# Walden University

College of Health Sciences

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Karen Denise Maxwell

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2015

Abstract

Technology as a Health Intervention and the Self-Efficacy of Men

by

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MBA, Long Island University, 1985

BS, Rutgers University, 1981

Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Philosophy

Health Services

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## Abstract

Mortality rates in the United States are higher for men than they are for women as a result of chronic diseases such as heart disease, cancer, and diabetes. Despite these disproportionate rates, few health interventions are targeted to men, and limited knowledge exists regarding the specific components needed to design technology health tools to appeal to men. The purpose of this quantitative study was to examine the relationship between the use of technology health tools and the role of self-efficacy in men and the influence on participation in healthy lifestyle behaviors. A quasi-experimental design was used to analyze data collected from the Health Information National Trends Survey ($N = 990$). A group of men ($n = 323$) who used technology health tools were compared to a control group of men ($n = 667$) who did not use technology health tools. Results from the regression analysis indicated that the use of technology health tools for self-management of health behavior had a significant effect on participation in healthy lifestyle behavior ($p = .026$). Self-efficacy was also found to mediate the relationship between technology health tools and participation in healthy lifestyle behavior ($p = .018$). This study supports the United States federal government's Healthy People 2020 objective to increase the proportion of people who use Internet health management tools. The implications for positive social change include knowledge for developing targeted technology health interventions to increase the participation of men in healthy lifestyle behavior, reduce the number of men with chronic diseases, improve chronic disease management, and reduce healthcare costs in the United States.

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# Dedication

I would like to dedicate this dissertation to my mother, Doris Dean. Caring for my mother due to the devastating effects of a stroke associated with diabetes provided the motivation to make a contribution to social change by increasing participation in healthy lifestyle behavior that can prevent and manage chronic diseases. I would also like to dedicate this dissertation to my 96-year-old grandmother, Margaret Rose, who showed me how to eat and engage in physical activity to prevent the development of chronic diseases. The example provided by grandmother demonstrates that you are as young as your body will allow you to be.

# Acknowledgments

I would like to first and foremost thank God for allowing me to write this dissertation. The determination that God placed in me allowed me to continue to press forward. I would like to also thank my daughter for her patience and encouragement. Though I know Melanie missed our time together, she pretended that she did not to allow the time I needed to complete this dissertation. I would also like to recognize my family and friends that supported me throughout the process.

I would like to give special thanks to my dissertation committee. My committee chair, Dr. Dee, provided knowledge, guidance and encouragement along with an excellent understanding of the University's processes. Despite process changes and new system implementations, Dr. Dee's ability to navigate through it all was a major contribution to completing this dissertation. It was a blessing to also have Dr. Gerrior as the methodology expert on my committee. In addition to providing excellent statistical insight, Dr. Gerrior offered valuable recommendations to the content of this dissertation. I would also like to thank Dr. Rodney Bowden for serving as the University Research Reviewer. To everyone, I extend my sincere thanks.

Table of Contents

List of Tables

# Chapter 1: Introduction to the Study

## Background

Men in the United States commonly suffer from chronic and preventable diseases that are the result of their health behaviors (Danaei et al., 2010). Despite their high rates of chronic diseases, men are infrequently targeted for technology health tools (Duncan et al., 2012; George et al., 2012). Research that focuses specifically on the use of technology health tools for men is also limited. Previous literature reviews on nutrition interventions (Taylor et al., 2013) and on physical activity (George et al., 2012) identified few health promotions programs are designed to change the health behavior of men. Innovative technological health tools exclusively targeted to men are needed to improve health behavior to reduce chronic diseases endured by men (Vandelanotte et al., 2013).

There is a gap in the literature concerning components of technology health tools that can increase and maintain participation of men in healthy lifestyle behavior (Duncan et al., 2012; George et al., 2012; Taylor et al., 2013; Vandelanotte et al., 2013). Theory based technology interventions have reported small but statistically significant effect on health behavior changes (Webb, Joseph, Yardley, & Mitchie, 2010). Despite results that indicate theory can have an effect on the success of technology health interventions, a debate exists on the importance of theory to successfully increase and sustain participation in healthy lifestyle behavior (Webb et al., 2010). The development of self-efficacy, a component of the social cognitive theory has been linked as a factor in the success of the use of technology health tools to increase and sustain participation in healthy lifestyle behavior (Anderson-Bill, Winett, & Wojcik, 2011). This study was

needed because limited research focused upon technology health tools specifically designed for men, hence it is unknown what components will successfully increase and sustain participation in healthy lifestyle behavior. The goal of this study was to understand if technology health tools that enhance self-efficacy have an effect upon men's participation in healthy lifestyle behaviors.

## Problem Statement

Treatment of chronic diseases such as heart disease, cancer, and diabetes is projected to cost the U.S. healthcare system approximately $4.2 trillion per year by 2023 (Anderko et al., 2012). This forecast is a significant increase from total healthcare expenditures in 2013 of $2.9 trillion (Centers for Medicare & Medicaid Services, 2014). According to the Centers for Disease Control and Prevention (CDC; 2013b), heart disease, cancer, and diabetes are costly chronic preventable diseases. Although more men than women have been diagnosed with a higher percentage of chronic diseases such as heart disease, cancer, and diabetes that are linked to poor nutrition and lack of physical activity (Duncan et al, 2012), health educators have not targeted or designed many health promotion interventions exclusively for men (George et al., 2012). In addition, health interventions used by women do not appeal to men (Duncan et al., 2012). Using technology health tools are more appealing to men than traditional health promotion interventions because self-tailored and self-paced activities allow self-management (Taylor et al., 2013).

Technology health tools have produced significant health behavior changes in the past. This suggests that creating effective tools would benefit from studying specific

content and theoretical designs to understand what factors affect participation in healthy lifestyle behavior (Davies, Spence, Vandelanotte, Caperchione, & Mummery, 2012). A systematic review of the literature conducted by Webb, Joseph, Yardley, and Mitchie (2010) found that the use of the theory of planned behavior increased the effectiveness of technology health tools; this suggests that research on additional theory-based technology health tools has a strong potential to result in an increase in participation and sustained health behavioral changes. This research specifically filled a gap in understanding the relationship between the use of technology health tools, and self-efficacy upon participation of men in healthy lifestyle behavior.

## Purpose of the Study

The purpose of this quantitative study was to examine the relationship between the use of technology health tools and the role of self-efficacy upon men in the United States, and their influence upon men's participation in healthy lifestyle behaviors. Technology health tools can be used to manage healthcare appointments, communicate with healthcare providers, fill prescriptions, monitor nutrition, physical activity, weight management, and calculate body mass index (BMI). The mediating variable self-efficacy was used to evaluate the relationship between the study's independent variable, the use of technology health tools, and the dependent variable, participation in healthy lifestyle behavior. In the context of this study, participation in healthy lifestyle behavior included fruit consumption, vegetable consumption, and regular physical activity.

Chronic diseases such as heart disease, cancer, and diabetes are among the most widespread preventable health conditions in the United States; however, tools to

successfully manage these chronic diseases are limited (Chaney et al., 2013). Improving health outcomes associated with heart disease, cancer, and diabetes requires technological tools that provide the opportunity for self-management (Chaney et al., 2013; Lorig et al., 2012; Miron-Shatz & Ratzan, 2011). Incorporating the self-management and self-efficacy components of the social cognitive theory into the design of diabetes technology health tools have successfully been used to significantly improve health behavior (Glasgow et al., 2012). Technology health tools used for disease prevention, preventing disease complications, or managing existing chronic diseases such as heart disease, and cancer are less costly, more effective treatment for chronic diseases (Hyman, 2009). According to the CDC, chronic preventable diseases are responsible for 75% of U.S. healthcare spending (2013a).

This study was designed to effect positive social change by identifying components for use in new technology health tools designed to appeal to men. Technology health tools that increase male participation in healthy lifestyle behavior are predicted to produce better health outcomes that prevent or minimize the effects of heart disease, cancer, and diabetes, ultimately reducing healthcare expenses (Kennedy et al., 2012). This study was also designed to support the Healthy People 2020 objective to increase the proportion of people in the United States who use Internet health management tools (Healthy People 2020, 2013).

## Research Questions

RQ1: Is there a quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior?

$H1_0$: There is no quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior.

$H1_a$: There is a quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior.

RQ2: Is there a quantitative effect of self-efficacy on participation in healthy lifestyle behavior?

$H2_0$: There is no quantitative effect of self-efficacy on participation in healthy lifestyle behavior.

$H2_a$: There is a quantitative effect of self-efficacy on participation in healthy lifestyle participation.

RQ3: What is the role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior?

$H3_0$: There is not a role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior.

$H3_a$: There is a role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior.

## Theoretical Framework for the Study

The theoretical framework for this study was based on social cognitive theory. Social cognitive theory was developed by Albert Bandura and is based upon modeling, self-regulation, and self-efficacy (Bandura, 2005). Self-efficacy describes human motivation as the basis for attaining positive results. According to this theory, a person's

belief in their ability to produce the desired results aids in their success in accomplishing their goals. The more confident people are in self-efficacy, the higher the goals they set. Utilizing self-efficacy and self-regulation skills have contributed to successful participation in positive health behavior changes that prevent disease (Bandura, 1997). Designing technology health tools with specific components has the potential to effect the level of self-efficacy of individuals and assist them in engaging in healthy lifestyle behaviors. The use of technology health tools provides knowledge and encouragement to increase the participation of men in healthy lifestyle behavior. Technology health tools assist with self-management of an individual's health behavior, thereby providing individuals the opportunity to employ self-regulation. Use of information in this manner assists individuals with increasing their self-efficacy by providing information that allow them to determine their ability to set goals they can accomplish (Bandura, 2005). Interactive technology provides a creative way to allow individuals to improve their self-efficacy (Bandura, 2005). Men that lack self-efficacy or have low self-efficacy can be provided with additional technology self-management tools to increase their efficacy.

The role of gender is a significant factor in computer efficacy (Aguirre-Urreta & Marakas, 2010; He & Freeman, 2010; Goh, 2011). From an early age, boys receive more encouragement from parents and teachers regarding the use of computers than girls (Cady & Terrell, 2008). The development of perceived self-efficacy in the use of computers continues at the college level for men and women (He & Freeman, 2010). Several studies have identified gender as a major factor in computer self-efficacy. Results using the technology acceptance model suggest computer self-efficacy in relationship to perceived

usefulness and intention to use was more significant for males than females (Bao, Xiong, Hu, and Kibelloh (2013). If men perceive the usefulness of technology health tools to change their health behavior, technology health tools will appeal to men.

This study explores using interactive technology health tools to influence lifestyle habits. Lifestyle habits are a major factor in the participation of disease prevention activities. Because individuals control their lifestyle habits, men can use these habits to have major input into their overall health (Bandura, 2005). Self-management provides individuals with the opportunity to realize the benefits of engaging in healthy lifestyle behavior. The benefits of positive self-management are effective in helping men live longer and healthier lives (Bandura, 2004). Interactive technology health tools offer methods of motivating individuals (Glasgow et al., 2012). If structured properly, interactive technology health tools have a strong potential to develop the motivation of individuals and provide the opportunity for self-management as they work through health behavior changes (Bandura, 2005). If technology health tools are not effectively designed to increase motivation and enhance self-management skills, the individuals that benefit most from these tools will not use them (Bandura, 2004).

## Nature of the Study

This quantitative study analyzed secondary data from the Health Information National Trends Survey (HINTS) (National Cancer Institute, 2014a). HINTS is a national database that allows open access to the public. Information regarding cancer, Internet usage, and various health related trends are evaluated by the HINTS survey. A quasi-experimental design was appropriate for this study because it compared a sample that

included men that use technology health tools to a control group of men that did not utilize technology health tools. The statistical significance of the effect of technology health tool use of men upon healthy lifestyle participation was clearly depicted by the measurement of the differences between the group of men that used technology health tools and the group of men that did not use technology health tools. Answer data from the HINTS database were selectively used for questions that were deemed to measure the variables analyzed by this study. The study's independent variable was technology health tool use. Self-efficacy was the mediating variable and the dependent variable was participation in healthy lifestyle behavior.

The data analyses were performed using Statistical Package for the Social Sciences (SPSS) version 21. Data from SPSS were imported into the software package WesVar 5.1 that was used to apply the replicate weights for data analysis in the HINTS database.

## Definitions

**Chronic diseases.** Non-communicable diseases such as heart disease, cancer, and diabetes that are linked to preventable risk factors that causes premature death (Ratzan, 2010).

**Health Information National Trends Survey (HINTS).** A national survey used to measure Internet use associated with healthcare, nutrition, physical activity, cancer screenings, cancer risks perceptions, and cancer diagnosis in relationship to individual's health (National Cancer Institute, 2014b).

**Health intervention.** Methods to promote good diet and physical activity participation (McCully, Don, & Updegraff, 2013).

**Healthy lifestyle behavior.** Behaviors such as eating the recommended amount of fruit and vegetables daily (Kreausukon, Gellert, Lippke, & Schwarzer, 2012) and regular physical activity participation (Glazebrook & Brawley, 2011) that prevent chronic disease.

**Self-efficacy.** The confidence an individual has in their ability to attain goals they set for themselves (Bandura, 1997).

**Self-management.** A method of self-monitoring used to regulate behavior (Bandura, 1995).

**Self-regulation.** In the context of this study, methods that individuals utilize to control their behavior in an effort to attain their goals (Bandura, 2005).

**Technology health tools**. Health tools that use Internet technology to monitor and manage activities such as fruit consumption, vegetable consumption, physical activity, and disseminate information (Lee, Park, Ho Yun, & Chang, 2013).

## Assumptions

An assumption of this study was that diet and physical activity are healthy lifestyle behaviors. This assumption was necessary to utilize diet and physical activity as measurements of participation in healthy lifestyle behavior. Another assumption of this study was that participants used technology health tools as a measurement of self-management. This assumption was necessary to measure the self-regulation effect of technology health tools upon self-efficacy.

Additional assumptions were made regarding the collection of the data in the HINTS database. It was assumed that the sample is representative of individuals throughout the United States. Another assumption was that data collection by individuals that recorded the survey responses was performed by the same guidelines and in a non-biased manner.

## Scope and Delimitations

This study focused upon the need to design technology health tools targeted specifically to men. It specifically examined if technology health tools that incorporate self-efficacy increased participation in healthy lifestyle behavior. The internal validity of the selection of the sample was addressed through the use of secondary data that measured the use of technology health tools to manage men's health. Self-efficacy behaviors were also measured by utilizing men's responses to various questions in the HINTS database.

This study specifically measured men's use of technology health tools and self-efficacy; women's use of technology health tools and self-efficacy were not studied. It also examined self-efficacy and self-management components of social cognitive theory. The health belief model, which also uses self-efficacy, was not evaluated by this study. Results from this study are generalizable only to the design of technology health tools targeted exclusively to men.

## Limitations

This study used secondary data gathered from the HINTS database. The surveys contained in this database assessed both men and women, using questions not designed

specifically to gather data from men. Some of the research questions contained in the database were directed exclusively to men, however, and focus on behaviors that tend to only be experienced by men, including specific physical activities typically performed by men. Data for this study was obtained from participants' self-reported responses. The HINTS database contains national survey data; however, the use of secondary data from this database prevented randomly assigning study participants.

Confounding variables were controlled by the use of a control group to maximize internal validity to identify the cause-and-effect relationships between the use of technology health tools and participation in healthy lifestyle behavior. Use of a control group of men that did not use technology health tools addressed a limitation of this study. By comparing a group of men that use technology health tools, to a group of men that did not use technology health tools the cause-and-effect relationship between the two groups can be compared.

## Significance

Establishing new methods to increase participation in healthy lifestyle behavior provide the opportunity for men to prevent chronic diseases. Disease prevention is less costly than treating a disease once it has occurred (Ormond, Spillman, Waidmann, Caswell & Tereshchenko, 2011). Technology offers innovative cost-effective disease prevention methods to manage health behavior.

The options for self-management technology health tool offer flexibility for men. Given the various responsibilities men encounter, technology health tools provide the opportunity for flexible scheduling options to increase the probability of participation.

Though more research is needed, theory based technology health tools have demonstrated to be effective tools for health behavior changes (Webb et al., 2010). Because these tools are available via the Internet, they are easily accessible by men. Tools that include goal setting and self-management have successfully influenced men to participate in physical activity and healthy nutrition, thus resulting in changing their health behavior (Duncan et al., 2012). The importance of self-management has been acknowledge by men when attempting to change health behavior; however, they expressed a need for self-monitoring tools that utilize methods that do not require a lot of time and are user friendly (Vandelanotte et al., 2013).

Lack of self-management has been identified as a major roadblock for men to change existing health behavior (Taylor et al., 2013). Because technology health tools provide the opportunity for self-management, these health interventions are tailored to provide guidance based upon an individual's self-efficacy. Customization allows self-efficacy to be adjusted based upon the beliefs of an individual. The use of self-management tools provides health care management at a lower cost than traditional services such as those offered by physicians or medical facilities (Bandura, 2005). Identifying methods to increase participation in technology health tools change health behavior, improve health, and reduce healthcare costs (Hyman, 2009). Providing healthcare alternatives that improve health outcomes of men contribute to social change by improving their quality of life and reducing healthcare costs.

## Summary

Health interventions used by women usually do not appeal to men (Duncan et al., 2012). Technology health tools are more attractive to men because health tool use can be tailored specifically to the individual to allow self-management (Taylor et al., 2013). Despite their high rates of chronic diseases, men are infrequently targeted for technology health tools (Duncan et al., 2012; George et al., 2012). Research on nutrition interventions (Taylor et al., 2013) and on physical activity (George et al., 2012) identified few health promotions programs designed to change the health behavior of men. Technology health tools need to be designed to change the behavior of men to increase their participation in healthy lifestyle behavior. Technology health tools used for disease prevention, preventing disease complications, or managing existing chronic diseases such as heart disease, and cancer are less costly, more effective treatment for chronic diseases (Hyman, 2009).

Health interventions delivered over the Internet have been effective in achieving small but significant behavioral changes; however, specific content and theoretical designs need to be studied to understand how to increase participation and improve effectiveness (Davies et al., 2012). Though self-efficacy has been a component of successful technology health tools that have demonstrated improved nutrition and increases in physical activity, limited knowledge exists about the demographics of the users (Anderson-Bill et al., 2011). This study filled a gap in the literature by providing an understanding of the relationship between the use of technology health tools, self-efficacy, and participation of men in healthy lifestyle behavior.

# Chapter 2: Literature Review

## Introduction

U.S. healthcare costs are projected to rise to approximately $4.2 trillion by 2023 for the treatment of chronic diseases such as heart disease, cancer, and diabetes (Anderko et al., 2012). This forecast is a significant increase from total healthcare expenditures in 2013 of $2.9 trillion (Centers for Medicare & Medicaid Services, 2014). Men in the United States commonly have poor nutrition habits and a lack of physical activity, two common health behaviors linked to chronic diseases (Duncan et al., 2012). In spite of this high occurrence of chronic diseases, few health interventions have been designed specifically for men (George et al., 2012). Health interventions that are used by women are generally not effective with men because they do not appeal to them (Duncan et al., 2012). This study specifically examines the use of technology health tools by men.

Technology health tools have been hypothesized to appeal more to men than traditional health interventions (Taylor et al., 2013). They specifically provide an opportunity for self-paced activities and personal monitoring that is being evaluated by this study. Increases in participation in healthy lifestyle behavior that occur as a result of the use of technology health tools are usually not maintained in the long term; as a result, new research is needed to identify specific content types and theoretical designs that will sustain health behavior changes in men that use technology health tools (Davies, Spence, Vandelanotte, Caperchione, & Mummery, 2012; Webb, Joseph, Yardley, & Mitchie, 2010).). The purpose of this quantitative study is to examine the relationship between the

use of technology health tools and the role of self-efficacy upon men in the United States and the influence upon participation in healthy lifestyle behavior.

This literature review discusses extant research on technology health tool use and its effects on men's participation in healthy lifestyle behaviors. This literature is especially important to this study because technology health tool use serves as the study's independent variable and men's participation in healthy lifestyle behaviors serves as the dependent variable. It also discusses the role of self-efficacy as a mediating variable, the power of self-efficacy to predict healthy lifestyle behavior, the role of self-efficacy in self-management, and its contribution to health behavior change.

## Literature Search Strategy

Several databases were utilized to locate literature pertinent to this study. Databases such as Thoreau multiple database search, CINAHL Plus, Medline, and Google Scholar were used. The primary keywords used for the initial database searches were *technology interventions*, *health technology interventions*, *Internet health interventions*, *gender*, *men OR male*, *self-efficacy AND self-regulation*, *diet*, *nutrition*, *exercise*, and *physical activity*. Searches using the aforementioned keywords yielded results suggesting other search terms such as self-regulatory efficacy and computer self-efficacy. These searches were limited to literature published between 2009 and 2014 due to the rapid rate of technological advances; however, seminal literature and relevant peer-reviewed articles published prior to 2009 were included.

## Theoretical Foundation

The social cognitive theory developed by Albert Bandura provided the theoretical foundation for this research. Social cognitive theory is based upon modeling, self-regulation, and self-efficacy (Bandura, 2005). According to this theory, self-efficacy is the foundation of human motivation (Bandura, 1995). Self-efficacy is the confidence a person has in their ability to develop and implement a plan to deal with possible circumstances that prevent one from attaining their goals (Bandura, 1995). A person's belief in their ability to achieve the desired result aids in the success of an individual accomplishing their goals.

Self-efficacy requires an individual to engage in goal-setting, self-motivation, and self-management (Bandura, 2005). Technology health tools offer an option for individuals to engage in self-management of health behavior. Self-efficacy is useful to influence health behavior to prevent and manage chronic diseases (Chen & Lin, 2010); in addition, a strong sense of self-efficacy is a key factor in the self-management of chronic disease (Ronzio & Ronzio, 2012). This study was designed to evaluate the significance of self-efficacy on technology health tools used for self-management of health behavior.

Despite the availability of information regarding the health risks associated with poor health behavior, warnings are often ignored by individuals. Health campaigns designed to improve self-efficacy have been influential in encouraging changes in health behavior (Bandura, 2004). Health interventions employing self-efficacy have been more effective than education-based interventions that focus upon providing nutrition and physical activity knowledge, as demonstrated by increases in fruit and vegetable

consumption associated with self-efficacy (Kreausukon, Gellert, Lippke, &Schwarzer, 2012). Social cognitive theory indicates the necessity for health education and self-management along with self-efficacy to affect changes in health behavior (Kennedy et al., 2012).

Technology health tools have been used as an incentive to motivate individuals to engage in self-management of health behavior (Lee, Park, Ho Yun, & Chang, 2013). In particular, Kazer, Bailey, Sanda, Colberg, and Kelly (2011) showed that technology health tools used for the management of chronic diseases provided the opportunity for self-management, improved self-efficacy, as well as increased participation in healthy lifestyle behavior. Providing methods of self-management of health behavior help to develop an individual's belief in their ability to change their health behavior (Yu et al., 2012).

Several studies have used self-efficacy as a mediating variable to explain the influence of participation in and adherence to physical activity interventions (Jung & Brawley, 2013; McAuley et al., 2011; Spink & Nickel, 2009). These studies indicated that self-efficacy explains the relationship between participation in physical activity programs and adherence to physical activity programs (Jung & Brawley, 2013; McAuley et al., 2011; Spink & Nickel, 2009).This study was designed to determine if self-efficacy can explain the relationship between the use of technology health tools and participation in healthy lifestyles. Self-efficacy was used to explain the relationship between the independent variable and the dependent variable as in the previously discussed research studies.

This study also sought to establish that technology health tools have an effect on male participation in healthy lifestyle behavior. Self-efficacy was used to provide a theoretical foundation to understand the relationship between the use of technology health tools and participation in healthy lifestyle interventions. Self-efficacy is a dependable predictor of health behavior, as demonstrated in studies by Hankonen, Absetz, Ghisletta, Renner, and Uutela (2010) and Renner et al. (2008). No other variable has demonstrated the capability to predict health behavior to the same extent as self-efficacy (Chen & Lin, 2010; Chen, Sheu, Wang, & Huang, 2009; Yu et al., 2012). The power of self-efficacy to predict health behavior has also been found to not vary based upon gender (Renner et al., 2008).

## Literature Related Research Methods

A quasi-experimental design was used to perform this study. Use of a quasi-experimental design allowed the comparison of a group of men that utilize technology health tools to a group of men that did not utilize technology health tools. The use of a control group provided the opportunity to measure the impact of the independent variable the use of technology health tools upon the dependent variable participation in healthy lifestyle behavior, because a group receiving the intervention was compared to a group not receiving the intervention (Rudestam & Newton, 2007). Self-efficacy as a mediating variable was used to explain the relationship between the independent variable the use of technology health tools and the dependent variable participation in healthy lifestyle behavior (Rudestam & Newton, 2007).

The use of a quasi-experimental design by McCully, Don, and Updegraff. (2013) to measure the use of technology for diet, weight and physical activity upon demographics such as gender, race/ethnicity, education and marital status was reasonable given the comparison to a control group that did not use technology for diet, weight, and physical activity. Measurement of health behavior by physical activity participation and fruit and vegetable consumption utilizing a control group was also reasonable. However, McCully et al. (2013) did not use a mediating variable to assist with the explanation of the relationship between the independent variable, the use of technology health tools for diet, weight, and physical activity and the dependent variable, participation in healthy behavior. A quasi-experimental study conducted by Morgan, Warren, Lubans, Collins, and Callister (2009) utilized technology health tools to measure diet and physical activity compared to a control group that received a single face-to-face educational presentation on diet and physical activity. Morgan et al. (2009) indicated an increase in sustained weight loss in both groups. The technology tools were designed for self-management; however, no significant difference between intervention and control was demonstrated for this variable (Morgan, Warren, Lubans, Collins, and Callister, 2009). A quasi-experimental design was used to measure the effect of the use of technology health tools upon participation in physical activity and fruit and vegetable consumption to measure healthy lifestyle behavior; in addition, the mediating variable self-efficacy was used to explain the relationship between the independent and dependent variable.

Regression analysis is used to examine the relationship of multiple independent variables upon a single dependent variable (Rudestam & Newton, 2007). Multiple linear

regression or logistic regression is used to predict or forecast the outcome of a dependent variable (Frankfort-Nachmias & Nachmias, 2008). Regression analysis is also used to demonstrate how theoretical models explain the relationship between an independent variable and a dependent variable (Frankfort-Nachmias & Nachmias, 2008).

The quantitative study conducted by McCully, et al., (2013) utilized multiple logistic regression to determine the demographics of individuals using technology health tools to assist with diet, weight, physical activity, and health behavior. McCully et al. (2013) used multiple linear regression to examine the relationship between the use of technology health tools and the consumption of fruits and vegetables and participation in physical activity. Multiple linear regression allowed for continuous measurement of questions using a Likert scale on the survey instruments. The HINTs database used by McCully et al. (2013) was also used for this study. Measurement of the health behaviors, which included consumption of fruits, consumption of vegetables, and physical activity, are the same dependent variables that were measured in this study. McCully et al. (2013) conducted a study using multiple linear regression to validate the associations between the use of fruit and vegetable consumption, and physical activity as a measurement of healthy lifestyle behavior.

The use of technology health tools were analyzed by Mitchell, Hayley, Watkins, Shires, and Modlin (2010); a study was conducted that used logistic regression to measure usage of health related technology health tools by measuring sociodemographic, medical, and access related factors. This study differed from Mitchell et al. (2010) because the use of technology health tools were used as an independent variable. This

study was designed to establish a relationship between the use of technology health tools, self-efficacy, and participation in healthy lifestyle behavior.

This study added to the body of knowledge by using self-efficacy as a mediating variable to explain the relationship between the use of technology health tools and participation in healthy lifestyle behavior. Self-efficacy has the power to predict behavior (Renner et al., 2008). When self-efficacy is used as a mediating variable, it explains the relationship between the use of the technology health tools and participation in positive health behavior (Pimchanok, Gellert, Lippke, & Schwarzer, 2012).

Data were utilized from the HINTS survey collected in 2012 unlike the McCully et al. (2013) study that used data collected in 2007 and 2011. McCully et al. (2013) indicated that the relationship between the use of technology health tools as a health intervention and vegetable consumption was similar in 2011 to 2007; the relationship between technology health tool use and fruit consumption and physical activity was less significant in 2011 than in 2007. The use of the technology for health interventions increased in 2011; however, sustaining healthy behavior such as physical activity and fruit and vegetable consumption decreased in 2011. This study was able to determine if any changes occurred since 2011 by measuring data collected in 2012.

A limitation of the study conducted by McCully et al. (2013) is a measurement of respondent's behavior in 2007 and 2011, measurement of individuals in these samples included different individuals; therefore, no longitudinal results were assessed over time. This study added to the body of knowledge by examining the use of technology health tool use and the relationship of healthy lifestyle behavior utilizing data from 2012. An

update of the measurement of current health behavior associated with the use of technology health tools measuring physical activity, and fruit and vegetable consumption was performed by using HINTS dated collected in 2012.

## Literature Review Related to Key Variables and/or Concepts

Key variables are discussed in further detail to demonstrate the justification for use in this study. The use of technology health tools includes various options; however, the opportunity for self-management offers a unique option for men to participate in the management of their health behavior. Evaluation of the independent variable, use of technology tools and the dependent variable, participation in healthy lifestyle behavior enable measurement of the role of technology upon the health behavior of men. The use of self-efficacy as a mediating variable was used to explain the relationship between the use of technology health tools and participation in healthy lifestyle behavior. Though this study focused upon men, the differences between men and women in relationship to each variable was also discussed.

### Technology Health Tool Use

Use of technology health tools for diet, weight, and physical activity management demonstrated a relationship to a higher level of fruit and vegetable consumption and higher levels of physical activity (McCully et al., 2013). The use of technology health tools assisted in the self-management of health behaviors; however, additional research is needed to evaluate the relationship between diet, weight, physical activity, technology health tool usage, and health behavior outcomes (McCully et al., 2013). Technology health tools offer the opportunity for self-management that could improve health

outcomes (Smoldt, 2009); hence, the use of technology health tools require future research because they have the potential to effectively change health behavior (Davies et al., 2012; Kelders, Kok, Ossebaard, & Van Gemert-Pijnen, 2012; McCully et al., 2013).

Technology health interventions that provide options for self-management have demonstrated to be effective in changing physical activity participation and dietary behavior (Davies et al., 2012; Duncan et al., 2012; George et al., 2012; Kirwan, Duncan, Vandelanotte, & Mummery, 2012). Self-management has been identified as a strategy that has contributed to increasing the effectiveness of technology health interventions to change health behaviors (Duncan et al., 2012; Webb et al., 2010). The inclusion of self-management options within technology health tools increases the effectiveness of behavior changes by providing the option to track results (Bandura, 2004; George et al., 2012; Morgan et al., 2009; Morgan, Warren, Lubans, Collins, & Callister, 2011).

Mobile technology health tools include features that allow self-management of physical activity (Fanning et al., 2012). The use of information technology has the potential to change health behavior because it enables individuals to self-manage their health behavior (Kennedy, Powell, Payne, Ainsworth, Boyd, & Buchan, 2012). Mobile technology provides the opportunity to frequently utilize technology health tools that monitor engagement in health interventions along with providing the opportunity for self-management (Kennedy et al., 2012). According to researchers, women have shown a stronger willingness to engage in self-management, than men when they participated in nutritional diet lifestyle interventions (Fukuoka, Kamitani, Bonn et, & Lindgren, 2011; Hankonen et al., 2010; Morgan et al., 2011; Vandelanotte et al., 2013). Technology

health tools have the potential to increase participation in healthy lifestyle behavior because of the opportunity for self-management of health interventions (Bandura, 2004; Kennedy et al., 2012).

Given the different usage patterns and characteristics of users, research is needed to understand how to develop technology interventions to appeal to specific user groups (Borosund et al., 2013). Health interventions often used by women are not desirable to men (Duncan et al., 2012); therefore, health interventions need to be designed that appeal to men based upon their preferences (Duncan et al., 2012; Vandelanotte et al., 2013). Researchers predict health interventions using technology will experience good results in men between the ages of 31 and 50 (Atkinson, Saperstein, & Pleis, 2009; Barysch et al., 2010; Gurr, Schwabb, Hansen, Noack, & Dazert, 2009; Morgan et al., 2011; Rasmussen, Rohde, Ravn, Sorensen, & Wynn, 2009). A gap exists because limited knowledge is limited regarding the specific components that should be used to design technology health tools that appeal to men (Vandelanotte et al., 2013); thus, future research is needed to understand how to develop technology health tools that focus upon the needs of men (Wong, Gilson, van Uffelen, & Brown, 2012).

Technology health tools are looked upon favorably by men because they have the potential to be designed to assist in changing current levels of physical activity, weight, or dietary behavior (Duncan et al., 2012; George et al., 2012; Morgan et al., 2011). The options available for the self-design of technology health tools utilize strategies that can be used to target males (Duncan et al., 2012). The flexibility of technology health tools have greater appeal to men because they do not require attendance in person, thus

competing with other responsibilities such as work and family (Duncan et al., 2012). Men participating in the ManUp study identified self-management as a key component that could change health behavior (Duncan et al., 2012). Men use technology health tools for diet, weight, and physical activity at higher rates than has been reported in previous research (McCully et al., 2013). The effectiveness of technology health interventions for self-management physical activity and physical activity and diet behaviors for men is primarily untested (Duncan et al., 2012); therefore, additional research is needed to understand the relationship of self-management, self-efficacy, and the use of technology health tools.

Health interventions that utilize theory have a greater chance of success in changing health behavior (Webb et al., 2010; Wong, Gilson, van Uffelen, & Brown, 2012). Use of technology health tools as a health intervention have been effective in changing nutritional behavior (Crutzen, Cyr, & de Vries, 2011; Neve et al., 2010; Taylor et al., 2013). Components contributing to the success of technology health tools have not been identified (Neve et al., 2010; Taylor et al., 2013); therefore, further research is required to understand which specific components increase effectiveness of technology health tools.

Technology health interventions have often been underutilized because they focus upon disseminating information, not behavioral changes (Kennedy et al., 2012). When the focus is upon obtaining information, individuals often have a limited understanding of the instructions to change health behavior (Kennedy et al., 2012). Technology health tools that included self-management achieved greater success than health interventions

focusing solely upon education (Manzoni, Pagnini, Corti, Molinari, & Casterinuovo, 2011). Self-management is strongly associated with sustained health behavioral change (Bandura, 2005; Taylor et al., 2013).

Non-Hispanic Blacks and Hispanics were less likely to use technology health tools for diet, weight, and physical activity than non-Hispanic Whites (McCully et al., 2013). Technology health tools offer options to deliver messages, disseminate information, and engage participants (Bandura, 2004; Duncan et al., 2012). Given the high rate of chronic diseases amongst non-Hispanic Blacks and Hispanics (McCully et al., 2013); use of technology health tools offer an option to combat health disparities amongst minorities (Mitchell et al., 2010). Technology health tools could be effective in reducing health disparities because of the opportunity to reach a large number of minorities (Kerr et al, 2010; Mitchell et al., 2010).

Men evaluate perceived usefulness when they determine whether to use technology, on the other hand, women decide whether to use technology by evaluation of the degree of difficulty (Goh, 2011). If men determine that a technology health intervention is useful, a higher probability exists they will try the technology health intervention and maintain usage (Goh, 2011). Future research is needed to understand what factors may inhibit acceptance of the design of technology health tools and the role of gender.

**Self-Efficacy**

The use of technology health tools provides a method of self-management of health behavior. Self-management provides successful self-regulation, which enhances

self-efficacy (Bandura, 2005). Self-efficacy has been associated with successful health behavior changes (Chen & Lin, 2010). Researchers have validated the effectiveness of technology health tools to strengthen self-efficacy to influence health behaviors (Fanning et al., 2012; Liang et al., 2011; Whittaker et al., 2009). Self-management of health behavior provides a vehicle for individuals to improve self-efficacy by taking responsibility for their health behaviors (Kazer, Bailey, Sanda, Colberg, & Kelly, 2011; Kelders et al., 2012). Healthy lifestyle participation is sustained with the use of technology health tools for self-management of diet and physical activity (Kazer et al., 2011). Self-efficacy along with self-management influence participation in nutrition and physical activity health interventions (Anderson-Bill et al., 2011).

The use of technology health tools differ between men and women (Borosund, Cvancarova, Ekstedt, Moore, & Ruland, 2013). Women experience lower levels of technology adoption than men due to higher levels of computer anxiety and lower levels of computer self-efficacy (Aguirre-Urreta & Marakas, 2010). The effect of gender was demonstrated by female's higher academic performance than men, which included higher levels of self-efficacy in the use of technology in online learning environments (Perkowski, 2013). However, results of the Perkowski (2013) study were contrary to other studies that demonstrated that men have higher computer self-efficacy (Bao, Xiong, Hu, & Kibelloh, 2013; He & Freeman, 2010). According to He and Freeman (2010), men are more confident using computers than females because they have learned about computers and practiced on them more than women (Goh, 2011; He & Freeman, 2010).

Because men have more experience with computers and higher computer self-efficacy (He & Freeman, 2010), the use of technology health tools appeal to men.

Understanding the theoretical association of self-efficacy upon participation in healthy lifestyle behavior provide an understanding of factors that contribute to the development of effective use of technology health tools for men. This study can affect social change by providing an understanding of the components necessary to design technology health tools that increase the participation of men in healthy lifestyle behavior. Incorporation of theory into the design of the use of technology health tools has the potential to improve health behavior to reduce chronic diseases (Fanning et al., 2012). Inclusion of components in the design of technology health tools for self-management that appeal to men could increase participation and result in better health outcomes.

**Participation in Healthy Lifestyle Behavior**

Healthy lifestyle programs generally have higher participation from women than men (Anderson-Bill et al., 2011; Duncan et al., 2012; George et al., 2012; Hankonen et al., 2010; Renner et al., 2008). Technology health tools for diet, weight loss, and physical activity are also likely to be used more by women (McCully et al., 2013). Future research utilizing theories that examine the role of gender are needed to determine factors that affect health behavior (Hankonen et al., 2010). Research conducted by McCully et al. (2013), indicated there were no differences in the use of technology health tools for diet, weight control, and physical activity among men and women. Technology health tools offer a low-cost options for effective diet, physical activity, and weight interventions capable of reaching numerous individuals (McCully et al., 2013). In addition, technology

health tools offer convenience to users by eliminating travel requirements and decreasing the time required to participate in diet, physical activity, and weight interventions (McCully et al., 2013). The use of technology health tools for diet, weight loss, and physical activity resulted in higher fruit and vegetable consumption, and greater participation in physical activity compared to not using technology health tools (McCully et al., 2013).

However, there are numerous scientific health interventions; participation in physical activity remains low for men and women (Fanning et al., 2012). Individuals that begin engaging in physical activity often do not sustain regular participation (Borosund et al., 2013; Crutzen et al., 2011; Fanning et al., 2012; Kelders et al., 2012; McCully et al., 2013). Fifty percent of the individuals that start a physical activity regime cease participation within six months (Fanning et al., 2012). New technologies provide options for the development of solutions to increase participation and adherence to the use of technology health tools for physical activity participation (Brouwer et al., 2011; Davies et al., 2012; Fanning et al., 2012).

Researchers have validated the effectiveness of mobile technology to strengthen self-efficacy to influence health behaviors (Fanning et al., 2012; Hankonen et al., 2010; Liang et al., 2011; Whittaker et al., 2009); therefore, the availability of mobile technology offers opportunities to increase participation in the use of technology health tools. Mobile technology provides the opportunity to increase participation in healthy lifestyle behavior because the devices are often carried by the user and easily accessible (Fanning et al., 2012; Riley et al., 2011). Theoretically designed health tools that use smartphone

technology focused upon behavioral change offer a tool to increase participation in healthy lifestyle behavior (Fanning et al., 2012). Analysis of the use of technology health tools offered by mobile technology devices provide researchers with a base of knowledge for guidance in the development of future health interventions using mobile technology (Fanning et al, 2012; Kirwan et al., 2012). Technology health tools using mobile phones need theoretical frameworks to help identify which factors contribute to successful interventions that change health behavior (Fanning et al., 2012). With that said, researchers have found mobile phone technology to be effective to influence health behaviors such as diabetes management (Fanning et al., 2012; Liang et al., 2011; Lorig et al., 2012) and smoking cessation (Fanning et al., 2012; Whittaker et al., 2009).

Though technology health tool use is effective in changing participation in healthy lifestyle behavior, maintenance of the behavior is a problem (Bandura, 2004; Blanson et al., 2009; Brouwer et al., 2011; Crutzen et al., 2011; Glasgow et al., 2010; Glasgow et al., 2012; Glazenbrook & Brawley, 2011; Kelders et al., 2012; Neve et al., 2010; Webb et al., 2010). The average rate of sustained usage of participants using health interventions, which use technology health tools for 10 weeks is 50% (Kelders et al., 2012), thus demonstrating the challenge of sustaining usage of technology health tools long-term. Sustained usage of technology health tools needs to be maintained throughout the life of men to change health poor behavior; therefore, a theoretical framework is needed to understand how to develop technology health tools that sustain participation of men in healthy lifestyle behavior (Crutzen et al., 2011; Fanning et al., 2012; Glazenbrook & Brawley, 2011; Kelders, et al., 2012; Webb et al. 2010).

Technology health tools that offer the opportunity to be personally designed specifically for men or women have demonstrated increased sustained participation in healthy lifestyle behavior (Brouwer et al., 2011; Crutzen et al., 2011; Davies et al., 2012; Fanning et al., 2012; Hansen et al., 2012; Kennedy et al., 2012; Vandelanotte et al., 2013). Technology health tools that offer high levels of contacts with men or women have increased participation in healthy lifestyle behavior (Hansen et al., 2012). Mobile technology health tools offer options for health reminders that provide the opportunity for frequent contact with men or women using these tools (Kelders et al., 2012). Technology health tools supply methods for frequent interaction to measure and facilitate health behavior changes (Blanson Henkemans et al., 2009; Hansen et al., 2012; Glasgow et al., 2010; Glasgow et al., 2012; Lorig et al., 2012; Kerr et al., 2010); thus, technology health tools designed with the capability for engagement in frequent contact increase the probability of successfully changing health behavior.

Health intervention targeted to men has potential to increase participation in healthy lifestyle behavior because of the use of technology health tools. According to Davies et al. (2012), small positive effect increases in physical activity resulted from the use of technology health tools to monitor participation in physical activity. Findings by Webb et al. (2010) also support increases in physical activity as a result of using technology tools. Increases in physical activity attributed to the use of technology health tools resulted in significant increases in physical activity across various diverse populations (Davies et al., 2012; McCully et al., 2013; Mitchell et al., 2010).

## Summary and Conclusions

A major theme that exists in the literature is men often are not adequately represented in the research of technology health tools as a method to prevent chronic diseases (Anderson-Bill et al., 2012; Duncan et al., 2012; George et al., 2012). Researchers have found that technology health tools are a feasible medium to be used for health interventions to change health behavior (Crutzen et al., 2011; McCully et al., 2013; Neve et al., 2010; Taylor et al., 2013). The effectiveness of technology health interventions for self-management of physical activity and diet behaviors for men is primarily untested (Duncan et al., 2012). Men are generally not well represented in health intervention research focusing upon changing health behaviors to prevent chronic disease (Duncan et al., 2012; George et al., 2012); therefore, further research is needed to understand how to change health behavior within this population (George et al., 2012; Vandelanotte et al., 2013).

Research is needed to understand how to design technology health tools that will sustain participation in healthy lifestyle behavior (Blanson Henkemans et al., 2009; Glazebrook & Brawley, 2011; Kelders et al., 2012; Nijland et al., 2011) throughout the lives of men. According to a systematic review of the literature, research is needed to understand if theoretical frameworks can improve the design of technology health tools (Webb et al., 2010). Technology health tools require future research because they have the potential to effectively change health behavior (Davies et al., 2012; Kelders et al., 2012; McCully et al., 2013).

Current literature indicates that theory-based technology health tools have a greater probability of sustained participation in healthy lifestyle interventions (Brouwer et al., 2011; Davies et al., 2012). Healthy lifestyle participation has been found to be sustained with the use of technology health tools for self-management of diet and physical activity (Brouwer et al., 2011; Davies et al., 2012; Kazer et al., 2011). Men participate in technology healthy lifestyle interventions less than women (Anderson-Bill et al., 2011; Duncan et al., 2012; George et al., 2012; Taylor et al., 2013).

Targeting men in diverse populations with technology health interventions could increase participation in healthy lifestyle behavior amongst these individuals. Researchers often report short-term behavioral changes as opposed to long-term behavioral changes; therefore, intervention elements such as theoretical design need to be further studied to determine their role in participation adherence in using technology health tools (Brouwer et al., 2011; Crutzen et al., 2011; Davies et al., 2012; Fanning et al., Hansen et al., 2012; Kelders et al., 2012; Kennedy et al., 2012; Vandelanotte et al., 2013; Webb et al., 2010). Future research is needed to understand factors in the use of technology health tools of specific target audiences (Davies et al., 2012, McCully et al., 2013); therefore, understanding the specific components of technology health interventions for men could result in use of technology tools, which could improve health behavior.

Lack of participation of men in healthy behavior is a problem; thus, research is needed to understand what factors increase participation in healthy lifestyle behavior (Blanson Heckemans et al., 2009; Glazebrook & Brawley, 2011; Kelders et al., 2012; Nijland et al., 2011). Men have identified motivation, willpower, and time as the main

causes that prevent participation in healthy lifestyle behavior; thus, research is needed to understand the components of technology health tools that address these issues (Duncan, 2012). A gap exists because there is limited knowledge regarding the specific components that should be used to design technology health tools to appeal to men (Vandelanotte et al., 2013); hence, future research is needed to understand how to develop technology health tools that focus upon the needs of men (Wong, Gilson, van Uffelen, & Brown, 2012).

Chapter 2 supported the need for this study by the discussion of literature that identified the need to examine components of technology health tools that influence men to change their health behavior. A gap in the literature exists regarding the specific components to successfully design technology health tools to appeal to men. The research questions in this study were addressed by the analysis of literature that measured the variables of the research questions in this chapter.

# Chapter 3: Research Method

## Introduction

The purpose of this quantitative study was to examine the relationship between the use of technology health tools and self-efficacy impact on men in the United States' participation in healthy lifestyle behavior. Technology health tool use was the independent variable and was measured by the use of technology to monitor nutrition and physical activity. Self-efficacy was used as a mediating variable to determine if there was a relationship between the independent variable of technology health tool use and the dependent variable of participation in healthy lifestyle behavior.

This chapter discusses the quasi-experimental design that was used to test the significance between the independent and dependent variables. Information was provided about the source of the secondary data that was used for this study. A plan outlining the methods that were used to analyze the data is discussed, along with the ethical procedures followed and threats to validity.

## Research Design and Rationale

A quasi-experimental design was utilized to compare men that used technology health tools to men that did not utilize technology health tools. A control group consisting of men not using technology health tools allowed the opportunity to measure the impact of the independent variable, the use of technology health tools upon the dependent variable, participation in healthy lifestyle behavior. This study used self-efficacy as a mediating variable to provide a theoretical foundation to explain the relationship between

the independent variable, the use of technology health tools, and the dependent variable, participation in healthy lifestyle behavior.

Three primary research questions were crafted to explore specific aspects of this topic. Research question one (RQ1) measured the effect of the use of technology health tools upon participation in healthy lifestyle behavior to a group using technology health tools to a control group not using technology health tools. The second research question (RQ2) evaluated the theoretical influence of the mediating variable self-efficacy upon the dependent variable participation in healthy lifestyle behavior. The last research question (RQ3) was used to examine the role of self-efficacy to explain the relationship between the use of technology health tools and participation in healthy lifestyle behavior.

The use of secondary data from the Health Information National Trends Survey (HINTS) 4 Cycle 1 survey (National Cancer Institute, 2014b) made it impossible to conduct a random assignment of the men in the sample; this led to a quasi-experimental design being used because it does not require random assignment (Frankfort-Nachmias & Nachmias, 2008). The use of a control group in a quasi-experimental design allowed the evaluation of an intervention upon a group to be compared to a group that does not receive the intervention. The control group that did not receive the intervention provided a baseline for the intervention. The use of two groups offers the most effective baseline of measurement of the intervention (Frankfort-Nachmias & Nachmias, 2008).

Limited knowledge exists regarding the use of technology health tools to assist with self-management of healthy lifestyle behavior in the United States (McCully, Don, & Updegraff, 2013). This study advanced knowledge in this discipline by the use of a

quasi-experimental study, which used data from a national sample to analyze the use of technology health tools by men in the United States. In addition, a mediating variable, which measured self-efficacy, was used to provide a theoretical explanation of the relationship between the independent variable, the use of technology health tools, and the dependent variable, participation in healthy lifestyle behavior.

**Population**

The target population of this study consisted of men at least 18 years of age and older. The sample consisted of 1,552 men whose responses were collected between October 2011 and January 2012 for the HINTS 4 Cycle 1 survey. Inclusion in the HINTS 4 Cycle 1 survey required respondents to be at least 18 years of age, but had no upper age limit. This led to all men's responses collected by the survey being included in the sample. The sample of the HINTS 4 Cycle 1 survey is generalizable to approximately 111,372,696 men in the United States according to Westat (2012).

**Sampling and Sampling Procedures**

This study's use of secondary data inherited the sampling procedure from the HINTS 4 Cycle 1 survey, which utilized a two-stage design. First, a stratified sample of addresses was selected from a database of residential addresses in the United States. High-minority, low-minority, and Central Appalachian strata were created based on demographic data. Creation of the three strata was performed to increase the accuracy of the estimates for the high-minority and Central Appalachian subpopulation. Because of the low responses to previous HINTS surveys, the high-minority stratum and the Central Appalachia stratum were oversampled to increase the total responses for these

subpopulations (Westat, 2012). The HINTS 4 Cycle 1 survey was mailed to 6,730 addresses in the high minority stratum, 5,475 surveys were mailed to addresses in the low minority stratum and 180 surveys were mailed to the addresses in the Central Appalachia stratum (Westat, 2012).

The second stage of the sample design consisted of selection of the adults living in the households that received the survey. Survey participants within the households were selected by either the "All Adult" method or the "Next Birthday" method. The "All Adult" method mailed two surveys that requested every adult in the household to respond. The "Next Birthday" method requested only the member of the household with the next upcoming birthday respond to the survey (Westat, 2012).

The survey response methods resulted in data collected from 3,959 respondents, including men and women (Westat, 2012). The final response rate for the high-minority strata was 27.97%, the low-minority strata response rate was 39.34%, and the Central Appalachia strata response rate was 32.62% (Westat, 2012). The overall response rate to the HINTS 4 Cycle 1 survey was 36.67% (Westat, 2012). Only the 1,552 responses from men were used for analysis of this study.

**Power Analysis**

A power analysis was performed to determine the sample size adequate for this study. The effect size of .10 was used to measure the strength of the relationship between the independent variable, the use of technology health tools, the mediating variable self-efficacy, and the dependent variable, participation in healthy lifestyle behavior. A variance of 1% can be explained by the use of an effect size of .10 (Cohen, 1988, 1992 as

cited by Field, 2009). An alpha level of .05 provides a 95% probability that a Type I error did not occur (Field, 2009). A statistical power of 0.8 was used because if a relationship exists between the independent variable, the mediating variable and the dependent variable, there is an 80% chance the relationship was detected (Cohen, 1988, 1992 as cited by Field, 2009). The statistical program G*Power was used to calculate the sample size (Faul, Erdfelder, Buchner, & Lang, 2009). The size of the sample used for this study was 1,552, which exceeds the required sample size of 110 calculated by G*Power. Results of the power analysis are displayed in Table 1.

Table 1

Sample Size Power Analysis

| Effect Size | Statistical Power Level | Alpha Level | Required Sample Size |
|---|---|---|---|
| 0.1 | 0.80 | 0.05 | 110 |

Note. G*Power was used to calculate the power analysis
(Faul, Erdfelder, Buchner, & Lang, 2009).

**Procedures for Recruitment, Participation and Data Collection**

The original surveys for the HINTS 4 Cycle 1 were delivered to the selected households by the U.S. Postal Service. The data collection for the HINTS 4 Cycle 1 survey began on October 25, 2011 and concluded on February 21, 2012. The survey was accompanied by a $2.00 monetary incentive in an effort to encourage participation in the survey. Potential respondents received up to five mailings associated with the HINTS 4 Cycle 1 survey. The initial mailing contained the survey and a cover letter including instructions. Households not responding to the survey were mailed a reminder postcard and three follow-up mailings.

The receipt of completed questionnaires were tracked by a unique barcode located on each questionnaire. Barcode tracking allowed the status of each questionnaire to be recorded. Tracking of the questionnaires determined which households required follow-up mailings or removal from the list because the questionnaires were undeliverable to the address.

The HINTS 4 Cycle 1 data set is located on the National Cancer Institute's website (http://hints.cancer.gov). The data set is open to the public; therefore, no formal letter requesting permission to use the HINTS data sets is required. Use of the data set requires users to agree to the HINTS Data Terms of Use located on the National Cancer Institute's website. Potential users are required to mark a box indicating agreement to the

terms and conditions along with entering the potential user's email. The terms and conditions are included in the appendices.

**Instrumentation**

The HINTS written questionnaire instrument was developed to collect information regarding health communication, cancer knowledge, cancer related behavior, nutrition, physical activity, and health behavior in association with the use of the Internet. The items used in the HINTS 4 Cycle 1 survey instrument were collected from different sources. Some items were created by members of the HINTS program at the National Cancer Institute, while others were from national surveys such as the CDC's Behavioral Risk Factor Surveillance System (BRFSS). Smaller health related surveys were also a source of items in the HINTS 4 Cycle 1 survey. A pilot study was conducted using the HINTS questionnaire to identify potential problems (Cantor et al., 2009). Problems associated with skipping responses to questions were identified and corrected. Three rounds of cognitive testing were performed prior to the finalization of the written instrument. Details of the development of the HINTS 4 Cycle 1 written survey instrument, details regarding pilot tests, and establishment of sufficiency are outlined in the HINTS Final Report (Cantor et al., 2009). Many of the questions used in the HINTS 4 Cycle 1 survey were used in HINTS surveys conducted in 2003, 2005, and 2007 (Cantor et al., 2009).

Researchers have used the datasets containing information from the HINTS survey to conduct studies analyzing the health trends of the United States population. Use of the datasets containing information collected by the HINTS survey by multiple

researchers demonstrates the validity and reliability of the survey instrument. Researchers McCully et al. (2013) utilized the datasets containing HINTS information to measure the association of technology upon diet, physical activity, and demographics. Volkman et al. (2014) conducted a study using information from the HINTS datasets to perform an analysis to understand the association of Internet use, seeking health information and demographics such as gender, age, income, and education. Spleen, Lengerich, Camacho, and Vanderpool (2014) obtained information from HINTS datasets to research health trends in negative health behaviors such as poor diet and lack of physical activity, in relationship to demographics and health care avoidance. However, this study analyzed the use of technology health tools by men and the effect upon their participation in healthy lifestyle behavior. In addition, the theoretical component self-efficacy was evaluated to explain the relationship between technology health tool use and participation in healthy lifestyle behavior of men.

**Operationalization**

Survey items in the HINTS 4 Cycle 1 survey were used to perform a secondary analysis of the variables in this study. Though the HINTS questionnaire provided measurement of numerous items, only some of the items measured are applicable to this study. The questions measuring each variable are located in the Appendix.

The use of technology health tools, the independent variable measured the use of the Internet to monitor nutrition and physical activity. One of the questions used to measure this variable from the HINTS 4 Cycle 1 questionnaire is: In the last 12 months, have you used the Internet for any of the following reasons? Used a website to help you

with your diet, weight, or physical activity. Response options are measured on a categorical scale, possible responses were: 1.Yes or 2. No.

Self-efficacy, the mediating variable is the confidence an individual has in their ability to attain goals they set for themselves. Self-efficacy has the power to predict health behavior (Renner et al., 2008). When self-efficacy is used as a mediating variable, it explains the relationship between the use of technology health tools and participation in healthy lifestyle behavior. One of the questions used to measure this variable from the HINTS questionnaire is: Overall, how confident are you about your ability to take good care of your health? Response options are measured on a Likert scale, possible responses are: 1. completely confident, 2. very confident, 3. somewhat confident, 4. a little confident, 5. not confident at all.

Participation in healthy lifestyle behavior, the dependent variable is participation in healthy lifestyle behavior that included, activities related to healthy nutrition and participation in regular physical activity. Fruit consumption, vegetable consumption, and physical activity were used to measure this variable. An example of a question from the HINTS questionnaire used to measure this variable is: In a typical week, how many days do you do any physical activity of at least moderate intensity, such as brisk walking, bicycling at a regular pace, swimming at a regular pace, and heavy gardening? Response options are measure on an interval scale, possible responses are: 1 day a week, 2 days a week, 3 days a week, 4 days a week, 5 days a week, 6 days a week, 7 days a week.

**Data Analysis Plan**

The Statistical Package for the Social Sciences (SPSS) version 21 was used to analyze the data sets available for public use containing information collected for the HINTS 4 Cycle 1 survey. The statistical program WesVar 5.1 was used in addition to SPSS version 21. Use of WesVar 5.1 is necessary to incorporate the jackknife replicate weights used in the HINTS database (National Cancer Institute, 2014a). Not including the jackknife replicate weights in the analysis of information in the HINTS 4 Cycle 1 data sets could increase the possibility of type I errors resulting from incorrect p-values (National Cancer Institute, 2014a). Results of the statistical test performed in SPSS were imported into WesVar 5.1 to complete the analysis of this study. Secondary data obtained from HINTS data sets were used to analyze information associated with the independent variable, the use of technology health tools, the mediating variable, self-efficacy and the dependent variable participation in healthy lifestyle behavior.

The HINTS data sets available for public use have undergone data cleaning by Westat (2012) using predetermined processing rules for the data collected from the HINTS 4 Cycle 1 questionnaire. Rules were created to recode items without responses or items with responses that could not be determined, missing values were recoded using a forced-choice standardized data cleaning methods, and responses that allowed respondents to elaborate verbally were cleaned for spelling errors (Westat, 2012). The gender question had 103 missing responses. Cases that did not answer the gender question were not included in the sample. Though 103 cases were eliminated from the sample, the remaining 1552 cases were well above the 110 cases required for the sample

as indicated by the power analysis (Faul, Erdfelder, Buchner, & Lang, 2009). Responses with missing data that are included in the 1552 cases were coded by Westat (2012) with a value of -9. Westat (2012) performed the coding to include the value -9 for missing data for all responses; therefore, no modification was required to any of the 1552 cases that contained missing data because these cases are clearly identified.

A visual inspection of the information assisted in cleaning the data to remove errors prior to analysis. SPSS sorts survey responses in ascending order for each variable (Creswell, 2012). SPSS was used to visually inspect the records of the responses to each survey question. Viewing the responses to each survey question in ascending order offered an easy method to identify out-of-range or misnumbered cases (Creswell, 2012).

The research questions that addressed in this study were:

RQ1: Is there a quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior?

$H1_0$: There is no quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior.

$H1_a$: There is a quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior.

RQ2: Is there a quantitative effect of self-efficacy on participation in healthy lifestyle behavior?

$H2_0$: There is no quantitative effect of self-efficacy on participation in healthy lifestyle behavior.

$H2_a$: There is a quantitative effect of self-efficacy on participation in healthy lifestyle participation.

RQ3: What is the role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior?

$H3_0$: There is not a role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior.

$H3_a$: There is a role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior. A description of the variables that were used to address the research questions and test the null hypotheses of this study was discussed. The levels of measurement of the variables are outlined. The statistical test that was used for analysis of the research questions and hypothesis are also described. In addition, Table 2 identifies the research questions, hypotheses, variables, level of measurement of the variables and the statistical tests that were used in this study.

Table 2

*Data Analysis Summary*

| RQ Hypothesis | IV Variable | IV Level of Measurement | Mediating Variable | MV Level of Measurement | Dependent Variable | Statistical Analysis |
|---|---|---|---|---|---|---|
| RQ1/H1 | Health Tools | Categorical | | | Healthy Lifestyle Behavior | Descriptive Statistics<br>Linear Multiple Regression<br>*t* test |
| RQ2/H2 | | | Self-Efficacy | Continuous | Healthy Lifestyle Behavior | Descriptive Statistics<br>Linear Multiple Regression |
| RQ3/H3 | Health Tools | Categorical | Self-Efficacy | Continuous | Healthy Lifestyle Behavior | Descriptive Statistics<br>Linear Multiple Regression |

Note. RQ = research question; H = hypothesis; IV = independent variable; MV = mediating variable
Dependent variable level of measurement is continuous for all research questions and hypothesis.

Descriptive statistics were computed to describe the sample. Frequencies and percentages were also computed for each demographic variable. Reporting of the demographics in the sample was categorized by men using technology health tools and men that did not use technology health tools. The demographics that were reported are age, ethnicity, and education. All demographics that were reported are categorical; therefore, only the mode was reported due to the limited usefulness of the information provided by the mean and the median for the categorical variables (Creswell, 2012). A table is included in Chapter 4 displaying the results.

Calculation of descriptive statistics of the demographics of the men in this study added to the body of knowledge by providing information on the age, ethnicity, and education. Demographic trends provide detail for the development of technology based health tools that achieve higher success because they are tailored to specific targeted groups (McCully et al., 2013). Descriptive statistics displaying the mean and the standard deviations for the groups that were used to test $H1_0$, $H2_0$, and $H3_0$ were also reported.

A group of men that use technology health tools $n = 323$ was compared to a group of men that did not use technology health tools $n = 667$. A $t$ test was used to determine if there is a significant difference between the samples of the two groups of men in this study. Comparison of the group of men using technology health tools to the group of men that did not use technology health tool offered the opportunity to measure the effect of the use of technology health tools by determining differences of the means between the two groups (Green & Salkind, 2011). The mean and the standard error of the mean were used to determine the significance of the differences of the means of the two groups.

Comparing the means of the two samples provide the opportunity to determine the significance of the null hypothesis of $H1_0$. The level of significance used was .05. In addition, the effect size was calculated. The results of the *t* test are depicted in Table 5 in Chapter 4. Though a *t* test enabled testing of the null hypothesis $H1_0$, the effect of the mediating variable self-efficacy upon the dependent variable participation in healthy lifestyle behavior could not be assessed. To test the null hypothesizes $H2_0$ and $H3_0$ regression analysis was used. In addition, the null hypothesis $H1_0$ was also tested using regression analysis.

Regression analysis is used to examine the relationship of multiple independent variables upon a single dependent variable (Rudestam & Newton, 2007). Multiple linear regression analysis is used to evaluate if a theoretical model explain the relationship between an independent variable and a dependent variable (Frankfort-Nachmias & Nachmias, 2008). Multiple linear regression was used to determine if the use of technology health tools, the independent variable had an effect upon participation of men in healthy lifestyle behavior, the dependent variable. Self-efficacy, the mediating variable was measured to determine if it provided a theoretical foundation that can be used to explain the relationship between the use of technology health tools and participation in healthy lifestyle behavior.

A multiple regression analysis was executed to ascertain the effects of the predictor variables the use of technology health tools and self-efficacy on the dependent variable participation in healthy lifestyle behavior. A mediator model was tested to determine if self-efficacy explained the relationship between the use of technology health

tools and participation in healthy lifestyle behavior. Results of the multiple regression analysis containing b-values, beta, confidence intervals and *R* squared at a significance level of .05 was reported in Tables 5, 6, and 7 located in Chapter 4. Performance of a Sobel test was attempted to determine if statistically significant results demonstrated mediation.

## Threats to Validity

External validity can be affected by threats such as the interaction of selection and treatment, interaction of setting and treatment, and interaction of history and treatment (Creswell, 2012). Interaction selection and treatment is a type of external validity that could affect this study because of the use of the HINTS 4 Cycle 1 secondary data. The low rate of minority responses was identified as a problem in the collection of HINTS data in previous years. In an effort to address external validity issues that could limit the generalizability of the survey results to minority populations, minority groups were sampled at higher rates during the collection of data for HINTS 4 Cycle 1 survey. Weighting was applied to the data to account for the increase in sampling of addresses in high minority communities. External validity threats associated with interaction of history and treatment were not applicable because no generalizations were made regarding past or future findings of the secondary HINTS 4 Cycle 1 data used for this study. External validity threats associated with interaction of setting and treatment were not applicable to the secondary HINTS data used for this study because no generalizations of the results were made to other settings.

This study utilized a quasi-experimental design; therefore, internal validity associated with history, maturation, testing, instrumentation, selection, and mortality were controlled (Campbell & Stanley (1963). According to Campbell and Stanley (1963), internal validity of regression could be a concern when using a quasi-experimental design. The internal validity associated with history, maturation, testing, instrumentation, selection, and mortality are controlled. Regression is not an internal validity threat because this study measured data collected from the HINTS 4 Cycle 1 questionnaire that measures multiple characteristics that were used to analyze the variables in this study. Subjects engaging in the pretest with extreme scores naturally perform better or worse on the posttest after receiving the intervention resulting in scores closer to the mean, thereby posing a regression internal threat to validity (Creswell 2012). The regression threat to internal validity was controlled in this study because subjects were not selected based upon extreme scores in the HINTS 4 Cycle 1 survey. There was no construct validity because data collected from the HINTS 4 Cycle 1 questionnaire measures multiple characteristics that adequately define the characteristics that were used to analyze the variables in this study. Multiple statistical tests were performed to address statistical conclusion validity threats.

**Ethical Procedures**

The secondary data that was used for this study does not require agreement from the owner of the HINTS 4 Cycle 1 data sets. The only requirement to obtain access for use of the data in the HINTS 4 Cycle 1 data sets is agreement to the 10 items listed in the terms and conditions. The online agreement to the terms and conditions has been

completed by populating the box on the website and supplying my personal email address. Once this proposal was approved, an application was submitted to the IRB to obtain the appropriate approval to perform analysis of the data in the HINTS 4 Cycle 1 data sets.

The secondary data obtained from the National Cancer Institute has kept the identity of the participants anonymous. No attempts were made to identify the study participants. Any attempt to identity individuals that participated in this study would be a violation of the terms and conditions agreement required for use of the HINTS 4 Cycle 1 data. Confidentiality of the participants in the survey remains the responsibility the National Cancer Institute. Because the survey participants were not identified, no responsibility is required to destroy data to maintain anonymity of the study participants.

**Institutional Permissions**

The Institutional Review Board (IRB) reviewed the proposal for this study to ensure Walden University's ethical standards were met. The ethical standards were met and permission was granted to conduct the study on September 18, 2014. The IRB approval number is 09-18-14-0228196.

## Summary

A quantitative study was conducted that utilized secondary data from the HINTS 4 Cycle 1 survey obtained from participants throughout the United States. This study examined the relationship between the use of technology health tools and the role of self-efficacy, upon participation of men in healthy lifestyle behavior. Limited knowledge exists regarding the specific components needed to design technology health tools that

appeal to men. This study filled a gap in the literature by the use of self-efficacy as a theoretical component of the social cognitive theory to evaluate the relationship between the use of technology health tools and the participation of men in healthy lifestyle behavior.

# Chapter 4: Results

## Introduction

The purpose of this quantitative study was to examine the relationship between the use of technology health tools and the role of self-efficacy upon men in the United States and the influence upon participation in healthy lifestyle behavior. The goal of the analysis was to establish if there is a significant relationship between the use of technology health tools, self-efficacy, and the effect of participation in healthy lifestyle behavior. Results that demonstrate a significant relationship between the use of technology health tools, self-efficacy, and participation in healthy lifestyle behavior offer a contribution to the body of knowledge to determine, which components are needed to design technology health tools to appeal to men.

The research questions and hypothesis for this study were as follows:

RQ1: Is there a quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior?

$H1_0$: There is no quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior.

$H1_a$: There is a quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior.

RQ2: Is there a quantitative effect of self-efficacy on participation in healthy lifestyle behavior?

$H2_0$: There is no quantitative effect of self-efficacy on participation in healthy lifestyle behavior.

$H2_a$: There is a quantitative effect of self-efficacy on participation in healthy lifestyle participation.

RQ3: What is the role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior?

$H3_0$: There is not a role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior.

$H3_a$: There is a role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior.

The results from this study are presented in this chapter along with a discussion of the methods used to collect the data. Because the goal of this study was to determine if there is an effect of the use of technology health tools, the analysis of the data compared men that used technology health tools to men that did not utilize technology health tools. Descriptive statistics were used to analyze the demographic data of the sample. Inferential statistical analysis was used to perform a *t* test to analyze hypothesis 1 and linear multiple regression analysis was used to test each hypothesis in this study. This chapter concludes with a summary of the statistical significance of the results to each research question.

## Data Collection

This study used secondary data from the Health Information National Trends Survey (HINTS) 4 Cycle 1. Data were collected between October 2011 and January 2012. A stratified sample of addresses was obtained from a database of residential addresses in the United States in an effort to survey individuals throughout the entire

United States. High-minority, low-minority strata, and Central Appalachian strata were created to increase the accuracy of the representation of minority and Central Appalachian subpopulations. The HINTS 4 Cycle 1 survey was mailed to 6,730 addresses in the high minority stratum, 5,475 surveys were mailed to addresses in the low minority stratum, and 180 surveys were mailed to addresses in the Central Appalachia stratum (Westat, 2012). Households selected to be surveyed by the "All Adult" method received two surveys; however, household surveyed by the "Next Birthday" method received only one survey (Westat, 2012).

Data collection methods resulted in 3,959 responses from men and women. The final response rate for the high-minority strata was 27.97%, the low-minority strata response rate was 39.34%, and the Central Appalachia strata response rate was 32.62% (Westat, 2012). The overall response rate to the HINTS 4 Cycle 1 survey was 36.67% (Westat, 2012). Only the responses to the survey from men were considered for this study. Responses from 1,552 men were obtained for the HINTS 4 Cycle 1 survey; however, 562 responses were excluded. The exclusion criteria for men consisted of responses to the survey questions measuring the use of technology health tools that were invalid, missing, "I don't know" (Westat, 2012). This inclusion led to an effective sample size of $N = 990$.

Survey respondents ranged in age from 18 and over. Survey participants' education ranged from less than 8 years to respondents completing postgraduate education. Non-Hispanic White men were the largest group represented in the sample; however, various ethnicities were represented such as Hispanic, Non-Hispanic Black,

Non-Hispanic American Indian or Alaska Native, Non-Hispanic Asian, Non-Hispanic Native Hawaiian or Pacific Islander, and Non-Hispanic multiple races. Please refer to Table 3 for specific percentages of each ethnic group represented in this study. According to Westat (2012), the sample of the HINTS 4 Cycle 1 survey is generalizable to approximately 111,372,696 men in the United States; therefore, the sample is representative of the population of this study.

## Results

The presentation of the initial results of the study begins with a discussion of the descriptive statistics of the sample. Next, the results of a *t* test comparing the means of the two groups of men are presented. The results of the regression analysis used to test the three hypothesis of this study are then outlined in conjunction with each hypothesis and the associated research questions.

### Descriptive Statistics

The final sample of men used for this study consisted of 990 participants. Table 3 shows the frequencies and percentages for age, education and ethnicity of the sample. The frequency and percentages of the sample were divided into two groups. One group consisted of men that used technology health tools and another group of men that did not use technology health tools. Men between the ages of 50 and 64 accounted for the highest usage of technology health tools. While technology health tool usage for men between 35 and 49 years of age was similar at 30.3%, men between 50 and 64 years of age had the highest technology health tool usage rate at 36.2%. Men between 18 and 34 years of age were the next largest group, utilizing technology health tools at a rate of 21.7%. Overall

use of technology health tools were 33% across the entire sample; however, the percentage of men that used technology health tools dropped dramatically for men 65 years of age and older. The largest group of men (37.8%) in the entire sample not using technology health tools were between 50 and 64 years of age.

The analysis highlighted a strong correlation between college attendance and technology health tool use. Technology health tool usage amongst college graduates was the highest at 33.7%. The next highest usage was found amongst men with postgraduate education, followed by college graduate's usage, at 26.9% and 21.7%, respectively. While college attendance significantly increases the use of technology health tools, post high school training did not have the same impact, with only 5.3% of these men using technology health tools. High school graduates used technology health tools at a rate of 9.0%, which was significantly higher than men with post high school training.

Distinct differences between ethnic groups were depicted by the results. Non-Hispanic white men used technology health tools at a rate of 68.7%, which was the highest usage by men of any ethnicity. Hispanic and Non-Hispanic Black men had the next highest use of technology health tools following Non-Hispanic white men at rates of 9.3% and 8.7% respectively. Non-Hispanic Asian men were the only other ethnic group to have significant technology health tool usage at a rate of 7.4%.

Table 3

*Frequencies and Percentages for Demographic Data*

| | Health Tool Users | | Non Health Tool Users | |
|---|---|---|---|---|
| Demographic | *n* | % | *n* | % |
| Age | | | | |
| 18-34 | 70 | 21.7% | 89 | 13.3% |
| 35-49 | 98 | 30.3% | 149 | 22.4% |
| 50-64 | 117 | 36.2% | 252 | 37.8% |
| 65-74 | 30 | 9.3% | 119 | 17.8% |
| 75+ | 8 | 2.5% | 58 | 8.7% |
| Education | | | | |
| Less than 8 years | 2 | 0.6% | 4 | 0.7% |
| 8 through 11 years | 9 | 2.8% | 18 | 2.7% |
| High School Graduate | 29 | 9.0% | 105 | 15.7% |
| Post high school training | 17 | 5.3% | 53 | 7.9% |
| Some college | 70 | 21.7% | 179 | 26.8% |
| College graduate | 109 | 33.7% | 162 | 24.3% |
| Postgraduate | 87 | 26.9% | 146 | 21.9% |
| Ethnicity | | | | |
| Hispanic | 30 | 9.3% | 51 | 7.6% |
| Non-Hispanic White | 222 | 68.7% | 483 | 72.5% |
| Non-Hispanic Black | 28 | 8.7% | 68 | 10.0% |
| Non-Hispanic American Indian or Alaska Native | 1 | 0.3% | 1 | 0.1% |
| Non-Hispanic Asian | 24 | 7.4% | 27 | 4.0% |
| Non-Hispanic Native Hawaiian or Pacific Islander | 1 | 0.3% | 1 | 0.1% |
| Non-Hispanic multiple races | 17 | 5.3% | 36 | 5.5% |

The mode and the standard deviation of the age of men using technology health tools differed from that of men who did not use technology health tools as depicted in Table 4. The mode of the age of men who used technology health tools is nine years less than men that did not use technology health tools. The mode and standard deviation of men that used technology health tools compared to men that did not use technology health tools in relationship to education also differed. The largest number of men who did not use technology health tools were college graduates, which was demonstrated by the mode. The standard deviation for education of men that did not use technology health tools were larger than that for men that used technology health tools. The mode for men that used technology health tools and men that did not use technology in relationship to ethnicity was the same; the standard deviation for each group was also relatively similar.

Table 4

Descriptive Statistics of the Sample

| | Health Tool Users | | Non Health Tool Users | |
|---|---|---|---|---|
| Demographic | Mode | *SD* | Mode | *SD* |
| Age | 54 | 15.02 | 63 | 16.84 |
| Education | College Graduate | 1.58 | Some College | 2.25 |
| Race/Ethnicity | Non-Hispanic White | 2.22 | Non-Hispanic White | 2.37 |

**Research Question 1 and Hypothesis 1**

Is there a quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior?

$H1_0$ There is no quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior.

$H1_a$ There is a quantitative effect of the use of technology health tools on participation in healthy lifestyle behavior.

An independent-samples *t t*est was conducted to evaluate the hypothesis that there is no effect of the use of technology health tools on participation in healthy lifestyle behavior as opposed to there is an effect of the use of technology health tools on participation on healthy lifestyle behavior. Results of the *t* test are outlined in Table 5. The two-tailed *t* test was significant, $t = (561) = 2.738$, $p = .006$, $p < .05$ which supported the alternative hypothesis. Men using technology health tools ($M = 5.42$, $SD = 1.22$) participated more in healthy lifestyle behavior then men not using technology health tools ($M = 5.21$, $SD = 1.06$). The 95% confidence interval for the difference in the means was quite distinct, ranging from .06 to .37. Calculation of an effect size of .12 indicated a small effect, which would explain approximately 1% of the total variance of the strength of the relationship between technology health tool usage and participation in healthy lifestyle behavior.

Table 5

Independent Samples t Test H1 Analysis

| | | | | | | | 95 % CI | |
|---|---|---|---|---|---|---|---|---|
| Health Tool Usage | *n* | *M* | *SD* | *SEM* | *t* | Effect Size | LL | UL |
| Health Tool Users | 323 | 5.42 | 1.22 | 0.07 | 2.74 | .12 | 0.06 | 0.37 |
| Non Health Tool Users | 667 | 5.21 | 1.06 | 0.04 | | | | |

Note. CI = confidence interval; LL = lower limit; UL = upper limit.

$p = .006$, $p < .05$

Two multiple linear regression analysis was conducted to determine if the use of technology health tools had an effect upon participation in healthy lifestyle behavior. To test the null hypothesis the average of two questions from the HINTS 4 Cycle 1 survey was used to measure the effect of the use of technology health tools by men in the sample. The questions used to measure technology health tool use can be found in the Appendix. In addition, the questions were used to form two groups within the sample. A yes response to either question resulted in placement in the group of men using technology health tools. Men responding no to both questions were placed in the group not using technology health tools.

Participation in healthy lifestyle behavior was measured by four questions from the HINTS 4 Cycle 1 survey. The questions used to measure healthy participation are located in the Appendix. An index was created to measure diet and physical activity participation of the men in the sample. Two questions were recoded to measure healthy fruit and vegetable consumption based upon the Dietary Guidelines for Americans 2010 established by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). Two questions were recoded to measure physical activity participation based upon the physical activity guidelines outlined by the U.S. Department of Health and Human Services (U.S. Department of Health and Human Services, 2014).

Hypothesis 1 was rejected for the men in the group using technology health tools because there was a significant effect upon the average use of technology health tools

upon participation in healthy lifestyle behavior as demonstrated by the significant statistical results illustrated in Table 6. The value of the *t* statistic and the associated significance $t\ (49) = -2.212$, $p = .032$, $p < .05$ also supports rejection of the null hypothesis because the probability of the *t* value was significant. The multiple linear regression analysis indicated that there was a significant effect upon technology health tool use and participation in healthy lifestyle behavior.

The null hypothesis was accepted for the men in the group not using technology tools because there was not a significant effect upon the average use of technology health tools on participation in healthy lifestyle behavior as illustrated in Table 6. The value of the *t* statistic and the associated significance $t\ (49) = 1.023$, $p = .312$, $p > .05$ also supported acceptance of the null hypothesis because the probability of the t value was not significant. The multiple linear regression analysis suggests that men that did not use technology health tools are less likely to participate in healthy lifestyle behavior than men that do use technology health tools.

Table 6

*Multiple Linear Regression Analysis H1*

| | Health Tool Users | | | | | Non Health Tool Users | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model 1 | *B* | *SE*ь | Beta | 95% CI | | *B* | *SE*ь | Beta | 95% CI | |
| (Constant) | 6.64 | 0.521 | | | | 5.19 | 0.055 | | | |
| Health tool use | -0.87 | 0.378 | -.16 | [-0.30, | -0.02] | 0.03 | 0.027 | .05 | [-0.04, | 0.13] |

Note: Health tool users $R^2$ = .025, $F(1, 49)$ = 5.298, $p$ = .026, $p$ < .05.

Non health tool users $R^2$ = .002, $F(1,49)$ = 1.097, $p$ = .300, $p$ > .05.

**Research Question 2 and Hypothesis 2**

Is there a quantitative effect of self-efficacy on participation in healthy lifestyle behavior?

$H2_0$ There is no quantitative effect of self-efficacy on participation in healthy lifestyle behavior.

$H2_a$ There is a quantitative effect of self-efficacy on participation in healthy lifestyle participation.

Two multiple linear regression analysis were conducted to determine if self-efficacy had an effect upon participation in healthy lifestyle behavior. To test the null hypothesis the average of two questions from the HINTS 4 Cycle 1 survey was used to measure the self-efficacy of the men in the sample. The questions used to measure self-efficacy are located in the Appendix. In addition, two questions from the HINTS 4 Cycle 1 survey was used to measure the use of technology health tools by men in the sample. The questions were used to form two groups within the sample. A yes response to either question resulted in placement in the group of men using technology health tools. Men responding no to both questions were placed in the group not using technology health tools.

Participation in healthy lifestyle behavior was measured by four questions from the HINTS 4 Cycle 1 survey. The questions used to measure healthy participation are located in the Appendix. An index was created to measure diet and physical activity participation of the men in the sample. Two questions were recoded to measure healthy

fruit and vegetable consumption based upon the Dietary Guidelines for Americans 2010 established by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). Two questions were recoded to measure physical activity participation based upon the Physical Activity Guidelines outlined by the U.S. Department of Health and Human Services (U.S. Department of Health and Human Services, 2014).

Hypothesis 2 was rejected for the men in the group of the sample using technology health tools because there was a significant effect of self-efficacy on participation in healthy lifestyle behavior as demonstrated by the significant statistical results illustrated in Table 7. The value of the *t* statistic and the associated significance $t(49) = -2.557$, $p = .014$, $p < .05$ also supports rejection of the null hypothesis because the probability of the *t* value was significant. The multiple linear regression analysis suggests that men with high self-efficacy are more likely to participation in healthy lifestyle behavior.

The null hypothesis was accepted for the men in the group of the sample not using technology tools because there was not a significant effect of self-efficacy upon participation in healthy lifestyle behavior as illustrated in Table 7. The value of the *t* statistic and the associated significance $t(49) = -1.619$, $p = .112$, $p > .05$ also supports acceptance of the null hypothesis because the probability of the *t* value was not significant. The multiple linear regression analysis suggests that men with low self-efficacy are less likely to participate in healthy lifestyle behavior.

Table 7

Multiple Linear Regression Analysis H2

| | Health Tool Users | | | | | Non Health Tool Users | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model 2 | B | *SE*ь | Beta | 95% CI | | B | *SE*ь | Beta | 95% CI | |
| (Constant) | 5.96 | 0.234 | | | | 5.34 | 0.129 | | | |
| Self-Efficacy | -0.24 | 0.101 | -.16 | [-0.29, | -0.03] | -0.07 | 0.053 | -.08 | [-0.18, | 0.02] |

Note: Health tool users $R^2$ = .026, $F(1, 49)$ = 5.545, $p$ = .023, $p$ < .05.

Non health tool users $R^2$ = .007, $F(1,49)$ = 1.634, $p$ = .207, $p$ > .05.

**Research Question 3 and Hypothesis 3**

What is the role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior?

$H3_0$ There is not a role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior.

$H3_a$ There is a role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior.

Two multiple linear regression analysis were conducted to determine if there is a role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior. To test the null hypothesis the average of two questions from the HINTS 4 Cycle 1 survey was used to measure self-

efficacy of the men in the sample. The questions used to measure self-efficacy are located in the Appendix. Two questions using categorical measurement from the HINTS 4 Cycle 1 survey was used to measure the use of technology health tools by men in the sample. The questions measuring technology health tool usage were used to form two groups within the sample. A yes response to either question resulted in placement in the group of men using technology health tools. Men responding no to both questions were placed in the group not using technology health tools. The questions used to measure technology health tool use can be found in the Appendix.

Participation in healthy lifestyle behavior was measured by four questions from the HINTS 4 Cycle 1 survey. The questions used to measure healthy participation are located in the Appendix. An index was created to measure diet and physical activity participation of the men in the sample. Two questions were recoded to measure healthy fruit and vegetable consumption based upon the Dietary Guidelines for Americans 2010 established by the U.S. Department of Agriculture and the U.S. Department of Health and Human Services (U.S. Department of Agriculture & U.S. Department of Health and Human Services, 2010). Two questions were recoded to measure physical activity participation based upon the Physical Activity Guidelines outlined by the U.S. Department of Health and Human Services (U.S. Department of Health and Human Services, 2014).

Hypothesis 3 was rejected for the men in the group using technology health tools because there was a significant effect of self-efficacy upon the use of technology health tools on participation in healthy lifestyle behavior as demonstrated by the significant

statistical results illustrated in Table 8. The value of the *t* statistic for self-efficacy and the associated significance $t\ (48) = -2.744$, $p = .008$, $p < .05$ also supports rejection of the null hypothesis because the probability of the *t* value was significant. The results in Table 8 indicate a significant relationship of the variable technology health tool usage, in addition to significance of the *t* value $t\ (48) = -2.084 = p = .042$, $p < .05$. The level of significance is lower for self-efficacy than technology health tools. The lower the significance of a variable the greater the contribution to a model (Field, 2009). Therefore, the multiple linear regression analysis indicates that self-efficacy had a greater significant effect upon participation in healthy lifestyle behavior than the use of technology health tools.

The null hypothesis was accepted for the men in the group of the sample not using technology tools because there was not a significant effect of self-efficacy on participation in healthy lifestyle behavior as illustrated in Table 8. The value of the *t* statistic and the associated significance $t\ (48) = -1.972$, $p = .054$, $p > .05$ also supports acceptance of the null hypothesis because the probability of the *t* value was not significant. The multiple linear regression analysis suggests that men that did not use technology health tools have lower self-efficacy and are less likely to participate in healthy lifestyle behavior.

Table 8

Multiple Linear Regression Analysis H3

| | Health Tool Users | | | | | Non Health Tool Users | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Model 3 | B | *SE*ь | Beta | 95% CI | | B | *SE*ь | Beta | 95% CI | |
| (Constant) | 7.72 | 0.663 | | | | 5.34 | 0.126 | | | |
| Health tool use | -0.89 | 0.410 | -.16 | [-0.32, | -0.01] | 0.04 | 0.028 | .06 | [-0.03, | 0.15] |
| Self-Efficacy | -0.25 | 0.096 | -.17 | [-0.29, | -0.04] | -0.08 | 0.050 | -.09 | [-0.18, | 0.00] |

Note: Health tool users $R^2$ = .052, $F(2, 48)$ = 4.368, $p$ = .018, $p < .05$.

Non health tool users $R^2$ = .010, $F(2,48)$ = 2.633, $p$ = .082, $p > .05$.

**Sobel Test for Mediation**

The Sobel test is used to measure mediation. Use of the Sobel test for mediation testing requires statistically significant results of all variables in the linear regression model. The regression analysis that measured men in the group not using technology health tools did not meet the criteria to test for mediation using the Sobel test because the statistical results were not significant. The lack of significance of the results of the men in the group not using technology health tools indicated that no mediation existed between the independent variable technology health tool usage, the mediating variable self-efficacy, and the dependent variable participation in healthy lifestyle behavior. As a result, only the model that measured men in the group using technology health tools met the criteria to proceed with the Sobel test.

To test for mediation an additional linear regression analysis was required to test the statistical significance between the independent variable technology health tool use and the mediating variable self-efficacy (Denis, 2010). Results of the linear regression was .08, which was not significant at the 95% level of confidence; therefore, mediation could not be tested due to insufficient correlation between the independent variable technology health tool use and the mediating variable self-efficacy (Denis, 2010). Though mediation could not be tested using the Sobel test, results of the linear regression analysis of hypothesis 2 indicated a significant effect between self-efficacy the mediating variable and participating in healthy lifestyle behavior. In addition, results of the linear

regression statistical test of hypothesis 3, which tested the role of self-efficacy between technology health tool use, the independent variable and participation in healthy lifestyle behavior, the dependent variable significant results of the effect of self-efficacy were also reported.

## Summary

Review of the results of the statistical analysis of the first question measuring the effect of the use of technology health tools on participation in healthy lifestyle behavior of men yielded a positive response. An independent samples *t* test and a regression analysis both demonstrated a significant effect of the use of technology health tools on participation in healthy lifestyle behavior. An overall analysis of the results of the regression analysis of the second research question that measured the effect of self-efficacy on participation in healthy lifestyle behavior of men demonstrated a significant effect upon men that used technology health tools. However, self-efficacy did not have a significant effect upon participation in healthy lifestyle behavior for men that did not use technology health tools. The final question in this study evaluated the role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior of men. For men that used technology health tools self-efficacy had a higher level of significance upon participation in healthy lifestyle behavior than the use of technology health tools. Thus, the results indicate that self-efficacy has a role in mediating the relationship between technology health tools use and participation in healthy lifestyle behavior of men.

# Chapter 5: Discussion, Conclusions, and Recommendations

## Introduction

The purpose of this quantitative study was to examine the relationship between the use of technology health tools and the role of self-efficacy on men's participation in healthy lifestyle behaviors. A quasi-experimental study design was used to compare a group of men using technology health tools to men not using technology health tools. Health tool usage, self-efficacy, and healthy lifestyle behavior were measured using data obtained from men responding to the Health Information National Trends Survey (HINTS) 4 Cycle 1 survey. Stratified sampling was used by the HINTS survey to allow the results to be generalizable to all men in the United States.

Men suffer from high rates of chronic diseases, but are not frequently targeted by technology health interventions (Duncan et al., 2012). Technology health interventions used by women do not appeal to men (Duncan et al., 2012), suggesting a need for technology health tools exclusively targeted to men (Vandelanotte et al., 2013). This study investigated the adoption of technology health tools in different demographic groups. Its results demonstrate a significant relationship between the use of technology health tools, self-efficacy, and participation in healthy lifestyle behavior support a contribution to the body of knowledge by identifying components of technology health tools that appeal to men.

The use of a quasi-experimental design provided an opportunity to measure the impact of technology health tool usage by comparing a group of men using technology health tools to a group of men that did not use technology health tools N = 990.

Statistically significant results were reported in response to all research questions in this study for men using technology health tools $n = 323$. However, statistical analysis of the results for the control group of men not using technology health tools $n = 667$ did not generate significant results. This chapter provides a discussion of the interpretation of the findings, limitations, recommendations, and implications for social change of this study.

## Interpretation of the Findings

This study contributes to the body of knowledge by providing an understanding of the components of technology health tools that have the potential to increase participation of men in healthy lifestyle behavior. Three research questions were used to conduct this study. First, is there an effect of the use of technology health tools by men on participation in healthy lifestyle behavior? Second, is there an effect of self-efficacy on participation of men in healthy lifestyle behavior? Third, what is the role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior of men?

Statistical analysis of the first question measuring the effect of the use of technology health tools on participation in healthy lifestyle behavior of men demonstrated a significant effect of the use of technology health tools on participation in healthy lifestyle behavior. These results confirm the finding of two previous studies. Kazer et al. (2011) found that technology health tools provide the opportunity for self-management in addition to increased participation in healthy lifestyle behavior. McCully et al. (2013) conducted a study that used data from HINTS surveys collected in 2007 and

2011 that also demonstrated a significant relationship between the use of technology health tools and participation in healthy lifestyle behavior.

The utility of self-management provided by technology health tools has been noted by several studies. Self-management has been identified as a strategy that increases the effectiveness of technology health tools (Duncan et al., 2012; (Webb, Joseph, Yardley, & Mitchie, 2010). The effectiveness of technology health tools are further increased when they include self-management options that allow results to be tracked (Bandura, 2004; George et al., 2012; Morgan, Warren, Lubans, Collins, and Callister (2009; Morgan, Warren, Lubans, Collins, & Callister, 2011).

The effects of self-management upon participation in healthy lifestyle behavior was confirmed by this study. Only men in the group using technology health tools, which accounted for 33% of the total sample, demonstrated a significant effect on healthy lifestyle participation. Men not using technology health tools, which represented 66% of men of the men in the total sample did not have a technological opportunity for self-management. There was no effect on participation in healthy lifestyle behavior on men in the group not using technology health tools.

The second research question measured the effect of self-efficacy on participation in healthy lifestyle behavior. Results of the statistical analysis demonstrated a significant effect of self-efficacy upon participation in the healthy lifestyle behavior of men that used technology health tools. However, self-efficacy did not have a significant effect upon participation in the healthy lifestyle behavior of men that did not use technology health tools. Self-efficacy requires an individual to engage in goal setting, self-motivation, and

self-management (Bandura, 2005). A chronic disease management program that used technology health tools that included self-efficacy and a self-management component increased the healthy lifestyle behavior of the participants (Lorig et al., 2012). Self-efficacy and self-management influence participation in healthy lifestyle behavior (Anderson-Bill et al., 2011). The results from this study confirmed the effect of self-efficacy upon participation in healthy lifestyle behavior through the significant effect of self-efficacy upon a group of men using technology health tools participation in healthy lifestyle behavior. This finding aligned with several studies that have validated the effectiveness of technology health tools to strengthen self-efficacy to change health behaviors (Fanning et al., 2012; Liang et al., 2011; Whittaker et al., 2009). Conversely, self-efficacy was not found to affect the group of men not using technology health tools.

The final question in this study evaluated the role of self-efficacy in mediating the relationship between the use of technology health tools and participation in healthy lifestyle behavior. Self-efficacy had a higher level of significance upon men that used technology health tools' participation in healthy lifestyle behaviors than the use of technology health tools. The results indicate that self-efficacy has a role in mediating the relationship between technology health tool use and participation in healthy lifestyle behavior. Technology health tools need to incorporate theory to effectively improve healthy lifestyle behavior (Fanning, Mullen, & McAuley, 2012). The significant mediation effect of self-efficacy between technology health tool use and participation in healthy lifestyle behavior indicates self-efficacy is a theoretical component of the social

cognitive theory that should be used to increase the effectiveness of technology health tools.

Self-efficacy increases the effectiveness of the self-management of technology health tools (Barnason, Zimmermann, & Young, 2011). Kazer, Bailey, Sanda, Colberg, and Kelly (2011) established that technology health tools provide an opportunity for self-management, improved self-efficacy, and increased participation in healthy lifestyle behaviors that prevent or assist in the management of chronic diseases. A need exists to identify theoretical frameworks to develop successful technology health tools to improve behavior (Fanning et al., 2012; Kirwan, Duncan, Vandelanotte, & Mummery, 2012). The inclusion of self-efficacy a component of the social cognitive theory in the design of technology health tools targeted specifically to men increases the probability participation of men in healthy lifestyle behavior will increase. The results from this study confirmed a significant relationship between technology health tools used for self-management of diet, physical activity, self-efficacy, and participation in healthy lifestyle behaviors.

## Limitations of the Study

This study has several limitations, including its dependency on self-reporting and the use of a cross-sectional design. Self-reporting of data is a limitation of this study. Missing or invalid responses reduced the size of the sample substantially. The original sample consisted of 1,552 men; however, the sample size was reduced to 990 due to screening. Although the size of the sample was reduced 36%, the results of this survey are still generalizable to all men in the United States because of the use of data from HINTS. Alternative survey methods may have resulted in a larger sample size.

Another limitation was the use of a cross-sectional design as opposed to a longitudinal design. The cross-sectional design used for this study only analyzed data collected from respondents to the HINTS 4 Cycle I survey, which collected data between October 2011 and February 2012. Previous data collections for HINTS surveys used different participants (McCully et al., 2013), preventing longitudinal comparisons. As a result, it was not possible to measure long-term trends or evaluate the sustainability of the use of technology health tools by men and their participation in healthy lifestyle behaviors.

## Recommendations

This study measured the effects of the use of technology health tools, self-efficacy, and participation in healthy lifestyle behavior utilizing a sample that was representative of men in the United States. A longitudinal follow-up study to measure the effects of the use of technology health tools, self-efficacy, and participation in healthy lifestyle behavior over a specific period of time would be valuable. Several iterations of HINTS have been conducted since 2003; however, the participants are different for each survey. Because different participants are used for each survey, data collected through HINTS is useful to monitor trends, but the same data cannot be used for a longitudinal study. Studying the same group of men over a specific period of time would allow researchers to gain insight into the long-term effects of the use of technology health tools, self-efficacy, and healthy lifestyle behaviors, in addition to evaluating cause-and-effect relationships over time.

The lack of long-term use of technology health tools to maintain participation in healthy lifestyle behaviors is a problem. Temporary use of technology health tools will not prevent or successfully manage chronic disease. Theoretical frameworks are needed to understand how to develop technology health tools that will sustain long-term participation by men in healthy lifestyle behaviors (Crutzen, Cyr, & de Vries, 2011; Fanning et al., 2012; Glazenbrook & Brawley, 2011; Kelders, et al., 2012; Webb et al. 2010). The results from this and prior studies show the significant benefits of using technology health tools and self-efficacy to improve participation in healthy lifestyle behaviors (Anderson-Bill et al., 2011; Kazer et al., 2011). However, future research can evaluate if the inclusion of self-efficacy in the design of technology health tools demonstrate greater success in sustaining participation in healthy lifestyle behavior than technology health tools that do not include a self-efficacy component.

## Implications

Heart disease, cancer, and diabetes are amongst the most pervasive chronic diseases that are projected to cost the U.S. healthcare system approximately $4.2 trillion per year by 2023 (Anderko et al., 2012). Increases in healthy lifestyle behavior can lead to decreases in the development, severity, and costs associated with chronic diseases such as heart disease, cancer, and diabetes. Technology health tools offer low cost methods to manage or prevent chronic diseases disease (Miron-Shatz & Ratzan, 2011; Smodlt, 2009). The use of technology health tools provides options for health care management at lower costs than services offered by physicians or medical facilities (Bandura, 2005). A significant effect of the use of technology health tools and self-efficacy upon the

participation of men in healthy lifestyle behavior was identified by this study. Implications for social change can be applied at the national level because the results are based upon secondary data, which utilized a national sample; therefore, results are generalizable to men in the United States. The implications for positive social change include an increase in participation of men in healthy lifestyle behavior, a reduction in the number of men with chronic diseases, improvement of the quality of life of men with chronic diseases, and reductions in healthcare costs in the United States

Employers incur significant expense to contribute to premiums to provide 60% of the United States population with health insurance (Baicker, Cutler, & Song, 2010). In an effort to reduce the healthcare expenses employers incur, many offer disease prevention programs to improve the health of employees. Effective employer disease programs can realize a positive return on investment from successful programs, which prevent and manage chronic diseases (Schwartz, et al., 2010); however, participation in disease prevention programs remain low (Robroek, van Lenthe, van Empelen & Burdorf, 2009). Distribution of financial incentives is the strategy frequently used to increase participation in employer disease prevention programs (Benavides & Haillee, 2010).

Participation of men in employer disease prevention program has been low (Wong, Gilson, van Uffelen, & Brown, 2012). The majority of employer disease prevention programs do not have health interventions targeted exclusively to men (Wong et al., 2012). This study was designed to explore the gap in the literature to understand the components needed for the design of technology health tools that appeal to men (Duncan et al., 2012; George et al., 2012; Taylor et al., 2013; Vandelanotte et al., 2013).

Implications for social change at the organizational level are development of new technology health tools that include components designed to appeal to men. Incorporation of technology health tools designed to appeal to men, provide an alternative method to financial incentives to increase the participation of men in employer disease prevention programs. Furthermore, technology health tools offer options to measure results and monitor participation of men in employer disease prevention programs.

Results from this study demonstrated the use of technology health tools and self-efficacy have a significant effect upon participation of men in healthy lifestyle behavior. The success of self-efficacy to contribute to health behavioral changes and improve chronic disease management has been demonstrated to improve health outcomes (Yu et al., 2012). Implications for positive social change at the organizational level include knowledge to develop technology health tools that incorporate self-efficacy along with self-management options for diet and exercise. In addition, the Affordable Care Act (ACA) includes employer disease prevention programs as a part of the national health strategy to focus upon the high rate of chronic diseases, which are projected to cost the U.S. healthcare systems approximately $4.2 trillion per year by 2023 (Anderko et al., 2012). Thus, providing knowledge to enhance employer disease prevention programs also contributes to social change at the national level.

The use of technology health tools offers a method of self-management of health behavior. Self-management provides successful self-regulation, which enhance self-efficacy (Bandura, 2005). Self-efficacy has been associated with successful health behavior changes (Chen & Lin, 2010). Self-management of health behavior supplies a

vehicle for individuals to improve self-efficacy by taking responsibility for their health behaviors (Kazer, Bailey, Sanda, Colberg, & Kelly, 2011; Kelders et al., 2012). Self-efficacy along with self-management influence participation in nutrition and physical activity health interventions (Anderson-Bill et al., 2011).

Understanding the theoretical association of self-efficacy upon participation in healthy lifestyle behavior provides identification of a theoretical component of the social cognitive theory to be used for the design of technology health tools for men. Social change can be affected from this study by making available results of a tested theoretical component, which can be used to design technology health tools to increase participation of men in healthy lifestyle behavior. Incorporation of theory into the design of technology health tools have the potential to increase participation in healthy lifestyle behavior and reduce chronic diseases (Fanning et al., 2012). The implications for positive social change include knowledge useful for developers to design technology health tools. Design of technology health tools, which incorporate self-efficacy and assist men with the self-management of healthy lifestyle behavior can contribute to social change at the national level to prevent and manage chronic diseases. Preventing disease is less costly than treating the disease once it develops (Ormond et al., 2011).

Mobile phones usage is prevalent throughout the United States, as evidenced by ownership of 91% of all adult Americans (Duggan & Smith, 2013). The number of men with smartphones continues to grow, currently 59% own smartphones (Smith, 2013). The availability of applications on smartphones offer men the flexibility to access technology health tools anywhere. Increasing options for self-management increase participation in

healthy lifestyle behavior (Bandura, 2004; Kennedy et al., 2012). According to the ManUp study conducted by Duncan et al. (2012) men designated self-management as a major factor to change health behavior. Access to methods for self-management, self-regulation of diet, and physical activity can contribute to increasing participation in healthy lifestyle behavior. The implications for social change include proliferation of opportunities for men to engage in self-management of diet and physical activity because mobile devices are usually always with users and easily assessable (Fanning et al., 2012; Riley et al., 2011).

Technology health tool usage by minorities has demonstrated significant results in participation in healthy lifestyle behavior (MuCully et al., (2013). Self-efficacy and self-management were demonstrated by this study to have a significant effects upon participation of men in healthy lifestyle behavior. Results from this study offer a solution to increase participation of minority men in healthy lifestyle behavior. Smartphone applications used to track health behavior have been downloaded at high rates by Non-Hispanic Blacks and Hispanics (Fox, 2011; Purcell, 2011). Smartphone applications, which incorporate self-efficacy and self-management have the potential to increase participation in healthy lifestyle behavior. Designing smartphone applications that all minority men have the ability to understand can increase participation in health lifestyle behavior. Minorities are disproportionately affected by low health literacy (Berkman et al., 2011; Chaudhry et al., 2011). Implications for positive social change is the opportunity for minority men to have frequent access to technology health tools they understand and to address the health literacy challenges many minority men experience

(Broderick et al., 2013). Increased participation of minority men in healthy lifestyle behavior can reduce development of chronic diseases in this population within the United States. A pilot study, which incorporates self-efficacy and self-management could be conducted to evaluate smartphone applications designed at the 6th grade level and the 12th grade level to measure the effect upon minority men to manage nutrition and physical activity. Additionally, the significance of health literacy and the effect upon self-management and participation of minority men in healthy lifestyle behavior using smartphone applications can also be analyzed.

## Conclusion

Technology health tools proliferate an increase in the participation of men in healthy lifestyle behavior since these tools provide options for self-management. Results from this study established the significant effect of the use of technology health tools used for self-management upon participation of men in healthy lifestyle behavior. Furthermore, accessibility of technology health tools offer frequent opportunities for men to practice self-management of diet and physical activity. The availability of mobile technology increases options for men to conveniently use technology health tools to participate in self-management of their health behavior. The significant effect of self-efficacy upon the participation of men in healthy lifestyle behavior was demonstrated by results from this study. In addition, results from this study indicated self-efficacy mediated the relationship between technology health tools and participation in the healthy lifestyle behavior of men. Results from this study provide researchers a theoretical option

for the design of technology health tools to increase the participation of men in healthy lifestyle behavior.

Technology has made numerous contributions to healthcare. This study contributes to social change by demonstrating the significant effect of self-efficacy to explain the relationship between technology health tool use and the participation of men in healthy lifestyle behavior. Limited research has focused upon technology healthy interventions for men. Establishment of self-efficacy to explain the significance of the use of technology health tools to increase participation in healthy lifestyle behavior offers a theoretical rationale to develop technology health tools. Increasing participation of men in healthy lifestyle behavior can reduce the development of chronic diseases, such as heart disease, cancer, and diabetes. Reducing the number of men with chronic diseases can effect social change by improving the quality of life of men and contribute to a reduction of costs the United States healthcare system incurs in the treatment of chronic diseases.

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# Appendix: Variables and Survey Questions

| Variable | Question | Response Options | Measurement |
|---|---|---|---|
| Health Tool Usage | Have you used a website to help you with your diet, weight, or physical activity? | 1) Yes<br>2) No | Categorical |
| Health Tool Usage | Have you used the Internet to keep track of personal health information such as care received, test results, or upcoming medical appointments? | 1) Yes<br>2) No | Categorical |
| Self-Efficacy | Overall, how confident are you that you could get advice or information about health or medical topics if you needed it? | 1) Completely confident<br>2) Very confident<br>3) Somewhat confident<br>4) A little confident<br>5) Not confident at all | Continuous |
| Self-Efficacy | Overall, how confident are you about your ability to take good care of your health? | 1) Completely confident<br>2) Very confident<br>3) Somewhat confident<br>4) A little confident<br>5) Not confident at all | Continuous |
| Healthy Lifestyle Participation | About how many cups of fruit (including 100% pure fruit juice) do you eat or drink each day? | 1) None<br>2) 1/2 cup or less<br>3) 1/2 cup to 1 cup<br>4) 1 to 2 cups<br>5) 2 to 3 cups<br>6) 3 to 4 cups<br>7) 4 or more cups | Continuous |

| Variable | Question | Responses | Measurement |
|---|---|---|---|
| Healthy Lifestyle Participation | About how many cups of vegetables (including 100% pure vegetable juice) do you eat or drink each day? | 1) None<br>2) 1/2 cup or less<br>3) 1/2 cup to 1 cup<br>4) 1 to 2 cups<br>5) 2 to 3 cups<br>6) 3 to 4 cups<br>7) 4 or more cups | Continuous |
| Healthy Lifestyle Participation | In a typical week, how many days do you do any physical activity or exercise of at least moderate intensity, such as brisk walking, bicycling at a regular pace, and swimming at a regular pace? | 1) None<br>2) 1 day per week<br>3) 2 days per week<br>4) 3 days per week<br>5) 4 days per week<br>6) 5 days per week<br>7) 6 days per week<br>8) 7 days per week | Continuous |
| Healthy Lifestyle Participation | In a typical week, outside of your job or work around the house, how many days do you do leisure-time physical activities specifically designed to strenghen your muscles such as lifting weights or circuit training (do not include cardio exercise such as walking, biking, or swimming)? | 1) None<br>2) 1 day per week<br>3) 2 days per week<br>4) 3 days per week<br>5) 4 days per week<br>6) 5 days per week<br>7) 6 days per week<br>8) 7 days per week | Continuous |

Note. Adapted from "Health Information National Trends Survey (HINTS)" by National Cancer Institute, n.d. Retrieved from http://www.hints.cancer.gov

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1984 - 1986 Bell Atlantic, Account Manager Princeton, NJ
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**PROFESSIONAL DEVELOPMENT ACTIVITIES**

Custom Complex Data Solutions
Field Service Automation
Wireless Email Solutions
Network Security
Wireless Network Technologies
Data Certification
Wireless Policy Management
Protecting Information
Global Business Solutions
Data Networking
Metro E Overview
Global Networking Capabilities
VoIP Portfolio Overview
VPN Strategy
Securing the Network Environment
Internet Protection & DDos Defense
Network Integration
Network Integration & Consulting
VoIP, Vision & Velocity
Strategic Direction for Voice over IP

Voice Over IP Services a Portfolio Perspective
Needs Assessment for Consultants
Becoming an Advanced Internet User
Optical Products Overview

**AWARDS**

AT&T Gold Club Outstanding Performance 2008, 2007, 2006, 2005, 2003, 1999 & 1998
AT&T Achievers Club Achievement over 100% of Objective 2008, 2007, 2006, 2005, 2004, 2003, 1999, 1998
Sprint Technical Consultant of the Year 1994

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Virginia Society for Technology in Education
Association of Information Technology Professionals
National MBA Association
Golden Key Honor Society