

Copyright
by
Staci Schield Grant
2021

PREDICTING ADHERENCE TO HEALTH BEHAVIORS: DEVELOPING A
SCREENING QUESTIONNAIRE TO FACILITATE ENGAGEMENT
IN DIET AND PHYSICAL EXERCISE

by

Staci Schield Grant, MA

DISSERTATION

Presented to the Faculty of
The University of Houston-Clear Lake
In Partial Fulfillment
Of the Requirements
For the Degree

DOCTOR OF PSYCHOLOGY

in Combined Clinical and School Psychology

THE UNIVERSITY OF HOUSTON-CLEAR LAKE

AUGUST, 2021

PREDICTING ADHERENCE TO HEALTH BEHAVIORS: DEVELOPING A
SCREENING QUESTIONNAIRE TO FACILITATE ENGAGEMENT
IN DIET AND PHYSICAL EXERCISE

by

Staci Schield Grant

APPROVED BY

Steven L. Bistricky, PhD, Chair

Sara R. Elkins, PhD, Committee Member

Ryan J. Marek, PhD, Committee Member

Beth Auslander, PhD, Committee Member

RECEIVED/APPROVED BY THE COLLEGE OF HUMAN SCIENCES AND
HUMANITIES:

Samuel Gladden, PhD, Associate Dean

Glenn M. Sanford, PhD, Dean

ABSTRACT

PREDICTING ADHERENCE TO HEALTH BEHAVIORS: DEVELOPING A
SCREENING QUESTIONNAIRE TO FACILITATE ENGAGEMENT
IN DIET AND PHYSICAL EXERCISE

Staci Schield Grant
University of Houston-Clear Lake, 2021

Dissertation Chair: Steven L. Bistricky, PhD

High rates of individuals are diagnosed with one or more chronic illnesses, such as heart disease, cancer, and diabetes. The prevalence of chronic illness has led to increased healthcare costs and spending, increased co-morbidities of mental and medical health problems, and increased risk of mortality. Moreover, individuals may also lack engagement in health-promoting behaviors (i.e., physical activity, weight management) and adherence to behavioral recommendations. Due to limited research on predictors of adherence, as well as a lack of objective measures to assess adherence to behavioral recommendations, the use of a brief screening questionnaire may be beneficial to healthcare providers as they seek to provide treatment and optimize patient adherence. Therefore, the aim of this study is to predict adherence to health behaviors through the use of a brief screening questionnaire, as well as to identify potential facilitators and

barriers to adherence. Participants were recruited from the University of Houston–Clear Lake and asked to complete the screener embedded within the Psychology Student Research Pool prescreen. Upon indicating that they have received at least one recommendation to modify health-related behaviors from a healthcare provider, participants were invited to complete the second and third phases of the study. Analyses consisted of using hierarchical regressions and a principal component analysis to identify constructs that either facilitate or act as a barrier to adherence. Findings suggest a relationship between adherence, self-efficacy (e.g., general, health), and constructs supported by the Health Belief Model and Theory of Planned Behavior (e.g., perceived behavioral control).

TABLE OF CONTENTS

List of Tables	vii
CHAPTER I: INTRODUCTION.....	1
Healthcare Costs and Rates of Disability.....	2
Mental Health.....	3
Rates of Mortality and Life Expectancy	3
Prevention and Treatment	4
Adherence	5
Identifying Predictors of Adherence	6
Facilitators and Barriers to Adherence	6
The Present Study	11
Hypotheses	11
CHAPTER II: METHOD	13
Participants.....	13
Procedure	14
Phase One: Prescreen	14
Phase Two: First Subsequent Assessment.....	14
Phase Three: Second Subsequent Assessment	15
Measures	16
CHAPTER III: DATA ANALYSIS	25
CHAPTER IV: RESULTS.....	27
Sample Characteristics.....	27
Scale Item Analyses.....	28
Principal Component Analysis	34
Specific Predictor Constructs on Adherence	36
Trending Predictor Constructs on Adherence.....	39
Performance of Candidate Items Summary	40
CHAPTER V: DISCUSSION.....	41
Hypothesis 1.....	43
Hypothesis 2.....	44
Hypothesis 3.....	45
Selection of Candidate Items	45
Implications.....	46
Limitations and Future Directions	47
Conclusion	50

LIST OF TABLES

Table 1. Means and Standard Deviations of Self-Report Measures Administered at Time 2 and Time 3.	28
Table 2. Item-Total Correlations Between Prescreen Scale Items and Time 2 Full Measure Sum Scores.....	30
Table 3. Zero-Order Correlation Matrix Between Prescreen Scale Items.	32
Table 4. Zero-Order Correlation Matrix Between Prescreen Scale Items and Average Adherence Scores across Time 2 and Time 3.	33
Table 5. Zero-Order Correlation Matrix Between Adherence and Full Measure Average Scores at Time 2.....	34
Table 6. Loadings for Principal Component Analysis of Screening Questionnaire Using a Promax Non-Orthogonal Rotation.	36
Table 7. Summary of Hierarchical Regression Analysis for Specific Variables predicting Adherence.	38
Table 8. Summary of Hierarchical Regression Analysis for Trending Variables predicting Adherence.	40

CHAPTER I:

INTRODUCTION

With the onset of chronic illness (e.g., heart disease, cancer, diabetes, arthritis), individuals are less likely to continue to engage in health-promoting behaviors, such as physical activity, changes in diet, and other means of weight management, than those who have not been diagnosed with a chronic illness (Newsom et al., 2012). Further, individuals who have been diagnosed with one or more chronic illnesses may find it more difficult to practice these behaviors due to possible limitations (e.g., physical, mental). As individuals begin to refrain from engaging in physical activity and increase their intake of unhealthy foods (i.e., high in fat, sugars, calories), they are more likely to increase their risk of obesity and heart disease, further increasing the prevalence of chronic health conditions (Hruby & Hu, 2015; Hu, Li, Colditz, Willet, & Manson, 2003; Wadden, Webb, Moran, & Bailer, 2012). According to the Centers for Disease Control and Prevention (CDC), more than 810,000 Americans die of heart disease or stroke every year, 1.7 million are diagnosed with cancer, 54 million adults are impacted by a form of arthritis (e.g., rheumatoid, fibromyalgia), and 29 million have diabetes (Benjamin et al., 2017; National Cancer Institute, 2018; American Diabetes Association, 2018; Centers for Disease Control and Prevention, 2018). Over the past decade, studies estimated between 51-60% of Americans had at least one chronic health condition, while 31% of Americans had multiple conditions (Buttorff, Ruder, & Bauman, 2017; Gerteis et al., 2014; Sambamoorthi, Tan, & Deb, 2015). Furthermore, healthcare costs, rates of disability, mental health diagnoses, and rates of mortality are associated with the rise in chronic health conditions and are also subject to increase over time (Buttorff et al., 2017; DuGoff, Canudas-Romo, Buttorff, Leff, & Anderson, 2014; Gerteis et al., 2014; Scott et al., 2016; Theis, Roblin, Helmick, & Luo, 2018).

Healthcare Costs and Rates of Disability

As briefly mentioned above, the increasing prevalence of chronic health conditions has led to significant healthcare costs and increased rates of disability in the United States, with nearly 90% of healthcare spending used toward treating individuals with one or more chronic health conditions (Gerteis et al., 2014). More specifically, as of 2014, 41% of total healthcare spending was used for 12% of Americans diagnosed with five or more chronic health conditions, compared to 10% of spending for nearly 40% of Americans with no chronic health conditions (Buttorff et al., 2017). The majority of healthcare spending for individuals with multiple chronic health conditions is used toward inpatient hospital stays, outpatient clinic visits, and home healthcare (Gerteis et al., 2014). Overall, with each chronic health condition individuals are diagnosed with, they will spend nearly double in healthcare costs compared to those who may only have one condition (Gerteis et al., 2014; Sambamoorthi et al., 2015). Furthermore, individuals with multiple chronic health conditions may find themselves having more emergency department visits, having higher out-of-pocket costs, utilizing more healthcare benefits if on a disease-by-disease basis, and increasing their amount of debt overall (Richard, Walker, & Alexandre, 2018; Sambamoorthi et al., 2015). Regarding rates of disability, approximately 20.1 million adults claimed work disability for all conditions between 2011 and 2013, with arthritis recognized as the leading cause (Theis et al., 2018). Studies have found that individuals who are classified as disabled are at a greater risk of developing poor health, further supporting a strong relationship between disability status and chronic health conditions (Dixon-Ibarra & Horner-Johnson, 2014; Froehlich-Grobe, Jones, Businelle, Kendzor, & Balasubramanian, 2016).

Mental Health

In addition to financial burden, the diagnosis of a chronic health condition (e.g., cancer, heart disease, arthritis, diabetes, chronic pain, asthma) can be associated with depression, anxiety, and substance use (Ferro, 2016; Kim et al., 2003; Scott et al., 2016). As of 2012, the prevalence of Major Depressive Disorder was higher among patients with cancer and diabetes compared to those with Alzheimer's disease (American Heart Association, 2012). According to Walker and Druss (2017), approximately 2.2 million individuals in the United States report co-morbidities among medical and mental health conditions, specifically psychological distress, substance abuse, and chronic health conditions. For example, older adults with co-occurring mental illness (e.g., bipolar disorder, depression, anxiety) and substance use dependence were more likely to develop a chronic health condition (e.g., hypertension, asthma; Lin, Zhang, Leung, & Clark, 2011). In a more recent study conducted by Ferro (2016), findings suggest that emerging adults (i.e., aged 15-30 years) with a chronic health condition had a greater risk of developing a mental health disorder. Moreover, levels of disability and pain were found to mediate the association between chronic health conditions and mental health (Ferro, 2016). Therefore, poor mental health and instances of substance use appear to be positively related to the diagnosis of one or more chronic health conditions.

Rates of Mortality and Life Expectancy

The risk of mortality and reduced life expectancy are among several potential outcomes associated with chronic illness. Within 2019, approximately 11.5 million deaths occurred due to ischemic heart disease and stroke in lower-middle to upper-middle income countries (World Health Organization, 2020). As of 2018, the leading cause of death in the United States was heart disease, followed by malignant neoplasms, chronic lower respiratory diseases, cerebrovascular diseases, and Alzheimer's disease (CDC,

2019; WHO, 2020). The number of deaths as a result of chronic health conditions are expected to continue to increase, as rates of mortality have nearly doubled within the past 10 years (WHO, 2020). Compared to healthy individuals, a greater risk of mortality was found among individuals with a tendency to respond negatively to daily stressors (e.g., discrimination, argument, stressor at home or school) and who were diagnosed with a chronic health condition (Chiang, Turiano, Mroczek, & Miller, 2018). In addition to a greater risk of mortality, presence of psychological distress, and increased healthcare costs, the life expectancy of an individual with multiple chronic health conditions decreases with the diagnosis of each additional condition (DuGoff et al., 2014). Overall, by having one or more chronic health condition(s), individuals are subject to endure detrimental effects physically, mentally, and financially.

Prevention and Treatment

Given the prevalence of chronic health conditions, means of prevention and the use of behavioral approaches to treatment are crucial in reducing total healthcare costs, rates of disability, and increased risk of mortality. Additionally, maintenance of persistent symptoms (e.g., pain, fatigue) is essential to improving the overall quality of life for individuals diagnosed with one or more chronic health conditions. Patients are often prescribed treatment regimens to address their chronic health condition, which can include the use of oral medication and behavioral recommendations (Ambrose & Golightly, 2015; Czajkowski et al., 2015). However, patients' adherence to their healthcare providers' recommendations varies significantly, and adherence can ultimately affect treatment course and outcomes (DiMatteo, Giordani, Lepper, & Croghan, 2002; Horwitz & Horwitz, 1993).

Adherence

Adherence can be defined as the extent to which a person's behavior (with regards to medication, diet, lifestyle, treatment regimen) corresponds with agreed upon recommendations from healthcare providers (Horne et al., 2005). The term adherence can also refer to the practice of effective medication use and related health behaviors.

Currently, research exists regarding measuring adherence to oral medication use, as well as predictors of adherence to behavioral treatment regimens (i.e., physical activity, diet modifications, other means of weight management); however, there is limited research on the use or availability of subjective measures to assess adherence to behavioral interventions. Presently, there are several measures being used to assess adherence to the use of oral medication, primarily to treat hypertension (Hawkshead & Krousel-Wood, 2007; Morisky, Green, & Levine, 1986; Svarstad, Chewning, Sleath, & Claesson, 1999; Toll, McKee, Martin, Jatlow, & O'Malley, 2007; Morisky, 2008). According to Lam and Fresco (2015), adherence can be measured both directly (e.g., pill count, blood samples) and indirectly (i.e., self-report). Indirect measures, such as the Brief Medication Questionnaire (BMQ; Svarstad et al., 1999), the Medication Adherence Questionnaire (MAQ; Morisky et al., 1986), and the Eight-Item Morisky Medication Adherence Scale (MMAS-8; Morisky, 2008), can be used to assess medication-taking behavior, as well as to determine potential barriers to adherence (e.g., forgetfulness, time). In addition to these questionnaires, patient interviews and diaries are most often used to evaluate adherence, given their ease of administration, economic advantage, and overall efficiency (Lam & Fresco, 2015). However, despite these benefits, the use of such subjective measures can result in inconsistencies among patient responses and their behaviors.

Identifying Predictors of Adherence

If healthcare providers could predict who would adhere to recommended treatments and what factors would be associated with adherence, they might be able to address those factors in the course of providing or following up on recommendations. A simple, yet very brief screening questionnaire that identifies possible facilitators or barriers that predict adherence for a given patient would be very useful to a prescribing healthcare provider. Through the use of this screening questionnaire, a provider could attempt to accentuate facilitators and problem-solve barriers to optimize the individual patient's treatment adherence to specific regimens. At a broader scale of addressing adherence as means of prevention and treatment effectiveness, it may be possible to achieve better patient health outcomes, reduce healthcare costs, reduce the risk of mortality and the prevalence of obesity, and improve mental health problems, such as depression and anxiety. Presently, no screener like the one described exists; therefore, healthcare providers would benefit from the creation of one. The most supportable approach for the development of such a questionnaire would be to draw from prior literature about predicting adherence to oral medication regimens. Moreover, common facilitators and barriers to the use of oral medication use could potentially translate to the implementation of behavioral treatment recommendations.

Facilitators and Barriers to Adherence

As described below, common factors (e.g., depression, anxiety, self-efficacy, social support, knowledge, stress, demographics), as well as constructs found within the Health Belief Model (HBM) and Theory of Planned Behavior (TPB) (e.g., perceived benefits, perceived barriers, perceived severity, perceived susceptibility, perceived behavioral control), have been indicated to have an effect on an individual's level of adherence. In the literature of predicting adherence to oral medication, perceived social

support (e.g., perceived adequacy of support from significant other, family, and friends), general feelings of self-efficacy (e.g., the belief that one can perform a task) and health self-efficacy (e.g., belief about ability to manage health), and the amount of acquired knowledge of a medical condition and its relationship to health are among the strongest predictors of adherence (Alefishat, Farha, & Al-Debei, 2017; DiMatteo, 2004; Dunbar-Jacob & Mortimer-Stephens, 2001; Leader & Raanani, 2014; Lee, Hwang, Hawkins, & Pingree, 2008; Mata, Todd, & Lippke, 2010; Olowe & Ross, 2017; Toft et al., 2006). Specific to acquired knowledge, hypertensive patients who displayed a moderate amount of knowledge on hypertension (e.g., medication, adequate blood pressure values) were found to exhibit moderate adherence to oral medication (Olowe & Ross, 2017). Moreover, additional studies have also found the relationship between acquired knowledge and reported adherence to be significant (Alm-Rojjer, Stagmo, Udén, & Erhardt, 2004; Al-Qazaz et al., 2011; Awwad, Akour, Al-Muhaissen, & Morisky, 2015). Additionally, at certain levels, perceived stress (e.g., personal, academic, financial), depressive symptoms, and specific demographic characteristics (e.g., age, socioeconomic status, ethnicity) have primarily been identified as barriers to adherence. Specific amounts are to be discussed in more detail (DiMatteo, Lepper, & Croghan, 2000; DiMatteo, Haskard, & Williams, 2007; Fair, Monahan, Russell, Zhao, & Champion, 2012; Pritchard, Butow, Stevens, & Duley, 2006; Susin et al., 2016).

The Health Belief Model. Individual characteristics strongly influence adherence to behaviors, specifically beliefs regarding their overall health. The health belief model (HBM) is a theoretical model comprised of six concepts that influence decisions on whether to take action to prevent illness and engage in health behaviors (Rosenstock, Strecher, & Becker, 1988). These constructs are perceived susceptibility (e.g., belief in the chance of developing a health or chronic condition), perceived severity (e.g., belief in

the seriousness of a condition and its consequences), perceived benefits (e.g., belief in the effectiveness of the recommended action to reduce risk), perceived barriers (e.g., belief in the tangible and/or psychosocial costs of the recommended action), cues to action (e.g., strategies to activate one's readiness or willingness to take action), and self-efficacy (e.g., belief in the confidence in one's ability to take action and engage in a recommended behavior). As evident in prior studies, the HBM has been used to successfully identify predictors of adherence to medication in patients with hypertension and children with cystic fibrosis (Dempster, Wildman, Masterson, & Omlor, 2018; Kamran, Sadeghieh Ahari, Biria, Malepour, & Heydari, 2014). In the hopes of promoting the use of preventative health behaviors (i.e., healthy dietary behaviors, physical activity), the proposed screening questionnaire will be used to identify predictors of adherence to specific health behaviors by presenting items informed by the HBM, similar to prior studies. By assessing individuals' health beliefs through the use of questions based on the HBM, reasons as to why individuals are non-adherent, less likely to engage in treatment, or more likely to seek services may become evident.

The Theory of Planned Behavior. Similar to the theoretical framework of the health belief model, the theory of planned behavior accounts for specific factors that influence an individual's intention to engage in different behaviors. This theory states that intent to engage in a particular behavior is influenced by an individual's attitude, their perceived behavioral control, and subjective norms (Ajzen, 1991). Despite relevance to the use of recommended preventative health behaviors (i.e., healthy dietary behaviors, physical activity), attitude and subjective norms were not assessed within the present study due to a lack of evidentiary support and a need to limit the number of proposed screening items. Therefore, more focus was placed on presenting items to assess

perceived behavioral control. However, in order to thoroughly discuss this theory and to provide context for future directions, each factor will be reviewed in detail.

According to Azjen (1991, p. 188), attitude is defined as “the degree to which a person has a favorable or unfavorable evaluation or appraisal” of a behavior. As an extension of the theory of reasoned action, perceived behavioral control (i.e., perception of control over performing a behavior) was included as a means of addressing ability to engage in a specific behavior. In reference to adhering to a recommended behavior, perceived behavioral control and attitude play an important role in intent to engage in a behavior, specifically one related to health (e.g., McDermott et al., 2015). In a study conducted by Gonzalez, Shreck, Psaros, and Safren (2015), individuals with higher levels of perceived behavioral control and self-efficacy for diabetes self-management were found to better adhere to their medication. Perceived behavioral control and self-efficacy were also found to mediate the association between diabetes-related distress and medication adherence, sequentially, yet indirectly (Gonzalez et al., 2015). Additionally, perceived behavioral control was independently associated with greater self-efficacy and significantly associated with better adherence to diabetes medication (Gonzalez et al., 2015). Relative to physical activity, normative beliefs (i.e., beliefs about whether specific individuals or groups that are important to the individual think the behavior should be performed) and perceived behavioral control were identified as predictors of adherence to an exercise program in cancer survivors, while perceived behavioral control strongly predicted physical activity behavior in obese individuals (Courneya, Friedenreich, Sela, Quinney, & Rhodes, 2002; Plotnikoff, Lubans, Costigan, & McCargar, 2013). In addition to attitude and perceived behavioral control, subjective norms also play a vital role in an individual’s intent to engage in a certain behavior. Subjective norms can be defined as perceived social pressure to perform or not to perform a behavior (Ajzen, 1991). The

relationship, established rapport, and trust between a patient and their healthcare provider can be influenced by the subjective norms of family, peers, and the provider, as well as strongly influence the patient's attitude toward their proposed treatment plan and willingness to follow through with specified regimens (Jin, Sklar, Oh, & Li, 2008; Kerse et al., 2004; Walker, Arnold, Miller-Day, & Webb, 2002). If a patient does not trust their provider and does not engage in open communication, their response toward any recommendations made by their provider may be adverse and will more than likely not be implemented. Overall, the perception of one's ability to engage in a health behavior has the potential to either positively or negatively influence adherence, accounting for other factors.

Consistent with these models of behavioral change (e.g., health belief model, theory of planned behavior), specific characteristics (i.e., perceived severity, behavioral control) regarding an individual's health beliefs and their ability to engage in behavior also play a vital role in adherence. Overall, studies suggest that levels of adherence are dependent on the quality of each characteristic. More specifically, increased social support, vast amounts of knowledge related to the individual's condition, and increased self-efficacy (i.e., general or health specific) often result in greater adherence to treatment (Alefishat, Farha, & Al-Debei, 2017; DiMatteo, 2004; Dunbar-Jacob & Mortimer-Stephens, 2001; Leader & Raanani, 2014; Mata, Todd, & Lippke, 2010; Olowe & Ross, 2017; Toft et al., 2006). However, individuals with low perceived severity (i.e., belief that a condition and its consequences are not serious), moderate to severe depression, increased levels of perceived stress, and low socioeconomic status may be at greater risk for low adherence and poor treatment outcomes (DiMatteo, Lepper, & Croghan, 2000; DiMatteo, Haskard, & Williams, 2007; Fair et al., 2012; Julian et al., 2009; Kim et al., 2003; Pritchard, Butow, Stevens, & Duley, 2006; Susin et al., 2016). By assessing the

quality and quantity of each characteristic prior to recommending treatment, healthcare providers will be able to determine what should be initially addressed in order to produce substantial treatment outcomes.

The Present Study

A first step in the development of a screening questionnaire used to predict adherence to behavioral treatment recommendations was to test a pool of candidate items selected based on prior literature and current measures. These items were tested in a non-clinical setting with individuals who have received recommendations from a healthcare provider regarding their physical activity or healthy dietary behaviors in recent years, as this population and setting are more cost effective and feasible at this early stage of screening measure development. Assessment of physical activity or healthy dietary behaviors occurred across two longitudinal follow up sessions to examine which pilot screener items would most efficiently predict prospective adherence. Recommended target behaviors of following a healthy diet and engaging in more exercise or physical activity are both common in those with and without chronic health conditions; therefore, the use of such target behaviors are quite relevant and impactful to the course and outcome of health conditions. By piloting this screening questionnaire in a non-clinical setting with a nontraditional undergraduate student population, facilitators and barriers to adherence may be more translatable to individuals who have a full-time job, children, and other responsibilities that may impact consistent engagement in adhering to a healthy diet or physical activity.

Hypotheses

The aim of this study is to predict adherence to health behaviors through the use of a brief screening questionnaire, as well as to identify potential facilitators and barriers to adherence. Therefore, it was predicted that: 1) higher levels of social support, and

general and health specific self-efficacy, would be correlated with higher levels of adherence, 2) higher levels of depression, health anxiety, and stress would be correlated with lower levels of adherence, and 3) based on previously discussed literature (see Alefishat, Farha, & Al-Debei, 2017; DiMatteo, 2004; Dunbar-Jacob & Mortimer-Stephens, 2001; Leader & Raanani, 2014; Mata, Todd, & Lippke, 2010; Olowe & Ross, 2017; Toft et al., 2006), social support, self-efficacy, and behavioral control would account for greater amounts of variance in adherence compared to stress, depression and health anxiety, perceived severity, and perceived benefits and barriers.

CHAPTER II:

METHOD

Participants

The initial number of participants who completed the online screening and first subsequent set of surveys was 188; however, roughly one tenth of participants ($n=22$, 11.7%) did not complete the second subsequent set of surveys three to four weeks later. The finalized analyzed sample was comprised of a set of particularly diverse individuals, who attend a small regional public university, across level of completed education, race/ethnicity, gender, relationship status, and having children. The majority of individuals in the sample identified as female ($n=110$, 84%), while 14.5 % ($n=19$) identified as male and 1.5% ($n=2$) as other. Participants ranged in age from 18 to 61 and older ($M=29.77$, $SD=9.47$). The majority of participants (78.6%; $n=103$) reported having either an associate's or bachelor's degree ($M=14.47$, $SD=2.07$). Of the 131 participants, 59.5% ($n=78$) identified as White or Caucasian, 14.5% ($n=19$) as Black or African American, 7.6% ($n=10$) as Multiracial, 6.1% ($n=8$) as Asian, 5.3% ($n=7$) as Other, and 0.8% ($n=1$) as Native Hawaiian or other Pacific Islander. 6.1% ($n=8$) chose not to respond to specify their race. Relative to ethnicity, 39.7% ($n=52$) identified as Hispanic/Latino(a), 55.7% ($n=73$) identified as Non-Hispanic/Latino(a), and 4.6% ($n=6$) chose not to respond. On average, participants reported their household income as ranging from \$60,000 to \$74,999 ($M=5.13$, $SD=2.67$). More than half of participants (47.3%, $n = 62$) identified as Single/Never married, while 16% ($n = 21$) identified as Not married, but in a long term relationship, 28.2% ($n = 37$) as Married, 0.8% ($n = 1$) as Separated, 6.9% ($n = 9$) as Divorced, and 0.8% ($n = 1$) as Widowed. Lastly, a majority of participants reported not having children (70.2%, $n = 92$).

Procedure

Phase One: Prescreen

Students at the University of Houston–Clear Lake enrolled in specific undergraduate psychology classes were invited to participate in the online mass SONA prescreen. Within the mass SONA prescreen, a pool of questions were generated from the present study (See Appendix A). These questions assessed participants' health provider recommendations for healthy dietary behaviors and physical activity, health anxiety, depressive symptoms, stress, social support, knowledge about their health, general self-efficacy, and perceived severity, benefits, and behavioral control regarding healthy dietary behaviors and physical activity.

Participants were presented with the informed consent (See Appendix B) through the SONA Research Pool interface before completing the mass SONA survey; however, those invited to participate in the second and third phase(s) of the study were presented with the informed consent specific to the study using Qualtrics software (Qualtrics, Provo, UT, 2018). Participants were asked to review the consent form that discussed the purpose, risks and benefits, confidentiality, right to withdraw, contact information, and consent to participate in the study, and endorse that they either agreed or disagreed. The participant was informed that he or she could have withdrawn their participation without penalty at any time.

Phase Two: First Subsequent Assessment

In the second phase of the study (i.e., first follow-up session), which was also completed online, participants were invited to access the study through SONA at a time that was convenient for them within approximately three to four weeks following the completion of the prescreen. Once they accessed the study, the participant was asked to complete a series of questionnaires on Qualtrics (Qualtrics, Provo, UT, 2018). Within the

first subsequent session, participants completed questionnaires online that included a demographic questionnaire, an assessment of their recommendations for healthy dietary behaviors and physical activity, Center for Epidemiological Studies Depression Scale (CES–D), General Self-Efficacy Scale (GSE), Health Anxiety Inventory–18 (HAI–18), an assessment of their adherence to health behaviors, as well as questions assessing health beliefs, Health Self-Efficacy Scale, Marlowe–Crowne Social Desirability Scale (MCSDS), Multidimensional Scale of Perceived Social Support (MSPSS), Perceived Stress Scale (PSS), RAND 36–Item Health Survey, and Sheehan Disability Scale. This set of questionnaires took participants approximately 20 to 30 minutes to complete.

Phase Three: Second Subsequent Assessment

To maximize retention, participants were contacted via email and/or phone up to three times as a reminder for them to complete the first and second subsequent sessions. Within the second subsequent session, participants completed the same set of questionnaires that were completed within the first session; however, the Marlowe–Crowne Social Desirability Scale was omitted. At the end of the second session, participants were provided with a written debriefing, thanked for their participation, and invited to email a student research assistant with any remaining questions (See Appendix C for debriefing script document). If a participant did not complete the second session, a student research assistant emailed the written debriefing, thanked the participant for her/his time, and answered any remaining questions. All completed questionnaire data were kept in a database separate from specific participant identifiers (e.g., name) and associated with a code. A separate password-protected database linked participant names with this code and no other research data.

Measures

Demographic information. Participants were asked to complete a demographic questionnaire that inquired about age, gender, race, ethnicity, socioeconomic status, and level of education. See Appendix D for questionnaire.

Assessment of recommendations for healthy dietary behaviors and physical activity. The following three questions were used to determine if and when participants had received treatment recommendations from a healthcare provider, as well as what type of recommendation they received. These questions are included in the prescreen and subsequent sessions: “Have you ever visited a healthcare provider where they made at least one recommendation to modify health-related behaviors?,” “What recommendation did your healthcare provider make?,” and “Approximately how many months or years ago did recommendation(s)/feedback get communicated to you?” Recommendations are specific to healthy dietary behaviors and/or physical activity, and were included based on common use and ease of implementation for the greatest number of individuals. Sample items included: “Eat only in designated areas of your home or work environment,” “Consume fewer calorie and/or lower levels of unhealthy fats and fried foods,” “Drink more water,” “Make exercise a priority and a planned activity in the day,” and “Have an exercise partner or engage in group exercise for encouragement.” See Appendix E for questionnaire.

Center for Epidemiological Studies Depression Scale. The Center for Epidemiological Studies Depression Scale (CES–D; Radloff, 1977) is a 20-item self-report measure used to assess symptoms associated with depression. Respondents are asked to use a scale from 0 to 3 (0 = Rarely or none of the time, 3 = Most or all of the time) to rate how they have felt during the past week. Sample items include: “My sleep was restless,” “People were unfriendly,” and “I felt hopeful about the future.” The

following items have been included on the prescreen to test their predictive value in assessing the level of adherence: “I felt sad” and “I enjoyed life.” These items were selected in order to account for depressed mood and anhedonia within the sample and represent the cardinal symptoms of depression. Total scores range from 0 to 60, with higher scores indicating the presence of more symptomatology. The CES–D has been found to be a reliable and valid instrument with alpha values ranging from .88 to .90 and acceptable concurrent and construct validity (Radloff, 1977; Clark, Mahoney, Clark, & Eriksen, 2002). Within the current study, the CES–D demonstrates good reliability with an alpha value of .75. See Appendix F for questionnaire.

General Self–Efficacy Scale. The General Self–Efficacy Scale (GSES; Schwarzer & Jerusalem, 1995) is a 10–item self-report measure of self-efficacy. Respondents are asked to use a scale from 1 to 4 (1 = Not at all true, 4 = Exactly true) to rate feelings of self-efficacy. Sample items consist of: “I can always manage to solve difficult problems if I try hard enough” and “I can usually handle whatever comes my way.” The following item has been included on the prescreen to test its predictive value in assessing level of adherence: “It is easy for me to stick to my aims and accomplish my goals.” The total score is calculated by finding the sum of all items. Total scores range from 10 to 40, with a higher score indicating more self-efficacy. The GSES demonstrates good internal consistency reliability (i.e., alpha values ranging from .76 to .90) and has been found to correlate with emotion, optimism, and work satisfaction (Schwarzer & Jerusalem, 1995). Within the current study, the GSES demonstrates good reliability with an alpha value of .85. See Appendix G for questionnaire.

Health Anxiety Inventory–18. The Health Anxiety Inventory (HAI; Salkovskis, Rimes, Warwick, & Clark, 2002) is an 18–item self-report measure of health anxiety and hypochondriasis. Respondents are asked to select a statement from a group of four

statements, using a scale from 0 to 3 (0 refers to no health concerns, 3 refers to excessive focus on health concerns), that best describes their feelings related to their health during the past six months. Sample items include: “I do not worry about my health,” “Resisting thoughts of illness is never a problem,” and “As a rule, I am not afraid that I have a serious illness.” Total scores are obtained by calculating the sum of each item and range from 0 to 54, with higher scores being indicative of greater health concerns. This measure has a reported alpha value of .89, indicating good internal consistency, and a value of .90 for test-retest reliability (Salkovskis et al., 2002). This measure was also found to have moderate convergent validity and significant discriminant validity (Salkovskis et al., 2002). Within the current study, the HAI-18 demonstrates excellent reliability with an alpha value of .87. See Appendix H for questionnaire.

Health behavior adherence. Five questions were used to determine participants’ adherence to treatment recommendations from a healthcare provider during subsequent sessions. Overall adherence is measured based on either consistency among high scores or an increase in scores across phase two and three. Adherence is also individualized and evaluated based on the types of recommendations endorsed, when recommendations were made, and the presence of external factors (e.g., children, schoolwork, watching television) that may influence engagement in health behaviors. By using these criteria to assess adherence across multiple timepoints, facilitators and barriers may be more readily identified. These questions are included in the prescreen, as well as subsequent sessions, to test their predictive value in assessing level of adherence: “In the last month, I have followed my healthcare provider’s recommendations on maintaining a healthy diet overall” and “In the last month, I have followed my healthcare provider’s recommendations regarding physical activity overall.” Respondents are asked to rate these statements on a scale from 0 to 5 (0 = Nearly always, 4 = Not at all, 5 = No

recommendations were made, or I do not at all recall specifically) and are given the option to not respond. See Appendix I for questionnaire.

Health beliefs. Seven statements were used to assess an individual's health beliefs consistent with constructs (e.g., perceived benefits, perceived barriers, perceived severity, perceived susceptibility, and perceived behavioral control) found within the Health Belief Model (HBM) (Rosenstock, Strecher, & Becker, 1988) and the Theory of Planned Behavior (TPB) (Ajzen, 1991). Statements specific to perceived benefits and perceived behavioral control were included in the prescreen, as well as subsequent sessions, in order to test their predictive value in assessing level of adherence: "Eating a healthy diet and engaging in physical activity will have benefits, like decreasing my chances of obesity-related health complications and/or helping me feel more energetic," "I have control over my ability to engage in healthy dietary behaviors nearly every day for the next month," and "I have control over my ability to engage in physical activity/exercise at least twice per week for 30 minutes for the next month." However, statements representing each subscale are included within phase two and three of the current study. Respondents are asked to rate how strongly they agree or disagree with each statement on a scale from 0 to 4 (0 = Strongly Agree, 4 = Strongly Disagree) and are given the option to not respond. Given that a measure based on the HBM is not given in its entirety within this study, a total score was not calculated. Rather, individual responses given on specific items that are representative of the HBM subscales (e.g., perceived benefits, perceived barriers, perceived severity, perceived susceptibility, perceived behavioral control) were used to determine likeliness to engage in health behaviors. See Appendix J for questionnaire.

Health Self-Efficacy Scale. The Health Self-Efficacy Scale (Lee, Hwang, Hawkins, & Pingree, 2008) is a 5-item self-report measure of health self-efficacy.

Respondents are asked to use a 4-point scale ranging from 0 to 3 (0 = Strongly Disagree, 3 = Strongly Agree) to indicate their level of agreement on each statement. A sample of a statement is “I have set some definite goals to improve my health.” The following item has been included on the prescreen: “I am confident that I can have a positive effect on my health.” A total score is obtained by summing all items. In a study conducted by Lee et al. (2008), women who were newly diagnosed with breast cancer completed a negative emotion and health self-efficacy questionnaire at baseline and post-treatment. Based on the results, this scale was found to have an alpha value of .84 at baseline and .75 at post-treatment, indicating good internal consistency reliability (Lee et al., 2008). Lee et al. (2008) conceptualized health self-efficacy as one of many self-efficacies, consistent with Schwarzer and Renner (2000), which suggests evidence of construct validity. Relative to validity, Within the current study, the HSES demonstrates good reliability with an alpha value of .83. See Appendix K for questionnaire.

Knowledge related to healthcare provider recommendations. Within the present study, the following two questions will be used within the prescreen to determine if participants have been educated on the importance of a healthy diet or adequate amounts of physical activity and to assess if the transmission of knowledge has increased willingness to engage in recommended behaviors. Questions include: “Has your healthcare provider ever offered you information (e.g., discussion, pamphlet) to educate you on healthy dietary behaviors or physical activity?” and “If yes, do you believe the information has increased your willingness to engage in these behaviors?” For the latter question, respondents are asked to use a 4-point Likert scale ranging from 0 to 3 (0 = To a great extent, 3 = Not at all).

Marlowe–Crowne Social Desirability Scale–Short Form. The Marlowe–Crowne Social Desirability Scale–Short Form (MCSDS; Crowne & Marlowe, 1960) is a

13-item self-report measure used as a control for response bias by assessing individuals' personal attitudes and traits. Given the subjectivity of reporting adherence, this scale is used within this study to assess for a self-serving bias that may be present within a participant's endorsements among the required questionnaires. Moreover, this scale is used to determine if participants are answering questions appropriately or based on social norms. Respondents are asked to read each statement and determine whether it is true or false. Five of the total items (e.g., "No matter who I'm talking to, I'm always a good listener," "I'm always willing to admit it when I make a mistake") are awarded 1 point if the participant answers *true*, while eight items (e.g., "I sometimes feel resentful when I don't get my way," "There have been occasions when I took advantage of someone") are awarded 1 point if the participant answers *false*. Total scores are obtained by calculating the sum of points awarded and range from 0 to 13, with higher scores suggesting a pattern of greater socially desirable responding. Thus, their total score could imply biased or even false reporting of adherence to health behaviors, as well as recommendations endorsed. Within the study, if a participant received a high total score (> 10), responses on additional measures would not have been included in further analyses. However, none of the participants scored higher than a 10 on this measure; therefore, no data was excluded prior to data analysis and responses were primarily used to characterize the sample, as well as to further interpret results. The MCSDS has been found to demonstrate acceptable internal consistency reliability ($\alpha = .76$), compared to the original form of the Social Desirability Scale, as well as concurrent validity (Reynolds, 1982). See Appendix L for questionnaire.

Multidimensional Scale of Perceived Social Support. The Multidimensional Scale of Perceived Social Support (MSPSS; Zimet, Dahlem, Zimet, & Farley, 1988) is a 12-item self-report measure of subjectively assessed social support. Respondents are

asked to use a seven point Likert scale from 1 to 7 (1 = Very Strongly Disagree, 7 = Very Strongly Agree) to rate each statement. Items correspond to three different forms of social support (i.e., family, friends, and significant other). Sample items include: “My friends really try to help me” and “My family is willing to help me make decisions.” The following items have been included on the prescreen to test their predictive value in assessing level of adherence: “There is a special person who is around when I am in need” and “I get the emotional help and support I need from my family.” These items were chosen based on their performance within a performed factor analysis (Zimet et al., 1988). Total scores are obtained by calculating the sum of all items. The MSPSS has been found to demonstrate good internal consistency reliability, with alpha values ranging from .84 to .92, and good internal validity across all subject groups (e.g., pregnant women, adolescents living with their families, pediatric residents) (Zimet, Powell, Farley, Werkman, & Berkoff, 1990). Within the current study, the MSPSS demonstrates excellent reliability with an alpha value of .93. See Appendix M for questionnaire.

Perceived Stress Scale. The Perceived Stress Scale (PSS; Cohen, Kamarck, & Mermelstein, 1994) is a 10-item self-report measure used to assess an individual’s perception of stress. Respondents are asked to use a scale from 0 to 4 (0 = Never, 4 = Very Often) to rate their levels of experienced stress during the past month. For example, “In the last month, how often have you been upset because of something that happened unexpectedly?” is a sample item found within the PSS. The following item was included on the prescreen in order to test its predictive value in assessing level of adherence: “In the last month, how often have you felt nervous and/or stressed?” This item was selected in order to directly assess level and feelings of stress. Total scores were obtained by reverse scoring specific items and summing all items. Total scores range from 0 to 40,

with higher scores indicating greater perceived stress. This measure has a reported alpha value of .72, indicating good internal consistency reliability, and has been found to correlate with other stress measures, smoking status, and help-seeking behaviors (Khalili, Ebadi, Tavallai, & Habibi, 2017; Cohen & Williamson, 1988). Within the current study, the PSS demonstrates poor reliability with an alpha value of .37. This finding may be due to inconsistent responding as a result of increased stress over time related to personal and academic responsibilities. See Appendix N for questionnaire.

RAND 36–Item Health Survey. The RAND 36–Item Health Survey (Hays, Sherbourne, & Mazel, 1993) is a 36–item self-report measure that assesses health-related quality of life. This survey addresses “physical functioning, bodily pain, role limitations due to physical health problems, role limitations due to personal or emotional problems, emotional well-being, social functioning, energy/fatigue, and general health perceptions” (Hays, Sherbourne, & Mazel, 1993). Depending on the construct being measured, respondents are asked to use different scales (e.g., yes/no, 1 to 5) to rate their health and level of functioning. Prior to scoring, responses are re-coded based on a scale from 0 to 100, with higher scores representing a more favorable health state. Items within the same scale are then averaged together to create the 8 scale scores. Sample items include: “Compared to one year ago, how would you rate your health in general now?” and “To what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbors, or groups?” All subscales within this survey have been found to have good internal consistency reliability, with alpha values ranging from .71 to .92. Additionally, this health survey was found to have high convergent validity with other measures assessing for physical and mental health, social functioning, and general health perception (e.g., COOP/WONCA, Nottingham Health Profile; VanderZee, Sanderman, Heyink, & de Haes, 1996). Within the current study, the

RAND 36 demonstrates excellent reliability with an alpha value of .94. See Appendix O for questionnaire.

Sheehan Disability Scale. The Sheehan Disability Scale (SDS; Sheehan, 1983) is a 5-item self-report measure that assesses functional impairment in three inter-related domains (work, family, and social life). Respondents are asked to use a scale from 0 to 10 (0 = Not at all, 10 = Extremely) to rate their level of functioning. The three domain scores, plus a total score, are used to ascertain level of functioning. A score above 5 in each domain is generally considered significantly impaired functioning, although there is no cutoff score for this measure. The SDS has been found to be a reliable instrument with an alpha value of .89 for the total score and test-retest reliability with a correlation coefficient of .73. Correlations with other measures of functioning demonstrate both convergent and divergent validity (Arbuckle et al., 2009). This scale has been modified for the present study to assess the degree to which health or medical symptoms have disrupted occupational, academic, and social functioning. See Appendix P for questionnaire.

CHAPTER III:

DATA ANALYSIS

In order to determine the quality of each candidate item and evaluate their performance within the screening questionnaire, item analyses were conducted (i.e., item total, zero-order, principal component analysis). Items were evaluated for retention or elimination based on correlation with other items, mean, and high variance, as well as reliability and validity. An item total correlation matrix was reported to compare items used within the screening questionnaire to the sum score of their respective measures administered at the first subsequent assessment to assess for construct validity. Also, a zero-order correlation matrix was reported to compare items to one another within the screening questionnaire at Time 1. Lastly, a principal component analysis (PCA) was conducted in order to identify relationships among variables, as well as to assess construct validity. Retention criteria for items include medium to high item total correlation, low zero-order correlations with other items administered within the screening questionnaire, and medium to high eigenvalues (e.g., greater than/equal to 1.0) with the PCA.

To examine if identified characteristics predict adherence to behavioral treatment recommendations, hierarchical linear regressions were conducted to assess the relationship between predictor variables (i.e., social support, self-efficacy, depression, health anxiety, knowledge, health beliefs) and adherence to recommendations specific to dietary behaviors or physical activity made by a healthcare provider (i.e., criterion variables). Consistent with prior research, the average of responses measuring health behavior adherence across Time 2 and Time 3 were used for data analysis (Nagpal, Prapavessis, Campbell, & Mottola, 2017). Moreover, hierarchical linear regressions were used to determine amount of variance accounted for by each individual variable, as well

as a full model consisting of all predictor variables. The F -test was used to assess whether the set of independent variables collectively predicts adherence to recommendations. R -squared—the multiple correlation coefficient of determination—was reported and used to determine how much variance in adherence was accounted for by the independent variables. The assumptions of multiple regression (e.g., linearity, homoscedasticity, multicollinearity) were also assessed. Additionally, means and standard deviations for each variable were reported at both time points.

CHAPTER IV:

RESULTS

Sample Characteristics

Analyses were conducted to characterize the sample based on the constructs (e.g., depression, health anxiety, self-efficacy, social support, stress, health beliefs) assessed within the study. Within the initial set of composite surveys, participants within the sample endorsed a number of items suggesting the presence of depressive symptoms ($M=23.29$, $SD=7.76$), indicated by an average score greater than 16 (The Center for Epidemiologic Studies Depression Scale; Radloff, 1977). The degree of anxiety specific to health was relatively low ($M=16.01$, $SD=7.07$; Health Anxiety Inventory–18; Salkovskis, Rimes, Warwick, & Clark, 2002). A majority of participants indicated feeling supported by friends and family ($M=64.97$, $SD=15.86$; Multidimensional Scale of Perceived Social Support; Zimet et al., 1988), yet also perceived their lives as stressful ($M=23.67$, $SD=3.92$; Perceived Stress Scale; Cohen, Kamarck, & Mermelstein, 1994). Overall, the sample perceived themselves as being able to achieve general goals, as well as goals relative to their health ($M=31.86$, $SD=4.13$, General Self-Efficacy Scale, Schwarzer & Jerusalem, 1995; $M=4.92$, $SD=7.07$, Health Self-Efficacy Scale, Lee et al., 2008, respectively), while most perceived themselves as having little control over their ability to engage in health behaviors ($M=6.45$, $SD=2.79$; Rosenstock, Strecher, & Becker, 1988; Ajzen, 1991). Lastly, rates of social desirability were relatively low ($M=5.35$, $SD=1.98$; Marlowe–Crowne Social Desirability Scale–Short Form; Crowne & Marlowe, 1960), suggesting a lack of response bias in reports of adherence toward health behaviors. See Table 1 for reported means and standard deviations.

Table 1.

Means and Standard Deviations of Self-Report Measures Administered at Time 2 and Time 3.

Self-Report Measures ^a	Time 2		Time 3	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
CES–D ^b	23.84	7.90	24.36	8.04
GSE ^b	31.76	4.16	31.72	4.20
HAI–18 ^b	15.79	7.12	15.19	7.70
HB ^b	6.39	2.91	6.24	2.95
HSES ^b	4.67	2.87	4.77	3.08
MCSDS ^b	5.35	1.98	--	--
MSPSS ^b	65.80	14.62	64.28	15.59
PSS ^b	23.73	3.95	22.95	3.81
RAND 36–Item				
Physical Functioning	85.92	18.85	85.64	20.97
Physical Limitations	83.58	27.90	81.60	31.89
Emotional Limitations	47.19	42.51	48.49	43.00
Energy/Fatigue	39.07	21.10	41.55	23.42
Emotional Well-Being	61.20	20.69	60.41	23.14
Social Functioning	66.57	28.41	68.64	27.14
Pain	72.27	22.37	73.66	21.33
General Health	69.26	22.04	67.03	26.97
SDS ^b	6.88	6.70	6.45	6.59

^aAll reported measures were given at Time 2 and Time 3, excluding MCSDS; ^bCES–D = Center for Epidemiologic Studies Depression Scale; GSE = General Self-Efficacy Scale; HAI–18 = Health Anxiety Inventory–18; HB = Health Beliefs; HSES = Health Self-Efficacy Scale; MCSDS = Marlowe–Crowne Social Desirability Scale–Short Form; MSPSS = Multidimensional Scale of Perceived Social Support; PSS = Perceived Stress Scale; SDS = Sheehan Disability Scale.

Scale Item Analyses

To begin to assess whether specific items selected from existing measures predicted adherence and, thus, would be good candidates for an eventual brief screener for clinicians, an item total correlation matrix and zero-order correlation matrix were provided as a result of subsequent analyses and evaluated. An item-total correlation matrix was used to ensure that the Time 1 prospective screener candidate item(s) chosen from standardized measures correlated with the measure when given in its entirety during the first follow up assessment, Time 2 (See Table 2). Multiple zero-order correlation

matrices were reviewed to determine whether multiple scale items are potentially accounting for some of the same variance in adherence in subsequent regression analyses, as well as to evaluate possible relationships between adherence and items given at Time 1 and Time 2 (See Table 3, 4, and 5).

Within the item total correlation matrix, items assessing for stress, social support, depression, general and health self-efficacy, and perceived control within the screening questionnaire at Time 1 demonstrated medium, statistically significant correlations with the sum score of the respective full measures at the first subsequent assessment at Time 2 (e.g., two CES-D items in prescreen correlated with full CES-D). However, the item assessing for perceived benefit at Time 1, as well as the item assessing for enjoyment of life within the screening questionnaire at Time 1, independently revealed small correlations with the sum score of their respective measures at Time 2.

Table 2.

Item-Total Correlations Between Prescreen Scale Items and Time 2 Full Measure Sum Scores.

Scale Items ^a	PSS (Sum) ^b	MSPSS (Sum) ^b	CES-D (Sum) ^b	GSE (Sum) ^b	HSES (Sum) ^b	HB (Sum) ^b	HB (Sum) ^b	HB (Sum) ^b
Stress (Prescreen)	.44**	--	--	--	--	--	--	--
Stress (Time 1)	.62**	--	--	--	--	--	--	--
Social Support (Special Person; Prescreen)	--	-.46**	--	--	--	--	--	--
Social Support (Special Person; Time 1)	--	.75**	--	--	--	--	--	--
Social Support (Family; Prescreen)	--	-.48**	--	--	--	--	--	--
Social Support (Family; Time 1)	--	.76**	--	--	--	--	--	--
CES-D (Sad; Prescreen) ^b	--	--	.44**	--	--	--	--	--
CES-D (Sad; Time 1) ^b	--	--	.75**	--	--	--	--	--
CES-D (Enjoyed Life; Prescreen) ^b	--	--	.22**	--	--	--	--	--
CES-D (Enjoyed Life; Time 1) ^b	--	--	-.38**	--	--	--	--	--
General Self- Efficacy (Prescreen)	--	--	--	-.38**	--	--	--	--
General Self- Efficacy (Time 1)	--	--	--	.62**	--	--	--	--
Health Self-Efficacy (Prescreen)	--	--	--	--	.34**	--	--	--
Health Self-Efficacy (Time 1)	--	--	--	--	.75**	--	--	--
Perceived Benefit (Prescreen)	--	--	--	--	--	.10	--	--
Perceived Benefit (Time 1)	--	--	--	--	--	.47**	--	--
Perceived Control (Phys; Prescreen)	--	--	--	--	--	--	.37**	--
Perceived Control (Phys; Time 1)	--	--	--	--	--	--	.59**	--
Perceived Control (Diet; Prescreen)	--	--	--	--	--	--	--	.31**
Perceived Control (Diet; Time 1)	--	--	--	--	--	--	--	.67**

^aScale items within the Y-axis are single items; ^bCES-D = The Center for Epidemiologic Studies Depression Scale; GSE = General Self-Efficacy; HB = Health Beliefs; HSES = Health Self-Efficacy Scale; MSPSS = Multidimensional Scale of Perceived Social Support; PSS = Perceived Stress Scale. * $p < .05$,

** $p < .01$

Within the zero-order correlation matrix, a scale item assessing perceived support from family at Time 1 demonstrated a large, statistically significant correlation with another item assessing perceived support from a special person also at Time 1. This was not surprising given their being part of the same overall measure of perceived social support. Conversely, a scale item from a measure assessing general self-efficacy at Time 1 revealed a medium, statistically significant correlation with an item from a measure assessing health self-efficacy at Time 1 as well. Lastly, a scale item assessing for sadness demonstrated a medium, statistically significant correlation with an item assessing for perceived stress, as well as an item assessing for enjoyment of life. Remaining correlations among selected items were relatively low ($< .40$; See Table 3).

Table 3.
Zero-Order Correlation Matrix Between Prescreen Scale Items.

Scale Items	1	2	3	4	5	6	7	8	9	10
1. Stress	1.00	--	--	--	--	--	--	--	--	--
2. Social Support (Special Person)	.16	1.00	--	--	--	--	--	--	--	--
3. Social Support (Family)	.22*	.55**	1.00	--	--	--	--	--	--	--
4. General Self-Efficacy	.22*	.12	.23**	1.00	--	--	--	--	--	--
5. Health Self-Efficacy	.27**	.00	.07	.47**	1.00	--	--	--	--	--
6. CES-D (Sad) ^a	.48**	.20*	.26**	.33**	.38**	1.00	--	--	--	--
7. CES-D (Enjoyed Life) ^{a, b}	.40**	.29**	.31**	.18*	.34**	.44**	1.00	--	--	--
8. Perceived Benefit	.08	.06	-.05	.06	.21*	.11	.03	1.00	--	--
9. Perceived Control (Phys)	.05	.01	-.03	.27**	.26**	.04	.07	.18*	1.00	--
10. Perceived Control (Diet)	.01	.14	.05	.25**	.26**	.11	.08	.17	.48**	1.00

^a CES-D = The Center for Epidemiologic Studies Depression Scale. ^b Scale item is reversed scored.

* $p < .05$, ** $p < .01$

Table 4.
Zero-Order Correlation Matrix Between Prescreen Scale Items and Average Adherence Scores across Time 2 and Time 3.

Scale Items	1	2	3	4	5	6	7	8	9	10	11
1. Health Behavior Adherence	1.00	--	--	--	--	--	--	--	--	--	--
2. Stress	.05	1.00	--	--	--	--	--	--	--	--	--
3. Social Support (Special Person)	-.07	-.17*	1.00	--	--	--	--	--	--	--	--
4. Social Support (Family)	-.11	-.23**	.54**	1.00	--	--	--	--	--	--	--
5. General Self-Efficacy	-.23**	-.30**	.18*	.27**	1.00	--	--	--	--	--	--
6. Health Self-Efficacy	-.26**	-.28**	.03	.09	.44**	1.00	--	--	--	--	--
7. CES-D (Sad) ^a	.05	.51**	-.22**	-.27**	-.33**	-.37**	1.00	--	--	--	--
8. CES-D (Enjoyed Life) ^{a, b}	.09	.40**	-.30**	-.32**	-.21**	-.33**	.42**	1.00	--	--	--
9. Perceived Benefit	-.04	.00	-.01	-.05	.03	.01	-.03	.00	1.00	--	--
10. Perceived Control (Phys)	-.27**	-.01	.00	-.02	.21**	.27**	-.03	-.07	.09	1.00	--
11. Perceived Control (Diet)	-.16*	.04	.12	.07	.25**	.21**	-.07	-.07	-.01	.44**	1.00

^a CES-D = The Center for Epidemiologic Studies Depression Scale. ^b Scale item is reversed scored.

* $p < .05$, ** $p < .01$

Table 5.

Zero-Order Correlation Matrix Between Adherence and Full Measure Average Scores at Time 2.

Self-Report Measures ^a	1	2	3	4	5	6	7
1. Health Behavior Adherence	1.00	--	--	--	--	--	--
2. CES-D ^b	-.04	1.00	--	--	--	--	--
3. GSE ^b	-.09	-.33**	1.00	--	--	--	--
4. HAI-18 ^b	.12	.48**	-.41**	1.00	--	--	--
5. HSES ^b	.31**	.17*	-.16*	.12	1.00	--	--
6. MSPSS ^b	-.18*	-.24**	.24**	-.20*	-.29**	1.00	--
7. PSS ^b	-.03	.47**	-.18*	.33**	.11	-.06	1.00

^aAll reported measures were given at Time 2 and Time 3; ^bCES-D = Center for Epidemiologic Studies Depression Scale; GSE = General Self-Efficacy Scale; HAI-18 = Health Anxiety Inventory-18; HSES = Health Self-Efficacy Scale; MSPSS = Multidimensional Scale of Perceived Social Support; PSS = Perceived Stress Scale.

Principal Component Analysis

A principal component analysis (PCA) was conducted on a 16-item questionnaire that measured health behavior adherence across 12 predictor constructs in order to potentially identify relationships among variables and to represent a wealth of data as a smaller set of variables. Specifically, this analysis is useful in revealing multiple items that may be measuring the same construct. Hence, this analysis has been conducted to serve as another approach to examine candidate items for retention within the brief screener and to reduce or eliminate redundancy of item coverage. Within the questionnaire, some predictor constructs were assessed through a single item, and other predictor constructs included multiple items. The suitability of performing a PCA was assessed by determining if appropriate assumptions (i.e., use of continuous variables,

presence of linear relationship among all variables, sampling adequacy, data is suitable for reduction, no significant outliers) were met prior to analysis. A Promax nonorthogonal rotation was employed to aid in interpretation, given that some of the predictors were expected to correlate with one another.

The PCA revealed three components that had eigenvalues greater than 1.0, which explained 29.3%, 16.8%, and 11.9% of the total variance, respectively. The three-component solution explained 57.9% of the total variance. The interpretation of the data suggests strong item loadings of items on a latent component thematically related to helplessness and hopelessness (e.g., depression, self-efficacy, stress, health self-efficacy) for Component 1, perceived behavioral control items for Component 2, and social support for Component 3 (see Table 6).

Table 6.

Loadings for Principal Component Analysis of Screening Questionnaire Using a Promax Non-Orthogonal Rotation.

Scale Items	Factor Loadings		
	1	2	3
Factor 1: Helplessness/Hopelessness			
PSS: In the last month, how often have you felt nervous and/or stressed? ^a	.61^b	-.27	-.32
GSE: It is easy for me to stick to my aims and accomplish my goals. ^a	.60	.25	-.01
HSES: I am confident I can have a positive effect on my health. ^a	.63	.35	-.37
CES–D: I felt sad. ^a	.71	-.18	-.31
CES–D: I enjoyed life. ^a	.69	-.25	-.15
Factor 2: Behavioral Control			
HB: I have control over my ability to engage in physical activity/exercise at least twice per week for 30 minutes for the next month. ^a	.32	.69	.24
HB: I have control over my ability to engage in healthy dietary behaviors nearly every day for the next month. ^a	.37	.61	.41
Factor 3: Social Support			
MSPSS: There is a special person who is around when I am in need. ^a	.49	-.36	.61
MSPSS: I get the emotional help and support I need from my family. ^a	.55	-.46	.47

^aCES–D = Center for Epidemiologic Studies Depression Scale; GSE = General Self-Efficacy Scale; HB = Health Beliefs; HSES = Health Self-Efficacy Scale; MSPSS = Multidimensional Scale of Perceived Social Support; PSS = Perceived Stress Scale; ^bBolding is indicative of which construct(s) loaded most strongly onto each component.

Specific Predictor Constructs on Adherence

To examine the impact of *specific* predictor constructs on level of treatment adherence, a hierarchical linear regression was performed. Variables that may explain adherence were entered in three steps. In step 1, the average of health behavior adherence across two timepoints following the initial screening was entered as the dependent variable, and (a) depression, (b) social support, (c) stress, (d) general self-efficacy, and (e) health self-efficacy items within the screening questionnaire were the predictor variables. In step 2, (a) health beliefs and (b) knowledge were added to the model as

predictor variables. Step 1 and step 2 variables were chosen based on prior research that suggests that each variable can predict level of adherence behaviors. Lastly, in step 3, (a) age, (b) gender, (c) race, and (d) ethnicity were added as the independent control variables.

In Step 1, the change in variance accounted for was equal to .08, which was not significantly different from zero ($F_{(7, 125)}=1.38, p=.222$). Ultimately, health self-efficacy was the only statistically significant independent variable ($\beta=0.25, p=.026$) within this step of the model. In Step 2, with four items (Perceived Behavioral Control, Knowledge, Perceived Benefits) added into the regression equation, the change in variance accounted for by adding these variables to the model was equal to .05, which was not significantly different from zero ($F_{(11, 125)}=1.45, p=.161$). Lastly, results of Step 3 indicated that the variance accounted for by demographic variables equaled .02, which was not significantly different from zero ($F_{(15, 125)}=1.17, p=.309$). However, health self-efficacy and perceived control were identified as *trending* predictor constructs within the full model ($\beta=0.25=3, p=.060$; $\beta=0.18=3, p=.069$, respectively). Overall, the full model of depression, social support, stress, general self-efficacy, and health self-efficacy, health beliefs and knowledge to predict health behavior adherence, and demographic variables (Model 3) was not statistically significant ($R^2=.137, F_{(15, 125)}=1.17, p=.309$). From this hierarchical regression analysis, health self-efficacy and perceived behavioral control appeared to be the strongest predictor(s). See Table 7.

Table 7.

Summary of Hierarchical Regression Analysis for Specific Variables predicting Adherence.

Variable	β	t	p	R	R^2	ΔR^2
Step 1				.275	.075	.075
Depression (Sad; CES-D ^a)	-.09	-.84	.402			
Depression (Enjoyed Life; CES-D ^a)	-.01	-.07	.941			
Social Support (Special Person; MSPSS ^a)	.04	.41	.684			
Social Support (Family; MSPSS ^a)	.00	.01	.993			
Stress (PSS ^a)	-.07	-.62	.534			
General Self-Efficacy (GSE ^a)	.10	.92	.362			
Health Self-Efficacy (HSES ^a)	.25	2.26*	.026			
Step 2				.350	.123	.047
Depression (Sad; CES-D ^a)	-.08	-.72	.473			
Depression (Enjoyed Life; CES-D ^a)	-.04	-.38	.706			
Social Support (Special Person; MSPSS ^a)	.04	.39	.695			
Social Support (Family; MSPSS ^a)	.03	.24	.809			
Stress (PSS ^a)	-.05	-.46	.649			
General Self-Efficacy (GSE ^a)	.06	.61	.543			
Health Self-Efficacy (HSES ^a)	.22	1.96*	.053			
Perceived Benefits (HB ^a)	.00	-.002	.998			
Perceived Control (HB ^a)	.18	1.90	.061			
Knowledge (Yes)	-.15	-.57	.568			
Knowledge (No)	-.29	-1.10	.274			
Step 3				.370	.137	.015
Depression (Sad; CES-D ^a)	-.07	-.59	.559			
Depression (Enjoyed Life; CES-D ^a)	-.05	-.44	.663			
Social Support (Special Person; MSPSS ^a)	.05	.40	.689			
Social Support (Family; MSPSS ^a)	.01	.11	.917			
Stress (PSS ^a)	-.04	-.37	.710			
General Self-Efficacy (GSE ^a)	.06	.54	.589			
Health Self-Efficacy (HSES ^a)	.23	1.90	.060			
Perceived Benefits (HB ^a)	-.01	-.11	.909			
Perceived Control (HB ^a)	.18	1.84	.069			
Knowledge (Yes)	-.15	-.56	.580			
Knowledge (No)	-.27	-1.03	.305			
Age	.11	1.21	.231			
Gender	.02	.15	.882			
Race	-.03	-.31	.761			
Ethnicity	-.09	-.80	.426			

^aCES-D = Center for Epidemiologic Studies Depression Scale; GSE = General Self-Efficacy Scale; HB = Health Beliefs; HSES = Health Self-Efficacy Scale; MSPSS = Multidimensional Scale of Perceived Social Support; PSS = Perceived Stress Scale; * $p < .05$, ** $p < .01$

Trending Predictor Constructs on Adherence

To examine the impact of *trending* predictor constructs on the level of treatment adherence, another hierarchical linear regression was conducted. Variables that may explain adherence were entered in three steps and were selected based on the strength of standardized coefficients from the previous analysis. Once again, the average of health behavior adherence across two timepoints subsequent to the initial screening was entered as the outcome variable. In step 1, health self-efficacy at prescreen was the sole predictor variable. In step 2, perceived control at prescreen was added as another predictor variable. Lastly, in step 3, (a) age, (b) gender, (c) race, and (d) ethnicity were added as control variables. In order to simulate the intended use of the screener being formed and to further examine the impact of these predictor constructs on level of treatment adherence, steps 1 and 2 will be focused on for interpretation. Results of step 1 indicated that health self-efficacy significantly accounted for 6% of the variance within health behavior adherence ($R^2=.060$, $F_{(1, 129)}=8.22$, $p=.005$). The step 2 model of health self-efficacy and perceived control was statistically significant ($R^2=.091$, $F_{(2, 129)}=6.34$, $p=.002$). Both health self-efficacy and perceived behavioral control were identified as significant independent predictor constructs within step 2 of the model ($\beta=0.19=3$, $p=.033$; $\beta=0.18=3$, $p=.041$, respectively). Additionally, the full model including health self-efficacy, perceived control, and demographic variables as predictors of health behavior adherence (Model 3) was statistically significant as well ($R^2=.107$, $F_{(6, 129)}=2.45$, $p=.028$). See Table 8.

Table 8.

Summary of Hierarchical Regression Analysis for Trending Variables predicting Adherence.

Variable	β	t	p	R	R^2	ΔR^2
Step 1				.25	.060	.06
Health Self-Efficacy (HSES ^a)	.25	2.87**	.005			
Step 2				.30	.091	.03
Health Self-Efficacy (HSES ^a)	.19	2.16*	.033			
Perceived Control (HB ^a)	.18	2.06*	.041			
Step 3				.33	.107	.02
Health Self-Efficacy (HSES ^a)	.20	2.12*	.036			
Perceived Control (HB ^a)	.18	2.01*	.047			
Age	.11	1.25	.215			
Gender	.02	.23	.819			
Race	-.03	-.29	.776			
Ethnicity	-.10	-.94	.352			

^aHSES = Health Self-Efficacy Scale; HB = Health Beliefs.

* $p < .05$, ** $p < .01$

Performance of Candidate Items Summary

Based on correlations among scale items, results from the principal component analysis, and findings from hierarchical linear regressions, it seems advisable that items assessing for social support, depression, perceived benefits, knowledge, and stress be eliminated as potential items within the screening questionnaire. Furthermore, it seems appropriate that items assessing for health self-efficacy and perceived behavioral control be retained for future studies. The performance of candidate items used within the screening questionnaire are to be discussed further.

CHAPTER V:

DISCUSSION

Existing research on treatment adherence primarily focuses on oral medication use, while not accounting for other health behaviors, such as physical activity and modifications to diet. In reviewing prior literature on adherence to oral medications, perceived social support, general and health-specific self-efficacy, and knowledge were identified as predictors of greater adherence (Alefishat, Farha, & Al-Debei, 2017; DiMatteo, 2004; Dunbar-Jacob & Mortimer-Stephens, 2001; Leader & Raanani, 2014; Lee et al., 2008; Mata, Todd, & Lippke, 2010; Olowe & Ross, 2017; Toft et al., 2006). Perceived stress (e.g., personal, academic, financial), depressive symptoms, and demographics (e.g., age, socioeconomic status, ethnicity) have also been found to influence level of adherence, albeit negatively (DiMatteo, Lepper, & Croghan, 2000; DiMatteo, Haskard, & Williams, 2007; Fair et al., 2012; Pritchard, Butow, Stevens, & Duley, 2006; Susin et al., 2016). Moreover, components of the Health Belief Model (e.g., perceived susceptibility, perceived severity, perceived benefits, perceived barriers, cues to action, self-efficacy; Rosenstock, Strecher, & Becker, 1988) and Theory of Planned Behavior (e.g., attitude, perceived behavioral control; Ajzen, 1991) have been referenced in previous studies as playing an important role in predicting adherence to a variety of medications across diverse populations.

As noted previously, the onset of chronic health conditions (e.g., heart disease, diabetes, cancer, arthritis) is highly related to health promotion, healthcare costs, rates of disability and mortality, mental health, and adherence overall (Newsom et al., 2012; Buttorff et al., 2017; DuGoff et al., 2014; Gerteis et al., 2014; Scott et al., 2016; Theis et al., 2018). Based on existing literature on adherence to behavioral treatment recommendations (Beinart, Goodchild, Weinman, Ayis, & Godfrey, 2013; Belanger &

Patrick, 2018; Lemstra, Bird, Nwankwo, Rogers, & Moraros, 2016; Marr & Wilcox, 2014; Middleton, Anton, & Perri, 2013), it is apparent that development of a validated measure used to assess the impact of psychosocial variables on increased health behaviors is warranted. The use of such a measure may potentially alleviate difficulty providers experience in establishing effective treatment plans, as well as promote patient follow-through with recommendations. As proposed, the use of a brief screening questionnaire could be used to both identify and accentuate facilitators, as well as problem-solve barriers, to ultimately optimize the individual's adherence to specific treatment regimens. Overall, through the use of such a proposed questionnaire in addressing adherence, providers might simultaneously target the prevalence of chronic conditions and mental health diagnoses, reduce healthcare costs and risk for mortality, and improve health and treatment outcomes.

Therefore, the primary purpose of the current study was to develop a screening questionnaire used to identify adherence facilitators and barriers, such as depression, health anxiety, self-efficacy (e.g., general, health specific), social support, stress, perceived health beliefs, and knowledge (Alefshat, Farha, & Al-Debei, 2017; DiMatteo, 2004; DiMatteo, Lepper, & Croghan, 2000; DiMatteo, Haskard, & Williams, 2007; Dunbar-Jacob & Mortimer-Stephens, 2001; Fair et al., 2012; Leader & Raanani, 2014; Lee et al., 2008; Mata, Todd, & Lippke, 2010; Olowe & Ross, 2017; Pritchard, Butow, Stevens, & Duley, 2006; Susin et al., 2016; Toft et al., 2006). In this study, participants who indicated they received at least one recommendation to modify health-related behaviors from a healthcare provider within a brief online screening survey (e.g., prescreen) were invited to complete two subsequent half-hour online composite surveys assessing adherence and related constructs (i.e., proposed facilitators and/or barriers to treatment adherence). The first subsequent survey was made available three to four weeks

following the completion of the screening survey, while the second subsequent survey was made available another three to four weeks after the first subsequent survey. More specifically, questions found within the online screening and composite surveys assessed participants' health provider recommendations for healthy dietary behaviors and physical activity, health anxiety, depressive symptoms, stress, social support, knowledge about their health, general self-efficacy, and perceived severity, benefits, and behavioral control regarding healthy dietary behaviors and physical activity.

In order to assess the relationship between adherence and potential constructs identified within existing literature on adherence to oral medication, a set of hypotheses were developed.

Hypothesis 1

It was proposed that higher levels of social support, and general and health specific self-efficacy would be correlated with higher levels of adherence across multiple timepoints. The relationship between social support and level of adherence was not supported. Based on existing literature, it is vital to consider the source and type of support received, as well as the behavior. Belanger and Patrick (2018) examined the effects of different sources (i.e., family, friends) and types of support (i.e., companionship, informational, esteem) on physical activity in college students. Their findings suggest an interaction between companionship and esteem support from family and friends and higher levels of physical activity, while informational support from family may be associated with less physical activity (Belanger & Patrick, 2018). Within the current study, the type of support was not assessed and behaviors (i.e., physical activity, diet modifications) could not be clearly distinguished from one another. Additionally, the relationship between general self-efficacy and level of adherence was not supported; however, the relationship between health self-efficacy and level of

adherence was positive. Consistent with previous research, this finding suggests that individuals are more likely to engage in health behaviors consistently if they are confident in their ability to meet such goals (Gonzalez et al., 2015). Despite the importance of general self-efficacy across several areas of functioning, health self-efficacy appears to play a more prominent role within the current study given its focus on adherence to health behaviors.

Hypothesis 2

It was predicted that higher levels of depression, health anxiety, and stress would be correlated with lower levels of adherence across multiple timepoints. This hypothesis was partially supported. Consistent with prior literature, findings revealed that depression was negatively correlated with adherence at Time 1 and Time 2, suggesting that individuals exhibiting symptoms of depression are less likely to adhere to treatment (DiMatteo, Lepper, & Croghan, 2000, Susin et al., 2016; See Table 7). Specifically, moderate to severe depression has been found to be significantly related to poor medication adherence (Julian et al., 2009; Kim et al., 2003). As demonstrated within the current study, participants reported experiencing mild to moderate symptoms of depression, further influencing their degree of adherence to health behaviors. Relative to health anxiety and stress, adherence was positively correlated with these constructs. These findings suggest that adherence increases as perceived levels of stress and health anxiety increase, which is inconsistent with prior research. Specific to sample characteristics, it is important to note that participants surveyed within this study may have experienced increased stress (See $M=23.67$, $SD=3.92$; Perceived Stress Scale; Cohen, Kamarck, & Mermelstein, 1994) related to personal (e.g., finances, employment, children, marriage) and academic responsibilities (e.g., midterm, final exams) as “non-traditional” college students. By comparison, another study examining the relationship

between general anxiety, stress, and level of adherence, included participants who were, on average, nine years younger ($M=20.53$, $SD=5.77$), attending a large Midwestern University, and who identified perceived lack of time, fatigue, and low motivation as barriers to adherence (Ebben & Brudzynski, 2008).

Hypothesis 3

Social support, general and health self-efficacy, and perceived behavioral control were predicted to account for greater amounts of variance in adherence to health behaviors compared to stress, depression, and perceived benefits and barriers. This hypothesis was partially supported. Health self-efficacy and perceived behavioral control assessed within the initial screening significantly predicted level of treatment adherence within subsequent assessments; however, neither general self-efficacy nor social support were significantly correlated with adherence over the same span. These findings suggest a relationship between perceived ability to change one's health and adhering to health behaviors at a later time, rather than perceived support from others in their immediate environment.

Selection of Candidate Items

In determining the quality of items within the screening questionnaire, each candidate item was evaluated for either retention or elimination based on correlations among items, performance within hierarchical linear regressions, and possible groupings identified within the principal component analysis. Based on findings, it is recommended that items assessing health and general self-efficacy, depression, and perceived behavioral control on health-promoting behaviors be retained. Specifically, these items demonstrated medium correlations with the sum score of the respective measures at the first subsequent assessment, further supporting retaining those items over items with low item-scale correlations. Additionally, results from the principal component analysis

(PCA) suggest that items assessing for general and health self-efficacy, depression, and perceived behavioral control sufficiently account for variance in predictor variables that can then be used to predict level of adherence efficiently. Furthermore, it is suggested that items assessing for social support, stress, knowledge, and perceived benefits be eliminated given eigenvalues within the PCA and magnitude of correlations with other items and item-totals. However, the candidate items to be retained would need to be reassessed and tested within another sample in order to further assess reliability in predicting level of adherence to behavioral treatment recommendations.

Implications

As noted previously, the most supportable approach for the development of a brief screening questionnaire used to measure adherence is to draw from prior literature examining adherence to oral medication regimens. However, it is possible that facilitators and barriers to taking oral medications as prescribed may differ from those for engaging in health behaviors. Brown and Bussell (2011) identified patient-related factors (i.e., lack of understanding of the disease, low health literacy, lack of involvement in the treatment decision-making process, motivation, health beliefs), physician-related factors (i.e., ineffective communication), and health system-related factors (i.e., limited healthcare coordination and access to care) as causes of poor adherence to medication. Conversely, factors that influence adherence to health behavior change (i.e., weight management strategies) were found to include environmental influences, means of self-monitoring, physiological changes, perceived barriers (e.g., time, transportation), perceived stress, social support, and extended care (Middleton, Anton, & Perri, 2013). This inconsistency among identified facilitators and barriers in comparing adherence to oral medication use to weight management may begin to explain why specific constructs did not significantly predict adherence in the present study.

Ultimately, current findings demonstrate a relationship between adherence, self-efficacy (e.g., general, health), and constructs supported by the Health Belief Model and Theory of Planned Behavior (e.g., perceived behavioral control) (Rosenstock, Strecher, & Becker, 1988; Ajzen, 1991). The data support the use of assessing individuals' self-efficacy and beliefs regarding their health in addressing non-adherence, hesitancy to engage in treatment, or identifying barriers to services. By assessing prominent health beliefs and level of self-efficacy, healthcare providers may be able to identify means of enhancing individuals' ability to engage in health behaviors, as well as target potentially unhelpful thoughts related to health.

Limitations and Future Directions

One limitation of the study was the attrition rate of participants, a frequent challenge for studies that include subsequent measures. This lack of retention could imply that the participants who chose not to complete the final phase of the study may have exhibited low rates of adherence to recommended health behavior change, compared to those who completed the study in its entirety.

An additional limitation of the study was generalizability. The study was conducted in the southern part of the United States and may not be applicable to other parts of the country, or to other countries. All participants were college students attending a non-traditional four-year university with either an associate's or bachelor's degree. Therefore, the demographic characteristics of participants were more varied than typical college populations, yet less varied than the general population. It should be noted that poor self-management skills, increased stress, perceived academic demands, and potential medication side effects have been identified as barriers to medication adherence in young adults transitioning to college (Schaefer et al., 2017). Future studies should consider these additional factors in examining adherence to behavioral recommendations, as well as

adherence behaviors in diverse adult populations, specifically those managing chronic health conditions through the use of multiple treatment regimens.

Within the current study, health behaviors and beliefs (e.g., perceived control, perceived benefit) associated with healthy dietary changes and increased physical activity were assessed. However, these constructs were measured across multiple variables and separated based on which health behavior the participant had initially endorsed. Therefore, perceived behavioral control was examined using the average of responses provided if participants indicated they had received recommendations specific to both diet and exercise. This should be considered a limitation because it does not accurately reflect participants' health beliefs, as beliefs were unable to be clearly distinguished or referenced in regards to specific behavioral treatment recommendations. Similarly, adherence was also examined using the average of responses to questions generated by the author, rather than questions established within a validated measure. Therefore, it is possible that adherence was not accurately assessed within or across timepoints. This approach to examining level of adherence to health behaviors, specifically physical activity and diet, is consistent with prior studies and has been considered a limitation within existing research (Nagpal et al., 2017).

The current study consisted of subjective measures of adherence and psychosocial variables, and did not include objective means of measurement. Due to the self-report nature of measuring adherence, rates of successful engagement in recommended health behavior change may be skewed by a participant's need to create a positive impression through rating their adherence higher than is realistic. Additionally, the timeframes in which some constructs were assessed were temporally inconsistent with the duration in which adherence is measured. For example, depression and health anxiety were assessed over the past week to the past six months respectively, while adherence was evaluated

based on engagement in health behaviors within the past month. These limitations could imply an inaccurate assessment of the relationship among adherence and predictor variables.

Future studies should consider examining adherence more frequently and consistently across a lengthier timeframe. Adherence was assessed only using data from three timepoints spanning approximately eight weeks. Furthermore, behavioral treatment recommendations received at any time over the past two years were welcomed and assessed accordingly. It is possible that there may have been a more accurate reflection of adherence to these treatment recommendations within the study closer to the time of the recommendation being made, an increase in data available, and duration of participant engagement in changes toward health behaviors. Comparatively, participants were expected to recall and report their adherence independently, whereas adherence to treatment recommendations given by a healthcare provider has been recorded and assessed by clinic staff in some prior studies. Similar to the current study, Nagpal et al. (2017) designed a measure to assess adherence to nutrition and exercise interventions and tested it based on a specific program (i.e., Nutrition and Exercise Lifestyle Intervention Program). Within this study, participants were asked to attend the initial exercise session in-person and to submit food intake records during weekly in-person sessions. Additional health behaviors were performed independently, consistent with the current study. Therefore, the current study utilized subjective measures of adherence, but more reliable means of tracking and a measure of accountability might be used in future studies.

Lastly, future studies should also consider reassessing candidate items tested within the current study based on findings previously discussed. Moreover, it may be prudent to consider testing the use of the screening questionnaire in other populations (e.g., children, adolescents, older adults, patients within medical settings) to assess for

replicability and further increase generalizability of prospective outcomes, while accounting for diversity in age, race, ethnicity, and other social determinants of health.

Conclusion

The current study suggests a relationship between level of adherence, self-efficacy (e.g., general, health), and constructs supported by the Health Belief Model and Theory of Planned Behavior (e.g., perceived behavioral control). By assessing and addressing indicators of these constructs, healthcare providers may be able to individualize recommendations, optimize adherence, and promote engagement in health behaviors in order to further improve the management of chronic health conditions.

REFERENCES

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50(2), 179-211.
- Al-Qazaz, H. K., Sulaiman, S. A., Hassali, M. A., Shafie, A. A., Sundram, S., Al-Nuri, R., & Saleem, F. (2011). Diabetes knowledge, medication adherence and glycemic control among patients with type 2 diabetes. *International Journal of Clinical Pharmacy*, 33(6), 1028-1035.
- Alefishat, E. A., Farha, R. K. A., & Al-Debei, M. M. (2017). Self-reported adherence among individuals at high risk of metabolic syndrome: Effect of knowledge and attitude. *Medical Principles and Practice*, 26(2), 157-163.
- Alm-Roijer, C., Stagmo, M., Udén, G., & Erhardt, L. (2004). Better knowledge improves adherence to lifestyle changes and medication in patients with coronary heart disease. *European Journal of Cardiovascular Nursing*, 3(4), 321-330.
- Ambrose, K. R., & Golightly, Y. M. (2015). Physical exercise as non-pharmacological treatment of chronic pain: why and when. *Best Practice & Research Clinical Rheumatology*, 29(1), 120-130.
- American Diabetes Association. (2018, June 29). *The cost of diabetes*. Retrieved from <http://www.diabetes.org/advocacy/news-events/cost-of-diabetes.html>
- Arbuckle, R., Frye, M. A., Brecher, M., Paulsson, B., Rajagopalan, K., Palmer, S., & Degl'Innocenti, A. (2009). The psychometric validation of the Sheehan Disability Scale (SDS) in patients with bipolar disorder. *Psychiatry Research*, 165(1-2), 163-174.
- Awwad, O., Akour, A., Al-Muhaissen, S., & Morisky, D. (2015). The influence of patients' knowledge on adherence to their chronic medications: a cross-sectional study in Jordan. *International Journal of Clinical Pharmacy*, 37(3), 504-510.

- Beinart, N. A., Goodchild, C. E., Weinman, J. A., Ayis, S., & Godfrey, E. L. (2013). Individual and intervention-related factors associated with adherence to home exercise in chronic low back pain: a systematic review. *The Spine Journal, 13*(12), 1940-1950.
- Belanger, N. M., & Patrick, J. H. (2018). The influence of source and type of support on college students' physical activity behavior. *Journal of Physical Activity and Health, 15*(3), 183-190.
- Benjamin, E. J., Blaha, M. J., Chiuve, S. E., Cushman, M., Das, S. R., ... & Gillespie, C. (2017). Heart disease and stroke statistics—2017 update: a report from the American Heart Association. *Circulation, 135*(10), e146.
- Brown M. T., & Bussell, J. K. (2011, April). Medication adherence: WHO cares?. In *Mayo clinic proceedings* (Vol. 86, No. 4, pp. 304-314). Elsevier.
- Buttorff, C., Ruder, T., & Bauman, M. (2017). Multiple chronic conditions in the United States. *Santa Monica (CA): RAND Corporation*.
- Centers for Disease Control and Prevention. (2019). *Leading causes of death and numbers of deaths, by sex, race, and Hispanic origin: United States, 1980 and 2018*. Retrieved from <https://www.cdc.gov/nchs/data/hus/2019/006-508.pdf>
- Chiang, J. J., Turiano, N. A., Mroczek, D. K., & Miller, G. E. (2018). Affective reactivity to daily stress and 20-year mortality risk in adults with chronic illness: Findings from the National Study of Daily Experiences. *Health Psychology, 37*(2), 170.
- Clark, C. H., Mahoney, J. S., Clark, D. J., & Eriksen, L. R. (2002). Screening for depression in a hepatitis C population: the reliability and validity of the Center for Epidemiologic Studies Depression Scale (CES-D). *Journal of Advanced Nursing, 40*(3), 361-369.

- Cohen, S., Kamarck, T., & Mermelstein, R. (1994). Perceived stress scale. *Measuring Stress: A Guide for Health and Social Scientists*, 235-283.
- Cohen, S. & Williamson, G. (1988). Perceived stress in a probability sample of the United States. *The Social Psychology of Health*. Newbury Park, CA: Sage.
- Courneya, K. S., Friedenreich, C. M., Sela, R. A., Quinney, H. A., & Rhodes, R. E. (2002). Correlates of adherence and contamination in a randomized controlled trial of exercise in cancer survivors: an application of the theory of planned behavior and the five factor model of personality. *Annals of Behavioral Medicine*, 24(4), 257-268.
- Crowne, D. P., & Marlowe, D. (1960). A new scale of social desirability independent of psychopathology. *Journal of Consulting Psychology*, 24(4), 349.
- Czajkowski, S. M., Powell, L. H., Adler, N., Naar-King, S., Reynolds, K. D., Hunter, C. M., ... & Epel, E. (2015). From ideas to efficacy: The ORBIT model for developing behavioral treatments for chronic diseases. *Health Psychology*, 34(10), 971.
- Dempster, N. R., Wildman, B. G., Masterson, T. L., & Omlor, G. J. (2018). Understanding treatment adherence with the Health Belief Model in children with Cystic Fibrosis. *Health Education & Behavior*, 45(3), 435-443.
- DiMatteo, M. R. (2004). Social support and patient adherence to medical treatment: a meta-analysis. *Health Psychology*, 23(2), 207.
- DiMatteo, M. R., Giordani, P. J., Lepper, H. S., & Croghan, T. W. (2002). Patient adherence and medical treatment outcomes a meta-analysis. *Medical Care*, 40(9), 794-811.
- DiMatteo, M. R., Haskard, K. B., & Williams, S. L. (2007). Health beliefs, disease severity, and patient adherence: a meta-analysis. *Medical Care*, 45(6), 521-528.

- DiMatteo, M. R., Lepper, H. S., & Croghan, T. W. (2000). Depression is a risk factor for noncompliance with medical treatment: meta-analysis of the effects of anxiety and depression on patient adherence. *Archives of Internal Medicine*, 160(14), 2101-2107.
- Dixon-Ibarra, A., & Horner-Johnson, W. (2014). Peer Reviewed: Disability status as an antecedent to chronic conditions: National health interview survey, 2006–2012. *Preventing Chronic Disease*, 11, 1-8.
- DuGoff, E. H., Canudas-Romo, V., Buttorff, C., Leff, B., & Anderson, G. F. (2014). Multiple chronic conditions and life expectancy: a life table analysis. *Medical Care*, 52(8), 688-694.
- Dunbar-Jacob, J., & Mortimer-Stephens, M. (2001). Treatment adherence in chronic disease. *Journal of Clinical Epidemiology*, 54(12), S57-S60.
- Ebben, W., & Brudzynski, L. (2008). Motivations and barriers to exercise among college students. *Journal of Exercise Physiology Online*, 11(5), 1-7.
- Fair, A. M., Monahan, P. O., Russell, K., Zhao, Q., & Champion, V. L. (2012, January). The interaction of perceived risk and benefits and its relationship to predicting mammography adherence in African-American women. In *Oncology Nursing Forum* (Vol. 39, No. 1, p. 53). NIH Public Access.
- Ferro M. A. (2016). Major depressive disorder, suicidal behaviour, bipolar disorder, and generalised anxiety disorder among emerging adults with and without chronic health conditions. *Epidemiology and psychiatric sciences*, 25(5), 462–474.
<https://doi.org/10.1017/S2045796015000700>
- Froehlich-Grobe, K., Jones, D., Businelle, M. S., Kendzor, D. E., & Balasubramanian, B. A. (2016). Impact of disability and chronic conditions on health. *Disability and health journal*, 9(4), 600-608.

- Gerteis, J., Izrael, D., Deitz D., LeRoy, L., Ricciardi, R., Miller, T., & Basu, J. (2014). Multiple chronic conditions chartbook. *Rockville, MD: Agency for Healthcare Research and Quality*, 7-14. Retrieved from <https://www.ahrq.gov/sites/default/files/wysiwyg/professionals/prevention-chronic-care/decision/mcc/mccchartbook.pdf>.
- Gonzalez, J. S., Shreck, E., Psaros, C., & Safren, S. A. (2015). Distress and type 2 diabetes-treatment adherence: A mediating role for perceived control. *Health Psychology, 34*(5), 505.
- Hawkshead, J., & Krousel-Wood, M. A. (2007). Techniques for measuring medication adherence in hypertensive patients in outpatient settings. *Disease Management & Health Outcomes, 15*(2), 109-118.
- Hays, R. D., Sherbourne, C. D., & Mazel, R. M. (1993). The RAND 36-item health survey 1.0. *Health Economics, 2*(3), 217-227.
- Horne, R., Weinman, J., Barber, N., Elliott, R., Morgan, M., & Cribb, A. (2005). Concordance, adherence and compliance in medicine taking. *London: NCCSDO, 2005*, 40-6.
- Horwitz, R. I., & Horwitz, S. M. (1993). Adherence to treatment and health outcomes. *Archives of Internal Medicine, 153*(16), 1863-1868.
- Hruby, A., & Hu, F. B. (2015). The epidemiology of obesity: a big picture. *Pharmacoeconomics, 33*(7), 673-689.
- Hu, F. B., Li, T. Y., Colditz, G. A., Willett, W. C., & Manson, J. E. (2003). Television watching and other sedentary behaviors in relation to risk of obesity and type 2 diabetes mellitus in women. *Jama, 289*(14), 1785-1791.

- Jin, J., Sklar, G. E., Oh, V. M. S., & Li, S. C. (2008). Factors affecting therapeutic compliance: A review from the patient's perspective. *Therapeutics and Clinical Risk Management*, 4(1), 269.
- Julian, L. J., Yelin, E., Yazdany, J., Panopalis, P., Trupin, L., Criswell, L. A., & Katz, P. (2009). Depression, medication adherence, and service utilization in systemic lupus erythematosus. *Arthritis Care & Research*, 61(2), 240-246.
- Kamran, A., Ahari, S. S., Biria, M., Malpour, A., & Heydari, H. (2014). Determinants of patient's adherence to hypertension medications: application of health belief model among rural patients. *Annals of Medical and Health Sciences Research*, 4(6), 922-927.
- Kerse, N., Buetow, S., Mainous, A. G., Young, G., Coster, G., & Arroll, B. (2004). Physician-patient relationship and medication compliance: a primary care investigation. *The Annals of Family Medicine*, 2(5), 455-461.
- Khalili, R., Ebadi, A., Tavallai, A., & Habibi, M. (2017). Validity and reliability of the Cohen 10-item Perceived Stress Scale in patients with chronic headache: Persian version. *Asian Journal of Psychiatry*, 26, 136-140.
- Kim, M. T., Han, H. R., Hill, M. N., Rose, L., & Roary, M. (2003). Depression, substance use, adherence behaviors, and blood pressure in urban hypertensive black men. *Annals of Behavioral Medicine*, 26(1), 24-31.
- Lam, W. Y., & Fresco, P. (2015). Medication adherence measures: An overview. *BioMed Research International*, 2015, 1-12. Retrieved from <https://pubmed.ncbi.nlm.nih.gov/26539470/>.
- Leader, A., & Raanani, P. (2014). Adherence-related issues in adolescents and young adults with hematological disorders. *Acta Haematologica*, 132(3-4), 348-362.

- Lee, S. Y., Hwang, H., Hawkins, R., & Pingree, S. (2008). Interplay of negative emotion and health self-efficacy on the use of health information and its outcomes. *Communication Research*, 35(3), 358-381.
- Lemstra, M., Bird, Y., Nwankwo, C., Rogers, M., & Moraros, J. (2016). Weight loss intervention adherence and factors promoting adherence: a meta-analysis. *Patient Preference and Adherence*, 10, 1547.
- Lin, W. C., Zhang, J., Leung, G. Y., & Clark, R. E. (2011). Chronic physical conditions in older adults with mental illness and/or substance use disorders. *Journal of the American Geriatrics Society*, 59(10), 1913-1921.
- Marr, J., & Wilcox, S. (2015). Self-efficacy and social support mediate the relationship between internal health locus of control and health behaviors in college students. *American Journal of Health Education*, 46(3), 122-131.
- Mata, J., Todd, P. M., & Lippke, S. (2010). When weight management lasts. Lower perceived rule complexity increases adherence. *Appetite*, 54(1), 37-43.
- McDermott, M. S., Oliver, M., Simnadis, T., Beck, E. J., Coltman, T., Iverson, D., ... & Sharma, R. (2015). The theory of planned behaviour and dietary patterns: a systematic review and meta-analysis. *Preventive Medicine*, 81, 150-156.
- Middleton, K. R., Anton, S. D., & Perri, M. G. (2013). Long-term adherence to health behavior change. *American Journal of Lifestyle Medicine*, 7(6), 395-404.
- Morisky, D. E., Green, L. W., & Levine, D. M. (1986). Concurrent and predictive validity of a self-reported measure of medication adherence. *Medical Care*, 24(1), 67-74.
- Morisky, D. E. (2008). Predictive validity of a medication adherence measure for hypertension control. *Journal of clinical hypertension*, 10, 348-354.

- Nagpal, T. S., Prapavessis, H., Campbell, C., & Mottola, M. F. (2017). Measuring adherence to a nutrition and exercise lifestyle intervention: is program adherence related to excessive gestational weight gain?. *Behavior analysis in practice*, 10(4), 347-354.
- National Cancer Institute (2018, June 29). *Cancer prevalence and cost of care projections*. Retrieved from <https://costprojections.cancer.gov>
- Newsom, J. T., Huguet, N., McCarthy, M. J., Ramage-Morin, P., Kaplan, M. S., Bernier, J., ... & Oderkirk, J. (2011). Health behavior change following chronic illness in middle and later life. *Journals of Gerontology Series B: Psychological Sciences and Social Sciences*, 67(3), 279-288.
- Olowe, O. A., & Ross, A. J. (2017). Knowledge, adherence and control among patients with hypertension attending a peri-urban primary health care clinic, KwaZulu-Natal. *African Journal of Primary Health Care & Family Medicine*, 9(1), 1-5.
- Plotnikoff, R. C., Lubans, D. R., Costigan, S. A., & McCargar, L. (2013). A test of the theory of planned behavior to predict physical activity in an overweight/obese population sample of adolescents from Alberta, Canada. *Health Education & Behavior*, 40(4), 415-425.
- Pritchard, M. T., Butow, P. N., Stevens, M. M., & Duley, J. A. (2006). Understanding medication adherence in pediatric acute lymphoblastic leukemia: a review. *Journal of Pediatric Hematology/Oncology*, 28(12), 816-823.
- Qualtrics. (2018). Qualtrics [Software]. Provo, UT. Available from <https://uhcl.col.qualtrics.com/>
- Radloff, L. S. (1977). The CES-D scale: A self-report depression scale for research in the general population. *Applied Psychological Measurement*, 1(3), 385-401.

- Reynolds, W. M. (1982). Development of reliable and valid short forms of the Marlowe-Crowne Social Desirability Scale. *Journal of Clinical Psychology*, 38(1), 119-125.
- Richard, P., Walker, R., & Alexandre, P. (2018). The burden of out of pocket costs and medical debt faced by households with chronic health conditions in the United States. *PloS One*, 13(6), e0199598.
- Rosenstock, I. M., Strecher, V. J., & Becker, M. H. (1988). Social learning theory and the health belief model. *Health Education Quarterly*, 15(2), 175-183.
- Sabaté, E. (2003). *Adherence to long-term therapies: Evidence for action*. World Health Organization. Retrieved from <https://apps.who.int/iris/bitstream/handle/10665/42682/9241545992.pdf>.
- Salkovskis, P. M., Rimes, K. A., Warwick, H. M. C., & Clark, D. M. (2002). The Health Anxiety Inventory: development and validation of scales for the measurement of health anxiety and hypochondriasis. *Psychological Medicine*, 32(5), 843-853.
- Sambamoorthi, U., Tan, X., & Deb, A. (2015). Multiple chronic conditions and healthcare costs among adults. *Expert Review of Pharmacoeconomics & Outcomes Research*, 15(5), 823-832.
- Schaefer, M. R., Rawlinson, A. R., Wagoner, S. T., Shapiro, S. K., Kavookjian, J., & Gray, W. N. (2017). Adherence to attention-deficit/hyperactivity disorder medication during the transition to college. *Journal of Adolescent Health*, 60(6), 706-713.
- Schwarzer, R., & Jerusalem, M. (1995). Optimistic self-beliefs as a resource factor in coping with stress. In S. E. Hobfoll & M. W. de Vries (Eds.), *Extreme Stress and Communities: Impact and Intervention* (pp. 159-177). Springer, Dordrecht.

- Schwarzer, R., & Renner, B. (2000). Social-cognitive predictors of health behavior: action self-efficacy and coping self-efficacy. *Health Psychology, 19*(5), 487.
- Scott, K. M., Lim, C., Al-Hamzawi, A., Alonso, J., Bruffaerts, R., Caldas-de-Almeida, J. M., ... & Kawakami, N. (2016). Association of mental disorders with subsequent chronic physical conditions: world mental health surveys from 17 countries. *JAMA Psychiatry, 73*(2), 150-158.
- Sheehan, D. V. (1983). Sheehan disability scale. *Handbook of psychiatric measures, 2*, 100-2.
- Susin, N., de Melo Boff, R., Ludwig, M. W. B., Feoli, A. M. P., da Silva, A. G., Macagnan, F. E., & da Silva Oliveira, M. (2016). Predictors of adherence in a prevention program for patients with metabolic syndrome. *Journal of Health Psychology, 21*(10), 2156-2167.
- Svarstad, B. L., Chewning, B. A., Sleath, B. L., & Claesson, C. (1999). The Brief Medication Questionnaire: a tool for screening patient adherence and barriers to adherence. *Patient Education and Counseling, 37*(2), 113-124.
- Theis, K. A., Roblin, D., Helmick, C. G., & Luo, R. (2018). Employment exit and entry among US adults with and without arthritis during the Great Recession. A longitudinal study: 2007–2009, NHIS/MEPS. *Work, 60*(2), 303-318.
- Toft, U. N., Kristoffersen, L. H., Aadahl, M., von Huth Smith, L., Pisinger, C., & Jørgensen, T. (2006). Diet and exercise intervention in a general population—mediators of participation and adherence: The Inter99 study. *European Journal of Public Health, 17*(5), 455-463.
- Toll, B. A., McKee, S. A., Martin, D. J., Jatlow, P., & O'Malley, S. S. (2007). Factor structure and validity of the Medication Adherence Questionnaire (MAQ) with cigarette smokers trying to quit. *Nicotine & Tobacco Research, 9*(5), 597-605.

- VanderZee, K. I., Sanderman, R., Heyink, J. W., & de Haes, H. (1996). Psychometric qualities of the RAND 36-Item Health Survey 1.0: a multidimensional measure of general health status. *International Journal of Behavioral Medicine*, 3(2), 104.
- Wadden, T. A., Webb, V. L., Moran, C. H., & Bailer, B. A. (2012). Lifestyle modification for obesity: new developments in diet, physical activity, and behavior therapy. *Circulation*, 125(9), 1157-1170.
- Walker, E. R., & Druss, B. G. (2017). Cumulative burden of comorbid mental disorders, substance use disorders, chronic medical conditions, and poverty on health among adults in the USA. *Psychology, Health & Medicine*, 22(6), 727-735.
- Walker, K. L., Arnold, C. L., Miller-Day, M., & Webb, L. M. (2002). Investigating the physician-patient relationship: Examining emerging themes. *Health Communication*, 14(1), 45-68.
- World Health Organization. (2020, December 9). *Global health estimates 2019: Deaths by cause, age, sex, by country and by region, 2000-2019*. Retrieved from <http://www.who.int/news-room/fact-sheets/detail/the-top-10-causes-of-death>.
- Zimet, G. D., Dahlem, N. W., Zimet, S. G., & Farley, G. K. (1988). The multidimensional scale of perceived social support. *Journal of Personality Assessment*, 52(1), 30-41.
- Zimet, G. D., Powell, S. S., Farley, G. K., Werkman, S., & Berkoff, K. A. (1990). Psychometric characteristics of the multidimensional scale of perceived social support. *Journal of Personality Assessment*, 55(3-4), 610-617.

APPENDIX A:

PRESCREEN

1. Have you ever visited a healthcare provider where they made at least one recommendation to modify health-related behaviors?
 - 0 – No
 - 1 – Yes

2. What recommendation did your healthcare provider make? Please select all that apply:
 - Eat only in designated areas of your home or work environment.
 - Increase availability of healthy foods (e.g., fruits, vegetables, nuts), compared to unhealthy foods in settings, such as home, school, or work.
 - Consume fewer calories and/or lower levels of unhealthy fats and fried foods.
 - Use smaller plates and bowls when serving food or eat smaller portions of food.
 - Drink more water.
 - Make exercise a priority and a planned activity in the day.
 - Have an exercise partner or engage in group exercise for encouragement.
 - Engage in activities or exercise (e.g., walking, running, cycling, weights, nautilus equipment, rowing, physical labor) appropriate to your age and health condition(s).
 - Walk, run, or bicycle more frequently and/or at greater distances.
 - Try out/use exercise phone applications (e.g., track “steps”).
 - No recommendations were made, or I do not recall specifically.

3. Approximately how many months or years ago did recommendation(s)/feedback get communicated to you?
 - 0 – Fewer than 6 months
 - 1 – Between 6 months and 12 months
 - 2 – Between 12 months and 18 months
 - 3 – Between 18 months and 2 years
 - 4 – More than 2 years
 - 5 – No recommendations were made, or I do not recall specifically
 - 6 – I choose not to respond

4. In the last month, I have followed my healthcare provider’s recommendations on maintaining a healthy diet overall.
 - 0 – Nearly always
 - 1 – Frequently
 - 2 – Sometimes
 - 3 – Occasionally
 - 4 – Not at all
 - 5 – No recommendations were made, or I do not at all recall specifically
 - 6 – I choose not to respond

5. In the last month, I have followed my healthcare provider's recommendations regarding physical activity overall.

- 0 – Nearly always
- 1 – Frequently
- 2 – Sometimes
- 3 – Occasionally
- 4 – Not at all
- 5 – No recommendations were made, or I do not at all recall specifically
- 6 – I choose not to respond

6. In the last month, how often have you felt nervous and/or stressed? (Perceived Stress Scale)

- 0 – Never
- 1 – Almost never
- 2 – Sometimes
- 3 – Fairly often
- 4 – Very often
- 5 – I choose not to respond

7. There is a special person who is around when I am in need. (Multidimensional Scale of Perceived Social Support)

- 1 – Very Strongly Agree
- 2 – Strongly Agree
- 3 – Mildly Agree
- 4 – Neutral
- 5 – Mildly Disagree
- 6 – Strongly Disagree
- 7 – Very Strongly Disagree
- 8 – I choose not to respond

8. I get the emotional help and support I need from my family. (Multidimensional Scale of Perceived Social Support)

- 1 – Very Strongly Agree
- 2 – Strongly Agree
- 3 – Mildly Agree
- 4 – Neutral
- 5 – Mildly Disagree
- 6 – Strongly Disagree
- 7 – Very Strongly Disagree
- 8 – I choose not to respond

9. It is easy for me to stick to my aims and accomplish my goals. (General Self-Efficacy Scale)

- 0 – Strongly Agree
- 1 – Agree
- 2 – Undecided
- 3 – Disagree
- 4 – Strongly Disagree
- 5 – I choose not to respond

10. I am confident I can have a positive effect on my health. (Health Self-Efficacy)

- 0 – Strongly Agree
- 1 – Agree
- 2 – Undecided
- 3 – Disagree
- 4 – Strongly Disagree
- 5 – I choose not to respond

During the past week...

11. I felt sad. (Center for Epidemiological Studies Depression Scale)

- 0 – Rarely or none of the time
- 1 – Some or a little of the time
- 2 – Occasionally or a moderate amount of time
- 3 – Most or all of the time
- 4 – I choose not to respond

12. I enjoyed life. (Center for Epidemiological Studies Depression Scale)

- 0 – Most or all of the time
- 1 – Occasionally or a moderate amount of time
- 2 – Some or a little of the time
- 3 – Rarely or none of the time
- 4 – I choose not to respond

13. Eating a healthy diet and engaging in regular physical activity will have benefits, like decreasing my chances of obesity-related health complications and/or helping me feel more energetic. (Perceived benefit).

- 0 – Strongly Agree
- 1 – Agree
- 2 – Undecided
- 3 – Disagree
- 4 – Strongly Disagree
- 5 – I choose not to respond

14. I have control over my ability to engage in physical activity/exercise at least twice per week for 30 minutes for the next month. (Perceived behavioral control)

- 0 – Strongly Agree
- 1 – Agree
- 2 – Undecided
- 3 – Disagree
- 4 – Strongly Disagree
- 5 – I choose not to respond

15. I have control over my ability to engage in healthy dietary behaviors nearly every day for the next month. (Perceived behavioral control)

- 0 – Strongly Agree
- 1 – Agree
- 2 – Undecided
- 3 – Disagree
- 4 – Strongly Disagree
- 5 – I choose not to respond

16. Has your healthcare provider ever offered you information (e.g., discussion, pamphlet) to educate you on healthy dietary behaviors or physical activity?

- 0 – No
- 1 – Yes

17. If yes, do you believe the information has increased your willingness to engage in these behaviors?

- 0 – To a great extent
- 1 – Somewhat
- 2 – Very little
- 3 – Not at all
- 4 – No recommendations were made, or I do not at all recall specifically
- 5 – I choose not to respond

APPENDIX B:
INFORMED CONSENT

Informed Consent to Participate in Research

You are being asked to participate in the research project described below. Your participation in this study is entirely voluntary and you may refuse to participate, or you may decide to stop your participation at any time. Should you refuse to participate in the study or should you withdraw your consent and stop participation in the study, your decision will involve no penalty or loss of benefits to which you may be otherwise entitled. You are being asked to read the information below carefully, and ask questions about anything you don't understand before deciding whether or not to participate.

Title: Predicting Adherence To Health Behaviors Scale (PATH-B)
Principal Investigator(s): Steven Bistricky, Ph.D.
Student Investigator(s): Staci Schield, M.A.
Faculty Sponsor: Steven Bistricky, Ph.D.

PURPOSE OF THE STUDY

The purpose of this research is to understand how individuals' adherence to healthcare provider health behavior recommendations relate to a range of psychosocial variables, which may eventually help improve the effectiveness of health provider recommendations.

PROCEDURES

The study consists of three parts. Only participants who intend to complete all parts of the study should complete part one. During the first part of the study, participants will be asked to:

- complete a brief screener (you already would have completed this as part of the UHCL Psychology Research Participation pool prescreen mass testing)
- complete a demographic questionnaire

During the second and third parts of the study, the participant will complete several online questionnaires wherever the participant prefers to log on (e.g., home, school).

EXPECTED DURATION

The anticipated time commitment for part one of the study will be 5 minutes. The second and third parts of the study will take about 30 minutes each. Total study duration: 1 hour, 5 minutes.

RISKS OF PARTICIPATION

There are no anticipated risks associated with participating in this study. As with any study, there is always risk of having personal information compromised; however, we are taking extensive measures in this study to ensure this risk is extremely small (see Confidentiality section below). Please note, although participants will be asked about health behaviors that may have been recommended by their health provider(s), participants will not be asked by this study to change their health behaviors in any way.

BENEFITS TO THE SUBJECT

There are no direct benefits of the research for participants; however, there will be indirect benefits of participating. Students will receive course credit for their participation. Participants will also receive information they may find helpful. The research findings may also lead to benefits for individuals in society.

CONFIDENTIALITY OF RECORDS

Every effort will be made to maintain the confidentiality of your study records and any responses. First, your questionnaire responses will be paired with an arbitrary 4-digit number instead of your name or any other identifying information. Thus, the data will be stored in de-identified form. Second, these de-identified data will be stored in a password-protected database on a password protected computer. Any data on paper (e.g., signed consent form) will be stored in a filing cabinet in a locked room, and will also be kept separate from any questionnaire data. Only research staff will have access to this cabinet. The data will be stored for a minimum of three years after the completion of the study in files in a locked room.

FINANCIAL COMPENSATION

There is no financial compensation to be offered for participation in this study.

INVESTIGATOR'S RIGHT TO WITHDRAW PARTICIPANT

The investigator has the right to withdraw you from the study at any time.

CONTACT INFORMATION FOR QUESTIONS OR PROBLEMS

If you have additional questions during the course of this study about the research or any related problems, you may contact the student researcher, Staci Schield, at phone number [REDACTED] or by email [REDACTED]. The Faculty Sponsor, Steven Bistricky, Ph.D., may be contacted at phone number 281-283-3404 or by email at Bistricky@uhcl.edu.

APPENDIX C:

DEBRIEFING SCRIPT

Below we describe rationale and background for this research. The validity of psychology research often depends on participants not knowing hypotheses of the research beforehand. Please do not discuss details of this study with anyone else who could possibly complete the study. Thank you!

This study is interested in understanding how individuals' adherence to health behavior recommendations relate to a range of psychosocial variables. Assessing facilitators and/or barriers to adherence may eventually help improve the effectiveness of health provider recommendations.

How was this tested?

In this study, questions asked within the initial screener were meant to assess specific variables, such as social support, self-efficacy, knowledge, and mental health. Questionnaires given within follow-up sessions correspond with each question on the screener to ensure that each psychosocial variable is accurately measured. By providing a series of questionnaires across two time points, we are able to look at the relationship between questions answered in the screener and their possible relationships to adherence to health behavior recommendations at later follow-up sessions.

Purpose

The purpose of this study will be to develop a screener that predicts adherence to treatment recommendations and potentially provides clinicians with a tool to address predictors, facilitators, and/or barriers at the time of making treatment recommendations to their patient in order to promote adherence.

Why is this important to study?

By assessing facilitators and/or barriers to adherence, we may eventually help improve the effectiveness of health provider recommendations, which will conversely reduce healthcare costs, improve mental health, and decrease rates of morbidity.

What if I want to know more?

If you are interested in learning more about adherence, if you want information about results of this research when it is completed, or if you have any additional questions please feel encouraged to contact Staci Schield: [REDACTED]

Thank you again for your participation!

APPENDIX D:
DEMOGRAPHIC QUESTIONNAIRE

What is your first AND last name?

Age:

Gender:

- Male
- Female
- Other
- I choose not to respond

Years of education: (12 = High school graduate; 14 = Associate's degree; 16 = 4-year Bachelor's degree)

Your race (Select one or more of the following):

- Black or African-American
- Asian
- American Indian or Alaskan Native
- White/Caucasian
- Native Hawaiian or other Pacific Islander
- Multiracial
- Other (Please specify)
- I choose not to respond

Your ethnicity:

- Hispanic or Latino/a
- Non-Hispanic or Latino/a
- I choose not to respond

Number of people who live with you:

Choose your estimated household income (i.e., including all income earners):

- \$0-14,999
- \$15,000-\$29,999
- \$30,000-\$44,999
- \$45,000-\$59,999
- \$60,000-\$74,999
- \$75,000-\$89,999
- \$90,000-\$104,999
- \$105,000 or higher
- I choose not to respond

Relationship Status:

- Single/never married
- Not married, but in a long term relationship
- Married
- Separated
- Divorced
- Widowed
- I choose not to respond

Do you have any children?

- Yes
- No
- I choose not to respond

APPENDIX E:
ASSESSMENT OF RECOMMENDATIONS FOR HEALTHY DIETARY
BEHAVIORS AND PHYSICAL ACTIVITY

1. Have you ever visited a healthcare provider where they made at least one recommendation to modify health-related behaviors?
 - 0 – No
 - 1 – Yes

2. What recommendation did your healthcare provider make? Please select all that apply:
 - Eat only in designated areas of your home or work environment.
 - Increase availability of healthy foods (e.g., fruits, vegetables, nuts), compared to unhealthy foods in settings such as home, school or work.
 - Consume fewer calories and/or lower levels of unhealthy fats and fried foods.
 - Use smaller plates and bowls when serving food or eat smaller portions of food.
 - Drink more water.
 - Make exercise a priority and a planned activity in the day.
 - Have an exercise partner or engage in group exercise for encouragement.
 - Engage in activities or exercise (e.g., walking, running, cycling, weights, nautilus equipment, rowing, physical labor) appropriate to your age and health condition(s).
 - Walk, run, or bicycle more frequently and/or greater distances.
 - Try out/use exercise phone applications (e.g., track “steps”).
 - No recommendations were made, or I do not recall specifically.

3. Approximately how many months or years ago did recommendation(s)/feedback get communicated to you?
 - 0 – Fewer than 6 months
 - 1 – Between 6 months and 12 months
 - 2 – Between 12 months and 18 months
 - 3 – Between 18 months and 2 years
 - 4 – More than 2 years
 - 5 – No recommendations were made, or I do not recall specifically
 - 6 – I choose not to respond

APPENDIX F:

CENTER FOR EPIDEMIOLOGICAL STUDIES DEPRESSION SCALE

Center for Epidemiologic Studies Depression Scale (CES-D), NIMH

Below is a list of the ways you might have felt or behaved. Please tell me how often you have felt this way during the past week.

	During the Past			
Week				
	Rarely or none of the time (less than 1 day)	Some or a little of the time (1-2 days)	Occasionally or a moderate amount of time (3-4 days)	Most or all of the time (5-7 days)
1. I was bothered by things that usually don't bother me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. I did not feel like eating; my appetite was poor.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I felt that I could not shake off the blues even with help from my family or friends.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I felt I was just as good as other people.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I had trouble keeping my mind on what I was doing.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I felt depressed.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I felt that everything I did was an effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. I felt hopeful about the future.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. I thought my life had been a failure.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I felt fearful.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
11. My sleep was restless.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
12. I was happy.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
13. I talked less than usual.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
14. I felt lonely.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
15. People were unfriendly.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
16. I enjoyed life.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
17. I had crying spells.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
18. I felt sad.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
19. I felt that people dislike me.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
20. I could not get "going."	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX G:

GENERAL SELF-EFFICACY SCALE

General Self-Efficacy Scale (GSE)

	Not at all true	Hardly true	Moderately true	Exactly true
1. I can always manage to solve difficult problems if I try hard enough	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. If someone opposes me, I can find the means and ways to get what I want.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. It is easy for me to stick to my aims and accomplish my goals.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I am confident that I could deal efficiently with unexpected events.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. Thanks to my resourcefulness, I know how to handle unforeseen situations.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
6. I can solve most problems if I invest the necessary effort.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
7. I can remain calm when facing difficulties because I can rely on my coping abilities.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
8. When I am confronted with a problem, I can usually find several solutions.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
9. If I am in trouble, I can usually think of a solution	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
10. I can usually handle whatever comes my way.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

APPENDIX H:

HEALTH ANXIETY INVENTORY – 18

Each question consists of a group of four statements. Please read each group of statements carefully and then select the one which best describes your feelings over the past six months. There are no right or wrong answers. Do not spend too much time on any one statement. This assessment is not intended to be a diagnosis. If you are concerned about your results in any way, please speak with a qualified health professional.

1. 0 – I do not worry about my health.
 1 – I occasionally worry about my health.
 2 – I spend much of my time worrying about my health.
 3 – I spend most of my time worrying about my health.
2. 0 – I notice aches/pains less than most other people of my age.
 1 – I notice aches/pains as much as most other people of my age.
 2 – I notice aches/pains more than most other people of my age.
 3 – I am aware of aches/pains in my body all the time.
3. 0 – As a rule, I am not aware of bodily sensations or changes.
 1 – Sometimes I am aware of bodily sensations or changes.
 2 – I am often aware of bodily sensations or changes.
 3 – I am constantly aware of bodily sensations or changes.
4. 0 – Resisting thoughts of illness is never a problem.
 1 – Most of the time I can resist thoughts of illness.
 2 – I try to resist thoughts of illness but am often unable to do so.
 3 – Thoughts of illness are so strong that I no longer even try to resist them.
5. 0 – As a rule, I am not afraid that I have a serious illness.
 1 – I am sometimes afraid that I have a serious illness.
 2 – I am often afraid that I have a serious illness.
 3 – I am always afraid that I have a serious illness.
6. 0 – I do not have images (mental pictures) of myself being ill.
 1 – I occasionally have images of myself being ill.
 2 – I frequently have images of myself being ill.
 3 – I constantly have images of myself being ill.

7. 0 – I do not have any difficulty taking my mind off thoughts about my health.
 1 – I sometimes have difficulty taking my mind off thoughts about my health.
 2 – I often have difficulty taking my mind off thoughts about my health.
 3 – Nothing can take my mind off thoughts about my health.

8. 0 – I am lastingly relieved if my doctor tells me there is nothing wrong.
 1 – I am initially relieved but the worries sometimes return later.
 2 – I am initially relieved but the worries always return later.
 3 – I am not relieved if my doctor tells me there is nothing wrong.

9. 0 – If I hear about an illness, I never think I have it myself.
 1 – If I hear about an illness, I sometimes think I have it myself.
 2 – If I hear about an illness, I often think I have it myself.
 3 – If I hear about an illness, I always think I have it myself.

10. 0 – If I have a bodily sensation or change, I rarely wonder what it means.
 1 – If I have a bodily sensation or change, I often wonder what it means.
 2 – If I have a bodily sensation or change, I always wonder what it means.
 3 – If I have a bodily sensation or change, I must know what it means.

11. 0 – I usually feel at very low risk for developing a serious illness.
 1 – I usually feel at fairly low risk for developing a serious illness.
 2 – I usually feel at moderate risk for developing a serious illness.
 3 – I usually feel at high risk for developing a serious illness.

12. 0 – I never think I have a serious illness.
 1 – I sometimes think I have a serious illness.
 2 – I often think I have a serious illness.
 3 – I usually think I have a serious illness.

13. 0 – If I notice an unexplained bodily sensation, I don't find it difficult to think about other things.
 1 – If I notice an unexplained bodily sensation, I sometimes find it difficult to think about other things.
 2 – If I notice an unexplained bodily sensation, I often find it difficult to think about other things.
 3 – If I notice an unexplained bodily sensation, I always find it difficult to think about other things.

14. 0 – My family/friends would say I do not worry enough about my health.
 1 – My family/friends would say I have a normal attitude to my health.
 2 – My family/friends would say I worry too much about my health.
 3 – My family/friends would say I am a hypochondriac.

Now for the following questions, please think about what it might be like if you had a serious illness of a type which particularly concerns you (e.g. heart disease, cancer, multiple sclerosis etc.) Obviously you cannot know for sure what it would be like; please give your best estimate of what you *think* might happen, basing your estimate on what you know about yourself and serious illness in general.

15. 0 – If I had a serious illness, I would still be able to enjoy things in my life quite a lot.
 1 – If I had a serious illness, I would still be able to enjoy things in my life a little.
 2 – If I had a serious illness, I would be almost completely unable to enjoy things in my life.
 3 – If I had a serious illness, I would be completely unable to enjoy life at all.
16. 0 – If I had a serious illness, there is a good chance that modern medicine would be able to cure me.
 1 – If I had a serious illness, there is a moderate chance that modern medicine would be able to cure me.
 2 – If I had a serious illness, there is a very small chance that modern medicine would be able to cure me.
 3 – If I had a serious illness, there is no chance that modern medicine would be able to cure me.
17. 0 – A serious illness would ruin some aspects of my life.
 1 – A serious illness would ruin many aspects of my life.
 2 – A serious illness would ruin almost every aspect of my life.
 3 – A serious illness would ruin every aspect of my life.
18. 0 – If I had a serious illness, I would not feel that I had lost my dignity.
 1 – If I had a serious illness, I would feel that I had lost a little of my dignity.
 2 – If I had a serious illness, I would feel that I had lost quite a lot of my dignity.
 3 – If I had a serious illness, I would feel that I had totally lost my dignity.

APPENDIX I:
HEALTH BEHAVIOR ADHERENCE

1. *If participant answers “yes” to any of the recommendations listed below, there will be a drop-down question, “In the last month, I have followed this recommendation____.”*

- 0 – Nearly always
- 1 – Frequently
- 2 – Sometimes
- 3 – Occasionally
- 4 – Not at all
- 5 – I choose not to respond

Eat only in designated areas of your home or work environment.

Increase availability of healthy foods (e.g., fruits, vegetables, nuts), compared to unhealthy foods in settings such as home, school or work.

Consume fewer calories and/or lower levels of unhealthy fats and fried foods.

Use smaller plates and bowls when serving food or eat smaller portions of food.

Drink more water.

No recommendations were made, or I do not recall specifically.

2. In the last month, I have followed my healthcare provider’s recommendations on maintaining a healthy diet overall.

- 0 – Nearly always
- 1 – Frequently
- 2 – Sometimes
- 3 – Occasionally
- 4 – Not at all
- 5 – No recommendations were made, or I do not at all recall specifically
- 6 – I choose not to respond

3. *If participant answers “yes” to any of the recommendations listed below, there will be a drop-down question, “In the last month, I have followed this recommendation____.”*

- 0 – Nearly always
- 1 – Frequently
- 2 – Sometimes
- 3 – Occasionally
- 4 – Not at all
- 5 – I choose not to respond

Make exercise a priority and a planned activity in the day.
 Have an exercise partner or engage in group exercise for encouragement.
 Engage in activities or exercise (e.g., walking, running, cycling, weights, nautilus equipment, rowing, physical labor) appropriate to your age and health condition(s).
 Walk, run, or bicycle more frequently and/or greater distances.
 Try out/use exercise phone applications (e.g., track “steps”).
 No recommendations were made, or I do not recall specifically.

4. In the last month, I have followed my healthcare provider’s recommendations regarding physical activity overall.

- 0 – Nearly always
- 1 – Frequently
- 2 – Sometimes
- 3 – Occasionally
- 4 – Not at all
- 5 – No recommendations were made, or I do not at all recall specifically
- 6 – I choose not to respond

5. If you answered *Occasionally* or *Not at all*, why do you believe you did not engage in physical activity? Select the extent to which any of these apply:

	Not at all	A little of the time	Moderately	A lot of the time	I choose not to respond
Watching television					
Phone use					
Schoolwork					
Job responsibilities					
Taking care of children					
Fatigue					

APPENDIX J:
HEALTH BELIEFS

Eating a healthy diet and engaging in physical activity will have benefits, like decreasing my chances of obesity-related health complications and/or helping me feel more energetic (Perceived benefit).

- 0 – Strongly Agree
- 1 – Agree
- 2 – Undecided
- 3 – Disagree
- 4 – Strongly Disagree

I do not have time to be physically active or to exercise (Perceived barrier).

- 0 – Strongly Disagree
- 1 – Disagree
- 2 – Undecided
- 3 – Agree
- 4 – Strongly Agree

Being obese can increase my risk of death (Perceived severity).

- 0 – Strongly Agree
- 1 – Agree
- 2 – Undecided
- 3 – Disagree
- 4 – Strongly Disagree

It is very likely that I will become obese if I do not engage in physical activity and eat a poor diet (Perceived susceptibility).

- 0 – Strongly Disagree
- 1 – Disagree
- 2 – Undecided
- 3 – Agree
- 4 – Strongly Agree

I have control over my ability to engage in physical activity/exercise at least twice per week for 30 minutes for the next month (Perceived behavioral control).

- 0 – Strongly Agree
- 1 – Agree
- 2 – Undecided
- 3 – Disagree
- 4 – Strongly Disagree

If I want to, I can exercise at least twice per week for 30 minutes for the next month
(Perceived behavioral control).

- 0 – Strongly Agree
- 1 – Agree
- 2 – Undecided
- 3 – Disagree
- 4 – Strongly Disagree

I have control over my ability to engage in healthy dietary behaviors nearly every day for
the next month (Perceived behavioral control).

- 0 – Strongly Agree
- 1 – Agree
- 2 – Undecided
- 3 – Disagree
- 4 – Strongly Disagree

APPENDIX K:
HEALTH SELF-EFFICACY SCALE

1. I am confident I can have a positive effect on my health.
0 – Strongly Agree
1 – Agree
2 – Disagree
3 – Strongly Disagree
2. I have set some definite goals to improve my health.
0 – Strongly Agree
1 – Agree
2 – Disagree
3 – Strongly Disagree
3. I have been able to meet the goals I set for myself to improve my health.
0 – Strongly Agree
1 – Agree
2 – Disagree
3 – Strongly Disagree
4. I am actively working to improve my health.
0 – Strongly Agree
1 – Agree
2 – Disagree
3 – Strongly Disagree
5. I feel that I am in control of how and what I learn about my health.
0 – Strongly Agree
1 – Agree
2 – Disagree
3 – Strongly Disagree

APPENDIX L:

MARLOWE-CROWNE SOCIAL DESIRABILITY SCALE – SHORT FORM

Listed below are a number of statements concerning personal attitudes and traits. Read each item and decide whether the statement is true or false as it pertains to you.

1. It is sometimes hard for me to go on with my work if I am not encouraged.
True
False
2. I sometimes feel resentful when I don't get my own way.
True
False
3. On a few occasions, I have given up doing something because I thought too little of my ability.
True
False
4. There have been times when I felt like rebelling against people in authority even though I knew they were right.
True
False
5. No matter who I'm talking to, I'm always a good listener.
True
False
6. There have been occasions when I took advantage of someone.
True
False
7. I'm always willing to admit it when I make a mistake.
True
False
8. I sometimes try to get even, rather than forgive and forget.
True
False

9. I am always courteous, even to people who are disagreeable.

True

False

10. I have never been irked when people expressed ideas very different from my own.

True

False

11. There have been times when I was quite jealous of the good fortune of others.

True

False

12. I am sometimes irritated by people who ask favors of me.

True

False

13. I have deliberately said something that hurt someone's feelings.

True

False

APPENDIX M:

MULTIDIMENSIONAL SCALE OF PERCEIVED SOCIAL SUPPORT

Multidimensional Scale of Perceived Social Support (Zimet, Dahlem, Zimet & Farley, 1988)

Instructions: We are interested in how you feel about the following statements. Read each statement carefully. Indicate how you feel about each statement.

Circle the "1" if you **Very Strongly Disagree**
 Circle the "2" if you **Strongly Disagree**
 Circle the "3" if you **Mildly Disagree**
 Circle the "4" if you are **Neutral**
 Circle the "5" if you **Mildly Agree**
 Circle the "6" if you **Strongly Agree**
 Circle the "7" if you **Very Strongly Agree**

1.	There is a special person who is around when I am in need.	1	2	3	4	5	6	7	SO
2.	There is a special person with whom I can share my joys and sorrows.	1	2	3	4	5	6	7	SO
3.	My family really tries to help me.	1	2	3	4	5	6	7	Fam
4.	I get the emotional help and support I need from my family.	1	2	3	4	5	6	7	Fam
5.	I have a special person who is a real source of comfort to me.	1	2	3	4	5	6	7	SO
6.	My friends really try to help me.	1	2	3	4	5	6	7	Fri
7.	I can count on my friends when things go wrong.	1	2	3	4	5	6	7	Fri
8.	I can talk about my problems with my family.	1	2	3	4	5	6	7	Fam
9.	I have friends with whom I can share my joys and sorrows.	1	2	3	4	5	6	7	Fri
10.	There is a special person in my life who cares about my feelings.	1	2	3	4	5	6	7	SO
11.	My family is willing to help me make decisions.	1	2	3	4	5	6	7	Fam
12.	I can talk about my problems with my friends.	1	2	3	4	5	6	7	Fri

APPENDIX N:

PERCEIVED STRESS SCALE

PERCEIVED STRESS SCALE

The questions in this scale ask you about your feelings and thoughts during the last month. In each case, you will be asked to indicate by circling *how often* you felt or thought a certain way.

Name _____ Date _____

Age _____ Gender (Circle): **M** **F** Other _____

0 = Never 1 = Almost Never 2 = Sometimes 3 = Fairly Often 4 = Very Often

1. In the last month, how often have you been upset because of something that happened unexpectedly?	0	1	2	3	4
2. In the last month, how often have you felt that you were unable to control the important things in your life?	0	1	2	3	4
3. In the last month, how often have you felt nervous and "stressed"?	0	1	2	3	4
4. In the last month, how often have you felt confident about your ability to handle your personal problems?	0	1	2	3	4
5. In the last month, how often have you felt that things were going your way?	0	1	2	3	4
6. In the last month, how often have you found that you could not cope with all the things that you had to do?	0	1	2	3	4
7. In the last month, how often have you been able to control irritations in your life?	0	1	2	3	4
8. In the last month, how often have you felt that you were on top of things?	0	1	2	3	4
9. In the last month, how often have you been angered because of things that were outside of your control?	0	1	2	3	4
10. In the last month, how often have you felt difficulties were piling up so high that you could not overcome them?	0	1	2	3	4

APPENDIX O:

RAND 36-ITEM HEALTH SURVEY

RAND 36-Item Health Survey 1.0 Questionnaire Items

1. In general, would you say your health is:	
Excellent	1
Very good	2
Good	3
Fair	4
Poor	5

2. Compared to one year ago , how would your rate your health in general now ?	
Much better now than one year ago	1
Somewhat better now than one year ago	2
About the same	3
Somewhat worse now than one year ago	4
Much worse now than one year ago	5

The following items are about activities you might do during a typical day. Does **your health now limit you** in these activities? If so, how much?

(Circle One Number on Each Line)

	Yes, Limited a Lot	Yes, Limited a Little	No, Not limited at All
3. Vigorous activities , such as running, lifting heavy objects, participating in strenuous sports	[1]	[2]	[3]
4. Moderate activities , such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	[1]	[2]	[3]
5. Lifting or carrying groceries	[1]	[2]	[3]
6. Climbing several flights of stairs	[1]	[2]	[3]
7. Climbing one flight of stairs	[1]	[2]	[3]
8. Bending, kneeling, or stooping	[1]	[2]	[3]
9. Walking more than a mile	[1]	[2]	[3]
10. Walking several blocks	[1]	[2]	[3]
11. Walking one block	[1]	[2]	[3]
12. Bathing or dressing myself	[1]	[2]	[3]

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of your physical health**?

(Circle One Number on Each Line)

	Yes	No
13. Cut down the amount of time you spent on work or other activities	1	2
14. Accomplished less than you would like	1	2
15. Were limited in the kind of work or other activities	1	2
16. Had difficulty performing the work or other activities (for example, it took extra effort)	1	2

During the **past 4 weeks**, have you had any of the following problems with your work or other regular daily activities **as a result of any emotional problems** (such as feeling depressed or anxious)?

(Circle One Number on Each Line)

	Yes	No
17. Cut down the amount of time you spent on work or other activities	1	2
18. Accomplished less than you would like	1	2
19. Didn't do work or other activities as carefully as usual	1	2

20. During the **past 4 weeks**, to what extent has your physical health or emotional problems interfered with your normal social activities with family, friends, neighbours, or groups?

(Circle One Number)

Not at all 1

Slightly 2

Moderately 3

Quite a bit 4

Extremely 5

21. How much **bodily** pain have you had during the **past 4 weeks**?

(Circle One Number)

None 1

Very mild 2

Mild 3

Moderate 4

Severe 5

Very severe 6

22. During the **past 4 weeks**, how much did **pain** interfere with your normal work (including both work outside the home and housework)?

(Circle One Number)

Not at all 1

A little bit 2

Moderately 3

Quite a bit 4

Extremely 5

These questions are about how you feel and how things have been with you **during the past 4 weeks**. For each question, please give the one answer that comes closest to the way you have been feeling. How much of the time during the past 4 weeks . . .

(Circle One Number on Each Line)

	All of the Time	Most of the Time	A Good Bit of the Time	Some of the Time	A Little of the Time	None of the Time
23. Did you feel full of pep?	1	2	3	4	5	6
24. Have you been a very nervous person?	1	2	3	4	5	6
25. Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
26. Have you felt calm and peaceful?	1	2	3	4	5	6
27. Did you have a lot of energy?	1	2	3	4	5	6
28. Have you felt downhearted and blue?	1	2	3	4	5	6
29. Did you feel worn out?	1	2	3	4	5	6
30. Have you been a happy person?	1	2	3	4	5	6
31. Did you feel tired?	1	2	3	4	5	6

32. During the **past 4 weeks**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting with friends, relatives, etc.)?

(Circle One Number)

All of the time 1

Most of the time 2

Some of the time 3

A little of the time 4

None of the time 5

How **TRUE** or **FALSE** is each of the following statements for you.

(Circle One Number on Each Line)

	Definitely True	Mostly True	Don't Know	Mostly False	Definitely False
33. I seem to get sick a little easier than other people	1	2	3	4	5
34. I am as healthy as anybody I know	1	2	3	4	5
35. I expect my health to get worse	1	2	3	4	5
36. My health is excellent	1	2	3	4	5

APPENDIX P:

SHEEHAN DISABILITY SCALE

Please answer the following 3 items as they relate to any health or medical symptoms you may have experienced in the last week.

Sheehan Disability Scale

A brief, patient rated, measure of disability and impairment.

Please mark ONE circle for each scale.

WORK* / SCHOOL										
The symptoms have disrupted your work / school work:										
Not at all	Mildly			Moderately			Markedly			Extremely
0	1	2	3	4	5	6	7	8	9	10
<input type="checkbox"/> I have not worked / studied at all during the past week for reasons unrelated to the disorder. * Work includes paid, unpaid volunteer work or training										

SOCIAL LIFE										
The symptoms have disrupted your social life / leisure activities:										
Not at all	Mildly			Moderately			Markedly			Extremely
0	1	2	3	4	5	6	7	8	9	10

FAMILY LIFE / HOME RESPONSIBILITIES										
The symptoms have disrupted your family life / home responsibilities:										
Not at all	Mildly			Moderately			Markedly			Extremely
0	1	2	3	4	5	6	7	8	9	10

Days Lost

On how many days in the last week did your symptoms cause you to miss school or work or leave you unable to carry out your normal daily responsibilities? _____

Days Unproductive

On how many days in the last week did you feel so impaired by your symptoms, that even though you went to school or work, your productivity was reduced? _____