2015

Mental Health, Health Behaviors, Social Support, Self-Efficacy and Disease: An Integrative Model

N. Simay Gokbayrak
University of Rhode Island, simaygokbayrak@gmail.com

MENTAL HEALTH, HEALTH BEHAVIORS, SOCIAL SUPPORT, SELF-

EFFICACY AND DISEASE: AN INTEGRATIVE MODEL

BY

N. SIMAY GOKBAYRAK

A DISSERTATION SUBMITTED IN PARTIAL FULFILLMENT OF THE

REQUIREMENTS FOR THE DEGREE OF

DOCTOR OF PHILOSOPHY

IN

PSYCHOLOGY

UNIVERSITY OF RHODE ISLAND

2015

DOCTOR OF PHILOSOPHY DISSERTATION

OF

N. SIMAY GOKBAYRAK

APPROVED:

Dissertation Committee

Major Professor   James O. Prochaska

Andrea L. Paiva

Bryan J. Blissmer

Nasser H. Zawia

UNIVERSITY OF RHODE ISLAND

2015

Abstract

The utility of modifiable health behaviors for better physical health outcomes is well-established. Because mental illness is a serious public health concern worldwide, an important question pertains to whether health behaviors likewise have benefits for mental health. Although simple research methods indicate positive relations, no investigations have tested models with mediating factors to discern specific pathways between health behaviors and mental health. As such, this study aimed to do so using path analysis to examine the impact of three key health behaviors (i.e., smoking cessation, exercise, and healthy eating) on mental health. In addition, the potential roles of perceived social support, general self-efficacy and physical health within the health behaviors and mental health relationship were investigated. A population-based sample of 427 adults completed survey measures. One important finding was the mediating effect of physical health between exercise/ healthy eating, and mental health functioning. Implications are further discussed. Group comparisons indicated that : 1) Smoking doesn't appear significantly related to self-efficacy, perceived social support and mental health functioning, 2) engaging in exercise and healthy eating for at least six months is strongly linked to better general self-efficacy and mental health, 3) those who are contemplating engaging in exercise and/or healthy eating in the next six months appear to be particularly different than maintainers in terms of their mental health status, 4) perceived social support is significantly related to physical and mental health functioning, and 5) general self-efficacy is significantly linked to mental health functioning.

Acknowledgements

I would like to take this opportunity to acknowledge my major professor, Dr. James Prochaska for all of his time, feedback, and patience over the past several years. I am also grateful to my core committee members. Dr. Andrea Paiva, whose feedback and guidance particularly on study design and data interpretation, care for my research questions, and continuous support have helped me tremendously through this process. Dr. Bryan Blissmer, for sharing his experienced ideas and evaluations to improve this project. Further, Si Yang and Hui-Qing Yin have provided complementary perspectives on this research project and statistical insight that have been invaluable in the execution of this project. Lastly, I would like to thank my family and friends for supporting my academic and professional goals throughout the past decade.

TABLE OF CONTENTS

LIST OF TABLES

LIST OF FIGURES

CHAPTER 1

DEFINITION AND SIGNIFICANCE OF THE PROBLEM

The positive impact of modifiable health behaviors such as smoking cessation, exercise and healthy eating on physical health has been well-established. When these key behaviors are enacted or present, the risk for chronic diseases, those that account for the majority of morbidity and mortality of the adult U.S. population, is significantly reduced or prevented (e.g. Centers for Disease Control and Prevention, 2013; Fryar, & Chen, 2012; US Department of Health and Human Service, 2014).

Similarly, social support and self-efficacy have also been linked to better overall physical health and the reduction in the prevalence of diseases associated with health behaviors. In a similar vein, a review article (Walsh, 2011) details the significant, yet, underestimated relationship between modifiable health behaviors, termed "lifestyle factors," and mental health. Yet, the specific direction of relationships between the latter health behaviors, social support and self-efficacy and their impact on mental health functioning is less understood.

Given this limited understanding, the present study aimed to investigate the relative role of three key health behaviors (smoking cessation, exercise and healthy eating), perceived social support, general self-efficacy and physical health functioning have in relation to mental health functioning in a cross-sectional population-based sample of U.S. adults. Furthermore, as health behaviors are pro-social, cost-effective, free of stigma and side-effects, and known to improve overall well-being, study findings have the potential to reinforce the burgeoning understanding of the

importance of health behavior change for mental health within the new approach to integrated health care systems.

In addition, this integrative study is timely in light of primary and behavioral health care integration under the Affordable Healthcare Act (2010), the goals of the American Psychological Association's *Blueprint for Change: Achieving Integrated Health Care for an Aging Population* (2008), and the National Institutes of Health's call for studies (2013; RFA-MH-14-060) looking at ways to improve the health and well-being of those with severe mental illness. As such, there is a clear systemic shift towards the further exploration of the role of health behaviors in primary and secondary interventions and the management of mental illness.

CHAPTER 2

REVIEW OF LITERATURE

Prevalence of Mental Illness.

It is estimated that approximately 25% of the adult U.S. population currently

suffers from a diagnosable mental illness (MI) and that approximately 50% of the

population will have a diagnosable MI in their lifetime (Kessler, Chiu, Demler, &

Walters, 2005). Furthermore, approximately 45% of those with any MI meet criteria

for two or more MI's, with severity correlated with comorbidity (Kessler et al., 2005).

MI's are the leading causes of disability worldwide (WHO, 2004) and cost the U.S. an

estimated $300 billion annually (Mark Levit, Buck, Coffey, Vandivort-Warren, 2007).

The rate of those who are affected by mental illness that qualify for Supplemental

Security Income (SSI) or Social Security Disability Insurance (SSDI) increased

approximately 2.5 times during 1987-2007—from 1 in 184 Americans to 1 in 76

(Angell, 2011). Collectively, MI's pose national and worldwide public health concern.

Physical Health and Mental Health.

Individuals with a MI are more likely to lead an unhealthy life compared to the

general population (Parks, Svendsen, & Singer, Foti et al., 2006) and have increased

rates of comorbid chronic physical illness such as cardiovascular disease, obesity,

diabetes and cancer (Walsh, 2011; Harris & Barraclough, 1998).

Wells and colleagues (1988) in the Epidemiologic Catchment Area Study

found that people suffering from one of eight chronic medical disorders (e.g. cancer,

cardiovascular disease) had a 42% increase in the risk of ever having a psychiatric disorder compared with people without a medical disorder. In the 2003 National Comorbidity Survey Replication study sponsored by the National Institutes of Health, more than 68% of adults with a mental disorder had at least one medical condition, and 29% of those with a medical disorder had a comorbid mental health condition (Alegria, Jackson, Kessler, & Takeuchi, 2003).

Comorbidity is also indicated by the fact that cardiovascular disease is one of the leading causes of mortality in people with schizophrenia (Casey & Hansen, 2003). Similarly, individuals with depression and anxiety are more likely to develop cardiovascular disease (Suls & Bunde, 2005). Depression has also been shown to increase the risk of mortality in people with diabetes by 30% (World Federation for Mental Health (WFMH), 2010). Conversely, individuals with a physical illness are at increased risk for clinically significant mental illnesses (De Hert, Correll, Bobes, Cetkovich-Bakmas, Cohen, Asai, et al., 2011). For instance, individuals with current or chronic depression are 60% more likely to be obese than those with no history of depression (WFMH, 2010). In sum, the staggering comorbidity rates between mental and physical illness range from mild to severe.

Smoking Cessation and Mental Health.

There is evidence to suggest that being a non-smoker is positively linked to better mental health. Close to 40% of adults with a MI are cigarette smokers compared with only 21% of adults who do not have a MI (CDC, 2013). In other words, those with a MI are about 70% more likely to smoke compared to adults with no MI (CDC, 2013). In a meta-analysis (Taylor, McNeill, Girling, Farley, Lindson-Hawley et al.,

2014) of 26 longitudinal studies evaluating adult mental health functioning prior to smoking cessation and at least six weeks after cessation (or baseline in healthy and clinical populations), found that anxiety, depression, mixed anxiety and depression, and stress significantly decreased between baseline and follow-up in quitters compared with continuing smokers. In addition, both psychological quality of life and positive affect significantly increased between baseline and follow-up in quitters compared with continuing smokers. There was no evidence of differing effect sizes between the general population and populations with physical or psychiatric disorders. Most importantly, the authors found that the effect sizes were equal or larger than those of antidepressant treatment for mood and anxiety disorders.

Some studies suggest that due to nicotine withdrawal, quitting smoking immediately results in a short-term increase in psychiatric symptoms (e.g. symptoms of depression), after which long-term improvement occurs in mental health functioning (Martini, Wagner, & Anthony, 2002). Longer term, and as with the case of depression, findings indicate that smoking cessation has an increased effect on reducing risk for anxiety related problems. In their study of 4,414 adults, Breslau and colleagues (2004) found that the likelihood of panic disorder and agoraphobia was significantly reduced as time since quitting smoking increased.

In contrast, smokers with MI often report smoking is a means of self-medication for psychiatric symptoms. In the 1981 Segmentation Study, participating smokers reported that they smoked for "mood enhancement" and "positive stimulation." Additional evidence indicated marketing efforts to target "psychologically vulnerable" individuals who reported that smoking "helps perk you

up" and "helps you think out problems" (Schellinck & Fenwick, 1981). The authors also identified the act of smoking as helping people "gain self-control," "calm-down," and "cope with stress." One interpretation of the latter is that the positive appraisal of smoking can potentially enhance the way one feels and improve mood for a short-term. However, to date, long term mood enhancement has not been established.

Exercise and Mental Health.

The high incidence of obesity and other morbid conditions is strongly related to physical inactivity among those with a MI. Exercise has been found to reduce risk of depression, anxiety, eating, addictive, and body dysmorphic disorders, in addition to, reducing the severity of several symptoms of schizophrenia (Hamer & Chida, 2009; Colcombe & Kramer, 2003; Daley, 2002; Deslandes, Moraes, Ferreira, Veiga, Sileria, Mata et al., 2009; Stathopoulous, Powers, Berry, Smits, & Otto, 2006), improve mental health conditions, particularly anxiety and depression, and enhance general well-being (Schmitz, Kruse, & Kugher, 2004).

Walsh's (2011) review indicated that the most studied disorder in relation to exercise is mild to moderate depression. Overall, studies suggest that aerobic and non-aerobic exercise is an effective concomitant treatment to pharmacotherapy and psychotherapy as a preventive and/or therapeutic measure (Sidhu, Vandora, & Balon, 2009; Dowd, Vickers, & Krahn, 2004). Potential psychological mediating factors that contribute to these antidepressant effects have been found to include enhanced self-efficacy and self-esteem, and the interruption of negative thoughts (Dowd et al., 2004).

The DOSE study (Dunn, Trivedi, Kampert, Clark, Chambliss, 2002; Dunn, Chambliss, 2005) found that exercising 30 minutes five or more days a week was the minimum needed to reduce depression. A review (Lawlor & Hopker, 2001) of 14 randomized controlled trials looking at the effectiveness of exercise in the management of depression found antidepressant effects comparable to that of cognitive therapy. A study of 16,483 university undergraduates found that exercise correlated with lower levels of depression (Steptoe, Wardle, Filler, Holte, Justo, Sanderman, 1997).

Similarly, aerobic exercise has been found to have anxiolytic, in other words, calming effects (Salmon, 2000). In a general population sample of 55,000, a self-reported correlation between recreational exercise and better mental health was demonstrated, including fewer symptoms of depression and anxiety (Stephens, 1988). Aerobic activity was shown to specifically reduce depression in two well-controlled studies of 10–11 weeks of walking and running in two populations selected for exposure to stress or high anxiety (Steptoe et al., 1989; Roth & Holmes., 1987, as cited in Salmon, 2001). Aerobic exercise compared to strength and flexibility training reduced anxious mood in subjects with high anxiety up to three months (Steptoe et al., 1989).

Healthy Eating and Mental Health.

Nutrients. There is evidence of the importance of nutrition for mental health, and the most prominent review of over 160 studies suggests that mental health is linked to diet (Go´mez-Pinilla, 2008). Specifically, individuals who consume a diet akin to the "Mediterranean diet" consisting of fruits, vegetables, nuts, whole grains,

fish, and unsaturated fat are approximately 30% less likely to develop depression than those who typically consume a diet that consists of processed food and saturated fats (Sánchez-Villegas, Delgado-Rodríguez, Alonso, Schlatter et al., 2009). Such a diet has been shown to improve cognitive functions and academic performance in children and alleviate affective and schizophrenia spectrum illnesses in adults (Walsh, 2011).

Some researchers strongly encourage the use of food supplements such as particular vitamins, folic acid, and fish oil for improving mental health (Sarris, Schoendorfer, & Kavanagh, 2009). While there are a number of studies advocating for the link between specific nutrients and diet and mental health function, findings remain limited and mixed with regard to nutritional supplementation as a specific treatment for depression (Jacka, Mykletun, & Berk, 2012). Aside from the utility of omega 3fatty acids in severe depression (Appleton, Rogers, & Ness, 2010) and folate as a concomitant treatment (Taylor, Carney, Goodwin, & Geddes, 2004), there is little robust evidence for such effectiveness (Jorm, Christensen, Griffiths, Rodgers, 2002).

Given the complex combinations and interactions among nutrients in an individual's daily diet, the analysis of the impact of a single food or nutrient on health outcomes has its limitations. Therefore, dietary patterns have gained considerable attention. Indeed, people do not consume nutrients or single foods but combinations of foods (Munoz, Fito, Marrugat, Covas et al., 2009). Furthermore, dietary components may interact, making the search for associations between single dietary factors and health outcome more difficult (Munoz et al., 2009). Diet is a multifaceted phenomenon and, hence, attempting to link specific single nutrients or food groups to disease prevalence and symptoms will continue to pose challenges (Quirk, Williams,

O'Neill, Pasco et al., 2013). Furthermore, dietary patterns may confound specific diet and illness relationships (Quirk et al., 2013).

One systematic review (Quirk et al., 2013) evaluated the association between overall diet quality and depression in adults across 25 studies from nine countries. Findings indicated limited evidence to support an association between traditional diets (i.e., Mediterranean - further discussed in a separate section below - or Norwegian diets) and depression. There was also mixed evidence for associations between a traditional Japanese diet and depression, a "healthy" diet and depression, a Western diet and depression, and individuals with depression and the likelihood of eating a less healthy diet (Quirk et al., 2013). A significant amount of variability was observed in relation to the measurement of diet quality and patterns, definitions of a "healthy diet," depression assessment and study samples (Quirk et al., 2013). The majority of studies included in the latter review were cross-sectional precluding any interpretations of directionality of associations. The authors commented that any potential association between diet quality and patterns and mental illness are likely influenced by a large number of confounding variables including demographic (e.g. socioeconomic), behavioral, genetic, environmental and sociocultural characteristics (Quirk et al., 2013). The analyses undertaken in each of the studies included in the review typically controlled for age and gender (Quirk et al., 2013). The association between diet and mental health is likely bi-directional, with depressed individuals to be more likely to eat unhealthy (Kilian, Becker, Kruger, Schmid et al., 2006).

The Mediterranean Diet (MD) and Social Support.

MD is characterized by high consumption of green foods, modest consumption of alcohol and low consumption of meat (Munoz, Fito, Marrugat, Covas et al., 2009). The reported health effects of MD have substantial biochemical underpinnings (Serra-Majem, Roman, & Estruch, 2006). In addition, this particular diet is embedded in a social context that has suggested increasing personal well-being (Munoz et al., 2009). One assumption is that that consuming a Mediterranean diet may reflect the living of the "Mediterranean lifestyle" and practicing the corresponding behaviors, including eating at home, spending time cooking, sharing lunchtime with other people and going to the market to buy foods (Munoz et al., 2009). Eating within the context of social gatherings may improve self-perceived quality of life (Munoz et al., 2009). Social and family support can promote health by providing persons with positive experiences, pro-social behaviors and roles and better ways of coping with stressors (Seeman, 2000).

Perceived social support from family members and significant others has received increasing attention as a factor contributing to health outcomes (Korkiakangas, Taanila, & Keinänen-Kiukaanniemi, 2011). A report from the Centers for Disease Control and Prevention (2008) suggested an association between perceived social support and health-related quality in older individuals. In addition, perceived social support has been the target of lifestyle modification interventions for persons with a variety of medical conditions, including obesity, cardiovascular disease, and type 2 diabetes (Kumanyika & Economos, 2011; Van Dyck et al., 2011). Perceived health has been shown to be a predictor of mortality at long term (Wannamethee & Shaper, 1991). There is growing evidence supporting the

effectiveness of social support approaches enhancing diet and increasing physical activity compared to interventions that focus solely on an individual (Gorin, Phelan, Tate, Sherwood, Jeffery, & Wing, 2005). A positive environment may contribute to having a better self-perceived health-related quality of life related to diet (Munoz et al., 2009).

Social support has been shown to be an important predictor of having fruit at the home (Baranowski, Watson, Missaghian, Broadfoot et al., 2008). Support from friends, family, and co-workers helped participants exercise more and eat less fat in an organizational health promotion program (Zimmerman & Conor, 1989). In a meta-analytic review across 148 prospective studies (308,849 participants followed for an average 7.5 years), the random effects weighted average effect size was OR = 1.50 (95%CI) of survival for participants with stronger social relationships (Holt-Lunstad, Smith, & Layton, 2010) suggesting a comparable effect to prominent risk factors of morbidity and mortality such as physical inactivity and obesity (Holt-Lunstad et al., 2010).

In this realm, one cross-sectional study (N=158) specifically looked at overweight participants with severe mental illness and characteristics of social support around healthy eating and exercise (Aschbrenner, Mueser, Bartels, & Pratt, 2013). Regular social contact was defined as at least twice monthly face-to-face contact with either family members or friends (Aschbrenner et al., 2013). Findings indicated a correlation between increased frequency of family contact and unhealthy family eating environments (e.g. buying or eating unhealthy foods in front of the participants), as well as increased friend contact and unhealthy eating environments (Aschbrenner et

al., 2013). Females compared to males were more likely to be exposed to unhealthy environments (Aschbrenner et al., 2013). Yet, females compared to males were more likely to receive encouragement for healthy eating behaviors from friends ($t(93) = -2.44$, $p < .05$ (Aschbrenner et al., 2013). Of note, participants who reported greater readiness to change their typical portion size were significantly more likely to receive encouragement from friends for healthy eating behaviors ($r(92) = .291$, $p < .01$) (Aschbrenner et al., 2013). And, higher level of symptoms was a significant predictor of more unhealthy family eating environments ($r(77) = .35$, $p < .001$) (Aschbrenner et al., 2013). This latter finding adds to the understanding of the complex bi-directional relationship between diet and mental health (Aschbrenner et al., 2013). One plausible assumption is that overweight and obese individuals attempting to make a lifestyle change may feel discouraged by unhealthy eating behaviors of family members and, thus, experience anxiety, frustration, and a sense of hopelessness in their efforts to change their own behaviors (Aschbrenner et al., 2013). Another assumption is that those with depression are potentially more likely to perceive the unhealthy behaviors of others as intentionally discouraging which could create a barrier to healthy eating (Aschbrenner et al., 2013).

In a 10-year longitudinal population-based study conducted in the U.S., data were obtained from 2,379 girls assessed annually from ages 9-19 (Franko, Thompson, Affenito, Barton, & Striegel-Moore, 2008). The mediational analysis sought to evaluate whether the frequency of family meals in childhood was related to health outcomes by examining the mediating links of family cohesion and coping skills, after adjusting for baseline demographics and previous levels of the outcome variables

(Franko et al., 2008). More frequent family meals in the first 3 years predicted greater family cohesion and coping in years 7 and 8 in to the study (Franko et al., 2008). Family cohesion mediated family meals and risk of smoking in Year 10 (Franko et al., 2008). Coping mediated family meals and stress in Year 10 (Franko et al., 2008). The authors concluded that eating together as a family during childhood may have benefits in adulthood (Franko et al., 2008).

Across most sub-areas of the healthy eating/diet research, it appears that eating behavior is often used as the dependent variable, typically conceptualized as food choice, selection, or preference or as food intake, and rarely as the independent variable. A diverse list of factors have been shown to predict food choice including, but not limited to, mood, parental influence, socioeconomic status, perceived stress, self-efficacy, mental illness, and social relationships. Making healthy food choices can make a person feel good about their choices, motivation, and dedication to eating healthy. Such eating habits can help an individual move toward a desirable goal that is likely consistent with his/her cultural values and may include preparing a meal for one's family, losing weight, increasing one's energy level or increased awareness of efforts aimed at improving one's physical health. The perception of committing to a behavior that is in line with what is considered as healthy, appropriate, or acceptable in one's own community, culture, or society also may have the ability to enhance self-confidence, self-esteem, and overall mental health.

Since this is an emerging area of research, to date, most studies evaluating the direct relationship between diet and mental health have been via biochemical based studies, or studies looking at social support and self-efficacy only in relation to healthy

eating/diet. Importantly, to our knowledge, the components of mental health have yet to be included as an outcome measure.

Social Support and Mental Health.

A concept that has been found to be linked to health just as strongly as health risk behaviors such as smoking and sedentary life is perceived social support (Cacioppo, Hawkley, Norman, & Berntson, 2011; Fratiglioni et al., 2004). Social support has been extensively studied, and the subject of medical and behavioral research for approximately 40 years, with the general conclusion that social support has therapeutic value in mental and physical health (Hogan, Linden, & Najarian, 2002; Uchino, 2009; Wallston et al., 1983) and is a key buffer to the effects of psychosocial stressors. Specifically, social support may influence health outcomes by encouraging individual behavior modification (Cohen, 1988) or adherence to medical recommendations (Wallston et al., 1983).

Social support has been specifically linked to depression and anxiety, recovery from chronic illnesses, greater life satisfaction, enhanced ability to cope with life stressors, and with an overall ability to perform instrumental activities of daily living (Cohen & Wils, 1985; Cohen, Underwood, & Gottlieb, 2000).

There are several pathways by which social relationships may affect health, one of which may be in the provision of social support (Golden, Conray, Bruce, Denihan, Greene, Kirby et al., 2009). Deficits in social support have been associated with a variety of adverse health outcomes, ranging from physical health to depression and self-harm (Dennis, Wakefield, Molloy, Andrews, & Friedman, 2005). Perceptions of support may reduce stress by altering one's evaluation of the stressors, by changing

one's coping patterns, by affecting perceptions of one's self-efficacy, or by altering problem-solving behaviors (Rogers, Anthony, Lyass, 2004). Indicators of perceived social support have been found to have the strongest links with indicators of reduced stress and psychological distress, as well as indicators of improved well-being (e.g., Gjesfjeld, Greeno, Kim, & Anderson, 2010). Although a positive relationship between social support and health have been demonstrated in the general population, less is known about the effect of perceived social support on mental health functioning.

Self-Efficacy and Mental Health.

Self-efficacy has been defined as the belief that one is capable of performing in a certain manner to attain a certain set of goals (Miller & Dollard, 1941). Health behavior and functioning is also influenced by the belief in one's own self-efficacy (Bandura, 1977). Perceived self-efficacy is related to subsequent behavior and, consequently, is relevant for clinical practice and behavior change (Schwarzer & Jerusalem, 1995). This core belief affects each of the basic stages of change, whether people even consider changing their health behaviors and how well they maintain the behavior changes they have achieved (Bandura, 2004). Self-efficacy has a valuable role in different aspects of life and health (Maddux , 2002; Dweck & Leggett, 1988) and a main role in individuals' thinking modes, their decision-making, the quality of their encounter with problems, and their depression and anxiety status (Kim, 2003). Researchers have shown that general self-efficacy is negatively related to depression and anxiety, as two main components of mental health, and positive self-efficacy beliefs have an effective role in the treatment of mental diseases.

CHAPTER 3

PURPOSE OF THE PRESENT STUDY

From infections to cancer, the most effective way of contributing to physical

health has been through prevention efforts rather than treatment (Jacka, Mykletun, &

Berk, 2012). In contrast, although mental health issues are regarded high on the public

health agenda in the U.S. and worldwide, the prevention of mental health issues has

received less consideration compared to direct treatment (Jacka et al., 2012). As such,

there is a need for emphasis on the development of preventive approaches to mental

health issues at a population level (Cuijpers, Beekman, & Reynolds, 2012).

An important challenge of developing prevention approaches and models to

mental health is the vast number of interacting factors contributing (Jacka et al., 2012).

While other potentially modifiable factors such as socioeconomic variables and

childhood maltreatment contribute to mental health issues, prevention efforts should

capitalize on variables of utmost modifiability (Jacka et al., 2012). One such universal

modifiable variable is "lifestyle," (Jacka et al., 2012; Walsh, 2010) which

encompasses health behaviors such as smoking cessation, exercise, and healthy eating.

As discussed, in the literature review, these health behaviors are shown to not only be

linked to chronic medical disease but also mental health issues.

In summary, growing evidence indicates that exercise has been shown to be

effective in treatment studies (Stathopoulous, Powers, Berry, Smits, & Otto, 2006).

There is some evidence for smoking also independently increasing the risk for

common mental health issues (e.g. Breslau, Novak, & Kessler, 2004; Mykletun, Overland, Aaro, Liabo, & Stweart, 2008; Pasco, Williams, Jacka, Ng, Henry, Nicholson, et al., 2008). Diet/healthy eating is the most recent area of interest in the lifestyle-mental health research field (Jacka et al., 2012). Diet-mental health related research has focused on nutritional supplementation to treat depression resulting in inconsistent and limited findings (Jacka et al., 2012).

Taking in to consideration these findings, there appears to be a dearth of research in the areas of delineating the specific pathways between health behaviors and mental health. As such, it is important to start moving away from looking at simple associations between such variables to utilizing more sophisticated multivariate tools and modeling.

Specifically, structural modeling and mediational analysis can help determine the relative role of each variable in a proposed relationship between variables (Lockwood, DeFrancesco, Elliot, Beresford, & Toobert, 2010). For example, in a review of 40 studies (Lockwood, et al., 2010), the authors presented all the observational studies and randomized intervention trials published in nutritional research utilizing mediational analysis. Of those, none of the studies looked at healthy eating/diet or proxy measures of healthy eating/diet as the independent variable or any mental health variable as the dependent variable.

Similarly, a different study on the applicability of a mediational model to study how physical activity influences mental health (Cerin, 2010) pointed to the shortage of such analyses in the exercise arena as well. Moreover, the author stated that even though there have been several biophysical and psychosocial factors identified as

potential mechanisms responsible for the association between physical activity and favorable mental health outcomes, by and large it is still fundamentally unknown how physical activity predicts positive mental health outcomes (Cerin, 2010). This is a startling fact given that physical activity is one of the most studied behaviors in health research, and further reflects the limitations within the diet and smoking cessation research fields.

In sum, although, the reviewed modifiable variables (i.e. health behaviors, perceived social support, self-efficacy, and physical health) have been looked at separately in relation to mental health, to our knowledge, they have not been looked at simultaneously in relation to mental health within a model testing approach. Based on this gap in the literature, the present cross-sectional study utilizes path analysis to examine the role of smoking cessation, exercise, healthy eating, perceived social support, self-efficacy, and physical health in relation to adult mental health functioning among a diverse, population-based adult sample.

CHAPTER 4

METHODOLOGY

Procedure.

The Institutional Review Board at the University of Rhode Island approved the study in May of 2014 prior to data collection.

To recruit participants representative of the general population, Survey Monkey (SM), an online company, recruited the original pool of participants (N=400) to complete the survey used for this study in a time-efficient manner. An additional 27 participants were also recruited by SM, at no additional cost, for oversampling purposes. SM has a large database of subjects willing to participate in survey research anonymously for pay. The company provided a cost of $7.00 per individual, aged 18-65 (with equal gender sampling), who completed the entire survey. Funding source for the study was provided by student researcher loans. On-line data collection took place for approximately 24 hours in July 2014.

The online procedure provided anonymity as well as an online informed consent. Contact information for the researchers was also provided for any questions or concerns participants may have about the study. Participants were allowed to withdraw from participation at any time. All procedures were IRB approved. The study necessitated few additional resources. IBM SPSS Statistics, Version 22, and EQS, Version 6.0 were utilized for analyses.

Measures.

Demographic Characteristics. Age, gender, race, sexual orientation, marital status, education level, and health insurance status were all assessed via single item measures (see Appendix).

Clinical Characteristics. Past and current diagnosis of mental illness, and current psychotropic medication type and use were assessed**.** Chronic physical illness was evaluated by asking participants if they currently suffer from the following: Cancer, cerebrovascular disease, cardiovascular disease, and type 1 or 2 diabetes. In addition, presence of obesity was assessed by self-reported height and weight, and corresponding Body Mass Index (BMI). Based on Centers of Disease Control and Prevention criteria, obesity is defined as a BMI of 30 or higher. (see Appendix)

Stage of Change.

The Transtheoretical Model of Behavior Change (TTM) is a comprehensive model which lays out a blueprint for intentional behavior change (Prochaska & DiClemente, 1983; Prochaska, DiClemente, & Norcross, 1992; Prochaska & Velicer, 1997). Stage of Change, one of the core constructs of the TTM, provides a useful approach to conceptualizing readiness to change any particular healthy behavior (Prochaska & Velicer, 1997). In the Precontemplation stage (PC), individuals are intending to take action to change a given behavior in the next six months. Their reluctance may be due to unawareness, misinformation, or resistance to change. In the next stage, Contemplation (C), individuals tend to be ambivalent about change but at the same time are intending to take action in their behavior in the next six months. In Preparation (PR), individuals have a clear intention of changing their behavior in the next 30 days and may have even started taking steps towards behavior change. In the

action stage (A), individuals are in the process of changing their behavior for at least 24 hours but have done so for less than six months. In the Maintenance (M) stage, individuals work on maintaining the acquired healthy behavior which they have managed for at least 6 months whilst also focusing on curtailing setbacks. In the Termination (T) stage (for smoking cessation), individuals have not smoked for at least 5 years.

Stages of Change for Smoking Cessation (**SMK,** Prochaska, Velicer, Fava, & Rossi, 2001).

Participants were categorized in one of the seven Stages of Change (Precontemplation, Contemplation, Preparation, Action, Maintenance, Termination, and Never Smoker) of the Transtheoretical Model of Behavior Change that was used to assess an individual's readiness to quit smoking (see Appendix). Smoking cessation was measured by assigning a numeric value to each of the stages of change (i.e. 1=Precontemplation, 2=Contemplation, 3=Preparation, 4=Action, and 5=Maintenance, 6=Termination, 7=Never Smoker) (see Appendix).

Stages of Change for Exercise (**EX**, CITE, Johnson, Paiva, Cummins, Robbins, Johnson, Dyment, Wright et al. 2008)**.** Participants were categorized in one of the five stages of change (Precontemplation, Contemplation, Preparation, Action, and Maintenance) of the Transtheoretical Model of Behavior Change that was used to assess an individual's readiness to initiate or adopt regular exercise based on guidelines established by the Centers for Disease Control and Prevention (see Appendix). Regular exercise was measured by assigning a numeric

value to each of the stages of change (i.e. 1=Precontemplation, 2=Contemplation, 3=Preparation, 4=Action, and 5=Maintenance) (see Appendix).

Stage of Change for Healthy Eating assessed by Calorie and Fat Intake (**CALFAT,** Johnson et al., 2008)**.** Participants were categorized in one of the five stages of change of the Transtheoretical Model of Behavior Change that was used to assess an individual's readiness to eat the number of calories that allows an individual to reach and maintain a healthy weight and eating a diet low in saturated and trans fats. Healthy eating was measured by assigning a numeric value to each of the stages of change (i.e. 1=Precontemplation, 2=Contemplation, 3=Preparation, 4=Action, and 5=Maintenance) (see Appendix).

The General Self-Efficacy Scale (**GSE**, Schwarzer & Jerusalem, 1995). This is a 10-item one-dimensional assessment tool assessing general sense of perceived self-efficacy with the aim in mind to predict coping with daily hassles, as well as adaptation after experiencing all kinds of stressful life events. Participants rated statements with response options ranging from 1 = *Not at all True* to 4 = *Exactly True*. GSE was calculated by averaging the items. Higher scores indicated a higher level of general self-efficacy. In samples from 23 nations, Cronbach's alphas ranged from .76 to .90, with the majority in the high .80s. The Cronbach's alpha for this sample was .92, indicating a high level of internal consistency (see Appendix).

The Multidimensional Scale of Perceived Social Support (**PSS**, Zimet, Dahlem, Zimet, & Farley, 1988). This measure is widely-used across a range of cultures, clinical populations and age with a fourth grade reading-level. It consists of 12 items and three subscales: Support from Family (α=.87), Support from Friends

(α=.85) and Support from Significant Others (α=.91). Cronbach's alpha for the total scale was .88. High levels of perceived social support were associated with low levels of depression and anxiety symptomatology (Zimet et al., 1988). The Cronbach's alpha for this sample was .95, indicating a high level of internal consistency. For the purpose of this study, only the total score of the measure was utilized in the analyses (see Appendix).

The Medical Outcome Study Short Form (McHorney, Ware, & Raczek, 1993). The SF-36 is a self-report questionnaire that is a reliable and valid measure of physical and mental health-related functioning. It measures health on eight multi-item dimensions, covering functional status, wellbeing and overall evaluation of health (Brazier et al., 1992). For each dimension, item scores are coded, summed, and transformed on a scale from 0 (worst health) to 100 (best health). The SF-36 is a generic measure, one that does not target a specific age group or disease, but instead, can be used with diverse populations. It was designed for use in surveys of general and specific populations, health policy evaluations, clinical practice and/or research.

The SF-36 has been widely used in clinical studies and has demonstrated adequate psychometric integrity (McHorney, Ware, & Raczek, 1993; Ware & Sherbourne, 1992). Factor analytic studies confirm that the eight scales assessing eight different health concepts make up two distinct factors: mental health and physical health, and that these factors account for 80-85% of the reliable variance in the eight scales in the U.S general population (Ware, Kosinski & Keller, 1994). The Mental Component Summary score (**MCS**) is made up of three scales: Mental Health (MH), Role-Emotional (RE), and Social Functioning (SF) and Physical Component Summary

score (**PCS**) is made up of three scales: Physical Functioning (PF), Role-Physical (RP), Bodily Pain (BP). The eight dimensions have a median reliability coefficient equal or greater than .80, except for SF which had a median reliability across studies of .76. For the PCS, relative validity coefficients range from .20 to .94 (median, .79) and from .93 to 1.45 (median, 1.02) for the MCS (Ware, Kosinski, Bayliss, McHorney, Rogers, & Raczek, 1995). As a result, the summary measures demonstrate adequate empiric validity (Ware et al., 1995). In addition, the SF-36 demonstrated high test-retest reliability (correlation = .60-.81) and high levels of internal consistency (Cronbach's a = .73 - .96). In the current study, the Cronbach alpha coefficient was .85, indicating a high level of internal consistency. Validation studies support the SF-36's convergent and discriminant validity when compared to similar measures (e.g., Nottingham questionnaire) (Braizer et al., 1992). For the current study, the MCS and PCS composite scores served as indicators of mental and physical health functioning, respectively. Scores on the composite scales range from 0 to 100 with lower scores indicating more impaired functioning (see Appendix).

Additional Measures Utilized for Exploratory Purposes.

  Stage of Change for Fruit and Vegetable Intake (**FV,** LaForge, Greene, & Prochaska, 1994; Cummins, Johnson, Mauriello, Paiva, & Dyment, 2006). Participants were categorized in one of the five stages of change (Precontemplation, Contemplation, Preparation, Action, and Maintenance) of the Transtheoretical Model of Behavior Change that assessed an individual's readiness to eat at least 4.5 cups of fruits and vegetables per day. Healthy fruit and vegetable intake was measured by

assigning a numeric value to each of the stages of change (i.e. 1=Precontemplation, 2=Contemplation, 3=Preparation, 4=Action, and 5=Maintenance) (see Appendix).

Stages of Change for Managing Emotional Distress (**EMOEAT,** Johnson, et al., 2008). This measure assessed an individual's readiness to not rely on eating to cope with emotional distress. Participants were categorized in one of the five stages of change (Precontemplation, Contemplation, Preparation, Action, and Maintenance) of the Transtheoretical Model of Behavior Change. Readiness was measured by assigning a numeric value to each of the stages of change (i.e. 1=Precontemplation, 2=Contemplation, 3=Preparation, 4=Action, 5=Maintenance, and 6=Never). The 12-item Distress Eating Scale (Johnson et al., 1999) listed signs of eating in response to emotional distress and assessed how often an individual experienced each item in the past 30 days. The Cronbach's alpha for this sample was .84, indicating a high level of internal consistency. Participants were also asked to complete four items assessing usual leisure-time exercise habits. Specifically, the Godin Leisure-Time Exercise Question (Godin & Shephard, 1997) measures the frequency of light-intensity, moderate-intensity, and vigorous-intensity leisure-time physical activity (see Appendix).

Facebook Utilization. Given that recent research has indicated a relationship between use of social networking sites and feelings of social support (Burke, Marlow, & Lento, 2010), this study included the following questions for exploratory purposes: 1) Do you currently have a *Facebook* account; 2) On average, how many hours a day do you spend on *Facebook*; 3) Do you use *Facebook* as a way to receive social

support?; and 4) In general, does your time on *Facebook* make you feel better, no different, or worse (see Appendix).

All five Stage of Change measures (for smoking cessation, exercise, calorie and fat intake, fruit and vegetable intake, and emotional eating) used for primary and exploratory analyses were available at no cost through Pro-Change Behavior Systems, Inc. The Multidimensional Scale of Perceived Social Support, and the General Self-Efficacy measures were available online to the public at no cost. Permission to use the Medical Outcome Study Short Form, SF-36 was granted by its publisher, QualityMetric, Inc., at no cost.

Data Analysis.

For **Hypotheses 1a-c and 2a**, a series of univariate MANOVAs with ANOVAs and follow-up Tukey post-hoc tests were conducted to assess the relationships between the three health behaviors (SMK, EX, CALFAT) and the four non-health behavior model variables including mental health functioning (MCS), physical health functioning (PCS), general self-efficacy (GSE) and perceived social support (PSS). For **Hypotheses 2b, 3a-d, 4a-b**, correlations were conducted to assess the relationships between the four non-health behavior variables (MCS, PCS, GSE, and PSS). For **Hypothesis 5**, three path analyses were conducted to determine the best model fit to the data. Path analysis, a type of structural equation modeling, uses a maximum likelihood estimation to determine if the proposed model will fit the data. Finally, it is important to note that three of the model variables (SMK, EX CALFAT) are categorical variables with five or more levels/groups. Bentler and Chou (1987) indicate that when the number of categories are large (i.e. four or more categories) as

is in the present study, treating categorical variables as continuous variables is appropriate as the chi-square statistic is less amenable to influence as the number of categories increases (Green, Akey, Fleming, Hershberger, & Marquis, 1997). As such, the aforementioned categorical variables (i.e SMK, EX, and CALFAT) will be treated as continuous variables for the purposes of the path analyses.

Structural equation modeling must satisfy four conditions: (1) specification (determining the causal paths between variables); (2) identification (determining whether there was adequate information to estimate the model); (3) estimation (testing the paths via structural equation modeling); and (4) model evaluation (see Kline, 2005).

Maximum likelihood (ML) estimation was used to estimate model parameters. Models were compared to one another in terms of their empirical fit with the data, using practical fit indices. Such indices consisted of the chi-square goodness-of-fit index (GFI), the comparative fit index (CFI; Bentler, 1990), the root mean square error of approximation (RMSEA; Steiger & Lind, 1998), R^2 values for estimating effect size, and standardized regression path coefficients for each model (Harlow, 2005). More specifically, the CFI is a normed fit index that adjusts for degrees of freedom. CFI greater than 0.90, and RMSEA of less than .10 are indicative of good fitting models (Bentler & Wu, 1995). Insignificant chi-squares are ideal, however, due to the large sample size, it is expected that the chi-squares may be significant for the main analyses. If the macro fit indices for the model were deemed adequate, then the micro-fit indices were examined. These included the number of significant paths, their

significance levels, and the strength of each relationship. For all analyses, a cut-off

value for significance was set at $p= 0.05$.

CHAPTER 5

RESULTS

Preliminary Findings.

    Demographics Characteristics.

As expected, the sample had demographic characteristics (race and sexual orientation) similar to that of the general U.S. population (U.S. Census Bureau, 2013). The largest group of participants (28.3%) fell in the 45-54 age range. A little more than half of the sample (54.1%) was married or in a domestic partnership/civil union. The majority of participants had health insurance (87.8%) and at least some college or equivalent education (i.e. vocational training) (76.5%). Participants participated from all four regions of the U.S. (Northeast – 24.4%, Midwest – 24.1%, South – 32.6% and West – 19.0%). See Table 1 for full demographic characteristics.

    Clinical Characteristics.

Forty-three percent of participants indicated ever having (past or current) been diagnosed with a mental illness. The most common diagnosed mental illness was depression (15.4%) followed by an "other" illness (4.9%) and anxiety (4.4%). Of the total sample, 37.5% indicated that, at some point in their life, they had been prescribed medication for a mental health condition. Of those who were ever diagnosed, 57.4% were prescribed an antidepressant, 16.4% antianxiety, 10.7% mood stabilizer/ anticonvulsant, 8.2% atypical antipsychotic, 6.6% stimulant, and 0.8% was prescribed typical antipsychotic medication. Of the total sample, 16.7% indicated currently

having a chronic medical illness including cancer, cerebrovascular disease, cardiovascular disease, and type I or II diabetes. A quarter of the total sample (25.5%) indicated currently undergoing medical treatment for an illness. Sixty-one percent of the total sample was overweight or obese. See Table 2 for full clinical characteristics.

Health Behaviors.

See Table 10 for correlations between health behaviors.

Smoking Cessation.

The stage of change distribution for the sample was as follows: Precontemplation 9.6%, Contemplation 8.2%, Preparation 4.4%, Action 4.9%, Maintenance 8.7%, Termination 11.7%, and Never Smoker 52.5%. Of the participants who endorsed current smoking (N = 95), approximately half (51.6%) indicated smoking 10-19 cigarettes, 27.4% less than 9, 12.6% 20-29 and 8.4% indicated smoking more than 30 cigarettes a day. See Table 3.

Exercise.

The stage of change distribution for the sample was as follows: Precontemplation 17.1%, Contemplation 14.3%, Preparation 12.4%, Action 21.3%, Maintenance 8.7%, and Termination 11.7%. The Godin Leisure-Time Exercise Questionnaire (GLTEQ: (Godin & Shepard, 1985) varied significantly by stage $F(1, 238) = 5.20$, $p = .02$. See Table 3.

Healthy Eating Measured by Stage of Change for Calorie and Fat Intake.

The stage of change distribution for the sample was as follows: Precontemplation 16.9%, Contemplation 17.8%, Preparation 18.5%, Action 14.8%, and Maintenance 32.1%. See Table 3.

Non-Health Behavior Continuous Model Variables.

Means, standard deviations and observed ranges for mental health functioning (MCS), physical health functioning (PCS), general self-efficacy (GSE) and perceived social support (PSS) are presented in Table 5.

Mean Comparisons between Health Behaviors (SMK, EX, HE) and Non-Health Behavior Model Variables (MCS, PCS, GSE, PSS).

Smoking Cessation. Based on one-way MANOVA, there was an overall statistically significant difference in non-health behavior variables based on SMK, $F(24, 1456) = 2.23$, $p = .001$; Wilk's $\Lambda = .88$, partial $\eta^2 = .03$.

Exercise. Based on one-way MANOVA, there was an overall statistically significant difference in non-health behavior variables based on EX, $F(16, 1281) = 6.21$, $p = .000$; Wilk's $\Lambda = .80$, partial $\eta^2 = .06$.

Healthy Eating. Based on one-way MANOVA, there was an overall statistically significant difference in non-health behavior variables based on HE measured by CALFAT, $F(16, 1281) = 2.87$, $p = .000$; Wilk's $\Lambda = .90$, partial $\eta^2 = .03$. For Hypotheses 1-4, please see Tables 6-8 for complete findings on follow-up ANOVAs (for the overall MANOVAs conducted above). See Tables 9 and 10 for correlations between non-health behavior model variables, and stages of change for each health behavior, respectively.

Hypothesis 1. Health Behaviors and Mental Health Functioning.

1a. Participants who endorse being further along the Stages of Change for Smoking Cessation (SMK) will report higher levels of mental health functioning (MCS).

A follow-up ANOVA, contrary to the hypothesis, indicated that SMK did not have a statistically significant relationship with MCS, $F(6, 420) = 1.32$, $p = .25$, partial $\eta^2 = .02$. See Table 6a.

1b. Participants who endorse being further along the Stages of Change for Exercise (EX) will report higher levels of mental health functioning (MCS).

Table 7b presents mean comparisons of MCS based on Tukey's HSD test findings between each of the stages of change. A follow-up ANOVA indicated that EX did have a significant relationship with MCS. The mean scores for MCS were statistically significantly different between Contemplators and Maintainers, $p = .000$ (M = -6.90, 95% CI= [-11.22, -2.58]), Preparers and Maintainers, $p = .002$ (M = -6.23, CI 95% = -10.77 – (-1.70)), Actives (those in Action) and Maintainers, $p = .001$ (M = -5.41, 95% CI = [-9.19, -1.63)].

1c. Participants who endorse being further along the Stages of Change for Healthy Eating measured by Calorie and Fat Intake (CALFAT) will report higher levels of mental health functioning (MCS).

A follow-up ANOVA, confirming the hypothesis, indicated that CALFAT did have a statistically significant positive relationship with MCS, $F(4, 422) = 3.71$, $p = .01$, partial $\eta^2 = .03$. Table 8b shows mean comparisons of MCS based on Tukey's HSD test findings between each of the stages of change. The mean scores for MCS were statistically significantly different between Contemplators and Maintainers, $p =$

.02 (M = -4.44, 95% CI = [-8.46,-0.42]).

Hypothesis 2. **General Self-Efficacy, Health Behaviors, and Mental Health Functioning**

2a. Participants who endorse higher general self-efficacy (GSE) will be associated with being further along the Stages of Change for smoking cessation (SMK), exercise (EX), and healthy eating measured by calorie and fat intake (CALFAT).

Based on follow-up ANOVAs, SMK did not have a statistically significant relationship with GSE, $F(6, 420) = .88$; $p = .51$; partial $\eta^2 = .01$) (Table 6). In contrast, EX did have a statistically significant positive relationship with GSE, $F(4, 422) = 7.49$; $p = .000$; partial $\eta^2 = .07$). Table 7b shows mean comparisons of GSE based on Tukey's HSD test findings between each of the stages of change. The mean scores for GSE were statistically significantly different between Precontemplators and Maintainers, $p = .000$ (M = -6.25, CI 95% = [-.10.05,-2.45]), Contemplators and Maintainers, $p = .001$ (M = -5.84, 95% CI = [-9.89, -1.80]), Preparers and Maintainers, $p = .03$ (M = -4.58, 95% CI = [-8.83, -0.33]), Actives and Maintainers , $p = .01$ (M = -4.28, 95% CI = [-7.82, -0.74]). Based on a follow-up ANOVA, CALFAT also had a statistically significant positive relationship with GSE, $F(4, 422) = 3.13$; $p = .02$; partial $\eta^2 = .03$. Table 8b shows mean comparisons of MCS based on Tukey's HSD test findings between each of the stages of change. The mean scores for GSE were statistically significantly different between Precontemplators and Maintainers, $p = .02$ (M = -4.17, 95% CI = [-7.81, -0.53]).

2b. Participants who endorse higher general self-efficacy (GSE) will report

higher levels of mental health functioning (MCS).

There was a moderate, positive correlation between MCS and GSE (GSE), r = .33, *p* <.01. See Table 9.

Hypothesis 3. Perceived Social Support, Health Behaviors, Physical Health Functioning, and Mental Health Functioning.

   3a. Participants who endorse higher levels of perceived social support (PSS) will report being further along the Stages of Change for smoking (SMK) cessation, exercise (EX), and healthy eating measured by calorie and fat intake (CALFAT).

   Contrary to the hypothesis, based on follow-up ANOVAs, SMK ($F(6, 420)$ = 1.31; p = .25; partial η^2 = .02), EX ($F(4, 422)$ = 1.64; p = .16; partial η^2 = .02), and CALFAT ($F(4, 422)$ = .66; p = .62; partial η^2 = .01) did not have a statistically significant relationship with PSS. See Tables 6 and 8.

   3b. Participants who endorse higher levels of perceived social support (PSS) will report higher levels of physical health functioning (PCS).

Contrary to the hypothesis, there was no significant correlation between PSS and PCS, r = .09. See Table 9.

   3c. Participants who endorse higher levels of perceived social support (PSS) will be associated with higher levels of general self-efficacy (GSE).

Confirming the hypothesis, there was a moderate, positive correlation between PSS and GSE, r = .31, *p* <.01. See Table 9.

   3d. Participants who endorse higher levels of perceived social support (PSS) will be associated with higher levels of mental health functioning (MCS).

Confirming the hypothesis, there was a moderate, positive correlation between PSS

and MCS, r = .31, p <.01. See Table 9.

Hypothesis 4. Physical Health Functioning, General Self-Efficacy, and Mental Health Functioning.

Participants who endorse higher levels of physical health functioning (PCS) will have:

   4a. higher levels of general self-efficacy (GSE).

Contrary to the hypothesis, there was no significant correlation between PCS and GSE, r = .09. See Table 9.

   4b. higher levels of mental health functioning (MCS).

Confirming the hypothesis, there was a small, positive correlation between PCS and MCS, r = .16, p <.01. See Table 9.

   Please see Tables 6b, 7b, and 8b for complete findings (including those evaluated outside of the hypotheses) on mean comparison of non-health-behavior model variables (MCS, PCS, GSE, and PSS) based on Tukey's HSD test findings across each of the stages of change for SMK, EX and CALFAT.

Hypothesis 5. Proposed Mediational Model.

It was expected that the following Mediational Model (Figure 1) would offer the best fit to the data: perceived social support, general-self-efficacy → three health behaviors (SMK, EX, CALFAT) → physical health functioning →mental health functioning.

   To test the relationship between health behaviors and non-health behavior model variables, and mental health functioning and explain the variances and covariances, three separate path models were tested. This method is designed to evaluate the way a set of variables relate and form a multivariate model (Schnoll, Harlow, Stolbach, & Brandt, 1998). Three models including Proposed Mediational

Model, Full Model, and Direct Model were analyzed for a primary outcome variable (mental health functioning). The Full Model (Figure 2) included all paths in order to evaluate the following: 1) whether perceived social support and general self-efficacy directly affects mental health functioning; 2) whether the three health behaviors (smoking cessation, exercise, and healthy eating) and physical health functioning indirectly mediate the latter relationship; and 3) whether physical health functioning mediate the relationship between the three health behaviors and mental health functioning. The third and final competing model, the Direct Model (Figure 3) tested paths between general self-efficacy, perceived social support, the three health behaviors and mental health functioning to examine the direct effects of the latter five variables on mental health independent of each other.

Model 1: Proposed Mediational Model.

Results indicated that the Proposed Mediational Model did not provide a good fit to the data at the macro and micro levels (χ^2 (8, N=427) = 70.69, p = .000; CFI=.74; RMSEA= .14, 90% CI = .11, .17]). Analysis of the largest standardized residuals indicated values exceeding |0.20|, which shows that this model did not adequately explain the relationships between variables.

Standardized parameter estimates are shown in Figure 1. However, because this model was not a good fit, estimates of individual parameters were unreliable and hence cannot be interpreted.

The Wald test suggested dropping the following parameters to improve fit: 1) Calorie and fat intake to physical health 2) perceived social support to calorie and fat intake, 3) calorie and fat intake to general self-efficacy, and 4) smoking cessation to

general self-efficacy. The Lagrange Multiplier test suggested adding the following parameters to improve fit: 1) Perceived social support to general self-efficacy, 2) perceived social support to mental health, and 3) perceived social support to physical health.

Model 2: Full Model.

Results indicated that the full model did provide a good fit to the data at the macro and micro levels (χ^2 (1, N=427) = 2.33, p = .13; CFI=.99; RMSEA=.06, 90% CI = [.00, .15]). Analysis of the largest standardized residuals indicated that all relationships among observed variables were adequately explained by the model; no residual values exceeded |0.20|. Physical health, general self-efficacy, and perceived social support had a cumulative effect on mental health (R^2 = 0.17), meaning that the latter three variables accounted for approximately 17% of the variance in mental health. Only EX and SMK had a small effect (R^2 = .13) on physical health (i.e., EX and SMK accounted for about 13% of the variance in physical health). GSE had a small effect on EX (R^2 = .06) and on CALFAT (R^2 = .02). PSS had a small effect (R^2 = .02) on SMK. Standardized parameter estimates are shown in Figure 2.

Unstandardized coefficients indicated that GSE had a direct effect on EX (β = .07, SE = .02, p < .05) and CALFAT (β = .04, SE = .02, p < .05) and an indirect effect on PCS (β = .10, SE = .04, p < .05). GSE did not have a direct effect on SMK (β = .04, SE = .02, p > .05) and PCS (β = .04, SE = .10, p < .05). GSE did have a direct effect on MCS (β = .53, SE = .10, p < .05).

PSS had a direct effect on SMK (β = .02, SE = .01, p < .05) but not on EX (β = .01, SE = .01, p > .05) and CALFAT (β = .00, SE = 01, p > .05). PSS did not have a

direct ($\beta = .02$, SE $= .03$, $p > .05$) or indirect effect ($\beta = .02$, SE $= .01$, $p > .05$) on PCS. PSS did have a direct effect ($\beta = .16$, SE $= .03$, $p < .05$) on MCS.

SMK had a direct effect on PCS ($\beta = .70$, SE $= .20$, $p < .05$) and an indirect effect ($\beta = .09$, SE $= .05$, $p < .05$) on MCS through PCS. Similarly, EX had a direct effect on PCS ($\beta = 1.91$, SE $= .31$, $p < .05$) and an indirect effect ($\beta = .24$, SE $= .11$, $p < .05$) on MCS through PCS. CALFAT did not have a direct effect on PCS ($\beta = .19$, SE $= .30$, $p > .05$) and MCS ($\beta = .13$, SE $= .33$, $p > .05$). Furthermore, CALFAT did not have an indirect effect ($\beta = .03$, SE $= .04$, $p > .05$) on MCS. PCS had a direct effect ($\beta = .13$, SE $= .05$, $p > .05$) on MCS.

The Wald test suggested dropping the following parameter to improve fit, 1) perceived social support to calorie and fat intake. The Lagrange Multiplier test indicated that no parameters should be added to the model to improve fit.

Model 3: Direct Model

Results indicated that the Direct model did not provide a good fit to the data at the macro and micro levels (χ^2 (2, N= 427) = 94.67, $p = .000$; CFI=.66. RMSEA=0.13, 90% CI = [.10, .15]). Analysis of the largest standardized residuals indicated values exceeding |0.20|, which shows that this model did not adequately explain the relationships between variables. Standardized parameter estimates are shown in Figure 3. However, because this model was not a good fit, estimate of individual parameters were unreliable and hence cannot be interpreted.

The Wald test suggested dropping the following parameters to improve fit: 1) SMK to mental health, 2) CALFAT to mental health, and 3) EX to mental health. The Lagrange Multiplier test suggested adding 12 parameters to improve fit.

Overall, of the three models tested, the Full Model, the model in which the relationship between various relationships between the model variables and mental health is the most appropriate model for the data based on the criteria of empirical fit described earlier. SMK and EX, had an indirect effect on mental health (i.e., mediated by physical health). The Mediational Model and the Direct Model each did not provide an adequate fit for the data.

Exploratory Analyses Findings.

To capture a more comprehensive snapshot and richer understanding of the study sample, additional descriptive analyses were conducted; some of the findings are presented below.

Demographic Characteristics by Presence of Mental Illness.

Chi-square testes indicated that there was no overall statistically significant difference between presence of mental illness across demographics characteristics including age group, gender, race, sexual orientation, marital status, education level, health insurance status, and region of residence. See Table 11.

Physical Health Characteristics by Presence of Mental Illness.

Chi-square tests indicated that there was an overall statistically significant difference between presence of mental illness across physical health characteristics including body mass index (χ^2 (3) = 10.34, $p = .02$) and currently undergoing any kind of medical treatment (e.g. medication) (χ^2 (1) = 27.72, $p = .000$). See Table 12.

For post-hoc comparisons, Delucchi (1993) recommends identifying the cells with the largest residuals. A residual is the difference between the observed and expected values for a cell. The larger the residual, the greater the contribution of the

cell to the magnitude of the resulting chi-square obtained value. Based on the latter assertion, post-hoc tests indicated that overweight and obese (standardized residual = 1.7) individuals were more strongly associated with being diagnosed with mental illness compared to those who were underweight or have normal weight (standardized residual = -1.7).

In addition, those who had been diagnosed with a mental illness, reported being currently under medical treatment more than would be expected (standardized residual = 3.4, larger than the critical value of 1.96).

Fruit and Vegetable Intake.

The stage of change distribution for the sample was as follows: Precontemplation 16.9%, Contemplation 17.8%, Preparation 18.5%, Action 14.8%, and Maintenance 32.1%. See Table 13.

Fruit and Vegetable Intake By Presence of Mental Illness.

Chi-square test indicated that there wasn't an overall statistically significant difference between presence of mental illness across stages of change for fruit and vegetable intake (χ^2 (4) = 6.44, p = .17). See Table 14.

Emotional Eating.

The stage of change distribution for the sample was as follows: Precontemplation 6.8%, Contemplation 9.6%, Preparation 12.2%, Action 16.6%, Maintenance 14.1%, and Never Emotional Eater 40.7%. See Table 13.

Emotional Eating By Presence of Mental Illness.

Chi-square test indicated that there was an overall statistically significant difference between presence of mental illness across stages of change for emotional eating (χ^2 (5) = 21.78, p = .001). See Table 14.

Post-hoc tests indicated that Never Eaters, in other words, those who had never eaten food in response to emotional distress (standardized residual = -2.0 < -1.96) were significantly less likely to be diagnosed with mental illness than expected.

Facebook Utilization.

Of the total sample, 85% indicated currently having a Facebook account. The majority of the latter group (53.7%) indicated that they did not use Facebook as a way to receive social support, while 36.1% indicated that they did use Facebook as a way to receive social support and 10.2% were unsure about whether they used Facebook as a way to receive social support. See Table 15.

Facebook Utilization by Presence of Mental Illness.

Chi-square tests indicated that there was no overall statistically significant difference between presence of mental illness and having Facebook account or not (χ^2 (1) = 2.58, p = .11). Similarly, there was no overall statistically significant difference between presence of mental illness and whether an individual uses Facebook as a means to receive social support or not (χ^2 (2) = 2.19, p = .33) and amount of time spent on Facebook (χ^2 (5) = 1.32, p = .93). However, there was an overall statistically significant difference between presence of mental illness and whether an individual's experiences on Facebook make them feel better, no different, or worse (χ^2 (2) = 7.87, p = .02). However, it should be noted that a very small sample was evident for those

who felt worse when using Facebook; those with (n=8) and without (n=3) a diagnosed

mental illness. See Table 16.

CHAPTER 6

CONCLUSION

The present study's primary goal was to explore the role of three key health behaviors (SMK, EX, and CALFAT) in relation to mental health among a population-based adult sample. In addition, the study explored the same three health behaviors and physical health functioning as mediators of the relationship between other modifiable variables including general self-efficacy and perceived social support, and adult mental health functioning. To our knowledge, this study is the first to explore the direct and indirect effects of multiple health behaviors on mental health functioning among a population-based sample.

Importantly, the present study participant demographic characteristics (Table 1) are fairly consistent with U.S. Census statistics (2014) across race, sexual orientation, marital status, and health insurance status prior to the launch of the Affordable Healthcare Act (January 2015). However, education level was higher than that of the general population. In terms of clinical characteristics (Table 2) and health behaviors (Table 3), for example, a little over 20% of participants were current smokers, higher than the national rate see among adults (17.8%) (CDC, 2015). Among the total sample, approximately 58% of participants were engaging in recommended regular exercise which is higher than the national trend at 49% (CDC, 2013), while 31% were engaging in healthy eating behaviors. Furthermore, 61% percent of the total sample was overweight or obese, lower than the rate observed in the general U.S.

population (69%) (National Center for Health Statistics, 2014), yet still indicating a substantial proportion of adults. Seventeen percent of participants were currently suffering from one of the four "lifestyle" chronic physical illnesses assessed (i.e. cardiovascular disease, cancer, cerebrovascular disease, and diabetes).

It must be noted that the rates of overweight/obesity, healthy eating and adequate exercise were simultaneously high among this sample. There may be several explanations for the latter finding in which unhealthy weight was coexisting with high levels of engagement in health behaviors typically utilized for weight management. One explanation is that adequate exercise and healthy eating measured by calorie and fat intake may not be enough to curb weight issues. A study published in 2014 (Ng, Slining, & Popkin) "found a small but steady decline" in the consumption of calories between 2003 and 2011 (not due to the economic recession at the time) among American youth and adults indicative of public attitudes shifting (i.e. anti-soda messages). However, their findings also indicated that, on average, Americans spend only approximately 25 minutes every day preparing food. A separate very recent study (Poti, Mendez, Ng, & Popkin, 2015) indicated that the majority of the U.S. diet is based on consuming "ready to eat" or "ready to heat" products typically highly processed and high in sugar, salt and saturated fat. Furthermore, Poti and colleagues (2015) found that, between 2000 and 2013, the moderately (e.g. flavored pasta, cheese, flavored fruit and vegetable juice, potato chips) and highly processed foods (e.g. soda, sports drinks, alcohol, hot dogs, bagels, frozen pizza, ice cream, candy), with high saturated fat, sugar and salt, comprised more than 75% of people's energy intake. In other words, over 50% of calories consumed by youth and adults are from

44

refined carbohydrates, desserts, fast food, and savory snacks (Poti et al., 2015). This shows that the U.S. diet is still not necessarily a healthier one. While there has been a reduction in the amount of food/calories consumed over the past decade or so, the quality and nutritional aspects of food consumed have not improved (Poti et al., 2015). In terms of exercise, more than 27% of adults engaged in regular exercise have graduated from college (CDC, 2013c). Those who had received less than a high school diploma had the lowest rates (12%) of exercise (CDC, 2013c). Population-based self-report data indicate that rates of exercise have plateaued, with those with higher income more likely to engage in exercise and eating more fruit and vegetables (Boseley, 2015). The present study sample did indicate engaging in high levels of fruit and vegetable intake (47%). Diet and nutrition is an area that is complex and national guidelines are consistently updated (about every 5 years) to reflect our current scientific knowledge of the role of different types of nutrition such as sugar, fat, and calories in our health and well-being.

In terms of mental health, 43% had been diagnosed with a mental illness at one point in time; close to the national rate at 50% and, of the total sample, 38% had been prescribed medication for a mental health issue. These findings portray the veracity of this population-based sample and also the dominance and pervasiveness of physical and mental health issues faced by the present sample, consistent with the general US adult population findings.

Hypotheses 1-4 – Group Mean Differences and Correlations.

Contrary to what was hypothesized, findings indicated that SMK did not have a significant relationship with mental health, general self-efficacy, or perceived social

support. As hypothesized, EX did have a significant relationship with mental health and general self-efficacy with moderate to large effect sizes (partial $\eta^2 = .07$). Particularly, engaging in regular exercise for at least six months compared to contemplating engaging in exercise, preparing to engage in exercise, and actually actively engaging in regular exercise for less than six months was strongly linked to better mental health. This may suggest that in order to feel the positive effects of exercise on mental health, exercise has to become routine and longer-term. Maintainers did not differ from Precontemplators perhaps since the latter group of individuals isn't even considering engaging in exercise and is content with their "status quo," and hence may not be feeling any distress about how they are leading their life or potentially engaging in a new behavior that may come with its added challenges. With respect to general self-efficacy, the sense of confidence in one's own ability to overcome challenges in everyday life, those who had been engaging in regular exercise for more than six months differed in their level of confidence compared to those not interested in engaging in EX, those considering engaging and those actively engaging in EX for less than six months. These findings suggest that engaging in longer-term exercise can potentially help build confidence.

As hypothesized, CALFAT had a significant relationship with general self-efficacy and mental health. Again, maintainers were significantly different than Precontemplators with respect to their level of confidence. One argument for this is the fact that contemplators can be quite ambivalent towards engaging in a new behavior, especially healthy eating, given the substantial lifestyle change it may require to practice additional behaviors such as buying healthier foods, reading food

labels, and reorganizing daily schedules to buy healthier foods. In addition, contemplators may have some awareness of the benefits of engaging in healthy eating as well as the negative effects of unhealthy eating, and as a result may experience more distress and less confidence about all of the challenges around this new behavior compared to those who are moving towards healthy eating, and even those who are not interested in healthy eating at all. With respect to mental health, those who had been eating healthy for at least six months (maintainers) were particularly different from those who were contemplating engaging in healthy eating in the next 6 months.

As expected, there was a significant relationship between general self-efficacy and mental health, indicating that higher levels of self-efficacy were associated with higher levels of mental health. As hypothesized, perceived social support and physical health were significantly related, indicating that higher levels of perceived social support were associated with higher levels of general self-efficacy. Similarly, there was a significant relationship between perceived social support and mental health, again, indicating that higher levels of perceived social support were associated with higher levels of mental health.

Contrary to what was expected, physical health did not significantly relate to general self-efficacy. And finally, as expected, there was a significant relationship between physical health and mental health, indicating that higher levels of physical health functioning were associated with higher levels of mental health functioning.

When looking at group comparisons, these finding can be summarized as: 1) Smoking doesn't appear significantly related to self-efficacy, perceived social support and mental health functioning, 2) engaging in exercise and healthy eating for at least

six months is strongly linked to better general self-efficacy and mental health, 3) those who are contemplating engaging in exercise and/or healthy eating in the next six months appear to be particularly different than maintainers in terms of their mental health status, 4) perceived social support is significantly related to physical and mental health functioning, and 5) general self-efficacy is significantly linked to mental health functioning.

Hypothesis 5 – Model Testing.

An examination of the fully saturated model (Figure 2), predicting mental health from general self-efficacy, perceived social support, and physical health functioning revealed good model fit, accounting for a small amount of variance ($R^2 =$ .17). This finding supported hypotheses and previous research that higher levels of general self-efficacy (e.g.Kim, 2003), perceived social support (e.g. Cacioppo et al., 2011; Fratiglioni et al., 2004) and physical health (e.g.Walsh, 2010) are associated with higher levels of mental health.

In contrast, the three health behaviors did not directly predict or have an effect on mental health. Interestingly, though, exercise and healthy eating had an indirect effect on mental health functioning through physical health. In other words, this may mean that if an individual is engaging in risky health behaviors, for example, not engaging in regular exercise or is a chronic smoker and as a result suffers from physical health issues, then they are likely to experience worse mental health. This is a nuanced finding supporting the significant levels of mental illness comorbidity seen among individuals with physical health issues and vice versa. As such, then, engaging in and maintaining health behaviors is strongly linked to improved physical health

which in turn can be linked to improved mental health. This finding is particularly relevant given the recent focus on the integration of behavioral health care in to primary care and medical settings. In such settings, mental and behavioral issues like sedentary lifestyle can be targeted as a way to not only improve more chronic physical health outcomes but also mental health issues.

Interestingly, exercise mediated the relationship between general self-efficacy and mental health. Previous research has found that mediators of physical activity and mental health have included self-efficacy and social interaction (e.g. Peluso, & Guerra de Andrade, 2005). Both findings could be indicative of the dual or bi-directional relationships between the variables.

Perceived social support predicted smoking behavior. This kind of social support refers to the perceived availability of people who can be supportive when one has problems, through behaviors such as empathic listening, providing tangible aid, and/or informational aid for the provision of supportive behaviors specific to health behavior change (Westmaas, Bontemps-Jones, & Bauer, 2010). These support functions can be "abstinence specific" in that they pertain to specifically support the quit attempt or they can be more general such as providing emotional support contributing to a more "stress free" environment that can help with the challenges that come with quitting (Mermelstein et al., 1986). An alternative is that specific supports like a partner or friend can deliberately engage an individual to distract him or her from withdrawal symptoms of smoking (Westmaas et al., 2010).

Exploratory Findings.

Fruit and vegetable intake were discussed previously. In terms of emotional eating, consistent with previous findings, those who do not engage in emotional eating tend to have had a mental illness diagnosis compared to those who have engaged in emotional eating.

With regard to Facebook utilization, those who tended to feel worse (importantly a small sample size) about Facebook experiences were inclined to have had a mental illness diagnosis. It would be important to further explore the presence of specific mental illness given that negative appraisals of experiences can be an inherent feature of certain mental health issues.

Limitations.

First, one important limitation is that this is a cross-sectional study with mediational analyses. Definitive statements about causality can be made only with prospective and longitudinal design. Maxwell and Cole (2007) state that the use of mediation in cross-sectional analyses is unlikely to accurately reflect longitudinal effects. The present results serve as exploratory models to engender ideas for further research. Ideally, the present results need to be replicated with longitudinal data with at least two to three time points (Maxwell & Cole, 2007). Furthermore, there is likely many other factors that play a role in mental health outcomes (e.g. genetic factors, early life exposures, and other situational factors) that are antecedent to and the present study only captured a small part of these complex relationships. In addition, a bi-directional relationship between all of the model variables is plausible.

Second, there was an assessment related limitation. Given that it wasn't within the scope of the present study to assess different forms of perceived social support

(PSS), the path analyses combined all forms of PSS (i.e. social support received from family, significant other, and friend) into one composite score that has been established by the authors of that particular measure. By doing so, analyses were not conducted on how a specific form of perceived social support may or may not contribute to mental health. It can be expected that different forms of perceived social support are qualitatively and quantitatively different and may or may not predict different outcomes. Further studies can apply latent variable model testing to include different types of perceived social support as potential predictors of mental health outcomes.

Third, for the purpose of the study in looking at mental health on a population level, the relationship between health behaviors and current (past 4 weeks) mental health functioning was assessed. It would be important to assess past mental health functioning as well to compare it to present functioning alongside the potential change in health risk behaviors to better understand the relationship between health behaviors and mental health functioning over time.

Future Recommendations

Based on the current study's findings and limitations, one major recommendation made is to further improve on the body of literature delineating the relationships between health behaviors and mental health outcomes. First, it is imperative that studies continue to explore direct outcomes health behaviors may have on mental health across cross-sectional and longitudinal studies as well as multivariate and model testing. Specifically, two recent studies have shown bi-directional relationships between depression and obesity (Kontinnen et al., 2014) and mental

health and physical activity in older adults (Steinmo, Hagger-Johnson, & Shahab, 2014). It will be important to examine how the model variables relate to each other within longitudinal bi-directional models given the emerging evidence in this realm.

Second, although it is important to continue to assess overall mental health functioning in the general population for public health purposes, it is also important to continue to look at the relative impact of health behaviors on the presence and severity of specific mental illnesses to further our understanding of potential non-pharmacologic prevention and intervention efforts for mental illness.

TABLE 1: DEMOGRAPHIC CHARACTERISTICS

	N	%
Gender		
Female	242	56.7
Male	184	43.1
Transgender	1	0.2
Age Group		
18-24	51	11.9
25-34	104	24.4
35-44	83	19.4
45-54	121	28.3
55-64	68	15.9
Race		
White	311	72.8
Hispanic or Latino	26	6.1
Black or African American	49	11.5
Native American	3	0.7
Asian / Pacific Islander	24	5.6
Other	4	0.9
Mixed	10	2.3
Sexual Orientation		
Heterosexual or straight	396	92.7
Gay	10	2.3
Lesbian	4	0.9
Bisexual	16	3.7
Other	1	0.2
Marital Status		
Single, never married	128	30.0
Married or domestic partnership/ civil union	231	54.1
Widowed	5	1.2
Divorced	53	12.4
Separated	10	2.3

TABLE 1. DEMOGRAPHIC CHARACTERISTICS CONT.

	N	%
Education Level		
Some high school, no diploma	13	3.0
High school graduate, diploma or the equivalent	87	20.4
Some college credit, no degree	98	23.0
Trade/technical/vocational training	29	6.8
Associate degree	45	10.5
Bachelor's degree	112	26.2
Master's degree	33	7.7
Professional/ Doctorate degree	10	2.3
Health Insurance Status		
Private Plan	49	11.5
Employment-based Plan	206	48.2
Direct Purchase	8	1.9
Government Plan	24	5.6
Medicare	35	8.2
Medicaid	41	9.6
Military Healthcare	12	2.8
Uninsured	52	12.2
Region of Residence		
Northeast	104	24.4
Midwest	103	24.1
South	139	32.6
West	81	19.0

TABLE 2: CLINICAL CHARACTERISTICS

	N	%
Body Mass Index Categories		
Underweight	20	4.8
Normal weight	144	34.4
Overweight	119	28.4
Obesity	136	32.5
Past or Current Diagnosis of Mental Illness (Multiple Events)		
Anxiety	99	23.2
Depression	127	29.7
Substance abuse/dependence	16	3.8
Bipolar disorder	16	3.8
Schizophrenia	7	1.6
Attention deficit/hyperactivity	20	4.7
Eating disorder	18	4.2
Panic	20	4.7
Post-traumatic stress disorder	19	4.5
Personality disorder	3	0.7
Obsessive Compulsive Disorder	13	3
Other	22	5.2
Never	242	56.7
	622	145.8
Ever Been Prescribed Medication for a Mental Health Condition?		
Yes	160	37.5
No	267	62.5
Current Psychotropic Medication Use		
Antianxiety	20	16.4
Antidepressant	70	57.4
Antipsychotic	11	9.0
Mood stabilizer/ Anticonvulsant	13	10.7
Stimulant	8	6.6

TABLE 2: CLINICAL CHARACTERISTICS CONT.

	N	%
Current Chronic Medical Illness		
Cancer	4	0.9
Cerebrovascular	5	1.2
Cardiovascular	34	8.0
Type I or II diabetes	28	6.6
No	356	83.4
Current Medical Treatment		
Yes	109	25.5
No	318	74.5

TABLE 3. STAGE OF CHANGE FREQUENCIES FOR HEALTH

BEHAVIORS

	N	%
Smoking Cessation		
Precontemplation	41	9.6
Contemplation	35	8.2
Preparation	19	4.4
Action	21	4.9
Maintenance	37	8.7
Termination	50	11.7
Never a smoker	224	52.5
Exercise		
Precontemplation	73	17.1
Contemplation	61	14.3
Preparation	53	12.4
Action	91	21.3
Maintenance	149	34.9
Calorie and Fat Intake		
Precontemplation	117	27.4
Contemplation	101	23.7
Preparation	77	18
Action	26	6.1
Maintenance	106	24.8

TABLE 4: STAGE OF CHANGE FREQUENCIES BY PRESENCE OF

MENTAL ILLNESS

	Current or past mental illness diagnosis				
	Yes		No		
	N	%	N	%	χ^2
Stage of Change for Smoking					
Precontemplation	19	4.4	22	5.2	0.71
Contemplation	19	4.4	16	3.7	
Preparation	9	2.1	10	2.3	
Action	10	2.3	11	2.6	
Maintenance	16	3.7	21	4.9	
Termination	24	5.6	26	6.1	
Never smoker	89	20.8	135	31.6	
Stage of Change for Exercise					
Precontemplation	25	5.9	48	11.2	0.10
Contemplation	26	6.1	35	8.2	
Preparation	29	6.8	24	5.6	
Action	46	10.8	45	10.5	
Maintenance	60	14.1	89	20.8	
Stage of Change for Calorie and Fat Intake					
Precontemplation	36	8.4	81	19.0	**0.00****
Contemplation	51	11.9	50	11.7	
Preparation	42	9.8	35	8.2	
Action	15	3.5	11	2.6	
Maintenance	42	9.8	64	15.0	

Note.**. Significant at the .01 level.

TABLE 5: UNIVARIATE STATISTICS FOR NON-HEALTH BEHAVIOR

MODEL VARIABLES

Variable	Range	N=427 M(SD)	Skewness	Kurtosis
MCS	6.96-64.71	44.30(10.68)	-0.496	-0. 1
PCS	19.44-70.61	50.75(9.50)	-0.777	0.127
GSE	9.10-36.40	27.89(4.92)	-0.538	1.063
PSS	11-77	53.80(15.02)	-0.589	0.117

Note. MCS = The Medical Outcome Study Short Form Mental Health Composite Score; PCS = The Medical Outcome Study Short Form Physical Health Composite Score; GSE = The General Self-Efficacy Scale; PSS= The Multidimensional Scale of Perceived Social Support. For all the variables, higher scores are indicative of improved functioning.

TABLE 6a: ANOVAs: SMOKING CESSATION AND NON-HEALTH BEHAVIOR MODEL VARIABLES

Dep. Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power	Mean	Std. Error	95% Confidence Interval Lower Bound	95% Confidence Interval Upper Bound
MCS	897.685	6	149.614	1.32	.248	0.02	7.902	.517	43.66	0.69	42.31	45.01
PCS	2444.864	6	407.477	4.76	.000	0.06	28.533	.990	48.84	0.60	47.66	50.01
GSE	528.778	6	88.130	0.88	.510	0.01	5.279	.350	50.30	0.65	49.03	51.57
PSS	784.502	6	130.750	1.31	.250	0.02	7.880	.516	49.07	0.64	47.81	50.34

Note. MCS = The Medical Outcome Study Short Form Mental Health Composite Score; PCS = The Medical Outcome Study Short Form Physical Health Composite Score; GSE = The General Self-Efficacy Scale; PSS= The Multidimensional Scale of Perceived Social Support.

TABLE 6b: MEANS AND STANDARD DEVATIONS: SMOKING CESSATION AND NON-HEALTH BEHAVIOR MODEL VARIABLES

Measures	PC n = 41 M	SD	C n = 35 M	SD	PR n = 19 M	SD	A n = 21 M	SD	M n = 37 M	SD	T n = 50 M	SD	NS n = 224 M	SD
MANOVA F = 2.23; df = 24, 1455; p = .001, partial η2 = .03														
MCS	43.64	10.57	46.07	12.40	38.93	11.07	42.33	9.83	44.27	10.92	45.95	9.48	44.42	10.63
PCS	49.49	9.18	47.24	11.54	46.8	10.29	48.3	8.62	48.5	8.31	48.55	9.13	52.96	9.01
GSE	51.09	7.96	50.54	10.13	48.18	15.57	50.55	6.01	50.08	8.43	52.38	10.56	49.27	10.14
PSS	47.78	9.8	50.13	11.41	48.35	12.34	48.83	11.72	48.91	9.15	48.32	10.01	51.19	9.5

Note. MCS=Mental Health Functioning; PCS=Physical Health Functioning; GSE=General Self-Efficacy; PSS=Perceived Social Support'
PC=Precontemplation; C=Contemplation; PR=Preparation; A=Action; M=Maintenance; T=Termination; NS=Never Smoker.

TABLE 7a: ANOVAs: EXERCISE AND NON-HEALTH BEHAVIOR MODEL VARIABLES

Dep. Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power	Mean	Std. Error	95% Confidence Interval Lower Bound	Upper Bound
MCS	3277.797	4	819.449	7.63	0.000	0.07	30.513	0.997	43.42	0.54	42.37	44.47
PCS	4597.831	4	1149.46	12.76	0.000	0.11	51.057	1.000	49.72	0.47	48.81	50.64
GSE	2823.699	4	705.925	7.49	0.000	0.07	29.958	0.997	49.19	0.50	48.21	50.18
PSS	651.126	4	162.781	1.64	0.164	0.02	6.55	0.504	49.76	0.51	48.75	50.77

Note. MCS = The Medical Outcome Study Short Form Mental Health Composite Score; PCS = The Medical Outcome Study Short Form Physical Health Composite Score; GSE = The General Self-Efficacy Scale; PSS= The Multidimensional Scale of Perceived Social Support.

TABLE 7b: MEANS AND STANDARD DEVATIONS: EXERCISE AND NON-HEALTH BEHAVIOR MODEL VARIABLES

	PC n = 73		C n = 61		PR n = 53		A n = 91		M n = 149	
Measures	M	SD	M	SD	M	SD	M	SD	M	SD
MANOVA F = 6.21; df = 16, 1280; p = .000, partial η2 = .06										
MCS	44.76	10.54	40.82	10.04	41.49	10.46	42.3	10.24	47.72	10.45
PCS	46.53	10.72	48.05	10.18	47.94	9.32	47.94	9.32	51.76	9.12
GSE	47.14	11.31	47.54	7.67	48.8	8.71	49.1	9.56	53.38	10.02
PSS	47.87	9.46	48.62	10.26	50.69	9.85	50.63	10.56	50.98	9.76

Note. MCS=Mental Health Functioning; PCS=Physical Health Functioning; GSE=General Self-Efficacy; PSS=Perceived Social Support' PC=Precontemplation; C=Contemplation; PR=Preparation; A=Action; M=Maintenance.

TABLE 8a: ANOVAs: HEALTHY EATING AND NON-HEALTH BEHAVIOR MODEL VARIABLES

Dep. Variable	Type III Sum of Squares	df	Mean Square	F	Sig.	Partial Eta Squared	Noncent. Parameter	Observed Power	Mean	Std. Error	95% Confidence Interval	
											Lower Bound	Upper Bound
MCS	1650.326	4	412.582	3.71	.006	0.03	14.830	.883	43.71	0.59	42.55	44.89
PCS	1674.356	4	418.589	4.81	.001	0.04	19.222	.955	50.55	0.53	49.52	51.58
GSE	1227.515	4	306.879	3.13	.015	0.03	12.521	.816	49.72	0.56	48.63	50.82
PSS	265.987	4	66.497	0.66	.618	0.01	2.651	.216	49.95	0.56	48.84	51.06

Note. MCS = The Medical Outcome Study Short Form Mental Health Composite Score; PCS = The Medical Outcome Study Short Form Physical Health Composite Score; GSE = The General Self-Efficacy Scale; PSS= The Multidimensional Scale of Perceived Social Support.

TABLE 8b: MEANS AND STANDARD DEVIATIONS: HEALTHY EATING AND NON-HEALTH BEHAVIOR

MODEL VARIABLES

Measures	PC n = 117		C n = 101		PR n = 77		A n = 26		M n = 106	
	M	SD	M	SD	M	SD	M	SD	M	SD
MANOVA F = 2.87; df = 16, 1280; p = .000, partial η2 = .03										
MCS	45.71	10.48	42.15	11.4	42.85	10.12	41.3	10.20	46.59	10.16
PCS	51.85	9.05	47.54	10.03	50.78	8.62	49.73	9.69	52.84	9.37
GSE	48.65	10.22	49.92	8.55	48.82	9.9	48.42	9.57	52.82	10.79
PSS	48.87	9.39	50.84	10.18	49.95	9.46	49.49	10.90	50.61	10.68

Note. MCS=Mental Health Functioning; PCS=Physical Health Functioning; GSE=General Self-Efficacy; PSS=Perceived Social Support; PC=Precontemplation; C=Contemplation; PR=Preparation; A=Action; M=Maintenance.

TABLE 9. CORRELATIONS: NON-HEALTH BEHAVIOR MODEL

VARIABLES

	MCS	PCS	GSE	PSS
MCS	1	.162**	.327**	.307**
PCS	.162**	1	.089	.086
GSE	.327**	.089	1	.312**
PSS	.307**	.086	.312**	1

Note.**. Correlation is significant at the .01 level (2-tailed). *. Correlation is significant at the .05 level (2-tailed). MCS=The Medical Outcome Study Short Form Mental Health Composite Score; PCS=The Medical Outcome Study Short Form Physical Health Composite Score; GSE=The General Self-Efficacy Scale; PSS=Perceived Social Support.

TABLE 10. CORRELATIONS: HEALTH BEHAVIORS

	SMK	EX	CALFAT	FV	EMOEAT
SMK	1	.117*	.067	.076	.018
EX	.117*	1	.315**	.358**	.081
CALFAT	.067	.315**	1	.320**	.116*
FV	.076	.358**	.320**	1	.050
EMOEAT	.018	.081	.116*	.050	1

Note. **. Correlation is significant at the .01 level (2-tailed). *. Correlation is significant at the .05 level (2-tailed). SMK=Stage of Change for Smoking Cessation; EX=Stage of Change for Exercise; CALFAT=Stage of Change for Calorie and Fat Intake; FV=Stage of Change for Fruit and Vegetable Intake; EMOEAT=Stage of Change for Emotional Eating.

TABLE 11. DEMOGRAPHIC CHARACTERISTICS BY PRESENCE OF

MENTAL ILLNESS

	Current or past mental illness diagnosis				
	Yes		**No**		
	N	**%**	**N**	**%**	χ^2
Gender					
Female	110	25.8	132	30.9	0.33
Male	75	17.6	109	25.5	
Transgender	1	0.2	0	0.0	
Age Group					
18-24	24	5.6	27	6.3	0.65
25-34	44	10.3	60	14.1	
35-44	34	8.0	49	11.5	
45-54	53	12.4	68	15.9	
55-64	31	7.3	37	8.7	
Race					
White	144	34.5	167	40.0	6.02
Non-White	20	4.8	33	7.9	
Mixed	16	3.8	37	8.9	
Sexual Orientation					
Heterosexual or straight	169	39.6	227	53.2	1.73
Non-heterosexual/Non-straight	17	4.0	14	3.3	
Marital Status					
Single, never married	47	11.0	81	19.0	3.63
Married or domestic partnership/ civil union	106	24.8	125	29.3	
Widowed/divorced/separated	33	7.7	35	8.2	
Education Level					
Some high school/High school diploma	51	12.0	49	11.5	5.95
Some college/Trade training/Associate's degree	79	18.5	93	21.8	
Bachelor's degree	40	9.4	72	16.9	
Graduate degree	16	3.8	26	6.1	
Health Insurance					
Insured	164	38.3	211	49.4	
Uninsured	22	5.2	30	7.0	
Region of Residence					
Northeast	47	11.0	57	13.3	4.91
Midwest	37	8.7	66	15.5	
South	69	16.2	70	16.4	
West	33	7.7	48	11.2	

TABLE 12. PHYSICAL HEALTH CHARACTERISTICS BY PRESENCE OF MENTAL ILLNESS

| | Current or past mental illness diagnosis | | | | |
| | Yes | | No | | |
	N	%	N	%	χ^2
Body Mass Index Categories					
Underweight	8	1.9	12	2.9	10.34*
Normal weight	49	11.7	95	22.7	
Overweight	53	12.6	66	15.8	
Obesity	72	17.2	64	15.3	
Current Chronic Medical Illness					
Cancer	1	0.2	3	0.7	7.81
Cerebrovascular	5	1.2	0	0	
Cardiovascular	17	4.0	17	4.0	
Type I or II diabetes	12	2.8	16	3.7	
No	151	35.4	205	48.0	
Current Medical Treatment					
Yes	71	16.6	38	8.9	27.72***
No	115	26.9	203	47.5	

Note. *$p <. 05$, ***$p <. 001$.

TABLE 13: STAGE OF CHANGE FREQUENCIES FOR EATING

BEHAVIORS

	N	%
Fruit and Vegetable Intake		
Precontemplation	72	16.9
Contemplation	76	17.8
Preparation	79	18.5
Action	63	14.8
Maintenance	137	32.1
Emotional Eating		
Precontemplation	29	6.8
Contemplation	41	9.6
Preparation	52	12.2
Action	71	16.6
Maintenance	60	14.1
Never	174	40.7

TABLE 14: EATING BEHAVIORS BY PRESENCE OF MENTAL ILLNESS

	Current or past mental illness diagnosis				
	Yes		**No**		
	N	**%**	**N**	**%**	χ^2
Stage of Change for Fruit and Vegetable Intake					
Precontemplation	23	5.4	49	11.5	0.17
Contemplation	32	7.5	44	10.3	
Preparation	39	9.1	40	9.4	
Action	32	7.5	31	7.3	
Maintenance	60	14.1	77	18.0	
Stage of Change for Emotional Eating					
Precontemplation	14	3.3	15	3.5	0.00**
Contemplation	23	5.4	18	4.2	
Preparation	32	7.5	20	4.7	
Action	38	8.9	33	7.7	
Maintenance	21	4.9	39	9.1	
Never	58	13.6	116	27.2	

.**. $p > .01$.

TABLE 15. FACEBOOK UTILIZATION FREQUENCIES

	N	%
Do you currently have a Facebook account?		
Yes	363	85
No	64	15
Frequency of Daily Use		
Not at all	39	10.7
2	44	12.1
3	35	9.6
4	55	15.2
5	39	10.7
6	26	7.2
Very Frequently	125	34.4
Frequency of Weekly Use		
Not at all	21	5.8
2	29	8.0
3	21	5.8
4	44	12.1
5	44	12.1
6	33	9.1
Very Frequently	171	47.1
Average Time Spent Per Session		
0–15 minutes	169	46.6
16–30 minutes	91	25.1
31–45 minutes	36	9.9
46–60 minutes	24	6.6
1–2 hours	24	6.6
2–4 hours	6	1.7
More than 4 hours	13	3.6
Do you use Facebook as a way to receive social support?		
Yes	131	36.1
No	195	53.7
Unsure	37	10.2

TABLE 16. FACEBOOK UTILIZATION BY PRESENCE OF MENTAL

ILLNESS

		Current or past mental illness diagnosis			
		Yes		No	
		N	%	N	%	χ^2
Do you currently have a Facebook account?						
	Yes	164	38.4	199	46.6	0.11
	No	22	5.2	42	9.8	
Do you use Facebook as a way to receive social support?						
	Yes	62	17.1	69	19.0	0.33
	No	82	22.6	113	31.1	
	Unsure	20	5.5	17	4.7	
In general, your experiences on Facebook make you feel:						
	Better	62	17.1	57	15.7	**0.02***
	No different	94	25.9	139	38.3	
	Worse	8	2.2	3	0.8	
Time spent per session on Facebook						
	0–15 minutes	74	20.4	95	26.2	0.93
	16–30 minutes	39	10.7	52	14.3	
	31–45 minutes	18	5.0	18	5.0	
	46–60 minutes	11	3.0	13	3.6	
	1–2 hours	12	3.3	12	3.3	
	More than 2 hours	10	2.8	9	2.5	

.*. $p > .05$.

FIGURES

FIGURE 1. PROPOSED MEDIATIONAL MODEL
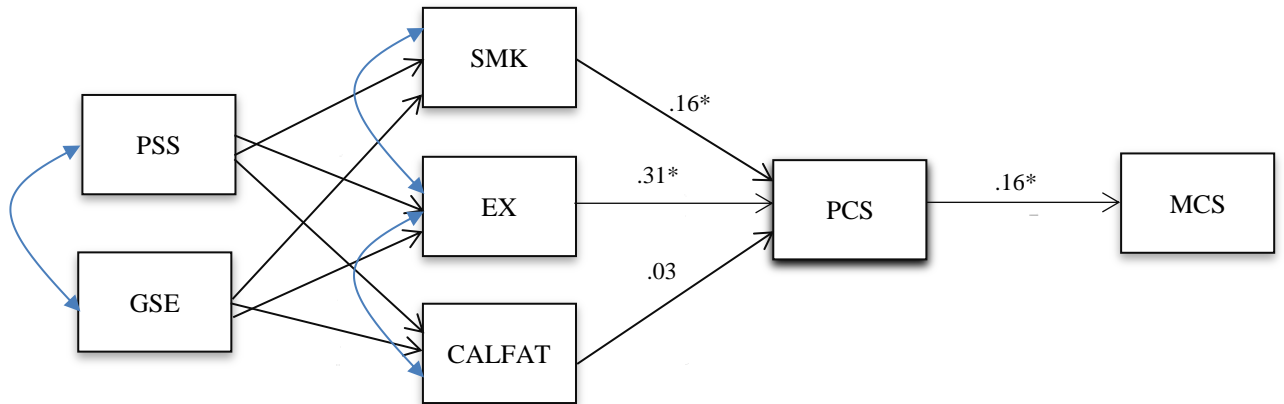
Standardized Parameter Estimates

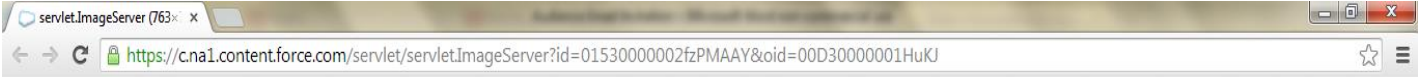|	
PSS→SMK, .12*	GSE→SMK, -.08
PSS→EX, .05	GSE→EX, .22*
PSS→CALFAT, .00	GSE→CALFAT, .13*

Note. MCS = The Medical Outcome Study Short Form Mental Health Composite Score; PCS = The Medical Outcome Study Short Form Physical Health Composite Score; GSE = The General Self-Efficacy Scale; PSS= The Multidimensional Scale of Perceived Social Support, CALFAT=Stage of Change for Calorie and Fat Intake, EX=Stage of Change for Exercise. *significant at the α =.05 level. Blue arrows indicate covariance..

FIGURE 2. FULL MODEL
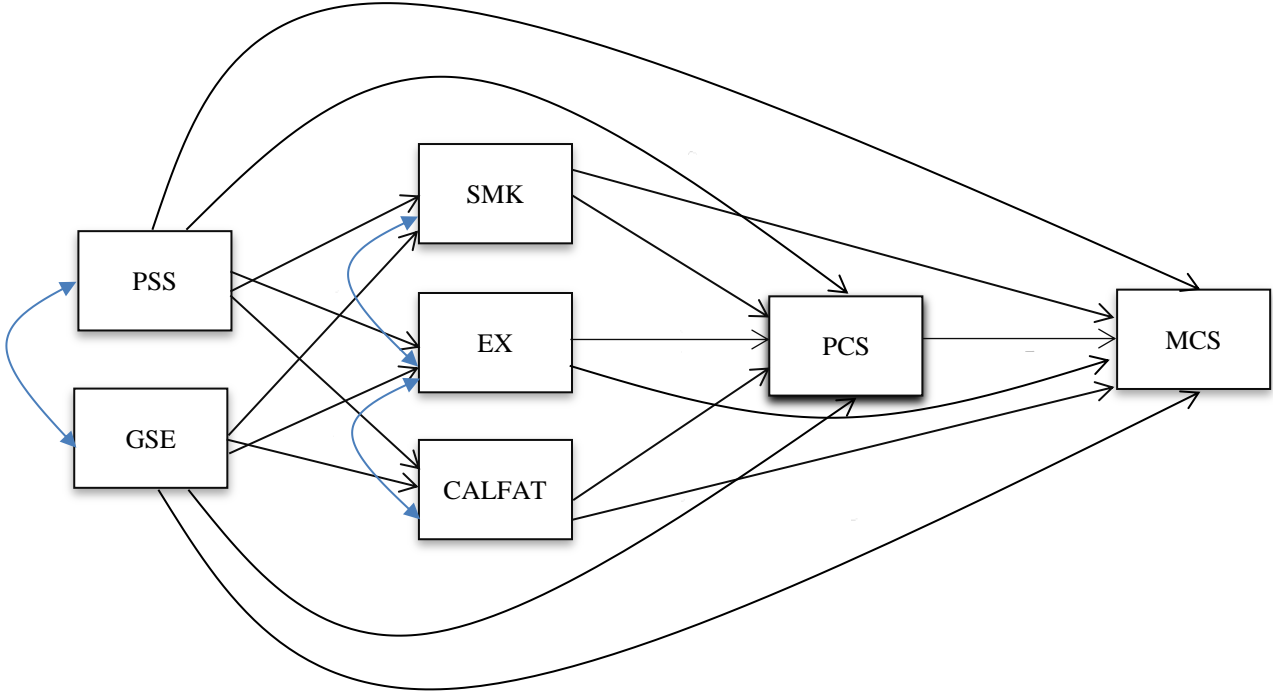
Standardized Parameter Estimates

PSS→SMK, .12*	GSE→SMK, -.08	SMK→PCS, .16*	EX→PCS, .30*	CALFAT→PCS, .03	PCS→MCS, .11*
PSS→EX, .05	GSE→EX, .22*	SMK→MCS, .00	EX→MCS, .03	CALFAT→MCS, .02	
PSS→CALFAT, .00	GSE→CALFAT, .13*				

PSS→PCS, .02   GSE→PCS, .03
PSS→MCS, .22*   GSE→MCS, .24*

Note. MCS = The Medical Outcome Study Short Form Mental Health Composite Score; PCS = The Medical Outcome Study Short Form Physical Health Composite Score; GSE = The General Self-Efficacy Scale; PSS= The Multidimensional Scale of Perceived Social Support, CALFAT=Stage of Change for Calorie and Fat Intake, EX=Stage of Change for Exercise. *significant at the α = .05 level. Blue arrows indicate covariance.

FIGURE 3. DIRECT MODEL
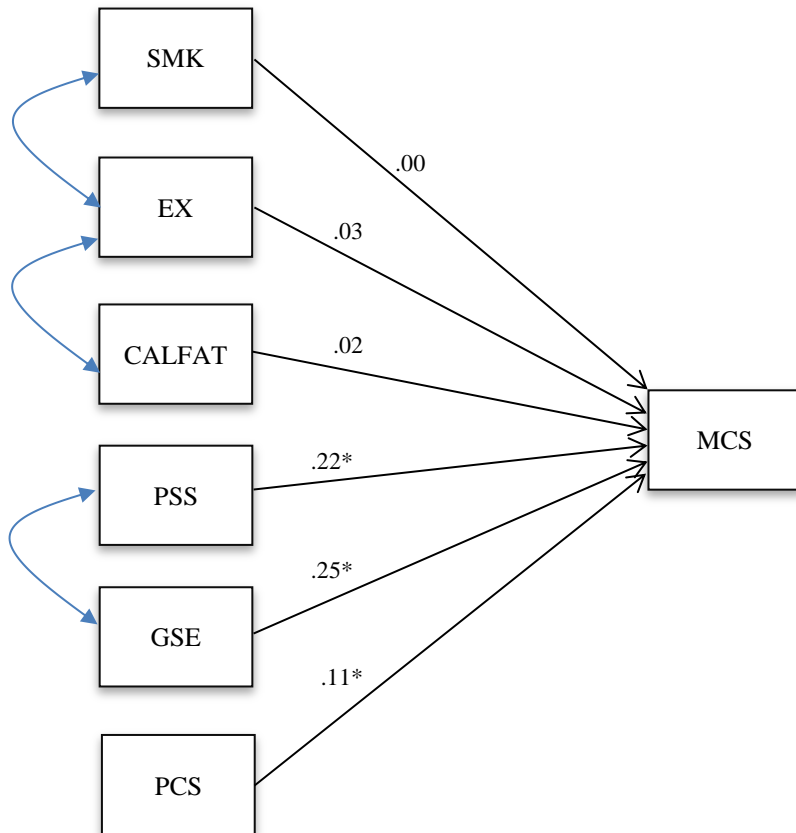
Note. SMK=Stage of Change for Smoking Cessation; EX=Stage of Change for Exercise, CALFAT= Stage of Change for Calorie and Fat Intake; PSS=Multidimensional Scale of Perceived Social Support Total Score; GSE=The General Self-Efficacy Scale Total Score; MCS = The Medical Outcome Study Short Form Mental Health Composite Score. *significant at the α = .05 level. Blue arrows indicate covariance.

APPENDICES

INFORMED CONSENT FORM

Title of Research Protocol: Mental health, health behaviors, social support, self-efficacy, and physical illness: An integrative model

Principal Investigator: James O. Prochaska

CONSENT FORM FOR RESEARCH: ASSESSMENT BATTERY

You have been asked to take part in a research study described below. If you have questions at any time, you may discuss them with principal investigator Dr. James Prochaska. He may be reached at 401-874-2830.

1. **Description of the Project**: The purpose of this research is to test a statistical model that looks at the relationships between three health behaviors, social support, self-efficacy, and physical health and their relationship to mental health functioning among adults.

2. What will be done: You are one of 400 people who will be asked to complete a survey that asks about mental health, health behaviors, social support, self-efficacy, physical health, and demographics. To participate, you must be at least 18 years-old and able to read and speak English. The survey is administered online and should take approximately 20 minutes.

3. **Risks or Discomforts**: You might experience some discomfort discussing your mental and physical health. There are no other known risks associated with participating in this study.

4. **Expected Benefits of the Study**: You may not receive any direct benefit from taking part in this study. Taking part in the study, however, may help others like you in the future. Some people may find participation in this research informative and personally beneficial.

5. **Confidentiality**:   Participation in this project is completely confidential and anonymous. Your information will not be shared with anyone except study personnel working for the Cancer Prevention Research Center. Survey responses to assessment questions will be stored by the secure database of the survey company server (SurveyMonkey). We will not collect or store IP addresses. SurveyMonkey makes no effort to identify individual responders by IP address and their privacy practices are reviewed for compliance by TRUSTe. SurveyMonkey databases are protected by passwords and database and network firewalls to protect survey

information. After online data collection is complete, the data will be transferred to a secure server at URI which is firewall protected with restricted access to study personnel through a virtual private network (VPN). These data will be destroyed within ten years of the collection date.

6. **Decision to Quit at Any Time**: Taking part in this study is entirely voluntary. If you wish, you may discontinue the survey at any time. You need not give any reasons for discontinuation. Your decision about whether or not to complete the survey will in no way affect on your relationship with the Cancer Prevention Research Center, the personnel associated with this study, or employees of the University of Rhode Island.

7. **Rights and Complaints**: If you are not satisfied with the way this study is performed, or if you have questions about your rights as a research subject, you may discuss your concerns with Dr. James Prochaska (401-874-2830), anonymously, if you choose. In addition, you may contact the office of the Vice President of Research, 70 Lower College Road, Suite 2, University of Rhode Island, Kingston, RI 02882 (401-874-4328).

You have read this Consent Form and currently have no further questions concerning your participation in this project. You understand that you may ask any additional questions at any time and that your participation in this project is voluntary. By participating in the project, you agree that your answers can be used without your signed consent.

 James O. Prochaska, Ph.D.

Demographic Questions

What is your age?
- 18 to 24
- 25 to 34
- 35 to 44
- 45 to 54
- 55 to 64
- 65+

What is your race (You may select more than one)?

- White
- Hispanic or Latino
- Black or African American
- Native American
- Asian / Pacific Islander
- Other
- Mixed

What is your gender?
- Male
- Female
- Transgender

Do you consider yourself to be:
- Heterosexual or straight
- Gay
- Lesbian
- Bisexual
- Queer
- Asexual
- Other
- Unsure

What is your marital status?

- Single, never married
- Married or domestic partnership/ civil union
- Widowed
- Divorced
- Separated

What is the highest degree or level of school you have completed? *If currently enrolled, select highest degree received.*

- Some high school, no diploma
- High school graduate, diploma or the equivalent (for example: GED)
- Some college credit, no degree
- Trade/technical/vocational training
- Associate degree
- Bachelor's degree
- Master's degree
- Professional degree
- Doctorate degree

What is your health insurance status?

- Private Plan
- Employment-based Plan
- Direct Purchase
- Government Plan
- Medicare
- Medicaid
- Military Healthcare
- Uninsured

Facebook Utilization Questions

Do you currently have a Facebook account?

- Yes
- No

On a daily basis, how often do you go on Facebook?
- Not at all
- 2
- 3
- 4
- 5
- 6
- Very frequently

On a weekly basis, how often do you go on Facebook?
- Not at all
- 2
- 3
- 4
- 5
- 6
- Very frequently

How much time do you usually spend on Facebook per session?

- 0–15 minutes
- 16–30 minutes
- 31–45 minutes
- 46–60 minutes
- 1–2 hours
- 2–4 hours
- more than 4 hours

Do you use Facebook as a way to receive social support?

- Yes
- No
- Unsure

In general, do your experiences on Facebook make you feel better, no different, or worse?
- Feel better
- No different
- Worse

Smoking Cessation

Have you quit smoking?

- ⚢ I was never a cigarette smoker.
- ⚢ No, and I do not intend to quit in the next 6 months.
- ⚢ No, but I intend to quit in the next 6 months.
- ⚢ No, but I intend to quit in the next 30 days.
- ⚢ Yes, I quit less than 6 months ago.
- ⚢ Yes, I quit more than 6 months ago, but less than 5 years ago.
- ⚢ Yes, I quit more than 5 years ago.

On average, how many cigarettes do you smoke during a typical day?

- Less than 9
- 10-19
- 20-20
- 30+

Exercise

Regular exercise means doing:

    Moderate-intensity aerobic or "cardio" activity that increases your breathing rate and causes you to break a light sweat (such as brisk walking) for **at least 150 minutes** (2 hours and 30 minutes) each week

<div align="center">OR</div>

    Vigorous-intensity aerobic or "cardio" activity that causes big increases in your breathing and heart rate and makes conversation difficult (such as jogging or running) for **at least 75 minutes** (1 hour and 15 minutes) each week

<div align="center">OR</div>

    A mix of moderate and vigorous aerobic activity that is equal to **at least 150 minutes** of moderate activity, such as 90 minutes of moderate activity and 30 minutes of vigorous activity each week. (Keep in mind that 1 minute of vigorous activity equals about 2 minutes of moderate activity.)

Do you engage in regular exercise according to any of the previous definitions?

- ⑀ No, and I do not intend to in the next 6 months.
- ⑀ No, but I intend to in the next 6 months.
- ⑀ No, but I intend to in the next 30 days.
- ⑀ Yes, I have been, but for less than 6 months.
- ⑀ Yes, I have been for more than 6 months.

Godin Leisure-Time Exercise Questionnaire

1) During a typical **7-Day period** (a week), how many times on the average do you do the following kinds of exercise for **more than 15 minutes** during your free time (write on each line the appropriate number)?

a) Strenuous exercise (heart beats rapidly)
(e.g. running, jogging, hockey, football, soccer, squash, basketball, cross country skiing, judo, roller skating, vigorous swimming, vigorous long distance bicycling)

Times per Week _____

b) Moderate exercise (not exhausting)
(e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, alpine skiing, popular and folk dancing)

Times per Week _____

c) Mild exercise (minimal effort)
(e.g., yoga, archery, fishing from river bank, bowling, horseshoes, golf, snow-mobiling, easy walking)

Times per Week _____

2) During a typical **7-Day period** (a week), in your leisure time, how often do you engage in any regular activity **long enough to work up a sweat** (heart beats rapidly)?

- Often
- Sometimes
- Never/Rarely

Healthy Eating

Healthy eating means doing both of the following:
> Eating the number of calories that allows you to reach and maintain a healthy weight
>
> Eating a diet that is low in saturated and trans fats

Eating the number of calories that allows you to reach and maintain a healthy weight means doing things like:
> Eating small portions
>
> Paying attention to serving sizes
>
> Eating more vegetables and fruits
>
> Limiting unhealthy snacks
>
> Telling yourself that calories count

Do you eat the number of calories that allows you to reach and maintain a healthy weight?

$ No $ Yes

Eating a diet low in saturated and trans fats means doing things like:
> Eating lean meat, such as chicken without the skin or extra lean ground beef
>
> Eating low-fat cheeses and other low-fat dairy products
>
> Eating fruits and vegetables as snacks
>
> Using olive oil in place of butter
>
> Limiting processed foods, particularly snack foods make with hydrogenated oils (trans fats)

Do you eat a diet that is low in saturated and trans fats?

$ No $ Yes

Are you planning to change what you eat so you can answer YES to questions 10 and 11?

$ No, and I do not intend to in the next 6 months. (Go to Question 14)

$ Yes, and I intend to in the next 6 months. (Go to Question 14)

$ Yes, and I intend to in the next 30 days. (Go to Question 14)

$ I did answer yes to questions 10 and 11. (Go to Question 13)

How long have you been doing these two things?

$ For less than 6 months $ For more than 6 months

Do you eat at least 4½ cups of fruits and vegetables per day? (A cup is equal to 1 cup 100% fruit or vegetable juice, 1 cup cooked vegetables, 2 cups raw leafy vegetables,

$ No, and I do not intend to in the next 6 months.

$ No, but I intend to in the next 6 months.

$ No, but I intend to in the next 30 days.

$ Yes, I have been, but for less than 6 months.

$ Yes, I have been for more than 6 months.

One cup of fruit is equal to:

- **8 large strawberries**
- **1 cup of 100% fruit juice**
- **2 canned peach halves**
- **a piece of fruit (such as an apple, orange, banana, or peach)**
- **a handful (½ cup) of dried fruit like raisins or apricots**

How many cups of fruits do you eat in a typical day?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15 and more

One cup of cooked or raw vegetables is equal to:

- 12 baby carrots
- 1 cup of 100% vegetable juice
- 1 large sweet potato
- 1 large ear of corn
- a large plate of raw, leafy greens such as spinach or lettuce

How many cups of vegetables do you eat in a typical day?

- 0
- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8

- 9
- 10
- 11
- 12
- 13
- 14
- 15 and more

Emotional Distress

Everyone experiences **emotional distress** from time to time. Emotional distress includes boredom, stress, loneliness, frustration, disappointment, unhappiness, failure, and feeling unappreciated, deprived, hassled, or worried. People use a variety of strategies to cope with emotional distress, including strategies that have negative long term consequences, such as eating, smoking, drinking, or using drugs. **We are most interested in people who eat in response to emotional distress.** When people eat to cope with distress, they are eating not because they are hungry, but to manage their emotions. They eat to feel better, reward themselves, relax, forget their worries, induce sleep, reduce stress, or escape.

Emotional Distress: Your Eating Habits

Some people may not be aware that they eat to cope with distress. The next section lists some signs of **eating in response to emotional distress**. Please tell us **how often** you have experienced each of them within the **last 30 days** (including today).
Your answer choices are:
1 = Never
2 = Seldom
3 = Occasionally
4 = Often
5 = Repeatedly

Think about how often you have done each of the following in the last month.	1	2	3	4	5
1. Eating when you are full	$	$	$	$	$
2. Giving in to the late night munchies	$	$	$	$	$
3. Eating large amounts of food while watching TV or reading	$	$	$	$	$
4. Craving "comfort foods"	$	$	$	$	$
5. Snacking after work or school	$	$	$	$	$
6. Eating more when you are alone	$	$	$	$	$
7. Eating soon after a big meal	$	$	$	$	$
8. Eating standing up	$	$	$	$	$
9. Rewarding yourself with food	$	$	$	$	$
10. Eating more than you planned to	$	$	$	$	$
11. Eating because you think that you deserve a break	$	$	$	$	$
12. Telling yourself that you can treat yourself with food	$	$	$	$	$

1. Do you rely on eating as a way to cope with emotional distress?

$ YES, and I do NOT intend to stop in the next 6 months
$ YES, and I intend to stop in the next 6 months
$ YES, and I intend to stop in the next 30 days
$ NO, but I have in the past 6 months
$ NO, and I have NOT in the past 6 months
$ NO, and I never have ⟶

The Multidimensional Scale of Perceived Social Support

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

2. There is a special person with whom I can share my joys and sorrows. 1 2 3 4 5 6 7

3. My family really tries to help me.   1 2 3 4 5 6 7

4. I get the emotional help and support I need from my family.   1 2 3 4 5 6 7

5. I have a special person who is a real source of comfort to me.   1 2 3 4 5 6 7

6. My friends really try to help me.   1 2 3 4 5 6 7

7. I can count on my friends when things go wrong.   1 2 3 4 5 6 7

8. I can talk about my problems with my family.   1 2 3 4 5 6 7

9. I have friends with whom I can share my joys and sorrows.   1 2 3 4 5 6 7

10. There is a special person in my life who cares about my feelings.   1 2 3 4 5 6 7

11. My family is willing to help me make decisions.   1 2 3 4 5 6 7

12. I can talk about my problems with my friends.   1 2 3 4 5 6 7

General self-efficacy (GSE)

GSE Scale (Schwarzer & Jerusalem, 1995)

Response options:
1 = Not at all true
2 = Hardly true
3 = Moderately true
4 = Exactly true

1. I can always manage to solve difficult problems if I try hard enough.   1 2 3 4

2. If someone opposes me, I can find the means and ways to get what I want.   1 2 3 4

3. It is easy for me to stick to my aims and accomplish my goals.   1 2 3 4

4. I am confident that I could deal efficiently with unexpected events.   1 2 3 4

5. Thanks to my resourcefulness, I know how to handle unforeseen situations.   1 2 3 4

6. I can solve most problems if I invest the necessary effort.   1 2 3 4

7. I can remain calm when facing difficulties because I can rely on my coping abilities.
                                                                                          1 2 3 4

8. When I am confronted with a problem, I can usually find several solutions.   1 2 3 4

9. If I am in trouble, I can usually think of a solution.   1 2 3 4

10. I can usually handle whatever comes my way.   1 2 3 4

Your Health and Well-Being

This survey asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. *Thank you for completing this survey!*

For each of the following questions, please mark an ⊠ in the one box that best describes your answer.

1.   **In general, would you say your health is:**

Excellent	Very good	Good	Fair	Poor
▼	▼	▼	▼	▼
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

2. **Compared to one year ago**, how would you rate your health in general **now**?

Much better now than one year ago	Somewhat better now than one year ago	About the same as one year ago	Somewhat worse now than one year ago	Much worse now than one year ago
▼	▼	▼	▼	▼
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

3.   The following questions are about activities you might do during a typical day. Does <u>your health now limit you</u> in these activities? If so, how much?

	Yes, limited a lot	Yes, limited a little	No, not limited at all
a<u>Vigorous activities</u>, such as running, lifting heavy objects, participating in strenuous sports	☐ 1	☐ 2	☐ 3
b<u>Moderate activities</u>, such as moving a table, pushing a vacuum cleaner, bowling, or playing golf	☐ 1	☐ 2	☐ 3
cLifting or carrying groceries	☐ 1	☐ 2	☐ 3
dClimbing <u>several</u> flights of stairs	☐ 1	☐ 2	☐ 3
eClimbing <u>one</u> flight of stairs	☐ 1	☐ 2	☐ 3
fBending, kneeling, or stooping	☐ 1	☐ 2	☐ 3
gWalking <u>more than a mile</u>	☐ 1	☐ 2	☐ 3
hWalking <u>several hundred yards</u>	☐ 1	☐ 2	☐ 3
iWalking <u>one hundred yards</u>	☐ 1	☐ 2	☐ 3
jBathing or dressing yourself	☐ 1	☐ 2	☐ 3

4.   During the <u>past 4 weeks</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of your physical health</u>?

	All of the time ▼	Most of the time ▼	Some of the time ▼	A little of the time ▼	None of the time ▼
aCut down on the <u>amount of time</u> you spent on work or other activities	☐ 1	☐ 2	☐ 3	☐ 4
bAccomplished less than you would like	☐ 1	☐ 2	☐ 3	☐ 4
cWere limited in the <u>kind</u> of work or other activities	☐ 1	☐ 2	☐ 3	☐ 4
dHad <u>difficulty</u> performing the work or other activities (for example, it took extra effort)	☐ 1	☐ 2	☐ 3	☐ 4

5.   During the <u>past 4 weeks</u>, how much of the time have you had any of the following problems with your work or other regular daily activities <u>as a result of any emotional problems</u> (such as feeling depressed or anxious)?

	All of the time ▼	Most of the time ▼	Some of the time ▼	A little of the time ▼	None of the time ▼
aCut down on the <u>amount of time</u> you spent on work or other activities	☐ 1	☐ 2	☐ 3	☐ 4
bAccomplished less than you would like	☐ 1	☐ 2	☐ 3	☐ 4
cDid work or other activities <u>less carefully than usual</u>	☐ 1	☐ 2	☐ 3	☐ 4

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

Not at all	Slightly	Moderately	Quite a bit	Extremely
▼	▼	▼	▼	▼
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

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

None	Very mild	Mild	Moderate	Severe	Very severe
▼	▼	▼	▼	▼	▼
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5	☐ 6

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

Not at all	A little bit	Moderately	Quite a bit	Extremely
▼	▼	▼	▼	▼
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

9. **These questions are about how you feel and how things have been with you <u>during the past 4 weeks</u>. 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 <u>past 4 weeks</u>…**

	All of the time ▼	Most of the time ▼	Some of the time ▼	A little of the time ▼	None of the time ▼
a Did you feel full of life?	☐ 1	☐ 2	☐ 3	☐ 4
b Have you been very nervous?	☐ 1	☐ 2	☐ 3	☐ 4
c Have you felt so down in the dumps that nothing could cheer you up?	☐ 1	☐ 2	☐ 3	☐ 4
d Have you felt calm and peaceful?	☐ 1	☐ 2	☐ 3	☐ 4
e Did you have a lot of energy?	☐ 1	☐ 2	☐ 3	☐ 4
f Have you felt downhearted and depressed?	☐ 1	☐ 2	☐ 3	☐ 4
g Did you feel worn out?	☐ 1	☐ 2	☐ 3	☐ 4
h Have you been happy?	☐ 1	☐ 2	☐ 3	☐ 4
i Did you feel tired?	☐ 1	☐ 2	☐ 3	☐ 4

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

All of the time ▼	Most of the time ▼	Some of the time ▼	A little of the time ▼	None of the time ▼
☐ 1	☐ 2	☐ 3	☐ 4	☐ 5

11. How TRUE or FALSE is <u>each</u> of the following statements for you?

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
	▼	▼	▼	▼	▼
aI seem to get sick a little easier than other people	☐ 1	☐ 2	☐ 3	☐ 4
bI am as healthy as anybody I know	☐ 1	☐ 2	☐ 3	☐ 4
cI expect my health to get worse	☐ 1	☐ 2	☐ 3	☐ 4
dMy health is excellent	☐ 1	☐ 2	☐ 3	☐ 4

Mental Health Questions

Have you been diagnosed with any of the following mental health conditions by a health professional in the past or currently? (You may select more than one)

- Anxiety
- Depression
- Substance abuse/dependence
- Bipolar disorder
- Schizophrenia
- Attention Deficit/ Hyperactivity Disorder
- Eating disorder
- Panic
- Post-traumatic stress disorder
- Personality disorder
- Obsessive Compulsive disorder
- Other
- Never

Have you ever been prescribed medication for a mental health condition such as anxiety or depression?

- Yes
- No

Do you currently have prescription(s) for any of the following mental health medications? (You may select more than one category)

- Anti-anxiety (e.g. Klonopin, Ativan, Valium, Xanax etc.)
- Antidepressants (e.g. Celexa, Cymbalta, Effexor, Lexapro, Luvox, Paxil, Prozac, Remeron, Wellbutrin etc.)
- Typical antipsychotics (e.g. Thorazine, Haldol, Clozaril etc.)
- Atypical antipsychotics (e.g. Risperdal, Zyprexa, Seroquel, Geodon, Abilify, Invega)
- Mood stabilizers/ Anticonvulsants (e.g. Depakote, Lamictal, Neurontin, Tegretol, Topamax)
- Stimulants (e.g. Ritalin, Concerta, Adderall, Dexedrine etc.)
- No

Physical Health Questions

Do you currently suffer from any of the following medical conditions? (You may select more than one)

- Cancer (e.g. breast, lung, colon etc.)
- Cerebrovascular disease (e.g. stroke)
- Cardiovascular disease (e.g. coronary heart disease, high blood pressure or hypertension, peripheral heart disease)
- Type 1 or 2 diabetes
- No

Do you receive medical treatment (e.g. medication) for any of the medical conditions you previously indicated?

- Yes
- No

What is your height? (feet and inches)

What is your weight? (pounds)

BIBLIOGRAPHY

Alegria, M., Jackson, J. S., & Kessler, R. C. (2003). *National Comorbidity Survey Replication (NCS-R), 2001-2003*. Ann Arbor: Interuniversity Consortium for Political and Social Research.

American Psychological Association. (2008). Presidential task force on integrated health care for an aging population. *Blueprint for change: Achieving integrated health care for an aging population*. Washington, DC: American Psychological Association. Retrieved from https://www.apa.org/pi/aging/programs/integrated/integrated-healthcare-report.pdf

Angell, M. (2011, June 11). *The epidemic of mental illness: Why?* Retrieved from http://www.nybooks.com/articles/archives/2011/jun/23/epidemic-mental-illness-why/?page=1

Appleton, K. M., Rogers, P. J, Ness, A. R. (2010). Updated systematic review and meta-analysis of the effects of n-3 long-chain polyunsaturated fatty acids on depressed mood. *American Journal of Clinical Nutrition*, *91*, 757-70. doi: 10.3945/ajcn.2009.28313

Aschbrenner, K. A., Mueser, K. T., Bartels, S. J., & Pratt, S. I. (2013). Perceived social support for diet and exercise among persons with serious mental illness enrolled in a healthy lifestyle intervention. *Psychiatric Rehabilitation Journal*, *36*, 65-71. doi: 10.1037/h0094973.

Baker, A., Richmond, R., Haile, M., *et a.l* (2006). A randomized controlled trial of a

smoking cessation intervention among people with a psychotic disorder. *American Journal of Psychiatry*, *163*, 1934–1942

Bandura, A. (2004). Health promotion and social cognitive means. *Health Education and Behavior*, *31*, 143-164.

Bandura, A. (1977). Self-efficacy: Toward a unifying theory of behavioral change. *Psychological Review*, *84*, 191-215.

Baranowski, T., Watson, K., Missaghian, M., Broadfoot, A., Cullen, K., Nicklas, T., Fisher, .J, Baranowski, J., & O'Donnell, S. Social support is a primary influence on home fruit, 100% juice, and vegetable availability. (2008). *Journal of the American Dietetic Association*, *108*, 1231-5. doi: 10.1016/j.jada.2008.04.016

Baron, R. M. & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: Conceptual, strategic, and statistical considerations. *Journal of Personality and Social Psychology*, *51*, 1173-1182.

Bentler, P. (1990). Comparative fit indexes in structural models. *Psychological Bulletin, 107*, 238-246.

Bentler, P.M. & Chou, C. (1987). Practical issues in structural modeling. *Sociological Methods and Research, 16*, 78–117.

Bentler, P. M., & Wu, E. (1995). *EQS for Windows User's Guide*. Multivariate Software Inc; Encino, CA.

Brazier, J. E., Harper, R., Jones, N. M., O'Cathain, A., Thomas, K. J., Usherwood, T., & Westlake, L. (1992). Validating the SF-36 health survey questionnaire: New

outcome measure for primary care. *BMJ (Clinical Research Ed.), 305*(6846), 160-164.

Breslau, N., Novak, S. P. & Kessler, R. C. (2004). Psychiatric disorders and stages of smoking. *Biological Psychiatry*, *55*, 69–76.

Burke, M., Marlow, C., & Lento, T. (2010). Social network activity and social well-being. Retrieved from: http://www.cameronmarlow.com/media/burke-2010-social-well-being.pdf.

Cacioppo, J. T., Hawkley, L. C., Norman, G. J., & Berntson, G. G. (2011). Social isolation. *Annals of the New York Academy of* Sciences, *1231*, 17-22.

Casey D. E & Hansen, T.E. (2003). *Excessive Morbidity and Mortality in Schizophrenia*. Chapter 2 *in* J.M. Meyer and H.A. Nasrallah (editors). *Medical Illness and Schizophrenia* (pp. 13–34). Washington, D.C.: American Psychiatric Publishing.

Centers for Disease Control and Prevention. (2010). *CDC Report: Mental illness surveillance among U.S. Adults* Retrieved from http://www.cdc.gov/mentalhealthsurveillance/index.html.

Centers for Disease Control and Prevention. (2014). Current Cigarette Smoking Among Adults—United States, 2005–2013. Morbidity and Mortality Weekly Report 2014;63(47):1108–12 [accessed 2015 July 1].

Centers for Disease Control and Prevention. Exercise or physical activity. NCHS FastStats web site. http://www.cdc.gov/nchs/fastats/exercise.htm. Accessed July 3, 2013.

Centers for Disease Control and Prevention. (2013a). NCHS data on obesity. NCHS

Fact Sheet web site. Retrieved from

http://www.cdc.gov/nchs/data/factsheets/factsheet_obesity.htm. Accessed

March 7, 2015.

Centers for Disease Control and Prevention. (2013b). *Vital signs: current cigarette*

smoking among adults aged ≥18 Years with Mental Illness — United States,

2009–2011. Retrieved from

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6205a2.htm?s_cid=mm62

05a2_w.

Centers for Disease Control and Prevention. (2013c). Adult participation in aerobic

and muscle-strengthening physical activities — United States, 2011. Retrieved

from

http://www.cdc.gov/mmwr/preview/mmwrhtml/mm6217a2.htm?s_cid=mm62

17a2_w.

Cerin, E. (2010). Ways of unraveling how and why physical activity influences mental

health through statistical mediation analyses. Mental Health and Physical

Activity, 3, 51-60. doi: 10.1016/j.mhpa.2010.06.002

Colcombe, S. & Kramer, A. F. (2003). Fitness effects on the cognitive function of

older adults. A meta-analytic study. *Psychological Science*, *14*, 125-130. doi:

10.1111/1467-9280.t01-1-01430.

Cohen, S., Underwood, L., & Gottlieb, .B (Eds.) (2000). Social support measurement

and interventions: A guide for health and social scientists. New York: Oxford.

Cohen, S. & Wils, T. A. (1985). Stress, social support, and the buffering hypothesis.

Psychological Bulletin, *98*, 310-357.

Cohen, S. (1988). Psychosocial models of the role of social support in the etiology of physical disease. *Health Psychology*, *7*(3), 269-297.

Cuijpers, P., Beekman, A. T., & Reynolds, C. F. (2012). Preventing depression: A global priority. *JAMA*, *307*, 1033-34.

Cummins, C. O., Johnson, J. L., Mauriello, L. M., Paiva, A., Dyment, S. (2006). Empirical support for the application of the Transtheoretical Model to fruit and vegetable consumption among college students. Paper presented at the 134th Annual Meeting of the American Public Health Association; Boston, MA.

Daley, A. J. (2002). Exercise therapy and mental health in clinical populations: Is exercise therapy a worthwhile intervention? *Advances in Psychiatric Treatment*, *8*, 262-270. doi: 10.1192/apt.8.4.262.

De Hert, M., Correll, C. U., Bobes, J.,Cetkovich-Bakmas, M., Cohen, D., Asasi, I., Detraux, J., Gautman, S., Moller, H. J., Ndetei, D. M., Newcomer, J. W., Uwakwe, R., & Leucht, S. (2011). Physical illness in patients with severe mental disorders. I. Prevalence, impact of medications and disparities in health care. *World Psychiatry*, *10*(1), 52–77.

Delucchi, K. L. (1993). On the use and misuse of chisquare. In G. Keren & C. Lewis (Eds.), A handbook for data analysis in the behavioral sciences (pp. 294-319). Hillsdale, NJ: Lawrence Erlbaum.

Dennis, M., Wakefield, P., Molloy, C., Andrews, H., & Friedman, T. (2005). Self-harm in older people with depression: Comparison of social factors, life events and symptoms. *British Journal of Psychiatry*, *186*, 538–539. doi: 10.1192/bjp.186.6.538.

Deslandes, A., Moraes, H., Ferreira, C., Veiga, H., Silveria, H., Mouta, R.,. . . Laks, J. (2009). Exercise and mental health: Many reasons to move. *Neuropsychobiology*, *59*, 191–198. doi:10.1159/000223730.

Dowd, S., Vickers, K., & Krahn, D. (2004). Exercise for depression: How to get patients moving. *Current Psychiatry*, *3*(6), 10–20.

Dunn, A. L., Trivedi, M. H., Kampert, J. B., Clark, C. G., Chambliss, H. O. (2002). The DOSE study: exercise as treatment for depression: a clinical trial to examine efficacy and dose response. *Controlled Clinical Trials, 23*, 584–603. doi: 10.1016/S0197-2456(02)00226-X

Dunn, A. L., Trivedi, M. H., Kampert, J. B., Clark, C. G., Chambliss, H. O. (2005). Exercise treatment for depression: efficacy and dose response. *American Journal of Preventive Medicine*, *28*, 1-8. doi:10.1016/j.amepre.2004.09.003

Dweck, C. S. & Leggett, E. L. (1988). A social cognitive approach to motivation and personality. *Psychological Review*, *95*, 256- 273.

Franko, D. L., Thompson, D., Affenito, S. G., Barton, B. A., Striegel-Moore, R. H. (2008). What mediates the relationship between family meals and adolescent health issues. *Health Psychology*, *27*, S109-17. doi: 10.1037/0278-6133.27.2(Suppl.).S109.

Fratiglioni, L., Paillard-Borg, S., & Winblad, B. (2004). An active and socially integrated lifestyle in late life might protect against dementia. *Lancet Neurology*, *3*, 343–353. doi: 10.1016/S1474-4422(04)00767-7.

Fritz, M. S. & MacKinnon, D. P. (2007). Required sample size to detect the mediated effect. *Psychological Science*, *18*, 233-239.

Fryar, C. D., Chen, T., & Li, X. (Prevalence of uncontrolled risk factors for

    cardiovascular disease: United States, 1999–2010. (2012). NCHS Data Brief,

    No. 103. Hyattsville, MD: National Center for Health Statistics, Centers for

    Disease Control and Prevention, US Dept. of Health and Human Services.

Gjesfjeld, C., Greeno, C., & Kim, K., & Anderson, C. (2010). Economic stress, social

    support, and maternal depression: Is social support deterioration occurring?

    Social Work Research, 34, 135–143.

Godin, G., & Shephard, R. J. (1997). Godin Leisure-Time Exercise Questionnaire.

    Medicine and Science in Sports and Exercise, *29*, S36-S38.

Gómez-Pinilla, F. (2008). Brain foods: The effects of nutrients on brain function.

    Nature Reviews Neuroscience, *9*(7), 568-578.

Gorin, A., Phelan, S., Tate, D., Sherwood, N., Jeffery, R., & Wing, R. (2005).

    Involving support partners in obesity treatment. *Journal of Consulting and

    Clinical Psychology*, *73*(2), 341.

Green, S. B., Akey, T. M., Fleming, K. K., Hershberger, S. L., & Marquis, J. G..

    (1997). Effect of the number of scale points on chi‑square fit indices in

    confirmatory factor analysis. *Structural Equation Modeling: A

    Multidisciplinary Journal*, *4*, 108-120. doi: 10.1080/10705519709540064

Hamer, M., & Chida, Y. (2009). Physical activity and risk of neurodegenerative

    disease: A systematic review of prospective evidence. *Psychological Medicine*,

    39, 3–11. doi:10.1017/S0033291708003681.

Harlow, L. L. (2005). *The essence of multivariate thinking: Basic themes and methods* (2nd Edition). Lawrence Erlbaum Associates, Inc., Publishers. New Jersey.

Harris, E. C. & Barraclough, B. (1998). Excess mortality of mental disorder. British *Journal of Psychiatry*, *173*, 11-53.

Hogan, B. E., Linden, W., & Najarian, B. (2002). Social support interventions do they work? *Clinical Psychology Review*, *22*(3), 381-440.

Holt-Lunstad, J., Smith, T. B., & Layton, J. B. (2010). Social relationships and mortality risk: A meta-analytic review. *PLoS Medicine*, *7*, e1000316. doi:10.1371/journal.pmed.1000316

Hu, L. & Bentler, P. M. (1999). Cutoff criteria for fit indexes in structure analysis: Conventional criteria versus new alternatives. *Structural Equation Modeling, 6*, 1-55.

Jacka, F. N., Mykletun, A., Berk, M. (2012). Moving towards a population health approach to the primary prevention of common mental disorders. BMC Medicine, 27, 10:149. doi: 10.1186/1741-7015-10-149.

Johnson, S. S, Paiva, A. L. Cummins, C., Johnson, J. L. Dyment, S., Wright, J. A., Prochaska, J. O., Prochaska, J. M., & Sherman, K. (2008). Evidence-based multiple behavior intervention for weight management: Effectiveness on a population basis. *Preventive Medicine, 46*, 238-246. doi: 10.1016/j.ypmed.2007.09.010.

Jorm, A. F, Christensen, H., Griffiths, K. M., & Rodgers, B. (2002). Effectiveness of

complementary and self-help treatments for depression. *Medical Journal of Australia*, *20*, Suppl, S84-96.

Kessler, R. C., Chiu, W. T., Demler, O., & Walters, E. E. (2005). Prevalence, severity, and comorbidity of twelve-month DSM-IV disorders in the National Comorbidity Survey Replication (NCS-R). *Archives of General Psychiatry*, *62*, 617-27.

Kilian, R., Becker, T., Krüger, K., Schmid, S., & Frasch K. (2006). Health behavior in psychiatric in-patients compared with a German general population sample. Acta Psychiatrica Scandinavica*, 114*(4), 242-8.

Kim, Y. H. (2003). Correlation of mental health problems with psychological construction in adolescence: Final results from a 2 year study. *International Journal of Nursing Studies*, *40*, 115-125.

Kline, R. B. (2010) *Principles and Practice of Structural Equation Modeling (3rd Edition).* New York, NY: The Guilford Press.

Korkiakangas, E., Taanila, A. M, Keinänen-Kiukaanniemi, S. (2011). Motivation to physical activity among adults with high risk of type 2 diabetes who participated in the Oulu substudy of the Finnish Diabetes Prevention Study. *Health & Social Care in the Community*, *19*, 15-22. doi: 10.1111/j.1365-2524.2010.00942.x

Kumanyika, *S. &* Economos, *C.* (2011). Prevention of obesity. Finding the best evidence. [Commentary] *World Nutrition*, *2*, 283-299.

LaForge, R. G., Greene, G. W., & Prochaska, J. O. (1994). Psychosocial factors

influencing low fruit and vegetable consumption. *Journal of Behavioral Medicine*, *17*, 361–374.

Lawlor, D.A., & Hopker, S.W. (2001). The Effectiveness of exercise as an intervention in the management of depression: Systematic review and meta-regression analysis of randomised controlled trials. *British Medical Journal*, 322, 763–767.

Boseley, S. (2015, July 31). Americans cutting calorie intake but junk food proves a hard habit to kick. *The Guardian*. Retrieved from http://www.theguardian.com/us-news/2015/jul/31/americans-cutting-calorie-intake-study-first-step?CMP=Share_AndroidApp_Gmail

Lockwood, C. M, DeFrancesco, C. A, Elliot, D. L., Beresford, S. A, & Toobert, D. J. (2010). Mediation analyses: applications in nutrition research and reading the literature. *Journal of American Dietetic Association*, *110*, 753-62. doi: 10.1016/j.jada.2010.02.005.

MacCallum, R.C., Browne, M.W., and Sugawara, H., M. (1996). Power analysis and determination of sample size for covariance structure modeling. *Psychological Methods*, *1*(2), 130-49. Maddux, J. E. (2002). *Self- efficacy: the power of believing you can*. The handbook of positive psychology. New York: Oxford University Press.

Mark, T. L., Levit, K. R., Buck, J. A., Coffey, R. M., Vandivort-Warren, R. (2007). Mental health treatment expenditure trends, 1986--2003. *Psychiatric Services*, *58*(8), 1041--8.

Martini, S., Wagner, F. A., & Anthony, J. C. (2002). The association of tobacco smoking and depression in adolescence: Evidence from the United States. *Substance Use & Misuse*, *3*, 1853-1867.

Maxwell, S. E., & Cole, D. A. (2007). Bias in cross-sectional analyses of longitudinal mediation. *Psychological Methods*, *12*(1), 23.

McHorney, C. A., Ware, J. E., Jr., Lu, J. F. R., & Sherbourne, C. D. (1994). The MOS 36 Item Short Form Health Survey (SF 36): Tests of data quality, scaling assumptions, and reliability across diverse patient groups. *Medical Care, 32*:40-66.

McHorney, C. A., Ware, J. E.,Jr, & Raczek, A. E. (1993). The MOS 36-item short-form health survey (SF-36): II. psychometric and clinical tests of validity in measuring physical and mental health constructs. *Medical Care, 31*(3), 247-263.

Mermelstein, R., Cohen, S., Lichtenstein, E., Baer, J. S., & Kamarck, T. (1986). Social support and smoking cessation and maintenance. *Journal of Consulting and Clinical Psychology*, *54*, 447-453.

Miller, N. E., & Dollard, J. (1941). Social Learning and Imitation. New Haven: Yale University Press.

Muñoz, M. A., Fíto, M., Marrugat, J., Covas, M. I., Schröder, H. (2009). Adherence to the Mediterranean diet is associated with better mental and physical health. *British Journal of Nutrition*, *101*, 1821-7. doi: 10.1017/S0007114508143598.

Mykletun, A., Overlan, S., Aaro, L. E., Liabo, H. M., & Stewart, R. (2008). Smoking in relation to anxiety and depression: Evidence from a large population survey: The Hunt study. *European Psychiatry*, *23*, 77-84.

National Center for Health Statistics. (2014). Health, United States, 2013: With special

    feature on prescription drugs. Hyattsville, MD.

Ng, S.W., Slining, M. M., & Popkin, B. M. (2014). Turning point for US diets?

    Recessionary effects or behavioral shifts in foods purchased and consumed.

    American Journal of Clinical Nutrition, *99*, 609-16. doi: 10.3945/

    ajcn.113.072892

Pasco, J. A., Williams, L. J., Jacka, F. N., Ng, G., Henry, M. J., Nicholson, G. C.,

    Kotowicz, M. A., & Berk, M. (2008). Tobacco smoking as a risk factor for

    major depressive disorder: Population-based study. *British Journal of*

    Psychiatry, *193*, 322-326.

Parks J.*,* Svendsen, D.*,* Singer, P. & Foti, M. *(*2006*). Morbidity and Mortality in*

    People with Serious Mental Illness. National Association of State Mental

    Health Program Directors (NASMHPD) Medical Directors Council,

    Alexandria, VA 22314. *Available at:*

    www.nasmhpd.org/general_files/publications/med_directors_pubs/Technical%

    20Report%20on%20Morbidity%20and%20Mortaility%20-%20Final%2011-

    06.pdf(accessed17March2010).

Peluso, M. A., & Guerra de Andrade, L. H. (2005). Physical activity and mental

    health: the association between exercise and mood. *Clinics (Sao Paulo),* 60,

    61-70. doi: 10.1590/S1807-59322005000100012

Poti, J. M., Mendez, M. A., Ng, S. W., & Popkin, B. M. (2015). Is the degree of food

    processing and convenience linked with the nutritional quality of foods

purchased by US households? *American Journal of Clinical Nutrition*, *101*, 1251-62. doi: 10.3945/ajcn.114.100925

Prochaska, J. O., & DiClemente, C. C. (1992). Stages of change in the modification of problem behaviors. In M. Hersen, R.M. Eisler, & P.M. Miller (Eds.), *Progress on behavior modification*. Sycamore, IL: Sycamore Press.

Prochaska, J. O., & DiClemente, C. C. (1983). Stages and processes of self-change of smoking: Toward an integrative model of change. *Journal Consulting and Clinical Psychology*, *51*(3), 390-5.

Prochaska, J.O., Diclemente, C.C., and Norcross, J.C. (1992). In search of how people change: Applications to addictive behaviors. *American Psychologist*, *47*(9), 1102–1114.

Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of behavior change. *American Journal of Health Promotion*, *12*(1), 38-48.

Quirk, S. E., Williams, L. J., O'Neil, A., Pasco, J. A., Jacka, F. N., Housden**, S.,** Berk, M., & Brennan, S. L. (2013). The association between diet quality, dietary patterns and depression in adults: a systematic review. *BMC Psychiatry*, *13*, 175. doi:10.1186/1471-244X-13-175.

Rogers, E. S., Anthony, W., & Lyass, A. (2004). The nature and dimensions of social support among individuals with severe mental illnesses. *Community Mental Health Journal*, *40*(5), 437-50.

Roth, D. L., & Holmes, D. S. (1987). Influence of aerobic exercise training and relaxation on physical and psychologic health following stressful life events. *Psychosomatic Medicine*, *49*, 355-365.

Sarris, J, Schoendorfer, N., Kavanagh, D. J. (2009). Major depressive disorder and nutritional medicine: a review of monotherapies and adjuvant treatments. *Nutrition Reviews*, *67*, 125-31. doi: 10.1111/j.1753-4887.2009.00180.x.

Salmon, P. (2001). Effects of physical exercise on anxiety, depression, and sensitivity to stress: a unifying theory. *Clinical Psychology Review*, *21*(1), 33-61.

Sánchez-Villegas**,** A**.**, Delgado-Rodríguez**,** M**.**, Alonso**,** A**.**, Schlatter**,** J**.**, Lahortiga**,** F**.**, Serra Majem**,** L**.**, Martínez-González**,** M**.** A. (2009). Association of the Mediterranean dietary pattern with the incidence of depression: the Seguimiento Universidad de Navarra/University of Navarra follow-up (SUN) cohort. *Archives of General Psychiatry*, *66*, 1090-8. doi: 10.1001/archgenpsychiatry.2009.129.

Schellinck, T. & Fenwick, I. (1981). *Testing the stability of market segmentation analysis*, in NA- Advances in Consumer Research Volume 08, eds. Kent B. Monroe, Ann Abor, MI : Association for Consumer Research, Pages: 723-727.

Schmitz**,** N**.**, Kruse**,** J**.**, & Kugler**,** J. (2004). The association between physical exercises and health-related quality of life in subjects with mental disorders: results from a cross-sectional survey. *Preventive Medicine*, *39*(6):1200-7.

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

Serra-Majem, L., Roman, B., & Estruch, R. (2006). Scientific evidence of

interventions using the Mediterranean diet: a systematic review. *Nutrition Review*, *64*(2 Supplement), S27-47.

Sidhu, K. S., Vandana, P., & Balon, R. (2009). Exercise prescription: A practical

effective therapy for depression. *Current Psychiatry*, *8*(6), 39–51.

Stathopoulous, G., Powers, M. B., Berry, A. C., Smits, A. J., & Otto, M. W. (2006).

Exercise interventions for mental health: A quantitative and qualitative review. *Clinical Psychological Science and Practice*, *13*, 179–193.

Steiger, J. (1998). A note on multiple sample extensions of the RMSEA fit index.

Structural Equation Modeling, *5*, 411-419.

Stephens, T. (1988). Physical activity and mental health in the United States and

Canada: Evidence from four popular surveys. *Preventive Medicine*, *17*, 35–47.

Steptoe, A., Wardle, J., Filler, R., Holte, A., Justo, J., Sanderman, R., Wichstrøm, L.

(1997). Leisure-time physical exercise: Prevalence, attitudinal correlates, and behavioral correlates among young Europeans from 21 countries. *Preventive Medicine*, *26*, 845–854.

Steptoe, A., Edward, S., Moses, J., and Mathews, A. (1989). The effects of exercise

training on mood and perceived coping ability in anxious adults from the general population. *Journal of Psychosomatic Research*, 33, 537–547.

Suls, J. & Bunde, J. (2005). Anger, anxiety, and depression as risk factors for

cardiovascular disease: the problems and implications of overlapping affective dispositions. *Psychological Bulletin*, *131*(2), 260-300.

Taylor, M. J, Carney, S. M, Goodwin, G. M., & Geddes, J. R. (2004). Folate for

depressive disorders: systematic review and meta-analysis of randomized

controlled trials. *Journal of Psychopharmacology*,*18*, 251-6.

Taylor, M. J., Carney, S. M., Goodwin, G. M., Geddes, J. R. (2004). Folate for

depressive disorders: systematic review and meta-analysis of randomized

controlled trials. *Journal of Psychopharmacology*, *18*(2), 251-6.

Uchino, B. N. (2009). Understanding the links between social support and physical

health: A life-span perspective with emphasis on the separability of perceived

and received support. *Perspectives on Psychological Science*, *4*(3), 236-255.

U.S. Census Bureau. (2013). State and County Quick Facts. Data derived from

Population Estimates, American Community Survey, Census of Population and

Housing, State and County Housing Unit Estimates, County Business Patterns,

Nonemployer Statistics, Economic Census, Survey of Business Owners,

Building Permits.

U.S. Department of Health and Human Services. (2014). The Health Consequences of

Smoking—50 Years of Progress: A Report of the Surgeon General. Atlanta,

GA: US Dept. of Health and Human Services, Centers for Disease Control and

Prevention.

Walsh, R. (2011). Lifestyle and mental health. *American Psychologist*, *66*, 579-592.

doi: 10.1037/a0021769.

Wallston, B. S., Alagna, S. W., DeVellis, B. M., & DeVellis, R. F. (1983). Social

support and physical health. *Health Psychology*, *2*(4), 367-391.

Wannamethee, G. & Shaper, A. G. (1991). Self-assessment of health status and

mortality in middle-aged British men. *International Journal of Epidemiology*, *20*, 239-45.

Ware, J. E., Jr., Kosinski, M., Bayliss, M. S., McHorney, C. A., Rogers, W. H., & Raczek, A. (1995). Comparison of methods for the scoring and statistical analysis of SF 36 Health Profile and Summary Measures: Summary of results from the Medical Outcomes Study. *Medical Care*, *33*, AS264-AS279.

Ware, J. E., Kosinski, M., & Keller, S. D. (1994). *SF 36 Physical and Mental Health Summary Scales: A User's Manual*. Boston, MA: The Health Institute, New England Medical Center.

Ware, J. E., Jr., & Sherbourne, C. D. (1992). The MOS 36 Item Short Form Health Survey (SF 36): Conceptual framework and item selection. *Medical Care, 30*:473-483.

Wells, K. B., Golding, J. M., & Burnham, M. A. (1988). Psychiatric disorder in a sample of the general population with and without medical disorders. *American Journal of Psychiatry*, *145*, 976-981.

Westmaas, J. L., Bontemps-Jones, J., & Bauer, J. E. (2010). Social support in smoking cessation: reconciling theory and evidence. *Nicotine Tobacco Research*. 12. 695–707. doi: 10.1093/ntr/ntq077

World Federation of Mental Health (WFMH). (2010). *Mental health and chronic physical illnesses. The need for continued and integrated care*. Accessed at http://www.wfmh.org/2010DOCS/WMHDAY2010.pdf. World Health Organization (WHO). (2004).

World Health Organization. (2004). The global burden of disease: 2004 update.

    Retrieved fromRetrieved from

    http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004updat

    e_full.pdf

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, 30-41.

Zimmerman, R. S., & Conor, C. (1989). Health promotion in context: the effects of

    significant others on health behavior change. *Health Education Quarterly*,

    16(1), 57-75.