3. Think about only those physical activities that you did for AT LEAST 10 minutes at a time. During the **last 7 days**, on how many days did you do **vigorous** physical activities like aerobics, running, fast bicycling, or fast swimming **in your leisure time**?

   _____ **days per week**

   ☐ No vigorous activity in leisure time → ***Skip to question 5***

4. How much time did you usually spend on one of those days doing **vigorous** physical activities in your leisure time?

   _____ **hours per day**
   _____ **minutes per day**

5. Again, think about only those physical activities that you did for AT LEAST 10 minutes at a time. During the **last 7 days**, on how many days did you do **moderate** physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis **in your leisure time**?

   _____ **days per week**

   ☐ No moderate activity in leisure time.

6. How much time did you usually spend on one of those days doing **moderate** physical activities in your leisure time?
   _____ **hours per day**
   _____ **minutes per day**

Appendix K: TAM Measure

Motivational text messages would be useful in helping to improve the confidence in my ability to carry out my exercise plans.

- ☐ Strongly disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neither agree or disagree
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

Motivational text messages would be useful in encouraging me to make a detailed plan of when, where, how often, and with whom I will exercise.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neither agree or disagree
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

Motivational text messages would be useful in helping me to cope with possible setbacks that may get in the way of carrying out my exercise plans.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neither agree or disagree
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree

Motivational text messages would be useful in helping me to increase my exercise frequency.

- ☐ Strongly Disagree
- ☐ Disagree
- ☐ Somewhat disagree
- ☐ Neither agree or disagree
- ☐ Somewhat agree
- ☐ Agree
- ☐ Strongly agree