

HEALTH-RELATED QUALITY OF LIFE, BEHAVIORAL INTENTION, AND
AMBIVALENCE IN OBESE ADULT PATIENTS DURING STAGES OF CHANGE IN A
HEALTHY LIFESTYLE/WEIGHT LOSS PROGRAM

By

JEFFERY DON GILLIAM

A DISSERTATION PRESENTED TO THE GRADUATE SCHOOL OF THE
UNIVERSITY OF FLORIDA IN PARTIAL FULFILLMENT OF THE
REQUIREMENTS FOR THE DEGREE OF DOCTOR OF PHILOSOPHY

THE UNIVERSITY OF FLORIDA

2014

© 2014 Jeffery Don Gilliam

To the many patients I worked with through the years

ACKNOWLEDGMENTS

I realize you never accomplish something without the help of others. I am grateful to my supervisory committee members, who offered direction and encouragement along the way. I also thank friends and family who cheered from the sidelines. Finally, I thank my wife, who has always supported my academic efforts.

TABLE OF CONTENTS

	<u>page</u>
ACKNOWLEDGMENTS.....	4
LIST OF TABLES.....	8
LIST OF FIGURES.....	9
ABSTRACT	10
CHAPTER	
1 INTRODUCTION	12
Problem	13
Purpose	13
Rationale.....	13
Research Questions	15
Hypothesis	15
Delimitations	15
Limitations.....	16
Assumptions	16
Summary	17
2 LITERATURE REVIEW	19
Factors That Affect Health Behavior	21
Biological and Environmental Factors That Affect Behavioral Change.....	21
Metabolism	22
Environmental Factors That Affect Behavior	23
Self-Control over Addictive Behaviors	24
Ambivalence in Health Behavior Change	25
Behavioral Intentions.....	27
Stages of Change and Ambivalence	27
Health-Related Quality of Life, Ambivalence, and Behavioral Intention.....	28
3 METHODS.....	33
Research Design	33
Research Variables	34
Health-Related Quality of Life.....	35
Attitudinal Ambivalence	35
Behavioral Intention.....	38
Stages of Change.....	38
Compliance for Exercise and Food Choices.....	39
Body Weight	40

Participants	40
Setting.....	41
Procedures	41
Data Collection	43
Data Analysis.....	45
Quantitative Analysis for Parametric Data	45
Quantitative Analysis for Non-Parametric Data.....	46
Correlational Data.....	46
Significance of the Study	47
4 RESULTS	51
Participant Demographics.....	51
Body Weight	52
Health Related Quality of Life.....	53
Stage of Change	53
Attitudinal Ambivalence	54
Behavioral Intentions.....	55
Program Compliance.....	55
Research Question 2	60
Research Question 3	62
Summary	64
5 DISCUSSION AND SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS..	83
Conclusions	91
Recommendations for Future Research	98
APPENDIX	
A IRB INFORMED CONSENT FORM.....	108
B SF-36 HEALTH SURVEY	116
C GRIFFIN INDEX	120
D POSITIVE ATTITUDINAL AMBIVALENCE ASSESSMENT FORM.....	121
E NEGATIVE ATTITUDINAL AMBIVALENCE ASSESSMENT FORM	123
F BEHAVIORAL INTENTION FORM	125
G STAGES OF CHANGE ASSESSMENT FORM.....	126
H FOOD CHOICE & EXERCISE LOG.....	127
I COMPLIANCE LOG FOR FOOD CHOICES AND EXERCISE.....	128

J FLYER	129
REFERENCE LIST.....	130
BIOGRAPHICAL SKETCH.....	142

LIST OF TABLES

<u>Table</u>	<u>page</u>
3-1 Description of the instruments and variable characteristics	48
4-1 Population demographics	67
4-2 Means by variable and time of measurement	69
4-3 Interactions with time	70
4-4 Pairwise Comparisons over time	71
4-5 Pairwise comparisons for ambivalence related to (weight loss),WL,daily exercise (DE), and food diary (FD)	72
4-6 Pairwise comparisons for behavioral intentions related to WL, DE, and FD	73
4-7 Mean weight loss by socioeconomic	74
4-8 Correlation between percent change in weight and percent change in physical component score (PCS) and mental component score (MCS)	75
4-9 Correlation between percent change in weight loss (WL) and behavioral intention (BI)	76
4-10 Correlation between percent change in weight loss (WL) and ambivalence (AMB)	77
4-11 Correlations between percent change in weight loss (WL) and compliance (COMP)	78
4-12 Correlations between health related quality of life (HRQL) and compliance (COMP)	79
4-13 Correlations between ambivalence (AMB) and behavior intentions (BI) for food diary (FD) and daily exercise (DE).....	80
4-14 Correlation between health related quality of life (HRQL) and behavioral intentions (BI)	81
4-15 Correlations between health related quality of life (HRQL) and ambivalence (AMB)	82
5-1 Percent change in HRQL PCS and MCS	100

LIST OF FIGURES

<u>Figure</u>		<u>page</u>
2-1	Level of attitudinal ambivalence (AA) varies across the stages of change.	31
2-2	Level of ambivalence affects behavioral intentions and subsequent behavior. ..	32
3-1	How factors/variables can affect outcomes: Health Related Quality of Life (HRQL) and Body weight/BMI (Weight Loss) during a Healthy Lifestyle/Weight Loss program	49
3-2	Attitudinal ambivalence.....	50
5-1	Changes in body weight and percent change in body weight.....	101
5-2	Mean changes in HRQL for PCS and MCS over time	102
5-3	Changes in Stage of change over time.....	103
5-4	Program compliance over time.....	104
5-5	Significance between WL, and both FD and DE for behavioral intention and attitudinal ambivalence..	105
5-6	The relationship between Program Compliance and Percent change in body weight.	106
5-7	Associations between stage of change, behavioral intention and ambivalence	107

Abstract of Dissertation Presented to the Graduate School
of the University of Florida in Partial Fulfillment of the
Requirements for the Degree of Doctor of Philosophy

HEALTH-RELATED QUALITY OF LIFE, BEHAVIORAL INTENTION, AND
AMBIVALENCE IN OBESE ADULT PATIENTS DURING STAGES OF CHANGE
IN A HEALTHY LIFESTYLE/WEIGHT LOSS PROGRAM

By

Jeff Gilliam

May 2014

Chair: R. Morgan Pigg Jr.

Major: Health and Human Performance

The obesity epidemic in the United States places an enormous financial burden on our healthcare system. Despite the abundant educational information available to the public on nutrition and exercise, the obesity epidemic continues to grow. Many behavioral intervention strategies are able to achieve short-term changes in health behaviors. However, because of lapses in health behavior, long-term benefits are often not realized. Ambivalence and behavioral intentions related to weight loss and lifestyle changes are suspected as factors influencing an individual's ability to successfully change behaviors to maintain long-term weight loss.

My study investigated relationships among health-related quality of life, attitudinal ambivalence, and behavioral intentions toward lifestyle change that may influence the deterioration of positive health behaviors as a person progresses through the stages of a weight loss/lifestyle program.

The research methodology used was a single-group repeated-measures design following 91 male and female patients who were physician-referred to an 8-week physical therapy and weight loss program. Data were collected using the following five

assessment tools: SF-36 HRQL, Attitudinal Ambivalence assessment, Behavioral Intentions assessment, and Stage of Change assessment. A repeated measures ANOVA demonstrated statistically significant changes in five of the variables: body weight, HRQL, ambivalence, stage of change and program compliance ($p = .0005$). Correlation analyses demonstrated statistically significant negative associations between ambivalence related to a food diary and behavioral Intentions related to a food diary. Also present were statistically significant negative associations between ambivalence related to daily exercise and behavioral intentions related to daily exercise. A positive association was detected between compliance and percent change in body weight.

A negative association with a medium effect size was demonstrated between HRQL for the mental component score and ambivalence related to a food diary. A negative association was also found between the mental component score and ambivalence related to daily exercise.

My study provides evidence of associations between ambivalence and behavioral intentions corresponding to a reduction in program compliance and a concurrent reduction in the rate of weight loss during the last 2 to 4 weeks of an 8-week healthy lifestyle/weight loss program.

CHAPTER 1 INTRODUCTION

More than 68% of the United States (US) adult population is either overweight or obese (Fegal et. al., 2010). Based on annual increases in prevalence, it is predicted that by 2015, 75% of the adult population will be overweight or obese; 2030 predictions indicate an adult overweight/obesity rate of 86.3% (Wang et al., 2007). The financial burden created by the obesity epidemic will increase health-care costs, potentially doubling every decade to \$900 billion by 2030 (Wang et al., 2008). Chronic health conditions including hypertension, dyslipidemia, and insulin resistance result from overweight/obesity and place individuals at increased risk for death from diseases of the heart, cancer, and cerebrovascular diseases (U.S. National Center for Health Statistics, 2006; Chronic Disease Prevention and Health Promotion, 2007). Obesity drastically intensifies the detrimental effect of diabetes, dyslipidemia, and hypertension on medical expenditures and productivity loss in the United States (Sullivan, Ghushchyan, & Ben-Joseph, 2008).

Those who are overweight or obese experience reduced quality of life resulting from an increased number of physical problems and reduced function (Doll, Peterson, & Stewart-Brown, 2000; Lopez-Garcia and et al., 2003; Renzah, Wooden, and Houg, 2010). However, in obese individuals, health-related quality of life (HRQL) has been shown to improve after weight loss (Kral, Sjostrom, & Sullivan, 1992; Mathus-Vliegen, de Weerd, & de Wit, 2004).

While biological factors can be associated with genetic predisposition to weight gain in some individuals, experts say the rapid increase in weight over the past 4 decades in the US population stems from an environmental change, not a genetic one

(Hill et al., 2003). Despite the significant amount of nutrition and exercise information available to the public, the obesity epidemic continues with little apparent change in behavior (Herbert, 1996; Cifuentes, 2004). Even among numerous commercial and self-help programs designed to facilitate weight loss, success is limited by minimal weight loss and unsuccessful long-term maintenance of weight loss (Tsai and Wadden, 2005).

Problem

Many behavioral intervention strategies are able to facilitate weight loss by achieving short-term changes in health behaviors. However long-term health benefits of weight loss are not often realized, since health behaviors decay over time and people lapse into previously held negative health behaviors (Hunt, Barnett, and Branch, 1971, Miguez and Becona 2008). Currently the causes of behavioral lapses during weight loss programs are neither well identified nor understood. The persistent and recalcitrant nature of overweight/obesity in the US population cannot be addressed until our understanding of factors driving the obesity epidemic improves. Without improved research in this area of inquiry, effective weight loss/maintenance interventions will remain rare.

Purpose

The purpose of my study was to investigate factors associated with the deterioration of health behaviors and intentions as a person progresses through a healthy lifestyle/weight loss program. Once this knowledge is gained, interventions intended to attenuate health behavior decay can be designed and implemented.

Rationale

Attitudinal and behavioral ambivalence related to weight loss may be a factor associated with an individual's inability to successfully change the behaviors necessary

to maintain long-term weight loss. Merely knowing what behaviors promote improved health does not assure that a change in behavior will be the subsequent outcome, nor that behavior will continue over the long-term, to realize an improvement in health status.

Sparks et al. (2001) examined ambivalence in the perspective of attitudes toward food consumption. Their findings indicate that ambivalence may have significance for the predictive ability of attitude intention behavior models, suggesting that those experiencing motivational conflicts with high levels of ambivalence demonstrate a reduction in behavioral intentions.

Armitage and Conner (2000) used ambivalence and behavioral intentions toward eating a low fat diet to demonstrate that less ambivalent attitudes are more predictive of behavioral intentions. They also demonstrated that increases in ambivalent attitudes were more adaptable when confronted with convincing communication (Armitage & Conner). Additionally, researchers have demonstrated high levels of ambivalence in the stages of change model (Prochaska 1982), namely the contemplation and preparation stages (Armitage 2003; Armitage & Arden 2007). Previous studies imply that individuals demonstrating high levels of ambivalence tend to be more adaptable (Armitage & Conner, 2000) and possibly more pliable. Also relevant to individuals exhibiting a high level of ambivalence in the contemplation and preparation stages of change is a greater likelihood to respond to persuasive communication; communication that, when needed, could be used to refocus their behavioral intentions.

Research has shown that obese individuals experience an improved health-related quality of life (HRQL) with weight loss (Kaukua, et al., 2003; Blissmer et al.

2006). Additionally research has demonstrated that ambivalence and behavioral intentions vary in accordance to the stages of change (Armitage & Arden, 2007; Armitage & Connor, 2000). Relationships among HRQL and progressive weight loss, ambivalence, and behavioral intentions through the stages of a healthy lifestyle/weight loss program remain unanswered.

Research Questions

RQ1: Does HRQL affect behavioral intentions and ambivalence as one progresses through a healthy lifestyle/weight loss program?

RQ2: Are improvements in HRQL proportional to the progression in weight loss and can associations among HRQL, ambivalence, and behavioral intentions be identified?

RQ3: Are lapses in behavior the result of improved HRQL, facilitating people's belief that they can return to previously held behaviors, with a subsequent deterioration of health behaviors and health status?

My study investigated relationships among health-related quality of life, ambivalence related to attitudes toward lifestyle changes, and behavioral intentions to make lifestyle changes associated with progression through the stages of a weight loss/lifestyle program.

Hypothesis

There will be an association between health-related quality of life and levels of ambivalence and behavioral intentions during progression through stages of a healthy lifestyle/weight loss program.

Delimitations

1. My study was conducted at a physical therapy clinic in Gainesville, Florida.
2. Patients enrolled in the healthy lifestyle/weight loss program carried medical insurance for coverage.
3. Data were collected from May 2011 through February 2013.

4. Variables were measured using psychometric assessment tools: The SF-36 health survey, behavior Intention assessment scale, stage of change assessment, and an ambivalence scale.
5. Psychometric assessment data were patient self-reported.
6. Patient demographic information was collected during the application process using intake medical information.

Limitations

1. The physical therapy clinic selected for participant recruitment may not represent all physical therapy clinics in Florida or elsewhere.
2. Patients covered by medical insurance do not represent all of the population.
3. Overweight or obese patients are candidates for a healthy lifestyle/weight loss program.
4. Data collected from May 2011 through February 2013 may differ from data collected during other time periods.
5. The assessment tools may not fully describe the associated constructs.
6. Self-reported responses may be based on inaccurate perceptions and may not be a true depiction of patients' attitudes
7. Records used to obtain patient demographic information may not be complete.

Assumptions

1. The selected physical therapy clinic was considered representative of physical therapy clinics in Gainesville, Florida.
2. Patients seen provided an adequate diversity of orthopedic patient populations.
3. Data collected from May 2011 through February of 2013 was considered adequate for the intention of this study.
4. The assessment questionnaires chosen for this study were considered appropriate to describe associated constructs involved with each patient.
5. Self-reported responses provide an acceptable level of honesty and perception for the purpose of this study.
6. Records used to obtain demographic information about each patient provide adequate information about each patient.

Definition of Terms

- **AMBIVALENCE.** Two equally intense, opposing attitudes about a construct.
- **BEHAVIORAL INTENTION.** An indication of an individual's readiness to perform a given behavior. It is assumed to be the immediate antecedent of behavior.
- **STAGE OF CHANGE.** Behavior change is a process rather than an event. The change process takes place over months and years and is characterized by six distinct stages: pre-contemplation, contemplation, preparation, action, maintenance.
- **SELF-CONTROL.** The ability to exert control over oneself by withholding immediate gratification for something that may be healthier (Muraven and Baumeister, 2000)
- **REWARDS.** Gratification received after an action, designed to cause a recurrence of the process.
- **RESTORATIVE BEHAVIORAL COPING.** Specific behavioral techniques which involve overt activity that would allow for continuation of a behavioral change during periods of lapses in behavior. Examples of these are stimulus control (throwing away the remaining food), social support (discussing the lapse with a friend), and compensation (eating fewer calories the next day).
- **RESTORATIVE COGNITIVE COPING.** Specific non-observable mental activities that allow for continuation of a behavioral change during periods of lapses in behavior. Examples are devaluing food (I don't want any more of this junk), and positive thoughts (self-encouragement, thoughts of accomplishment).
- **LAPSE.** A slight error or temporary deviation typically due to forgetfulness or inattention.
- **RELAPSE.** The act of or an instance of backsliding, worsening, or subsiding.
- **HEALTHY LIFESTYLE PROGRAM.** A cognitive and behavioral program designed to improve food choices and facilitate exercise in overweight/obese patients.
- **WEIGHT LOSS.** A volitional effort to lose weight through dietary modifications and/or addition of regular exercise (Miller, 2010).
- **METABOLISM.** The energy it takes for the body to operate its basic bodily functions (Ravussin and Bogardus, 1989).

Summary

Many obesity-related health issues increase the risk for associated diseases.

Health-related quality of life is detrimentally affected by obesity through reduced quality

in the areas of function and health, both physical and emotional. Long-term weight loss is difficult to maintain. Those who embark on lifestyle changes often regain much of their weight and many associated health problems. Factors affecting health behavior decay include genetic factors interacting with environmental influences. Attitudinal ambivalence is an expression of a person's ambivalence toward a lifestyle change, which affects behavioral intentions and behavior toward areas related to weight loss.

CHAPTER 2 LITERATURE REVIEW

Health care costs will unquestionably increase during the next 30 years, as a result of baby boomers “coming of age” and accessing Medicare benefits. The economic and social impact of the future growth of US health care expenditures for the elderly will be significant (Rice & Fineman, 2004). Obesity will impact costs since an obese 65-year-old individual entering the Medicare program requires immediate and higher health-care expenditures than normal-weight individuals (Finkelstein et al. 2008).

An obese 45-year old person surviving to age 65 has significantly higher average lifetime Medicare costs of \$163,000 compared to \$117,000 for a normal-weight 45-year-old surviving to age 65 (Cai, Lubitz, Flegal, & Pamuk, 2010). Additionally, as obesity and resulting health effects occur in younger individuals, costs to the healthcare system will be earlier and for longer than in past years when obesity developed at older ages. The reality of these costs are substantiated by recent estimates of national healthcare expenditures for children related to obesity: \$14.1 billion in additional prescription drug, emergency room, and outpatient costs annually (Trasande & Chatterjee, 2009).

Many obesity-related chronic diseases affect the health-related quality of life of obese individuals (Field et al. 2001). When obese individuals are assessed using the health assessment short form (SF-36), they typically exhibit low scores on the physical aspects of assessment involving functioning (Doll, Petersen, Stewart-Brown, 2000). Physical functioning is most commonly affected by orthopedic problems, that impede joint mobility and interfere with gait and other activities of daily living (such as climbing steps, lifting groceries, and getting into and out of the bathtub) (Gelber et al., 1999; Oliveria et al., 1999). Researchers have found a positive association with the body

mass index (BMI) and knee osteoarthritis (OA) (Coggon et al., 2001); specifically knee, hip, and back pain (Anderson et al., 2003). A study comparing obese/non-obese individuals demonstrated a 13-fold increase in the incidence of knee osteoarthritis (OA) among the heaviest subjects (Felson et al., 1988). Studies have also demonstrated that hip-joint replacement at younger ages is positively associated with body weight and hip contact stress (Recnik, Kralj-Iglic, Iglic, et al., 2009). In contrast, research shows that obese individuals who lose a modest amount of weight (0 to 9.9% weight loss) have improved SF-36 scores in the area of psychosocial functioning, physical functioning, and general health at 2 years, demonstrating a dose response improvement with increasing weight loss. In my study, participants who had >10% weight loss at 2 years showed an improvement in psychosocial problems, physical functioning, physical role functioning, bodily pain general health, mental health, and vitality (Kaukau et al., 2003). The literature also offers studies describing overweight people with radiological evidence of knee (OA) who, upon losing 10 to 12 pounds on average, reported a 30% improvement in knee pain and experienced 24% improvement in their ability to perform daily activities; including the ability to walk up stairs more quickly and easily than those subjects who did not lose weight (Messier et al., 2004; Christianson et al., 2005).

Long-term changes in health behavior are central to lasting health benefits in many disease-prevention models (Lisspers et al. 2005; Wing and Phelan, 2005). Genetic components driving the interaction between behaviors and challenging environments provide obstacles that sometimes counter the efforts of health behavior change, causing limited long-term success (5+ years) of health behavior programs (Stalonas, Perri, & Kerzner, 1984; Kramer, et al., 1989). Many factors affect the

progression of health behavior change. Long-term health behavior change cannot be accomplished merely by knowing which behaviors promote improved health outcomes (Steuart, 1967; Page and Cole, 1984-85; Becker & Joseph, 1988; Becker 1990; Silverman Perakyla, and Bor 1992; Ferris et al., 2001; West and O'Neal, 2004). Moreover, programs that focus solely on behavior change make assumptions about the potential cause and effect of changes in health status (Lorig & Laurin, 1985). Therefore, targeting outcomes that will measure improvements in health status is highly important.

Factors That Affect Health Behavior

Biological and Environmental Factors That Affect Behavioral Change

Factors affecting relapse into addictive behaviors are multiple and include environmental factors (Brownell, Marlatt, Lichtenstein, & Wilson, 1986), genetic predisposition, and habitual circuitry. Habitual circuitry is an internal system that reinforces cognitive and behavioral processes based on a rewards system involving the dopanergic pathways (Newlin and Strubler, 2007). By performing a task that stimulates the dopanergic pathway, learned behavior occurs to reinforce further cognitive decisions that continue to support the repetitive behavior, thereby developing a habitual circuitry. The mesolimbic dopamine pathway, a chemical circuit in the brain, is stimulated by many drugs and some foods (Kreek, 1996). This circuitry involves the medial forebrain bundle, sometimes referred to as the pleasure center. It has been demonstrated that the following drugs intensify the action of neurotransmitters: dopamine, gamma amino butyric acid (GABA), and serotonin (Koob, 1992). These pathways work on either a rewards principle, similar to the rewards received from heroin, alcohol, and cocaine (Rocha et al 1998), or a "relief" from withdrawal principle, such as that received from nicotine (Epping-Jordan, 1998). Studies have demonstrated that even activities such as

gambling and playing video games have a pronounced effect on stimulating the dopamine pathway (Koepp et al., 1998; Potenza, 2008). Biochemical, functional neuroimaging, genetic studies, and treatment research have demonstrated a strong neurobiological link between behavioral addictions and substance use disorders (Grant, Brewer, and Potenza, 2006). Research has demonstrated behavioral and neurochemical similarities between binge eating and the administration of drugs with abuse potential (Alsio, Olszewski, Levine, & Schioth, 2012). Animal models have been used to verify similarities between bingeing on sugar and behaviors associated with abuse-potential drugs (behaviors such as opiate-like withdrawal signs, heightened intake following abstinence, and overlapping areas of sensitivity). Aveena (2007) demonstrated the exacerbation of these neurochemical alterations when low-weight animals binged on sugar when the food they ingested was purged. Given that in humans these underlying neuro-physiological pathways evoke immediate and often overwhelming gratification for the individual, health behavior models theorize the need for progressive stages of self-awareness in order to help override this basic biological phenomena and to facilitate behavior change.

Metabolism

The amount of energy it takes for the body to operate its basic bodily functions (including lung, heart, kidney and liver functions) while at rest is defined as the basal metabolic rate. The metabolic rate of an individual can be altered secondary to age, sex, lean body mass, and certain diseases. Eighty-three percent of the variance in metabolic rate is attributed to fat-free mass, while age and gender contribute minimally (Ravussin and Bogardus, 1989). Activation of the sympathetic nervous system occurs predominately in response to stress and works to stimulate the catecholamines

(epinephrine and norepinephrine) from the adrenal glands, which increases the metabolic rate. The thyroid gland produces hormones that play a major role in maintaining and altering metabolism.

Environmental Factors That Affect Behavior

Environmental changes contribute to the obesity epidemic. Environmental changes that have contributed to the obesity epidemic include increased marketing and accessibility to food products (predominantly fast food, and other prepackaged foods that are immediately consumable and usually eaten away from home). A transformation in the dynamics of family life, driven by changes in social conditions (such as dramatic increases in the proportion of women who work outside the home) has introduced time constraints that have replaced meal preparation with convenience foods (French, Story and Jeffrey, 2001). Additionally, other contributing factors such as increased forms of sedentary entertainment (for example, television, video games, and computer use) and a reduction in walking and biking compound obesigenic behaviors.

Environmental factors contribute to weight gain and complicate efforts to maintain weight loss over time. Studies of long-term adherence to treatment strategies have demonstrated that most subjects regained a major portion of the weight lost during treatment 5 years later and points to the need for new conceptual models to behavioral programs (Jeffery, Epstein, Wilson, Drewnowski, Stunkard, & Wing, 2000; Anderson, Konz, Frederich, & Wood, 2001). One study reported that fewer than 2% of individuals were able to maintain 10% weight loss over 5 years (French, Jeffery, Folsom, McGovern, & Williamson 1996). Subjects reported numerous situational, social, and emotional factors as negatively impacting their weight control efforts (Stalonas, Perri, & Kerzner, 1984; Visram, Crosland, & Cording, 2009).

Research attempting to understand subjects' ability to resist behavioral temptations to overeat was predicted by immediate coping. However, the particular type of coping mechanism (cognitive versus behavioral) made little difference. Restorative behavioral coping was elicited as a response to overeating, while restorative cognitive coping seemed elicited by the negative thoughts and feelings accompanying behavioral lapses or temptations (Grilo, Shiffman & Wing, 1993). Recovery from relapse into previous behaviors demonstrated behavioral relapses (defined as weight regain of 5% or more) showed that recovery from even minor weight regain was uncommon (Phelan, Hill, Lang, Dibello, & Wing, 2003).

Self-Control over Addictive Behaviors

Self-control is described as the ability to exert control over oneself. An example is the ability to suppress the desire for immediate gratification when faced with a behavioral decision to make the healthier choice. Self-control involves overriding challenging urges, behaviors, or desires for purposes of optimizing the most advantageous long-term interests of an individual.

The significance of self-control in relation to the resolve needed to overcome urges for self-gratification is uncertain. Muraven and Baumeister (2000) said individual resources for self-control are limited and most likely partially consumed in the energy process required for demonstrating self-control over circumstances. Managing stressors while simultaneously practicing self-control (including overriding distracting thoughts, urges, and emotions) can be exacerbated while trying to focus attention and avoid distraction and fatigue from multiple extenuating factors. Coping with stressors is believed to result in decreased ability to exercise self-control. At the same time, the increased pressure to exert self-control results in depletion of the energy needed to

accomplish a particular task (Muraven, Gagne, & Rosman, 2008). According to Muraven, Tice, and Baumeister (1998) individuals have limited physical and emotional resources to control and/or alter their behavior, and this capacity appears to be challenged by continuous and mounting demand. These resources can be depleted when people find themselves in circumstances requiring additional self-control or when self-control reserves are reduced in response to various life stressors. As a result, some individuals may find fulfilling important life goals (particularly goals requiring self-control, discipline, and focus) increasingly difficult. Additionally feeling compelled to exert self-control requires greater amounts of resolve than exertion of self-control for more independent or autonomous reasons (Muraven, Gagne, Rosman, 2008).

Ambivalence in Health Behavior Change

Ambivalence is an attitude characterized by one or more of the following attributes: 1) exhibits stability over time, 2) ability to influence information processing, 3) with ability to resist persuasion, and 4) ability to impact behavior (Krosnick & Petty, 1995). Ambivalence regarding health behavior change is characterized by simultaneous and conflicted feelings toward one's understanding of what is healthy and beneficial, in combination with impulses and desire to go against that understanding in a given situation (van Harreveld, van der Pligt, & de Liver, 2009). Sparks et al. (2001) examined ambivalence in relation to food consumption attitudes. Their research cites conflicts arising between the sensory rewards received from sweet and fatty foods and the resulting repercussions to one's health and body image. As such, the relationships between ambivalence and behavior can differ as a function of the degrees of ambivalence. This dichotomy (individual knowledge of what should occur versus individual desire for a particular reward) suggests that ambivalence underlies the

internal struggle of choosing the immediate benefits of short-term desires (often sensory rewards) or the long-term benefits of delayed gratification (usually health benefits).

Research findings indicate implications for ambivalence regarding the predictive ability of attitude-intention-behavior models, especially when applied to health-related behaviors characterized by motivational conflicts (Sparks et al., 2001). Feelings of conflict and discomfort are most apparent when ambivalent individuals must make a choice regarding the existing conflict. When feelings of ambivalence conflict with personal values, negative affect can occur (Baron & Spranca, 1997). For example while on a weight loss/lifestyle program, an individual may experience conflict when trying to make good food choices in the setting of important family get-togethers or social gatherings centered around food. One may experience a negative affect by not participating when trying to make a choice. However, when a choice between the two can be avoided, commitment to either can remain low, resulting in less discomfort, even in the presence of ambivalent feelings.

Ambivalence about health issues presents in diverse forms, including cognitive ambivalence (characterized by mixed views), and affective ambivalence (characterized by mixed feelings), potential ambivalence (individuals are unaware of their existing beliefs), or felt ambivalence (both aware of and experiencing their feelings) (Armitage and Arden 2007). When individuals experience “felt ambivalence” in relation to a health behavior or issue, emotional discomfort can result.

When attempting to change health behaviors, the degree and form of ambivalence may vary as one progresses through stages of change. While the concept of potential and felt ambivalence differs, Armitage and Arden (2007) demonstrated a

moderate correlation between the two. In a sample of the general population Armitage et al., (2003) demonstrated a quadratic relationship between the stages of change and attitudinal ambivalence. Findings demonstrated significantly higher levels of ambivalence among participants in the contemplation, preparation, and action stages in regarding eating a healthy diet than among people in either the precontemplation or maintenance stages.

Behavioral Intentions

Behavioral intentions mediate attitudes and behavior. The Theory of Planned Behavior asserts that attitude toward the action and perceived behavioral control best explains the variation in intention (Schifter & Ajzen, 1985; Godin & Kok, 1996). However, in the presence of ambivalent attitudes, the Theory of Planned Behavior loses predictive ability in the constructs behavioral intention and behavior (Figure 2-1) (Armitage & Conner, 2000; Sparks et al., 2001). Less ambivalent attitudes are more predictive of behavior, while ambivalent attitudes are less predictive of behavior, but may be more easily influenced with intervention (Figure 2-2), (Armitage & Conner 2000).

Stages of Change and Ambivalence

The Transtheoretical model (TTM) developed by Prochaska, and DiClemente (1982) asserts movement through six stages of change (pre-contemplation, contemplation, preparation, action, maintenance and termination) which are characterized by periods of progression and relapse. Prochaska and colleagues (1982; 1994) said changes in the balance between pros and cons are responsible for individual progression through contemplation, preparation, and action stages of change (Prochaska, et al., 1994). The changing balance between pros and cons also

characterizes the stages with the greatest ambivalence. Notably, the precontemplation and maintenance stages are characterized by the least ambivalence, since the pros and cons are more polarized (Armitage & Arden, 2007).

The pre-contemplation stage describes individuals who do not recognize a need for change. This lack of recognition does exclude developing intentions to change later. The contemplation stage includes individuals contemplating a behavior change within the next 6 months. Individuals in the preparation stage aim to take action within the next 30 days and have taken some behavioral steps in a positive direction. The action stage is distinguished by evident, quantifiable changes in behavior consistently practiced for the past 6 months. Individuals in the action stage are at risk for relapse. Therefore, successful movement through this stage requires constant attention and vigilance. When changes in behavior continue for 6 consecutive months, a person moves into the maintenance stage. In this stage, the behavior is now a regular action or activity. As a result, the probability for relapse decreases, but remains present and requires occasional attention. Individuals enter the termination stage once the behavior change has been maintained 5 or more years and temptation to engage in the nondesirable behavior has been replaced with feelings of total self-efficacy when performing the new behavior (Prochaska & Velicer, 1997).

Health-Related Quality of Life, Ambivalence, and Behavioral Intention

Neuro-pathways involved in the basic mechanisms of survival are mimicked by activities that stimulate a similar pathway (the dopanergic pathway) (Pani & Gessa, 1997). Activities such as smoking; gambling; and ingesting certain foods, alcohol, and drugs are activities that present rewards through stimulation of brain areas similar to

those of the dopanergic pathway, despite hazards posed to species (Koepp et al., 1998; Kreek, 1996; Potenza, 2008).

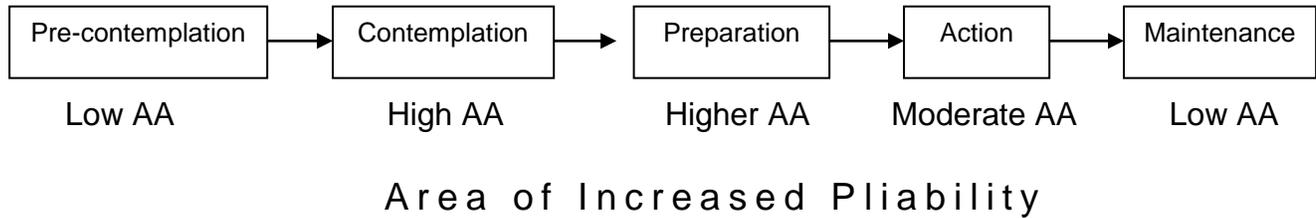
In contrast, an individual may experience feelings of ambivalence when significantly challenged by pain and discomfort that are linked to certain diseases or health conditions (such as those associated with obesity), while simultaneously facing pleasure (reward) seeking behavior through certain foods or activities that may have enabled the original condition. Individuals willing to continue the “status quo” in relation to their quality of life, feed their resistance to major behavioral change.

To complete any type of behavioral change, people must be dissatisfied with their current quality of life status. Once obese individuals become dissatisfied with their health-related quality of life, they become more inclined to make behavioral changes to improve their health condition and associated quality of life (Bish et al., 2007), particularly if the goal is perceived as attainable (Fujioka, 2010).

As a person progresses through the lifestyle/weight loss program, an improved quality of life with a reduction in problems from health issues/conditions often occurs (Ross et al., 2009). As a result, individuals may be more inclined to seek out previously pleasurable activities that may have contributed to the initial health issue (Miguez & Becona 2008.) This dichotomy may explain the persistent problem sustaining long-term health behavioral changes. Lapses in behavior can occur even while one is progressing toward positive changes in health status (Phelan, Hill, Lang, Dibello, & Wing, 2003). Associated increases in ambivalence most often occur during the contemplation, preparation, and action stages. Additionally, increased attitude ambivalence during these stages has been shown to be more pliable, resulting in a more positive response

to behavioral change interventions (Armitage & Conner, 2000). Stages in which increased ambivalence occurs (contemplation, preparation, and action stages) may be times when a patient best responds to motivational interviewing (West et al. 2007) followed by implementation of intentions (Chapman & Armitage, 2009), in order to encourage continued behavior changes. The least ambivalence is experienced during the precontemplation and maintenance stages (Armitage, Povey & Arden, 2003).

Attitudinal Ambivalence Related to the Stages of Change



Attitudinal Ambivalence = AA

Figure 2-1. Level of attitudinal ambivalence (AA) varies across the stages of change. A lower level of ambivalence is seen both at the pre-contemplation and maintenance stages, while a higher level of ambivalence is seen in the contemplation, preparation and action stages. Attitudes have increased pliability in the areas of high attitudinal ambivalence.

Ambivalence Predicts Behavioral Intention and Subsequent Behavior

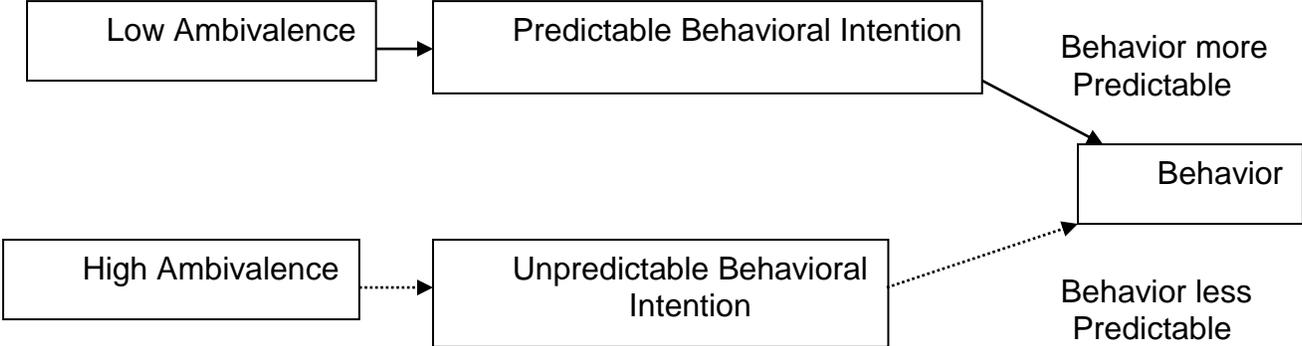


Figure 2-2. Level of ambivalence affects behavioral intentions and subsequent behavior. Behavioral intention is less predictable during a heightened level of ambivalence compared to low levels of ambivalence.

CHAPTER 3 METHODS

Recently, the CDC classified obesity as a chronic disease (Byas, 2013). This new classification recognizes the importance of intervention programs designed to achieve long-term weight loss. Weight loss programs able to demonstrate sustainability and resulting long-term benefits are vital if obesity and its sequelae are to be addressed (Gilden, Tsai, Thomas, 2005). Efforts at long-term weight loss and sustainability have been hampered by health behavior decay which often leads to lapses in weight loss efforts, and ultimately an individual's return to previously embraced addictive eating behaviors (Dohm, Beattie, Aibel, Striegel-Moore, 2001; Miguez and Becona 2008). Also complicating weight loss efforts is the time span between actual weight loss and evident health benefits. For many, the absence of immediate tangible health benefits dampens continued efforts at dietary control and increased physical activity levels. During this time frame, health behavior decay is also occurring, adding to an individuals' already waning commitment to weight loss and improved health. As a result, research identifying factors that contribute to health behavior decay is vital for the success of long-term weight loss and maintenance programs. To better understand the behavioral lapses frequently associated with weight loss, we examine the relationships among changes in body weight and health-related quality of life (HRQL), ambivalence, behavioral intentions, stage of change, and program compliance.

Research Design

Before data collection Institutional Review Board (IRB) was obtained. The research methodology used quantitative data collection. My study used quantitative data implemented collectively on three separate occasions, with one quantitative

variable collected repeatedly throughout the study. My study used a prospective quasi-experimental single-group research design, with multiple measurements taken at three points in time. Baseline data were collected from all participants during the initial evaluation (Time 1), at 4 weeks post initial evaluation (Time 2), and again at 8 weeks post initial evaluation (Time 3). Time lines for data collection best approximate the time of treatment for the prognosis-related patient referral.

A repeated measures design allows the researcher to monitor participant behavior changes over time. This design also reduces the variance of estimates of treatment effects over time, allowing statistical inference to be made with a smaller sample.

Research Variables

My study measured behavior via health-related quality of life (HRQL), attitudinal ambivalence, behavioral intentions, stage of change, and program compliance. These variables were itemized based on each assessment tool. The SF-36 HRQL was used to measure a physical and mental component score. The Attitudinal Ambivalence Assessment Tool was used to measure ambivalence related to weight loss, keeping a food diary, and daily exercise. The Behavioral Intentions Assessment Tool was used to assess weight loss, keeping a food diary, and daily exercise. The Stage of Change Assessment Tool measured food choices and daily exercise behaviors by individual stage of change. A program compliance assessment tool was used to determine program compliance. Additionally, weight loss was measured weekly, to assess physical changes occurring over time. Table 3-1 shows instruments and variable characteristics.

Continuous variables included health-related quality of life, attitudinal ambivalence, behavioral intentions, stage of changes, program compliance, and body weight. Dependent variables included health-related quality of life, attitudinal ambivalence, behavioral intentions, stage of changes, program compliance and body weight. The independent variable included intervention over time.

Health-Related Quality of Life

Scores for the physical and mental components were measured using the SF-36 health assessment scale (Appendix B). The SF-36 is a multi-item psychometric health assessment scale that measures 8 domains of health: 1) limitations in physical activities because of health problems; 2) limitations in social activities because of physical or emotional problems; 3) limitations in usual role activities because of physical health problems; 4) bodily pain; 5) general mental health; 6) limitations in usual role activities because of emotional problems; 7) vitality (energy levels and fatigue); and 8) general health perceptions. The SF-36 is described as a valid psychometric assessment tool when used with patient population (Mchorney, Ware, & Raczek, 1993), mixed gender populations (Lim, Seubsman, & Sleigh, 2008), and obese adult patient populations (Corica et al., 2006).

Attitudinal Ambivalence

The Griffin index (Appendix C) was used to measure attitudinal ambivalence. Attitudinal ambivalence, initially described by Thompson (1995) and later highlighted by Armitage and Connor, (2000) is a condition in which a person regards an issue with an equally strong positive and negative assessment. To determine both the positive and negative attitudes (including individual feelings, thoughts and beliefs regarding three specific areas: weight loss, daily exercise, and maintaining a food diary), patients were

presented with two attitudinal assessments. The first assessment measured positive attitudes, feelings, and beliefs toward each above-named area. The second assessment measured corresponding negative attitudes. The following statement is a weight loss-related example:

Think about your *attitude* toward or evaluation of weight loss. That is an intentional reduction of your body weight through diet, exercise or both.

Considering only the favorable characteristics of weight loss and ignoring the unfavorable characteristics, rate how favorable is your evaluation of weight loss?

Not at all Unfavorable	Slightly Unfavorable	Quite Unfavorable	Extremely Unfavorable
---------------------------	-------------------------	----------------------	--------------------------

The second statement is the same but addresses *feelings* toward weight loss:

Think about your *feelings or emotions* when I mention weight loss.

Considering only your *feelings* of satisfaction toward weight loss and ignoring your feelings of dissatisfaction, *how satisfied do you feel* about weight loss?

The third statement addresses *thought and beliefs* toward weight loss.

Think about your *thoughts or beliefs* when I mention weight loss.

Considering only the beneficial qualities of weight loss and ignoring the harmful characteristics, *how beneficial do you believe* weight loss to be?

These same questions were presented to evaluate attitudes toward “food diary” and “daily exercise”. The second assessment concerned negative attitudes, feelings, thoughts, and beliefs toward weight loss, the food diary, and daily exercise. The first example concerned attitude about weight loss.

Think about your *attitude* toward or evaluation of weight loss. That is an intentional reduction in your body weight through diet, exercise or both.

Considering only the *unfavorable* qualities of weight loss and ignoring the favorable characteristics, *how unfavorable is your evaluation* of weight loss?

Not at all Unfavorable	Slightly Unfavorable	Quite Unfavorable	Extremely Unfavorable
---------------------------	-------------------------	----------------------	--------------------------

Each question was weighted from 0 to 3 as in the Griffin formula. All three assessment areas follow a similar pattern, to ascertain an individual's level of ambivalence regarding each issue (positive ambivalence assessment Appendix D; negative ambivalence assessment, Appendix E). The Griffin index was designed to attain the level of similarity and the intensity of the two issue-specific attitudinal ambivalence assessments, and is determined by the equation: $Ambivalence = (positive + negative)/2 - |positive - negative|$ (Appendix C). The Griffin Index has been shown to fulfill Breckler's (1994) conditions for a good measure of ambivalence, in which greater ambivalence is associated with positive and negative evaluations that are both intense and similar. In Griffin's Index, the mean of the positive and negative evaluations demonstrates the intensity, while the difference between the absolute value of the positive and negative evaluations indicates the similarity of the construct evaluation. Table 3-2 was developed using a weighted 0 to 3 scale to demonstrate the possible outcomes of a construct positively evaluated and illustrate how a negative evaluation is used to determine an individual's level of ambivalence.

According to the Griffin Index, constructs rated as 1 (positive) and 2 (negative) yield an ambivalence rating of .5, whereas ratings of 3 (positive) and 3 (negative) yield an ambivalence rating of 3. According to the index high ambivalence is characterized by equally intense and similar positive and negative evaluations. Therefore, a higher score represents greater ambivalence than would a smaller or negative number.

Thompson & Zanna, (1995), demonstrated validity of ambivalence as a construct using a positive, self-reported measure of ambivalence among a sample of 61 female

psychology students. Armitage & Connor, (2000) demonstrated both acceptable reliability of .84 and discriminant validity.

Behavioral Intention

Behavioral intention (Appendix F) was assessed using two similar 7-point bipolar scale (from -3 to +3) statements. Each statement addresses the same 3 areas used to assess attitudinal ambivalence (weight loss, daily exercise, and a food diary). Each statement is followed by a measured degree of intent or plan, with response options ranging on a continuum from “definitely do not” to “definitely do”:

I intend to *lose weight* in the future.
definitely do not -3, -2, -1, 0, 1, 2, 3 definitely do

I plan to *lose weight* in the future.
definitely do not -3, -2, -1, 0, 1, 2, 3 definitely do

Past behavioral intention research by Armitage and Conner (2000) demonstrated test validity and reliability ranging from .83 to .88. Wilson and Rogers (2004) used the 3-item behavioral intention scale with a sample of 49 overweight/obese females, and demonstrated an internal consistency of .89.

Stages of Change

Stage of change (Appendix G) for both exercise and food choices was determined at T1, T2, and T3. To determine current stages of change, participants were asked to choose a personal descriptor from among 5 topic-relevant statements. For example, exercise precontemplators would choose the statement, ‘I currently do not exercise and I’m not thinking about starting.’ Responses were numbered as indicated: 1) precontemplation stage, 2) contemplation stage, 3) preparation stage, 4) action stage, and 5) maintenance stage. Similar statements were used to determine stage of change for food choices.

Daily exercise and food choice criteria were established. The criteria for regular moderate exercise was exercising 5 to 7 days per week for 30 to 40 minutes. Moderate intensity was characterized as a lack of painful, increased breathing, but able to carry on a conversation while exercising, and light sweating. Criteria for food choices were established for five areas: including eating high fiber foods (Tucker & Thomas, 2009), at a frequency of 1) 5 to 9 servings of fruits and vegetables daily; 2) 2 to 3 servings of beans and whole grains, partaking of high calcium foods; 3) 2 to 3 servings of fat-free dairy, getting enough protein (Layman, et al., 2009); avoiding high fat foods by 4) eating lean meats only and avoiding high fat fried foods and condiments; and avoiding high-sugar items like 5) high-sugar drinks or foods like sugary sodas and deserts (Malik, Schulz, & Hu, 2006). The established criteria were used daily by participants when completing their “Food Choice and Exercise Logs” (Appendix H).

The Stage of Change measures demonstrated good validity when used with both obese adults and hospital workers (Armitage, Sheeran, Conner & Arden, 2004; Sarkin et al., 2001). Using the scale with a sample of 768 overweight/obese individuals demonstrated good internal consistency (.66 to .92), (Valis et al., 2003).

Compliance for Exercise and Food Choices

The “Food Choice and Exercise Log” was used to measure participants’ level of compliance with food choices and exercise. Compliance was determined by fulfillment of an established percentage of the criteria indicated for both food choices and exercise. For example, compliance with food criteria was measured by the number of points participants received in this category. Participants received 1 point for fulfilling each food choice category and one additional point for staying within 5 points of their total daily point allocation. If they reached their goal in each area at a 100% they received 6

points. Fully compliant participants who reached their goals in each area (score 100%) received 6 points. For fulfilling exercise goals of 30 to 40 minutes per day, participants received 2 compliance points. Participants could receive a maximum of 8 points each for food choice and exercise compliance. Participant compliance was determined using their self-report “Food Choice & Exercise Logs” (Appendix I).

Body Weight

Body weight and height were measured using a medical scale (Detecto medical scale, Webb City, MO.). For consistency, one scale was used throughout the study, for all but 2 participants whose weight exceeded the scales’ weight capacity. During the study period, these two participants were weighed using an alternate scale (Health o Meter professional scale, Rye, NY). Both scales were calibrated by BioMed Techs, Inc.(Mt. Arlington, NJ) for reliability and validity. For all participants, weight was recorded to the nearest .25 pounds and height was recorded to the nearest 1 inch. Height and weight measurements were used to determine participant body mass index (BMI) values. For all participants, measurements and BMI calculations were performed at T1, T2, and T3.

Participants

Study participants included males and females ranging in age from 18 to 83 years. All participants received physician referrals to the weight loss/healthy lifestyle program. Before starting the study, informed consent was obtained from each participant. Participants received a copy of the informed consent for their personal records. Throughout the study, HIPAA guidelines (Health Insurance Portability and Accountability Act) issues relating to patient confidentiality were strictly followed.

Assessment data were collected confidentially and kept in a secured file cabinet behind locked doors.

Setting

My study was conducted in ReQuest Physical Therapy clinic, in Gainesville, Florida.

Procedures

My study involved patients referred to an orthopedic physical therapy clinic with a primary orthopedic diagnosis and a secondary diagnosis of obesity. All subjects were first assessed by a medical physician and then referred with a prescription of a primary orthopedic diagnosis and a secondary diagnosis of obesity. Inclusion criteria: all patients referred with a primary orthopedic diagnosis and a secondary diagnosis of overweight/obesity. Descriptive statistics were recorded for all participants and included age, gender, race, body weight, height, body mass index, and zip code. Additionally diagnosis and insurance plans were recorded. Measures of change in the following areas were included: health-related quality of life, ambivalence, behavioral intentions, body weight, and compliance with the program.

My study followed protocols set forth by the institutional review board (IRB) for clinical studies. All patients received an informed consent release form established through the IRB's confirmation process. After the initial evaluation process, patients were told about the study and given an opportunity to participate. Patients were referred to the physical therapy clinic by a licensed medical physician with a primary orthopedic diagnosis (e.g., low back pain or knee pain) and a secondary diagnosis of obesity. An advertising flyer was also used to inform people about the study and included general eligibility information, affiliation, purpose, location, and contact information (Appendix J).

Inclusion criteria: Patients referred to physical therapy by a licensed medical physician with a primary orthopedic diagnosis and a secondary diagnosis of obesity.

Exclusion criteria: Patients who have a body mass index lower than 25 were not considered for the study. Patients had to be able to comprehend reading material at a 7th grade level. This was ascertained both through the initial medical application process and the initial intake assessment for physical therapy. Additional exclusion criteria included the following.

1. Patients must not have any gastrointestinal diseases (e.g., Crohn's disease) that would interfere with their participation in a lifestyle/weight loss program that encourages plentiful high fiber foods such as fruits, vegetables, beans, and high fiber cereals.
2. Patients with diseases or syndromes that interfere with the appetite (hyperthyroidism, Prader-Willi syndrome).
3. Patients that are on medications that would significantly interfere with appetite (corticosteroids, cyproheptadine, and tricyclic antidepressants).
4. Patients with diseases that affect the metabolism (hypothyroidism, hyperthyroidism).
5. Patients with gastric bypass or similar surgeries (such as gastric balloon or gastric band).

Each patient received an orthopedic evaluation followed by an assessment of body mass index and disease risk identification related to obesity, performed by the physical therapist carrying out this study. Assessment forms were then given to patients after instruction on the healthy lifestyle/weight loss program. The physical therapist helped the patient with goal setting for weight loss and instructed on exercise and food choices. Short and medium-range goals were set based on 5 to 10% of the patient's initial body weight (Grundy et al., 2005) and a long-range goal of 15% of their initial body weight were set with weight loss at the rate of approximately 1.25 pounds per week (NHLB, 1998; Jakicic et al., 2001). All patients were involved in a cognitive and

behavioral lifestyle program that included a behavioral contract (Ureda, 1980); a lifestyle binder with educational information on nutrition and exercise along with daily food choice and exercise logs (Appendix H) (Shay et al., 2009); as well as motivational information designed to encourage, inform, and challenge the patient. Patients were weighed at least once every week and received a weight graph of their progress (Butyn, Phelan, Hill & Wing, 2007). Patients were involved with an exercise program on each of their clinical visits and were to bring their lifestyle binder to each session, to enhance accountability regarding participation in the program. Patients received detailed instruction of the program on their first visit, including instruction on all educational material and behavioral components of the program. Thereafter patients were involved with therapeutic exercise each session to address their functional problems and were also instructed on progressive integration of their rehabilitation exercises into a general fitness program.

Data Collection

Data collection took place over a 20-month period, from May 2011 through February 2013. After orthopedic evaluation and instruction on the healthy lifestyle/weight loss program, research assessment forms were then given to patients. This first set of assessments served as a baseline (Time 1) for all behavioral areas. The assessment forms were completed in the following order: SF-36, HRQL, followed by the Attitudinal Ambivalence form for positive attitude, then the Stage of change assessment form, followed by the Behavioral intentions form, and then the Negative Attitudinal Ambivalence form.

Patients received their second set of assessments at 4 weeks (Time 2), completing all assessment forms in the same order as in their baseline assessment.

The third set of assessments were performed at 8 weeks (Time 3), with all participants completing all assessment forms in the same order.

The procedure used each time a participant completed the set of assessment forms was as follows:

1. Thanking them for their willingness to participate in the study.
2. Giving participants the assessment forms and instructing them on completion of the assessments that followed a script: "I am doing research to better understand how to help people as they progress through a healthy lifestyle/weight loss program. I am studying changes in health status and changes in behavior as people go through this healthy lifestyle/weightloss program. As a part of my research, I'd like you to give me some information about your current health status and different feelings you experience related to ambivalence and behavioral intentions, as well as where you feel you are regarding to making a healthy lifestyle change." This was followed by answering any questions they may have regarding the assessments.
3. Participants were then asked to circle only one answer that best describes them for each statement.
4. Reminding participants to take their time completing the assessment forms.
5. Making sure participants were not interrupted or distracted as they completed the assessment forms.
6. Making sure I was available to answer any questions participants may had as they completed the forms.
7. Upon completion, forms were checked for any missed questions, or stray marks that confuse data results.
8. Assessment forms were then collected from participants and placed in a secured file cabinet. Patients then completed their therapy session.

Other data-collection measures involved measuring body weight. This was done weekly, using the same scale the participant used at baseline, with as close as possible to same attire (shoes on versus off). Body weight was recorded to the nearest .25 pounds and placed in participants' files.

Data were collected on program compliance measured each patient visit by assessing participants' food choices and exercise logs in their lifestyle binder. Program compliance logs were kept on all patients, for daily food choice and exercise compliance. Patient visits were recorded each visits, in patient charts. Total visits were later computed for compliance.

Data Analysis

Methods for data analysis were selected based on the nature of the data invoked by the research question. This led to methods that would analyze parametric versus nonparametric data, and ordinal versus interval data. A Type 1 error rate was set at .05 for all tests. Correlational analysis was performed on data to look for associations among variables.

Demographic data were analyzed using descriptive statistics on all study participants. Frequencies and percentages were reported for each variable, along with the mean, standard deviation, and range. Variables included age, ethnicity, BMI, socioeconomic level, insurance, and diagnosis.

Quantitative Analysis for Parametric Data

Descriptive analysis was performed on variables for mean, range, and standard deviation. Statistical analysis was performed on the effects of physical therapy and a healthy lifestyle/weight loss program intervention over time on dependent variables Weight loss at time 1 (baseline), time 2 (4 weeks), and time 3 (8 weeks). Program compliance was analyzed at 2 week intervals: Time 1 (1 to 2 wk), Time 2 (2 to 4 wk), Time 3 (4 to 6 wk) and Time 4 (6 to 8 wk). Repeated measures analysis of variance (ANOVA) was used to determine statistically significant changes in body weight, including percent change in body weight over Time 1, Time 2, and Time 3 with a

bonferroni correction factor. Program compliance was also analyzed with repeated measures ANOVA at 2 week intervals over 8 weeks. Effects size was calculated using partial eta squared for which Cohen (1988) suggested effect sizes of .01, .06, and .14 to indicate small, medium, and large effects, respectively. Results of these analyses would indicate statistically significant differences in the variable between times.

Quantitative Analysis for Non-Parametric Data

Descriptive analysis was also performed on variables for mean, range, and standard deviation. Statistical analysis was performed to determine the effects of physical therapy and a healthy lifestyle/weight loss program intervention over time on dependent variables HRQL, Attitudinal Ambivalence, and Behavioral Intentions at Time 1 (baseline), Time 2 (4 weeks), and Time 3 (8 weeks). A Friedman test was performed initially, to determine significance among variables. Wilcoxon Signed Ranks was performed to determine pairwise comparisons with a Bonferroni correction factor to $p = .017$ level. This statistical analysis would determine if differences were found for the variable over time.

These statistical analyses were used to draw inferences on the effects of progression through a healthy lifestyle/weight loss program measured three separate times, separated by 4-week periods, on the dependent variables weight loss, HRQL, attitudinal ambivalence, behavioral intentions, and program compliance.

Correlational Data

For research questions 1 to 3 including subset questions, analysis to determine associations was performed using correlational analysis. Examining correlations among variables weight loss, HRQL, attitudinal ambivalence, behavioral intentions, stage of change, and program compliance was performed using Pearson correlation for

parametric data weight loss and compliance. Spearman's rho correlation was used for non-parametric data analysis, HRQL, Attitudinal Ambivalence, Behavioral Intentions and stage of change. Correlational studies used a two-tailed test. Interpretation of strength of correlation coefficient followed Cohen's (1988) classification for effect size; .0 to .09 as no effect; .10 to .23 as a small effect size; .24 to .36 as a medium effect size; and .37 to 1.00 as a large effect size.

Significance of the Study

The obesity epidemic has amplified the urgency of improving interventions that will curtail this ongoing crisis. Once we understand the critical relationships between ambivalence to lifestyle changes and progression through a lifestyle/weight loss program, healthcare programs will insist on altering their approach to changing behaviors. By understanding causal behaviors that perpetuate obesity in a person, we can develop new ways to intervene, and modify current interventions. Then, progress may be realized. My study to understand relationships among HRQL, weight loss, ambivalence, and behavioral intentions, so predictions in behavior may allow for optimal intervention at key times when patients may lapse back into old behaviors. Understanding where a person is in the stages of change provides important information that allows health behaviorists a way to predict and intervene through motivational interviewing (West et al., 2007) and supportive counseling that may improve long-term success in terms of health behavior change.

Table 3-1. Description of the instruments and variable characteristics

Instrument	Variable	Score
SF-36 HRQL	Physical component score	Sum of 4 domains
	Mental component score	Sum of 4 domains
Attitudinal ambivalence	Weight loss Food diary Daily exercise	Average of attitudes, thoughts and beliefs, and feelings from both positive and negative 0-3 point scale
Behavioral intentions	Weight loss Food Diary Daily Exercise	Average of intent and plan from -3 to +3 bipolar scale
Program compliance	Food choice exercise	Sum of points from 7 areas of compliance
Stage of Change	Stage	Stage of change 1 to 5
Medical scale	Body weight	Body weight in pounds
Continuous measures		

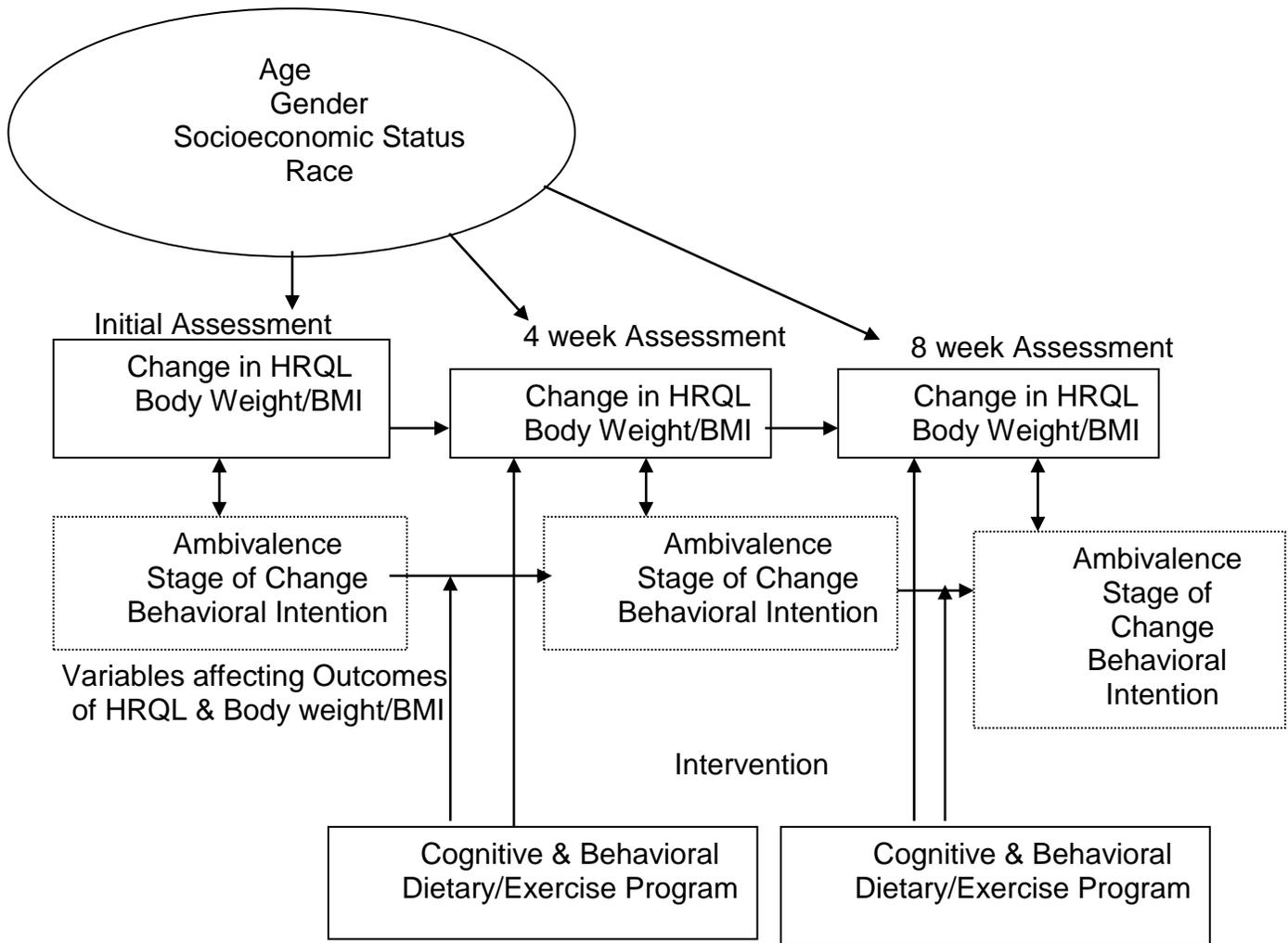


Figure 3-1. How factors/variables can affect outcomes: Health Related Quality of Life (HRQL) and Body weight/BMI (Weight Loss) during a Healthy Lifestyle/Weight Loss program

		Positive Rating			
		0	1	2	3
Negative Rating	0	0	-0.5	-1.0	-1.5
	1	-0.5	1	.5	0
	2	-1.0	.5	2	1.5
	3	-1.5	0	1.5	3

Figure 3-2. Attitudinal ambivalence

CHAPTER 4 RESULTS

My study examined associations among weight-loss, health-related quality of life, ambivalence, stage of change, and behavioral intentions as patients progressed through stages of an 8-week healthy lifestyle/weight loss program. Data collected during my study are presented in this chapter. The data demonstrate changes in these variables that occur over an 8-week period. Other factors that may influence these variables are also examined, including age, race, socioeconomic status, and program compliance.

Participant Demographics

Participants were referred to a physical therapy clinic in Gainesville, Florida. Participants were referred for physical therapy and a healthy lifestyle/weight loss program by their physicians, with a primary orthopedic diagnosis and a secondary diagnosis of overweight/obesity. All participants were from the area within and surrounding Gainesville, Florida, a community within Alachua county, which is located in North Florida. All participants required a physicians' referral in order to participate in the healthy lifestyle/weight-loss program. All participants completed the usual medical intake assessment for physical therapy. Participants involved in the study completed an IRB-approved informed consent and completed the baseline assessment. There were 112 participants in the study. Nineteen patients dropped out of the program for the following reasons: 7 for medical and/or health-related problems, 4 for insurance/financial problems, and 8 for personal or family problems. Two patients' data were incomplete and could not be used.

Participants ranged from 18 to 83 years of age. The mean age was 55.6 years: 26.37% of patients were 50 to 59; 26.37% were 60-69, 16.48% were 40 to 49; 13.18% were 70 to 79; and 3.29 and 2.19% were 18 to 29 and 80 to 89, respectively. There were 71 female and 20 male participants: 8.79% were African American, 2% were hispanic, and 89% were Caucasian. Table 4-1 shows demographic data and descriptive statistics, with categories for body mass index. This data demonstrates that at time 1, 15.38% of patients were in the overweight category (25 to 29.9); 37.26% of patients were in the obesity class I category (30 to 34.9); 24.17% were in the class II obesity category (35 to 39.9); and 24.27% were in the class III obesity category (>40). Primary insurance providers for patients were Blue Cross and Medicare at 47.25 and 30.76% respectively. The two prevailing diagnoses were low back and knee, at 42.85 and 30.76%, respectively.

Table 4-7 shows socioeconomic factors (Population Studies Center) and weight loss. Those in the \leq \$20,000 to 59,999 category had a -4.14% reduction in body weight compared to -4.58% weight loss for those in the \$60,000 to \geq \$80,000 category.

Body Weight

Mean body weight progressively decreased from Time 1 through Time 3, (Table 4-2). Changes in mean body weight using a Repeated Measures Analysis of Variance with a pairwise comparison using a Bonferroni correction supported significant differences in body weight over time, ($p=.0005$, $F=184.18$, $df=1.349$) (Table 4-3). Pairwise comparisons for Times 1 to 2, $p=.0005$, mean difference= 6.84; Times 2 to 3, $p=.0005$, mean difference 3.21; Times 1 to 3, $p=.0005$, mean difference=10.05 pounds. Mean weight loss during the eight week period was 10.05 ± 6.63 pounds, with a range of -34.2 to 4.5 pounds. Mean weight loss from baseline to 4 weeks was $6.84 \pm .38$ pounds;

and from 4 weeks to 8 weeks, it was 3.21 ± 3.86 pounds (Table 4-2). Mean percent change in weight was 4.42% from baseline to 8 weeks; 2.98% from baseline to 4 weeks; and 1.49% from 4 weeks to 8 weeks. A Repeated Measures Analysis of Variance supported significant changes in percent body weight among times ($p=.0005$, $F=131.112$, $df=1.835$). A pairwise comparison using a Bonferroni correction for times 1 to 2, $p=.0005$, mean difference $-.015$ percent; Time 2 to 3, $p=.0005$, mean difference $.029$ percent, and Times 1 to 3, $p=.0005$, mean difference $.014\%$. Table 4-4 shows weight loss data.

Health Related Quality of Life

Mean scores for Health Related Quality of Life for the physical component score (PCS) and mental component score (MCS) progressively increased from Time 1 through Time 3 (Table 4-2). Changes in mean scores for Health Related Quality of Life for physical component score (PCS) using a Friedman test demonstrated significant differences in scores, ($p=.0005$, $\chi^2=86.89$, $df=2$) (Table 4-3). This was followed by Wilcoxon Sign Ranks for pairwise comparisons with a Bonferroni correction requiring $p=.017$; (Times 2 to 1, $p=.0005$, $Z= -6.762$; Times 3 to 2, $p=.0005$, $Z= -4.692$; Times 3 to 1, $p=.0005$, $Z= -7.773$) (Table 4-3). Changes in mean scores for Health Related Quality of Life for MCS using a Friedman test demonstrated significant differences in scores, ($p=.0005$, $F=$, $\chi^2=26.643$, $df=2$) followed by Wilcoxon Sign Ranks for pairwise comparisons with a Bonferroni correction requiring $p=.017$; (Times 2 to 1, $p=.0005$, $Z= -4.579$; Times 3 to 2, $p=.021$, $Z= -2.306$; Times 3 to 1, $p=.0005$, $Z= --4.706$) (Table 4-4).

Stage of Change

There was a statistically significant change in stage increasing from Time 1 to Time 2, and from Time 1 to Time 3 for both exercise and food choices. Stage of change

(Table 4-3) related to exercise using a Friedman test demonstrated significant differences in ratings among times ($p=.0005$, chi square=87.085, $df=2$) followed by Wilcoxon Sign Ranks for pairwise comparisons with a Bonferroni correction requiring $p=.017$; (Time 2 to 1, $p=.0005$, $Z= -6.673$; Time 3 to 2, $p=.537$, $Z=-.617$; Time 3 to 1, $p=.0005$, $Z= -6.257$). The mean change in stage of change related to food choices using a Friedman test demonstrated significant differences in scores, ($p=.0005$, chi square=114.902, $df=2$) followed by post hoc pairwise comparisons with a Bonferroni correction requiring $p=.017$; (time 2 to 1, $p=.0005$, $Z= -7.313$; time 3 to 2, $p= .243$, $Z= -1.166$; time 3 to 1, $p=.0005$, $Z= -7.369$) (Table 4-4).

Attitudinal Ambivalence

Ambivalence related to weight loss, daily exercise, and food diary was calculated to assess for significant changes over time. Mean scores for ambivalence progressively decreased for weight loss, daily exercise, and food diary from Time 1 through Time 3 (Table 4-2) Mean changes in ambivalence related to weight loss (WL), daily exercise (DE), and food diary (FD) using a Friedman test demonstrated significant differences in scores for WL, ($p=.0005$, chi square = 21.342, $df = 2$) followed by a Wilcoxon Sign Ranks for pairwise comparisons with a Bonferroni correction requiring $p=.017$; (Time 2 to 1, $p=.059$, $Z= -1.891$; Time 3 to 2, $p=.003$, $Z= -3.006$, Time 3 to 1, $p=.0005$, $Z= -5.956$); DE, ($p=.0005$, chi square=33.174, $df=2$) (Table 4.4), followed by pairwise comparisons; (time 2 to 1, $p=.0005$, $Z= -3.801$; Time 3 to 2, $p=.003$, $Z= -2.953$; Time 3 to 1, $p=.0005$, $Z= -5.412$), and for FD, ($p=.0005$, chi square=41.282, $df=2$) followed by pairwise comparisons; (Time 2 to 1, $p=.0005$, $Z= -4.152$; Time 3 to 2, $p=.208$, $Z= -1.258$; time 3 to 1, $p=.0005$, $Z= -5.225$) (Table 4.4). Findings supported differences in ambivalence at all levels with exception of Time 3 to 2 for food diary and Time 1 to 2 for

weight loss. When comparing differences among weight loss, daily exercise, and food diary, a difference was noted between ambivalence for weight loss and daily exercise for Time 1, 2, and 3, ($p = .011$, $z = -2.550$; $p = .002$, $z = -3.088$; $p = .001$, $z = -3.0463$) and between ambivalence for weight loss and food diary for Time 3 ($p = .012$, $z = -2.515$) (Table 4-5)

Behavioral Intentions

Mean scores for behavioral intentions for weight, daily exercise, and food diary from Time 1 through Time 3 are given in Table 4-2. Mean changes in behavioral intentions related to levels of weight loss (WL), daily exercise (DE) and food diary (FD) using a Friedman test demonstrated no statistically significant differences in scores for WL ($p = .944$, $\chi^2 = .115$, $df = 2$), for DE ($p = .447$, $\chi^2 = 1.610$, $df = 2$), and for FD ($p = .113$, $\chi^2 = 4.360$, $df = 2$) (Table 4-3). Additionally, when comparing differences among weight loss daily exercise and food diary. A notable difference was found among behavioral intentions for weight loss and daily exercise for Times 1, 2, and 3, ($p = .0005$, $z = -4.591$; $p = .0005$, $z = -3.990$; $p = .004$, $z = -2.880$) and among behavioral intentions for weight loss and food diary for Times 1, 2, and 3, ($p = .0005$, $z = -4.084$; $p = .0005$, $z = -3.522$; $p = .0005$, $z = -3.609$) respectively (Table 4-6).

Program Compliance

Program compliance (Table 4-3) was recorded in 2-week intervals over the 8-week period represented by Times 1 to 4. Program compliance was greatest from 2 to 4 weeks and 4 to 6 weeks. Repeated Measures Analysis of Variance with a pairwise comparison using a Bonferroni correction supported significant differences in compliance ($p = .008$, $F = 4.484.18$, $df = 2.385$). Post hoc pairwise comparisons for Time 1 to 2 ($p = .012$); and Time 1 to 3 ($p = .006$) were statistically significant. Pairwise

comparisons were not significantly different for times (Times 2 to 3 ($p=1.000$), Times 1 to 4 ($p= .690$), Times 2 to 4 ($p= 1.0000$, or Times 3 to 4 ($p= .450$) (Table 4.4).

Socioeconomic category is shown in (Table 4-7). Participants in the socioeconomic category \leq \$20,000 to 39,999 demonstrated a mean weight loss of - 5.20, ± 1.66 percent change compared to - 3.91, ± 2.88 and -4.58, ± 2.54 for categories \$40,000 to 59,999 and \$60,000 to $\geq 80,000$, respectively.

The following research questions are listed below followed by an itemized breakdown of each question for analysis.

Research Questions

1. Are the improvements in HRQL proportional to the progression in weight loss and are there associations between weight loss and HRQL, ambivalence, and behavioral intentions, which can be identified?
2. Are lapses in behavior an effect of improvement in the HRQL, that facilitates a person's belief that they can return to previous held behaviors, with a subsequent deterioration of health behaviors and health status?
3. Does HRQL affect behavioral intentions and ambivalence as one progresses through a healthy lifestyle/weight loss program?

In order to answer the research questions the following areas must be separately identified and analyzed.

Are the improvements in HRQL proportional to the progression in weight loss and can associations among weight loss, HRQL, ambivalence, and behavioral intentions, which can be identified?

The relationship between weight loss and HRQL is first addressed by examining percent change in body weight and percent change in the physical and mental component scores of the HRQL of the SF-36. This is followed by identifying relationships among HRQL, ambivalence, and behavioral intentions. Finally

relationships among categories within the ambivalence and behavioral intentions (food diary, weight loss and daily exercise) will help identify meaningful data related to behavioral changes. Itemized questions below are followed by results.

Is there a correlation between weight loss and health related quality of life (SF-36)? Statistical analysis used Spearman's rho to determine correlations. We investigated potential associations of weight loss using percent change in weight and percent change in the physical component score (PCS) and the mental component score (MCS) of the HRQL. Percent change in weight and PCS for Time 1 to 2 demonstrated a weak correlation ($r = -.232$, $p = .027$) but no significant correlations for Time 2 to 3 ($r = -.092$, $p = .383$) or Time 1 to 3 ($r = -.107$, $p = .311$). The correlation between weight loss and the mental component score (MCS) was not statistically significant for Time 1 to 2 ($r = .002$, $p = .988$), Time 2 to 3 ($r = -.037$, $p = .725$) or Time 1 to 3 ($r = -.173$, $p = .101$) (Table 4-8).

Are there associations between behavior plans/intentions and weight loss? We analyzed a mean for planned and intended behavior for each category, behavior related to weight loss (WL), behavior related to daily exercise (DE), and behavior related to food diary (FD). Spearman's rho test was used to analyze correlations between behavior and percent weight loss. There were no significant correlations between behavior related to weight loss at Time 1 and percent change in weight between Time 1 to Time 2 ($r = -.129$, $p = .225$). A weak correlation was found in behavior at Time 2 and percent change in weight from time 2 to Time 3 ($r = -.219$, $p = .037$), but no correlation was found for behavior at time 3 and percent weight loss from Time 1 to Time 3 ($r = -$

.029, $p = .78$). Table 4-9 shows percent change in body weight and mean behavior for weight loss, food diary, and daily exercise.

Behavior related to daily exercise at Time 1 and percent change in weight from Time 1 to Time 2 showed no correlations ($r = -.036$, $p = .735$) between Time 2 to 3 for weight and Time 2 for behavior ($r = -.187$, $p = .076$), or between Time 1 to 3 for weight and Time 3 for behavior ($r = .098$, $p = .355$). Behavior related to food diary at Time 1 and percent change in weight between Times 1 and 2 showed no correlations ($r = .040$, $p = .707$), from Time 2 to Time 3 for weight and Time 2 for behavior ($r = -.069$, $p = .516$), or between Time 1 to 3 for weight and Time 3 for behavior ($r = .064$, $p = .546$).

Are there associations between ambivalence and change in body weight? Table-4-10 shows correlations between percent change in body weight and mean ambivalence for categories WL, FD and DE. For each category, a mean was taken for subsets: thoughts/beliefs, feelings, and attitudes related to ambivalence. An average of the subsets for each category (ambivalence related to WL, ambivalence related to DE, and ambivalence related to FD) was used in analysis. Spearman's rho test was used to analyze correlations between behavior and percent weight loss. No significant correlations were found for mean ambivalence related to weight loss at time 1 and percent change in weight from Time 1 to Time 2 ($r = -.012$, $p = .913$), or between mean ambivalence at time 2 and percent change in weight from Time 2 to Time 3 ($r = .178$, $p = .091$), however a weak correlation for mean ambivalence at Time 3 and percent weight loss between Time 1 and Time 3 ($r = .258$, $p = .013$). Table 4-9 shows percent change in body weight and mean ambivalence for weight loss, food diary, and daily exercise.

Ambivalence related to daily exercise at Time 1 and percent change in weight from Time 1 to Time 2 showed no correlations ($r = .015$, $p = .889$), or between Time 2 to Time 3 for weight and Time 2 for mean ambivalence ($r = -.093$, $p = .378$), or between Time 1 to Time 3 for weight and time 3 for mean ambivalence ($r = .163$, $p = .124$).

Ambivalence related to food diary at Time 1 and percent change in weight between Time 1 to Time 2 demonstrated no correlations ($r = -.057$, $p = .593$), or between Time 2 to Time 3 for weight and Time 2 for mean ambivalence ($r = .053$, $p = .619$), or between Time 1 to Time 3 for weight and Time 3 for mean ambivalence ($r = .104$, $p = .326$).

Are there significant differences between categories within ambivalence and behavioral intentions? Table 4-5 and 4-6 demonstrates differences found between categories for ambivalence and behavior intentions. For Time 1 ambivalence related to weight loss, daily exercise, and food diary demonstrated a significant difference between weight loss and daily exercise ($p = .0005$, $z = -4.558$), and between weight loss and food diary ($p = .001$, $z = -3.284$) however no statistically significant difference between food diary and daily exercise ($p = .274$, $z = -1.095$). For Time 2 ambivalence related to weight loss, daily exercise, and food diary demonstrated a significant difference between weight loss and daily exercise ($p = .002$, $z = -3.088$), however no significant difference between weight loss and food diary ($p = .467$, $z = -.727$) or food diary and daily exercise ($p = .018$, $z = -2.359$). For Time 3 ambivalence related to weight loss, daily exercise, and food diary demonstrated a significant difference between weight loss and daily exercise ($p = .001$, $z = -3.463$), and between weight loss and food diary ($p = .012$, $z = -2.515$) however no significant difference between food diary and daily exercise ($p = .385$, $z = -.870$).

Categories within behavioral intentions demonstrated similar differences (Table 4-6). For Time 1 behavioral intention related to weight loss, daily exercise, and food diary demonstrated a significant difference between weight loss and daily exercise ($p = .0005$, $z = -4.591$) and weight loss and food diary ($p = .005$, $z = -4.084$), however no significant difference between food diary and daily exercise ($p = .871$, $z = -1.62$). For Time 2 behavior intention related to weight loss, daily exercise, and food diary demonstrated a significant difference between weight loss and daily exercise ($p = .0005$, $z = -3.900$), and between weight loss and food diary ($p = .0005$, $z = -3.522$) However no significant difference between food diary and daily exercise ($p = .899$, $z = -1.127$). For Time 3 behavior intention related to weight loss, daily exercise, and food diary demonstrated a significant difference between weight loss and daily exercise ($p = .004$, $z = -2.880$), and between weight loss and food diary ($p = .0005$, $z = -3.609$) however no significant difference between food diary and daily exercise ($p = .098$, $z = -1.656$).

Research Question 2

Are lapses in behavior an effect of improvement in the HRQL that facilitates a person's belief that they can return to previous held behaviors, with a subsequent deterioration of health behaviors and health status? Lapses in behavior are a recognized part of regressing in terms of behavior and health status (Elfhag & Rossner, 2005). Variables related to patients' behaviors and health status must be examined in order to address this question. Additionally program compliance is a reflection of a lapse in behavior. Examining potential correlations between program compliance and weight loss, along with associations between Health Related Quality of Life and compliance may provide meaningful information related to this question.

Are there associations between program compliance and change in body weight? Table 4-11 shows correlations between program compliance at 2 weeks, 4 weeks, 6 weeks and 8 weeks and percent change in body weight from Times 1 to 2, Times 2 to 3, and Times 1 to 3. No correlation was seen between Time 1 to Time 2 for percent change in body weight and compliance from Time 1 to 2 weeks ($r = -.140$, $p = .187$). There was a moderate negative correlation between Time 1 to Time 2 for percent change in body weight and compliance from weeks 2 to 4, ($r = -.301$, $p = .004$). There was a weak negative correlation between percent change in body weight between Time 2 to Time 3 and compliance from 4 to 6 weeks ($r = -.276$, $p = .008$) and a moderate correlation for compliance from 6-8 weeks ($r = -.345$, $p = .001$). There was not a significant correlation between percent change in body weight between Time 1 to Time 3 and compliance from 1 to 2 weeks ($r = -.144$, $p = .172$). However there was a moderate negative correlation between percent change in body weight at Times 1 to Times 3 and compliance from 2 to 4 weeks ($r = -.332$, $p = .001$), compliance from 4 to 6 weeks ($r = -.304$, $p = .003$), and compliance from 6-8 weeks ($r = -.318$, $p = .002$). There was also a moderate negative correlation between average compliance over 8 weeks and percent weight loss over 8 weeks ($r = -.313$, $p = .003$).

Is there a correlation between program compliance and HRQL? Table 4-12 shows correlations between program compliance totals from baseline to 4 weeks, 4 to 8 weeks, and the 8 week average; and the physical and mental component score. There was not a significant correlation between compliance from baseline to 4 weeks, 4 to 8 weeks, and the 8-week average; and the difference in mental component score from time 1 to 2, 2 to 3 and 1 to 3, ($r = -.105$, $p = .320$; $r = .065$, $p = .542$; $r = -.069$, $p = .515$).

Also there was not a significant correlation between compliance from baseline to 4 weeks, 4 to 8 weeks and the 8-week average; and the difference in the physical component score from Time 1 to 2, Time 2 to 3 and Time 1 to 3, ($r = -.017$, $p = .872$; $r = -.055$, $p = .602$; $r = -.019$, $p = .855$).

Research Question 3

Does HRQL affect behavioral intentions and ambivalence as one progresses through a healthy lifestyle/weight loss program? To investigate this question associations between behavioral intentions and ambivalence need to be addressed. Then the relationship between mean changes in HRQL for both the MCS and PCS from Time 1 to Time 2 and Time 2 to Time 3 affect ambivalence or behavioral intentions needs to be examined. Finally, the relationship between ambivalence and behavioral intentions was addressed.

Are there associations between ambivalence and behavioral intentions? Table 4-13 shows correlations between ambivalence and behavior. No correlations seen between ambivalence and behavior related to WL for Times 1 and 2, ($r = -.172$, $p = .103$; $r = -.177$, $p = .093$) respectively, however a weak correlation seen between ambivalence and behavior related to WL for time 3, ($r = -.202$; $p = .055$). A weak, strong, and moderate negative correlation was seen between ambivalence and behavior related to FD for Times 1, 2, and 3, ($r = -.217$, $p = .039$; $r = -.457$, $p = .0005$; $r = -.371$, $p = .0005$) respectively. A moderate, weak, and strong negative correlation seen between ambivalence and behavior related to DE for Times 1, 2, and 3, ($r = -.303$, $p = .003$; $r = -.261$, $p = .013$; $r = -.413$, $p = .0005$) respectively.

Are there associations between Health related quality of life (SF-36) and behavioral intentions? Table 4-14 shows correlations among components of the SF-36

Health Related Quality of Life (HRQL), physical component score (PCS), and mental component score (MCS); and behavior related to weight loss (WL), food diary (FD), and daily exercise (DE). No correlations were found between the PCS and mean behavior related to WL for Times 1, 2, or 3 ($r = .060, p = .574$; $r = .023, p = .828$; $r = .170, p = .107$) respectively. There were no correlations seen between PCS and mean behavior related to FD for Times 1, 2, or 3 ($r = .010, p = .927$; $r = .036, p = .738$; $r = -.015, p = .885$) respectively. There were no correlations seen between PCS and mean behavior related to DE for Times 1, 2, or 3, ($r = -.034, p = .808$; $p = .109, p = .303$; $r = .029, p = .787$), respectively.

No correlations were found between the MCS and mean behavior related to WL for Times 1, 2, or 3 ($r = .060, p = .574$; $r = .023, p = .828$; $r = .170, p = .107$), respectively. No correlations were seen between MCS and mean behavior related to FD for times 1, 2, or 3 ($r = .010, p = .927$; $r = .036, p = .738$; $r = -.015, p = .885$), respectively. No correlations were seen between MCS and mean behavior related to DE for Times 1, 2, or 3 ($r = -.034, p = .808$; $p = .109, p = .303$; $r = .029, p = .787$), respectively.

Are there associations between health related quality of life (SF-36) and ambivalence? Table 4-15 shows correlations among components of the SF-36 Health Related Quality of Life (HRQL), physical component score (PCS) and mental component score (MCS); and mean ambivalence related to weight loss (WL), food diary (FD), and daily exercise (DE). No correlations were found between the PCS and mean ambivalence related to WL for times 1, 2, or 3 ($r = -.066, p = .535$; $r = -.112, p = .289$; $r = -.160, p = .131$), respectively. A weak negative correlation was seen between PCS and mean ambivalence related to FD for Time 1 ($r = -.282, p = .007$), however no

correlations were seen for Times 2 and 3 ($r = -.023, p = .830$; $r = .050, p = .640$), respectively. No correlations were seen between PCS and mean ambivalence related to DE for Times 1, 2, or 3 ($r = -.089, p = .400$; $r = -.160, p = .130$; $r = -.137, p = .195$), respectively.

No correlations were found between the MCS and mean ambivalence related to WL for Times 1 and 2, ($r = -.034, p = .748$; $r = -.183, p = .083$), respectively; however, there was a moderate negative correlation between MCS and mean ambivalence related to WL for Time 3 ($r = -.337, p = .001$). There were no correlations seen between MCS and mean ambivalence related to FD for Times 1 ($r = -.084, p = .427$); however, a moderate negative correlation was seen between MCS and mean ambivalence related to FD for Times 2 and 3 ($r = -.323, p = .002$; $r = -.356, p = .001$), respectively. No correlation was seen between MCS and mean ambivalence related to DE for Time 1 ($r = -.152, p = .150$); however, a weak and moderate negative correlation was seen between MCS and mean ambivalence related to DE for Times 2 and 3 ($r = -.262, p = .012$; $r = -.342, p = .001$), respectively.

Summary

These findings suggest that involvement in physical therapy concurrent with a weight loss/healthy lifestyle program can facilitate weight loss as demonstrated by a mean weight loss of 4.42 % over an 8-week period. My study also demonstrated statistically significant increases in the physical and mental status of a patient indicated by a 32.24 % increase in the mean physical component score and a 19.42% increase in the mental component score over an 8-week period. Also demonstrated was a progressive decrease in ambivalence related to weight loss (WL), food diary (FD), and daily exercise (DE) over the 8-week program. The most significant decrease in

ambivalence was seen from baseline to 4 weeks, which corresponded to a mean increase in stage of change from Category 3 (preparation stage) to Category 4 (action stage). Additionally, there were statistically significant differences between categories of ambivalence for weight loss and daily exercise (Table 4-5), and between categories of behavioral intentions for weight loss and daily exercise as well as for weight loss and food diary (Table 4-6). The mean rating for the category weight loss had the lowest level of ambivalence and the highest level of behavioral intention compared to food diary or daily exercise.

Associations were found between compliance with food and exercise logs, and weight loss, demonstrating greater compliance at increased weight loss. My study also found negative associations between the MCS and ambivalence related to the food diary and daily exercise. This suggests that as ambivalence decreases, MCS increases. Additionally, negative associations were found between ambivalence and stage of change; and between ambivalence and behavioral intentions for food diary and daily exercise. This suggests that as ambivalence decreases, there is a resultant increase in stage of change and behavioral intentions for the specified areas of food diary and daily exercise.

One of the strengths of my study was its experimental design, using an actual clinical setting with repeated measures collected longitudinally over time, using the same subjects. This effectively reduces the variance of estimates of the treatment effects over time, allowing statistical inference to be made with a smaller quantity of subjects. This type of design allowed for investigation of how subjects respond to stages of change during a lifestyle/weight-loss program in a real-life setting, without being

encumbered by potential bias that may occur when the experimental environment has imposed restrictions.

Table 4-1. Population demographics

Demographic	Frequency = n	Percent
Male	20	22.0
Female	71	78.0
Age, mean SD (range)	55.6 y \pm 14 (18-83)	
Age Groups (yrs)		
18-29	3	3.29
30-39	11	12.09
40-49	15	16.48
50-59	24	26.37
60-69	24	26.37
70-79	12	13.18
80-89	2	2.19
Ethnicity		
Caucasian	81	89.01
African American	8	8.79
Hispanic	2	2.19
Annual Household Income (dollars)		
Mean	64,832	
Median	54,607	
Range	28,039 to 78,873	
Annual Household Income (dollars)		
\leq 20,000 to 39,999	6	6.97
40,000 to 59,999	28	32.55
60,000 to \geq 80,000	52	60.46
Obesity classification BMI		
Overweight 25 to 29.9	14	15.38
Obesity Class I 30 to 34.9	33	36.26
Obesity Class II 35 to 39.9	22	24.17
Obesity Class III \geq 40	22	24.17
Insurance		
Medicare	28	30.76
Blue Cross	43	47.25

Table 4-1. Continued

Demographic	Frequency = n	Percent
Insurance		
Medicare	28	30.76
Blue Cross	43	47.25
Avmed	7	7.69
UHC	3	3.29
Cigna`	2	2.19
Tricare	1	1.09
Champ	1	1.09
Aetna	2	2.19
Mail Handler	1	1.09
Workers Compensation	1	1.09
Vocational Rehab.	1	1.09
BCHO	1	1.09
Diagnosis		
Back pain	39	42.85
Knee pain	28	30.76
Shoulder pain	3	3.29
Neck pain	3	3.29
Ankle pain	3	3.29
Muscle weakness	3	3.29
Hip/thigh pain	3	3.29
Joint pain	2	2.19
ITB syndrome	1	1.09
Fibromyalgia	1	1.09
Achilles tendonosis	1	1.09
Abdominal strain	1	1.09
Myofascial pain	1	1.09
Pelvic arthritis	1	1.09

Table 4-2. Means by variable and time of measurement

Physical and psychosocial variables	Time 1		Time 2		Time 3	
	Mean	SD	Mean	SD	mean	SD
Body weight	2225.2	44.9	218.4	42.9	215.1	42.9
SF-36 HRQL						
PCS	35.71	10.43	41.60	9.76	44.98	9.91
MCS	47.38	12.97	52.13	10.16	53.45	10.97
Ambivalence						
Weight loss	-.676	.637	-.791	.759	-1.034	.547
Food diary	-.353	.798	-.730	.777	-.859	.672
Daily exercise	-.238	.857	-.558	.676	-.782	.760
Behavioral intention						
Weight loss	2.918	.291	2.918	.318	2.852	.535
Food diary	2.588	.728	2.676	.664	2.462	.981
Daily exercise	2.577	.702	2.659	.686	2.604	.892
Stage of Change						
Exercise	2.97	.936	3.80	.670	3.77	.747
Food choices	2.93	.800	3.86	.569	3.72	.500

Table 4-3. Interactions with time

	F	df	p	Partial eta Squared	Power
Body Weight	184.18	1.349	.0005	.672	1.000
Percent Change In Body weight	131.112	1.835	.0005	.593	1.000
Compliance	4.484	2.385	.008	.047	.815
		Chi-Square	df	Two tailed Probability	
PCS of HRQL	86.893		2	.0005	
MCS of HRQL	26.643		2	.0005	
Ambivalence					
Weight Loss	21.342		2	.0005	
Food Diary	41.282		2	.0005	
Daily Exercise	33.174		2	.0005	
Behavioral Intentions					
Weight Loss	.115		2	.944	
Food Diary	4.360		2	.113	
Daily Exercise	1.610		2	.447	
Stage of Change					
Exercise	.085		2	.0005	
Food Choices	114.902		2	.0005	

Table 4-4. Pairwise Comparisons over time

Behavioral Variable	T-T	Mean diff.	p-value	Lower	Upper
Body Weight	1-2	6.840	.0005	5.179	7.962
	2-3	3.205	.0005	2.219	4.192
	1-3	10.046	.0005	8.351	11.741
Percent change in body wt	1-2	-.015	.0005	-.020	-.010
	2-3	.029	.0005	.025	.033
	1-3	.014	.0005	.010	.018
Compliance	1-2	-5.000	.012	-9.248	-.752
	1-3	-6.396	.006	-11.434	-1.357
	1-4	-3.648	.690	-9.834	2.537
	2-3	-1.396	1.000	-6.054	3.263
	2-4	1.352	1.000	-3.810	6.513
	3-4	2.747	.450	-1.368	6.862
	T-T		Z	Two tailed Prob.	
PCS of HRQL	2-1		-6.762	.0005	
	3-2		-4.692	.0005	
	3-1		-7.773	.0005	
MCS of HRQL	1-2		-4.579	.0005	
	3-2		-2.306	.021	
	1-3		-4.706	.0005	
Ambivalence					
	Weight loss	2-1	-1.891	.059	
		3-2	-3.006	.003	
Daily exercise		1-3	-5.956	.0005	
		2-1	-3.801	.0005	
		3-2	-2.953	.003	
Food diary		1-3	-5.412	.0005	
		2-1	-4.152	.0005	
		3-2	-1.258	.208	
Stage of change		1-3	-5.225	.0005	
	Exercise	2-1	-6.673	.0005	
		3-2	-.617	.537	
1-3		-6.257	.0005		
Food choices	2-1	-7.313	.0005		
	3-2	-1.166	.243		
	1-3	-7.369	.0005		

Table 4-5. Pairwise comparisons for ambivalence related to (weight loss),WL,daily exercise (DE), and food diary (FD)

Time	Category	Z	Two tailed Prob.
Time 1	DE-WL	-4.558	.0005
	FD-DE	-1.095	.274
	WL-FD	-3.284	.001
Time 2	DE-WL	-3.088	.002
	FD-DE	-2.359	.018
	WL-FD	-.727	.467
Time 3	DE-WL	-3.463	.001
	FD-DE	-.870	.385
	WL-FD	-2.515	.012

Table 4-6. Pairwise comparisons for behavioral intentions related to WL, DE, and FD

Time	Category	Z	Two tailed Prob.
Time 1	DE-WL	-4.591	.0005
	FD-DE	-.162	.871
	WL-FD	-4.084	.0005
Time 2	DE-WL	-3.990	.0005
	FD-DE	-.127	.899
	WL-FD	-3.522	.0005
Time 3	DE-WL	-2.880	.004
	FD-DE	-1.656	.098
	WL-FD	-3.609	.0005

Table 4-7. Mean weight loss by socioeconomic

Socioeconomic Category	N	Mean Percent WL	SD	Min	Max
≤20,000 – 39,999	6	- 5.20	1.66	-3.46	-7.56
40,000 – 59,999	28	- 3.91	2.88	1.59	-11.14
≤20,000 –59,999*	34	- 4.14	2.73	1.59	-11.14
60,000 -≥80,000	52	- 4.58	2.54	1.50	-9.39

*Categories 1 & 2 combined

Table 4-8. Correlation between percent change in weight and percent change in physical component score (PCS) and mental component score (MCS)

Category	Time	Correlation coefficient	Two tailed probability
PCS	1 - 2	-.232	.027
	2 - 3	-.092	.383
	1 - 3	-.107	.311
MCS	1 - 2	.002	.988
	2 - 3	-.037	.725
	1 - 3	-.173	.101

Table 4-9. Correlation between percent change in weight loss (WL) and behavioral intention (BI)

	WL/BI	Correlation coefficient	Two tailed probability
Weight loss	Time 1-2/1	-.129	.225
	Time 1-2/2	-.074	.484
	Time 2-3/2	-.219	.037
	Time 2-3/3	-.129	.222
	Time 1-3/1	-.243	.020
	Time 1-3/2	-.213	.042
	Time 1-3/3	-.029	.788
Food diary	Time 1-2/1	.040	.707
	Time 1-2/2	.043	.685
	Time 2-3/2	-.069	.516
	Time 2-3/3	.012	.913
	Time 1-3/1	-.037	.728
	Time 1-3/2	-.038	.719
	Time 1-3/3	.064	.546
Daily exercise	Time 1-2/1	-.036	.735
	Time 1-2/2	.053	.615
	Time 2-3/2	-.187	.076
	Time 2-3/3	-.090	.394
	Time 1-3/1	-.098	.355
	Time 1-3/2	-.086	.420
	Time 1-3/3	.098	.355

Table 4-10. Correlation between percent change in weight loss (WL) and ambivalence (AMB)

	WL/AMB		Correlation coefficient	Two tailed probability
Weight loss	Time	1-2/1	.012	.913
	Time	1-2/2	.059	.576
	Time	2-3/2	.178	.091
	Time	2-3/3	.285	.006
	Time	1-3/1	.107	.315
	Time	1-3/2	.161	.127
	Time	1-3/3	.258	.013
Food diary	Time	1-2/1	-.057	.593
	Time	1-2/2	-.040	.704
	Time	2-3/2	.053	.619
	Time	2-3/3	.100	.346
	Time	1-3/1	.054	.613
	Time	1-3/2	.012	.911
	Time	1-3/3	.104	.326
Daily exercise	Time	1-2/1	.015	.889
	Time	1-2/2	.083	.435
	Time	2-3/2	.093	.378
	Time	2-3/3	.256	.014
	Time	1-3/1	.097	.359
	Time	1-3/2	.081	.446
	Time	1-3/3	.163	.124

Table 4-11. Correlations between percent change in weight loss (WL) and compliance (COMP)

Time: WL/COMP	Correlation coefficient	Two tailed probability
0-4/1-2	-.140	.187
0-4/2-4	-.301	.004
4-8/4-6	-.276	.008
4-8/6-8	-.345	.001
0-8/1-2	-.144	.172
0-8/2-4	-.332	.001
0-8/4-6	-.304	.003
0-8/6-8	-.318	.002

Table 4-12. Correlations between health related quality of life (HRQL) and compliance (COMP)

	Time: HRQL/ COMP	Correlation coefficient	Two tailed probability
PCS	1 - 2	-.017	.872
	2 - 3	-.055	.602
	1 - 3	-.019	.855
MCS	1 - 2	-.105	.320
	2 - 3	.065	.542
	1 - 3	-.069	.515

Table 4-13. Correlations between ambivalence (AMB) and behavior intentions (BI) for food diary (FD) and daily exercise (DE)

	AMB/BI	Correlation coefficient	Two tailed probability
Food diary	Time 1/1	-.217	.039
	Time 2/2	-.457	.0005
	Time 3/3	-.371	.0005
Daily exercise	Time 1/1	-.303	.003
	Time 2/2	-.261	.013
	Time 3/3	-.413	.0005

Table 4-14. Correlation between health related quality of life (HRQL) and behavioral intentions (BI)

	HRQL/BI	Correlation coefficient	Two tailed probability	
PCS	Time 1/1	.060	.574	
	Weight Loss	Time 2/2	.023	.828
		Time 3/3	.170	.107
Food Diary	Time 1/1	.010	.927	
	Time 2/2	.036	.738	
	Time 3/3	-.015	.885	
Daily Exercise	Time 1/1	-.034	.808	
	Time 2/2	.109	.303	
	Time 3/3	.029	.787	
MCS	Time 1/1	.111	.294	
	Weight Loss	Time 2/2	.273	.009
		Time 3/3	.215	.041
Food Diary	Time 1/1	.041	.701	
	Time 2/2	.220	.036	
	Time 3/3	.098	.356	
Daily Exercise	Time 1/1	.127	.229	
	Time 2/2	.074	.483	
	Time 3/3	.168	.112	

Table 4-15. Correlations between health related quality of life (HRQL) and ambivalence (AMB)

	HRQL/AMBFD	Correlation coefficient	Two tailed probability
MCS	Time 1/1	-.034	.748
Weight loss	Time 2/2	-.183	.083
	Time 3/3	-.337	.001
	Time 1/1	-.084	.427
Food diary	Time 2/2	-.323	.002
	Time 3/3	-.356	.001
	Time 1/1	-.152	.150
Daily exercise	Time 2/2	-.262	.012
	Time 3/3	-.342	.001
	Time 1/1	-.066	.535
PCS	Time 2/2	-.112	.289
	Time 3/3	-.160	.131
	Time 1/1	-.282	.007
Food diary	Time 2/2	-.023	.830
	Time 3/3	.050	.640
	Time 1/1	-.089	.400
Daily exercise	Time 2/2	-.160	.130
	Time 3/3	-.137	.195

CHAPTER 5 DISCUSSION AND SUMMARY, CONCLUSIONS, AND RECOMMENDATIONS

There are many obesity-related health issues that increase one's risk for chronic disease. The food and exercise-challenged environment, genetic predisposition toward calorie-dense foods (high sugar and fat) (Johnson and Kenny, 2010; Berthoud, Lenard, and Shin, 2011; Alsio J, Olszewski, Levine, and Schioth, 2012), create hardships for individuals trying to reach a healthy body weight. My study assessed weight-loss behaviors of participants enrolled in a healthy lifestyle/weight loss program. Program participants demonstrated a mean weight loss of 4.42%, (10.05 pounds in 8 weeks), a rate of 1.25 pounds per week. This amount of weight loss is within suggested guidelines for adults (Wadden, Foster and Letizia, 1994) (Figure 5-1).

Obesity reduces quality of life in the areas of physical function and vitality and also causes bodily pain, as well as reduced emotional health (Ul-Haq, Mackay, Fenwick, & Pell, 2013). My study demonstrated that quality of life improvements can be obtained via participation in an 8-week healthy lifestyle/weight loss program when combined with physical therapy, with a 28% reduction in pain, 22% improvement in physical functioning and a 33% increase in energy levels. These findings followed a dose response demonstrating a negative association between mean body weight and quality of life. This finding confirms previous research associating the benefits of weight loss with physical therapy demonstrating a 30% reduction in pain and a 24% improvement in physical functioning with a 5% reduction in body weight (Messier et al. 2004; Christianson et al. 2005).

Participants in my study showed a 32.4% improvement in the physical component score (PCS) and 19.32% improvement in the mental component score

(MCS) of the SF-36 health related quality of life (HRQL) (Table 5-1). Previous research (Paans, van den Akker-Scheek, Dilling, Bos, van der Meer, Bulstra, et al. 2013) examining the effects of weight loss and exercise on people with hip osteoarthritis demonstrated similar improvements in physical function (32.6%). In my study, as participant mean body weight decreased from T1 to T3, a corresponding incremental increase in the mean PCS and MCS occurred (Figure 5-1 and 5-2).

However, no correlations were seen between percent changes in body weight and percent changes in PCS or MCS within subjects. This suggests that other factors may influence participant responses in these domains, including intervening factors related to an individual's diagnosis. For example, an individual with knee pain and underlying osteoarthritis will respond differently to weight loss in terms of reduced pain and improved function than persons with osteoarthritis with low back or hip pain. While the literature supports a reduction in pain along with improved function with weight loss for those with hip and back pain (Lidar, Behrbalk, Regev, 2012; Paans, van den Akker-Scheek, & Dilling, 2013), notable reduction in symptoms specific to knee osteoarthritis (Gudbergesen, Boesen, Lohmander, 2012; Riddle & Stratford, 2013) are shown in the literature with weight loss versus weight gain. This suggests that, with different diagnoses, responses to weight loss, vary regarding to the physical and mental component scores of the SF-36 HRQL. Additionally, in terms of perceived pain improvement as result of weight loss, diagnoses such as shoulder and neck pain, fibromyalgia, ankle/foot pain, and rheumatoid arthritis are likely to differ in their response to weight loss, in terms of perceived improvement in the PCS and MCS.

Participant mean stage of change score was 2.97 and 2.93 for exercise and food choices, respectively, at baseline. These scores are indicative of Stage 3, when individuals begin making preparations to change. The mean scores suggest that most of the participants were preparing to make changes and had taken small steps in the areas of food choice and physical activity at baseline (Time 1). Since all patients were aware of their physician-referral to physical therapy for weight loss, it is plausible that individuals had started thinking about a lifestyle change in regarding weight loss by the time of the initial meeting. Therefore, it is likely these small changes are reflected in the baseline assessment scores for stage of change (Zimmerman, Olsen, Bosworth, 2000).

During the T2 assessment, the mean stage of change score for the group was 3.80 for exercise and 3.86 for food choices, indicating that most patients had entered the 'action' stage (Figure 5-3). The mean score change was predictable, because patients were now monitoring their daily exercise and food choices with the food and exercise log, to confirm active involvement (Armitage, Sheeran, Conner & Arden, 2004). Movement from the preparation stage to the action stage represents significant increase from the baseline stage of change rating, regarding both exercise and food choices. At 8 weeks, progression through the action stage was not statistically significant (3.77 and 3.92) for exercise (3.77) and food choices (3.92). This lack of progression is to be expected since the action is characterized by evident and quantifiable behavioral changes which take within a 6-month time frame. Therefore by definition, stage progression by week 8 was not expected.

Work by Armitage and Arden (2007) demonstrates a linear relationship between stage of change and behavior intentions. However, they describe the relationship

between stage of change and ambivalence as quadratic. As their work predicts, findings from my study demonstrate a negative association between SOC and ambivalence in relation to daily exercise at T1 ($r = -.352, p = .001$), T2 ($r = -.226, p = .031$), and T3 ($r = -.434, p = .0005$) with corresponding medium, small, and large effect sizes for the associations. On the other hand, the association between SOC and behavioral intentions related to exercise was positive with large and medium effect sizes at T2 ($r = .453, p = .0005$) and T3 ($r = 3.57, p = .001$) (Figure 5.3).

Ambivalence, (which is two equally opposing attitudes about a construct) incrementally decreased from baseline to 8 weeks for each category: weight loss, daily exercise, and food diary. This change was demonstrated by a statistically significant reduction in ambivalence for daily exercise from T1 to T2, T2 to T3; and from T1 to T3. Ambivalence related to weight loss also demonstrated a statistically significant reduction from T2 to T3, and from T1 to T3. A statistically significant reduction was absent from T1 to T2. Also present was a statistically significant difference in ambivalence toward maintaining a food diary, from T1 to T2, and from T1 to T3. Once again, a statistically significant decrease was absent from T2 to T3. Medium and large effect sizes were present for ambivalence related to weight loss and maintaining a food diary, weight loss and daily exercise, and daily exercise and a food diary.

Findings relating to ambivalence and stage of change correspond to those of Armitage & Arden (2007), in which ambivalence was lowest in pre-contemplation and the maintenance stage, highest in the contemplation and preparation stage, and progressing downward in the action stage. Specifically, the mean stage of change score at baseline was 2.97 for daily exercise and 2.93 for food choices (those scores

correspond to the “preparation” stage). In all categories, mean ambivalence scores were higher at T1 than at T2. Mean stage of change at T2 for participants was 3.80 and 3.86 (which places them in the action stage).

Lower ambivalence scores are predictive of subsequent behavioral intentions and behavior (Armitage and Connor, 2000). Regarding maintaining a food diary, mean ambivalence scores did not decrease significantly from T2 to T3. This finding may indicate difficulties participants face when making good food choices during later stages of a weight-loss program. As such, ambivalence toward maintaining the food diary is likely reflected in the decreased mean compliance scores for food choice log maintenance present from T2 to T3 (Figure 5-4).

Ambivalence was highest for daily exercise followed by food diary maintenance; and lowest for weight loss at T1, T2, and T3. Also present was a statistically significant difference for ambivalence toward weight loss and daily exercise at T1, T2 and T3; and for weight loss and food diary maintenance T1 and T3 (Figure 5-5). These findings suggest greater ambivalence among weight-loss program participants toward daily exercise and a food diary, but less ambivalence toward weight loss. This finding may influence the discouraging “plateau” phase of weight loss experienced by some individuals

Behavioral intentions are a valid indicator for measuring the degree to which individuals are willing to expend the effort required for participation in particular behaviors (Armitage & Conner, 1991). For study purposes, behavioral intention was determined by summed responses for the subcategories: plans and intentions regarding weight loss, daily exercise, and maintaining a food diary. Mean baseline scores were as

follows: weight loss 2.92, maintaining a food diary 2.59, and daily exercise 2.58. Mean behavioral intention scores for maintaining a food diary and participating in daily exercise demonstrated an upward trend from T1 to T2 (2.68 and 2.60) followed by a slight reduction from T2 to T3 for plans and intentions regarding weight loss, daily exercise, and maintaining a food diary. However, for each comparison time frame mean behavioral intention scores or weight loss, maintaining a food diary, or daily exercise lacked statistical significance.

The Theory of Planned Behavior asserts behavioral intentions are predictive of behavior (Ajzen, 1991; Rosen, 2000; Armitage & Conner, 2001), and studies using the Theory of Planned Behavior to predict behavior demonstrated a linear relationship with behavioral intentions related to stage of change (Armitage, 2006; Armitage & Arden, 2007). However, my research failed to demonstrate a consistent statistically significant difference in ratings of behavioral intentions with progression through the stage of change, particularly from the preparation to action stage.

Statistically significant difference were found in mean scores between weight loss and daily exercise, and between weight loss and food diary for T1, T2, and T3 with mean behavioral intention scores greatest in the weight loss category (Figure 5-5). These findings suggest the presence of both participants' intentions and plans to lose weight, in tandem with decreased intentions to perform the actual behavior necessary for weight loss (that is, keeping a food diary and performing daily exercise). This finding points to participants who are more goal-oriented than process oriented. Goal-oriented individuals (Pieters, Baumgartner, & Allen, 1995; Bagozzi, Dholakia, 1999) attribute importance to weight loss, and characterize weight loss programs by the amount of

weight they wish to lose. However inadequate attention and thought regarding the behavioral intentions required during the process of weight loss may introduce frustration if not recognized and addressed early during a weight loss program. Ideally healthy lifestyle/weight loss programs are designed with both goal and process-oriented participants in mind. Specifically programs should include weight loss, daily exercise, and healthy food choice objectives for both types of participants.

The appeal of today's commercial weight loss programs is enhanced through extravagant weight loss claims made to attract goal-oriented clients and depiction of food choices and exercise as processes that are seemingly effortless. For new program entrants, the above mentioned claims combined with their high behavioral intentions, lessen early stage process-oriented ambivalence (Gilden and Wadden, 2005). However, this entry-level (goal-oriented) focus cannot sustain individuals who must endure a process of weight loss which often requires months and many times more than a year. As demonstrated in this work, over time ambivalence toward the process of weight loss begins to emerge, with negative effects on behavioral intention.

In this study, there was a negative association between ambivalence and behavioral intentions. These were seen at T2 and T3 for food diary and at T1 and T3 for daily exercise. As ambivalence starts to decrease from T1 (preparation stage) to T2 (action stage), behavioral intentions correspondingly increase (Figure 5-5). In agreement with the findings in the published literature lower levels of ambivalence suggest greater behavioral intentions which translate into performance of the desired behavior (Armitage & Conner, 2000; Armitage, Povey, Arden, 2003).

Process-oriented program goals included “attendance to physical therapy” and “program compliance”. Attendance to physical therapy was measured by the number of physical therapy appointments attended during the 8 week study period. The mean number of visits during the eight week study was 11.86, or approximately 1.5 per week; which approximates the national average for patient visits for low back pain (Jette, Smith, Haley, & Davis, 1994). Program compliance involved maintaining a food diary and daily exercise log. Participants presented their logs during physical therapy appointments and program compliance was recorded in two week intervals over the 8 week period. Positive compliance was reflected by participants engaging in at least 30 minutes of moderate exercise daily, consuming 5 to 9 servings of fruits and vegetables daily along with recommended amounts of legumes, dairy, nuts and lean meats, and whole grains, (Kushi , Byers, Nestle, McTiernan, Doyle, et. al. 2006). During the study period a statistically significant increase in mean compliance from T1 to T2 and from T1 to T3 was present (Figure 5-4). Participant compliance stabilized from T2 to T3 and decreased from T3 to T4 however did not reach statistical significance. Increased compliance from T1 to T2 likely reflects the learning curve present in relation to making better food choices and planning to engage in some daily exercise (Blackburn, 2005). The stabilization from T2 to T3, followed by the slight drop in mean compliance from T3 to T4, may be a signal for an initial lapse in behavioral intentions and behaviors. Future research is needed to confirm this finding.

There were moderate negative associations found between the overall percent change in weight (T1-T3) and program compliance at T2, T3 and T4. There were also moderate negative associations present between percent weight loss from T1-T2 and

T2-T3, and T3 and T4 for program compliance respectively (Figure 5-6). An association between percent change in weight and program compliance from 1-2 weeks was absent. Program compliance was lowest during this 1-2 week period and may also reflect the learning curve present for participants. Following the third physical therapy visit improvements in the food diary and exercise logs were noted. This improvement is likely due to the discussion of related concerns during patients' second and third visits. Participants' uncertainties regarding completion of the logs may account for the low level of mean program compliance during the first 2 weeks, especially since program compliance improved over the next 2 week period.

Current findings concur with the literature through demonstration of reduced ambivalence associated with stage progression. Specifically during the last 2-4 weeks of the program significant associations were present between behavioral intentions and ambivalence in relation to maintaining a food diary and engaging in daily exercise such that ambivalence did not keep reducing at the same amount and behavioral intentions reduced their upward trend. During this same time there was a reduction in program compliance and a reduction in the percent change in body weight compared to T1 to T2 measurements. These findings confirm assertions of the Theory of Planned Behavior demonstrating the effects of attitudinal ambivalence on behavioral intentions and ultimately behavior (Ajzen).

Conclusions

The challenge of changing obesity-related behaviors requires a better understanding of behavioral change theories and constructs, along with theoretically framed interventions. The physical therapy/healthy lifestyle/weight loss program which served as the basis for this dissertation demonstrated behavioral changes which

promoted weight loss and a corresponding improvement in participant physical and mental status. To better understand weight-loss-related behavioral change this study sought to examine participant behaviors as they progressed through an 8-week physical therapy/healthy lifestyle/weight loss program. Specifically measured were attitudinal ambivalence, behavioral intentions, program compliance and stage of change. Associations present between concepts add to the current literature and inform future research efforts.

High attrition rates in weight loss programs are an accepted fact. Examples of attrition rate appearing in the literature include a study of 80 women randomly assigned to attend Weight Watchers which demonstrated an attrition rate of 25% at 12 weeks (Rippe, Price, Hess et. al.1998). A 1981 study demonstrated 50% of the enrollees stopped attending Weight Watchers in the first 6 weeks and 70% stopped by 12 weeks (Volkmar, Stunkard, Woolston, and Bailey, 1981); and a large clinic-based weight-loss program reported attrition rates of 13 and 31percent at 8 and 16 weeks respectively (Honas, Early, Frederickson, O'Brien, 2003). The attrition rate of 16% (21) for the current study is slightly lower than studies referenced above. The lower attrition rate may relate to the physical therapy/pain relief component of the program which is absent from most commercial weight loss programs. Also of note is research by Muraven & Baumeister (2000) which suggest individuals have limited resources for self-control, resources which are partially consumed as energy during aspects of life that require self-control, may exceed an individual's capacity to sustain engagement in a healthy lifestyle/weight loss programs. Reasons for program non-completion included death of family members or friends, taking a difficult class while completing a degree and

working fulltime, an illness of a child, or increased stress from their job, all of which increase added effect on energy consumption and decreased the energy needed to engage in behavior change and self-control efforts. Muraven and colleagues believe that individuals compelled to exert self-control, as that required through self-discipline, are required to expend greater energy than when exerting self-control for more independent or autonomous reasons (Muraven, Gagne & Rosman, 2008). Of note, the high attrition rate in weight loss programs may be minimized by attention paid to the increased energy demands faced by program participants, especially in the early program stages.

The Theory of Planned Behavior suggests that behavioral intentions are predictive of behavior. According to the theory behavioral intentions are influenced by attitudes, subjective norms and perceived behavioral control (Ajzen). Ambivalence may influence attitudes, intentions and behavioral control as individuals progress through a healthy lifestyle/weight loss program (Armitage and Arden, 2007). Previous research demonstrates a quadratic relationship between ambivalence and stage of change along with a linear relationship which exists between the stage of change and behavioral intentions (Armitage, Povey & Arden, 2003). Previous work has demonstrated ambivalence as highest in the contemplation and preparation stages, while lowest in the precontemplation and maintenance stages. The action stage of change is characterized by ambivalence levels which are progressively declining.

Weight loss and improvements in health related quality of life results solely from behavioral changes (Wing & Phelan, 2005). A decline in either is said to produce a decrease in one's behavioral intentions and ultimately behavior. As such questions arise

as to the cause of the decline and relationships involved, especially since changes in ambivalence can either increase or stabilize the effects of behavioral intentions and ultimately behavior itself, ways to circumvent lapses in behavior through intervention strategies will be paramount.

Behavior in this study was defined as program compliance to daily food and exercise logs. The value of maintaining written behavioral logs was demonstrated by the relationship between compliance and percent change in body weight. Findings indicate an increase in program compliance was associated with a decrease in percent body weight. The importance of tracking behavioral activities in relation to weight loss/activity cannot be overlooked. In addition, participants who were not compliant with their food choice and exercise logs may be demonstrating an early stage of ambivalence. This observation is valuable for early intervention with process-oriented goals to possibly avoid program drop outs. Figure 5-6 demonstrates the association present between program compliance and percent change in body weight.

The data demonstrate a significant reduction in ambivalence related to weight loss, food diary and daily exercise (Figure 5-3). From 4 to 8 weeks ambivalence in relation to maintaining a food diary leveled off. From baseline to 4 weeks ambivalence in relation to weight loss changed 17%, along with a 106% change for ambivalence in relation to maintaining a food diary and a 134% change for ambivalence in relation to engaging in daily exercise. The percent changes from 4 weeks to 8 weeks for weight loss, food diary and daily exercise was 31, 18 and 40 percent. Percent at 4 to 8 week percent changes showed a marked reduction in the percent rating of ambivalence

toward daily exercise and maintaining a food diary while demonstrating a significant increase in percent rating for ambivalence toward weight loss.

Ambivalence and behavioral intention in relation to percent change in body weight demonstrated a small effect size for ambivalence related to weight loss and daily exercise at T3 and percent change in body weight from 4 and 8 weeks of ($r = .285, p = .006$; $r = .256, p = .014$) respectively. A small effect size was demonstrated between behavioral intentions related to weight loss at Time 1 and Time 2 and percent change in weight from 2-3 weeks and from 1-3 weeks respectively ($r = -.219, p = .037$; $r = -.243, p = .020$; $r = -.213, p = .042$).

Interestingly the relationship between ambivalence and health related quality of life (HRQL) has not been previously explored, even though changes in health status may potentially affect ambivalence during one's progression through a healthy lifestyle program. Study findings demonstrated a negative association between HRQL-MCS and ambivalence in relation to maintaining a food diary at T2 and T3 respectively ($r = -.322, p = .002$; $r = -.356, p = .001$). Also demonstrated was a negative association between HRQL-MCS and ambivalence related to engaging in daily exercise at T2 and T3 respectively ($r = -.262, p = .012$; $r = -.342, p = .001$). These findings suggest that the mental status of a participant as related to HRQL, while participating in a healthy lifestyle/weight loss program is associated with their corresponding level of ambivalence. In other words, as one's health improves levels of ambivalence toward program activities is expected to decrease. This finding has implications for individuals engaging in long term weight loss efforts. Program directors should expect levels of

ambivalence as related to HRQL to decrease as the amount of weight loss begins to produce positive changes in health.

As participants progress through healthy lifestyle/weight loss program stages research suggests the presence of a quadratic association between ambivalence and stage of change and a linear relationship between behavioral intentions and stage of change (Armitage & Arden, 2007). Data from this study demonstrate negative associations between ambivalence as related to daily exercise-related stage of change at T1, T2, and T3, ($r = -.352, p = .001$; $r = -.226, p = .031$; $r = -.434, p = .0005$). There was a positive association between behavioral intentions related to daily exercise and stage of change related to exercise with a large and medium effect size at T2 and T3 respectively ($r = .453, p = .0005$; $r = .357, p = .001$). These findings point to as much as 6-10% of the variance between in these variables explained by the relationships involved between stage of change related to exercise and both ambivalence related to daily exercise, and behavioral intentions related to daily exercise (Figure 5-7).

Understanding the associations between behavioral intentions and ambivalence is essential for predicting behavior. In this study process-oriented behaviors (maintaining a food and daily exercise log) facilitated weight loss. Also present were negative associations between ambivalence as related to maintaining a food diary and behavioral intentions related to maintaining a food diary at T1, T2, and T3, ($r = -.217, p = .039$; $r = -.457, p = .0005$; $r = -.371, p = .0005$). Associations were also demonstrated for ambivalence and behavioral intentions in relation to engaging in daily exercise were present at T1, T2, and T3 respectively, ($r = -.303, p = .003$; $r = -.261, p = .013$; $r = -.413, p = .0005$). The negative relationship between these two variables suggests ambivalence is

a factor in behavioral intentions and behavior performed. The non-significant changes seen in ambivalence toward a food diary from T2 to T3 along with the correlation seen between ambivalence and behavioral intentions toward a food diary suggest that this may be an initial sign of indecisiveness in regards to keeping a food diary.

The percent change in mean ambivalence related to maintaining a food diary and daily exercise declined from 4-weeks to 8-weeks. The change for T1 reached statistical significance for maintaining an exercise log, but failed to do so for maintaining a food diary. While not statistically significant behavioral intentions decreased from T2 to T3. During the same time period there was a 100% reduction in mean percent change in body weight when comparing baseline to 4 weeks to percent change from 4 weeks to 8 weeks (Figure 5-1). These associations together with reduced program compliance from 6-8 weeks would suggest these may be initial signs of a behavior lapse or developing ambivalence. While these associations do not imply causation, these relationships offer reason for increased program attrition and lapses in behavior as the duration of a weight loss program extends (Teixeira, Going, Houtkooper, Cussier, Metcalfe, Blew, et al. 2004; Tur, Escudero, Romagurera, Burguera, 2013). These findings are beneficial for directing further studies to better clarify behavioral markers which can be used to predict weight loss related behaviors occurring as individuals progress through weight loss programs, either commercial or self-directed. Understanding the array of variables and their relationships to each other, and to weight loss behaviors can aid clinicians when implementing and designing evidence-based lifestyle/weight loss programs and interventions. The ability to predict lapses in weight loss/physical activity behaviors, and

to redirect individuals experiencing these lapses, will make positive contributions to individual efforts aimed at weight loss and physical activity.

Recommendations for Future Research

Paramount to building a research agenda is the ability to reproduce research methodology. The research design for this study used a clinical model to investigate the study hypothesis. While use of a clinical model may limit use of this design for some obesity-related research, the rising overweight/obese epidemic is expected to push more individuals into physician-referred weight loss programs. While this treatment model has a number of advantages, a major disadvantage is present when clinicians have limited experience dealing with weight loss interventions. As clinics and clinicians move into the area of weight loss, the need for effective interventions will grow exponentially. Concurrent with increased need for physical therapists to manage and treat obesity-related disorders, conditions, and diseases, is the need for clinic-based interventions and programs that are evidenced-based and theoretically framed. Publication of these findings in peer-reviewed journals can enable establishment of external validity through study replication of different settings and times and with different population.

The study design was limited by the restraints of the clinical setting. This repeated measures longitudinal study (8 weeks) was based on the average length of treatment for the obesity-related diagnoses. The 8 week study provides some evidence of the associations involved in behavioral changes. Future research designs will be strengthened by longer study periods such as 12 to 16 weeks. The longer study period will provide an increased ability to identify preceding factors of behavioral relapse.

In my study data collection and management were labor-intensive. The use of multiple assessment tools for data collection required attention to organization and timeliness in the clinical setting. Also, collection of follow-up assessments added complexity to data collection and counseling. Streamlining the research process in this area of inquiry will be achieved through development and refinement of a valid reliable assessment tool that will provide a broad and tailored information base of obesity-related behaviors. Future research may focus on the development of an assessment tool that provided a broader base of information related to behavioral factors studied.

Professional Practice. The necessity for developing effective clinical interventions for overweight and obese patients is vital for the healthcare system. Targeting specific populations such as physical therapy patients provides a venue within the healthcare system that allows for affective intervention. As more health professionals are called to work with those who are overweight/obese, the need for affective tools used in interventions becomes more important. The cognitive and behavioral lifestyle/weight loss program used in my study is informed by past and ongoing research and incorporates the concepts which are central to the philosophy of healthy education and promotion of wellness.

Table 5-1. Percent change in HRQL PCS and MCS

	Baseline to 8 weeks	Baseline to 4 weeks	4 to 8 weeks
PCS			
mean	32.24	20.98	10.43
SD	34.19	27.66	20.54
Min	-17.78	-21.37	-40.04
Max	176.51	128.19	92.23
MCS			
mean	19.42	15.38	4.13
SD	37.52	27.88	21.87
Min	-53.32	-26.78	47.57
Max	169.84	111.07	92.45

Body Weight/Percent Change in BW

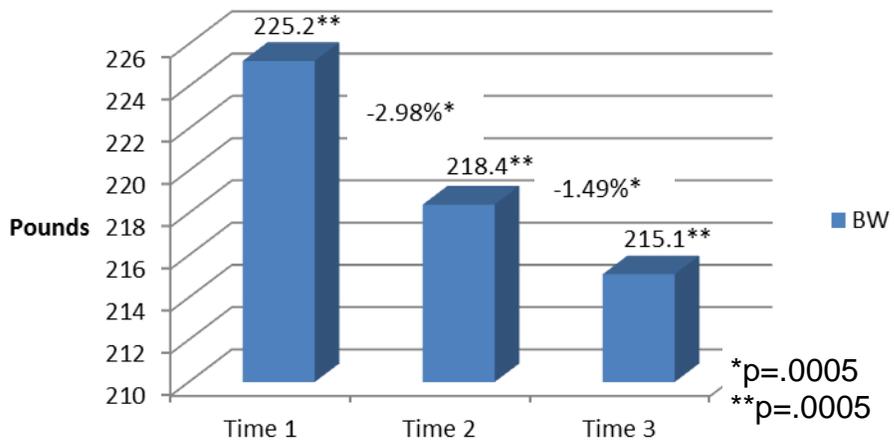


Figure 5-1. Changes in body weight and percent change in body weight

Health Related Quality of Life

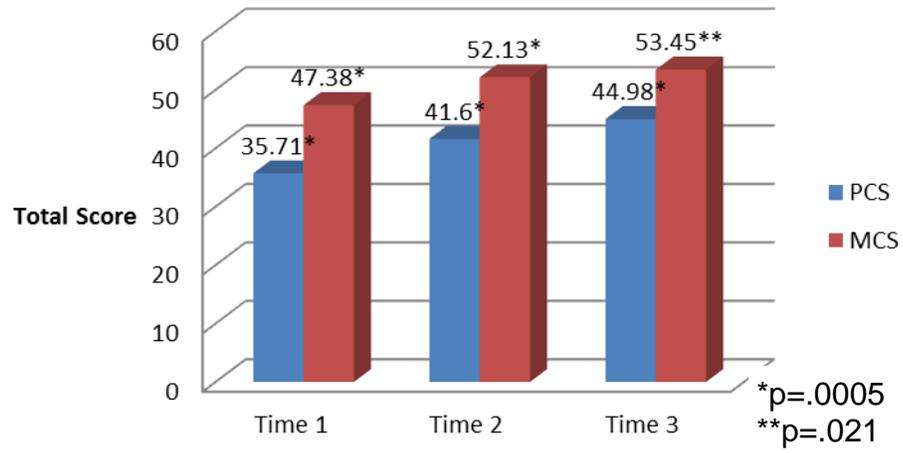


Figure 5-2. Mean changes in HRQL for PCS and MCS over time

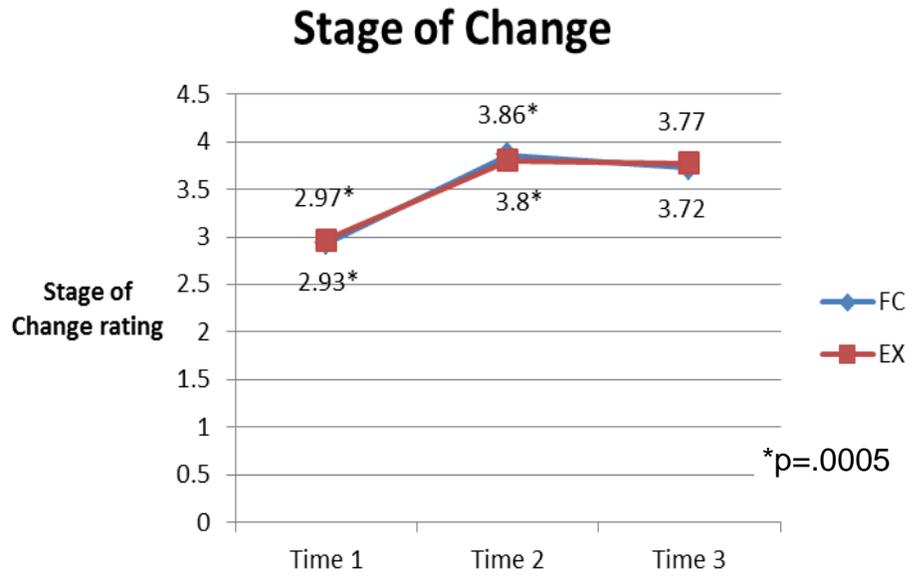


Figure 5-3. Changes in Stage of change over time

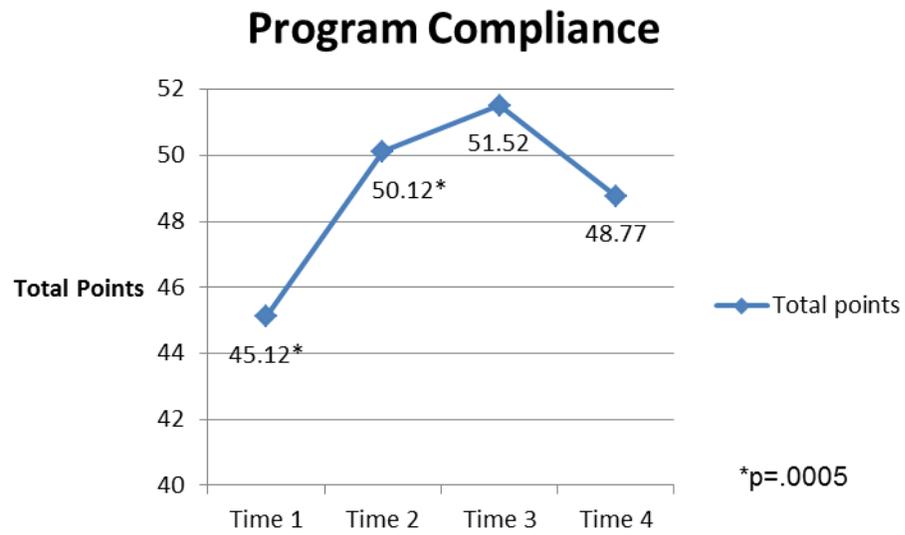


Figure 5-4. Program compliance over time.

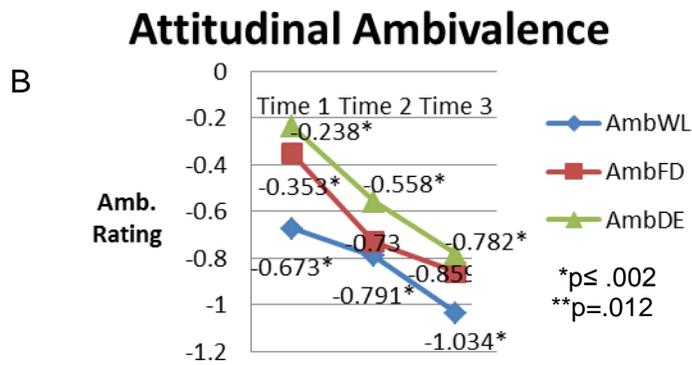
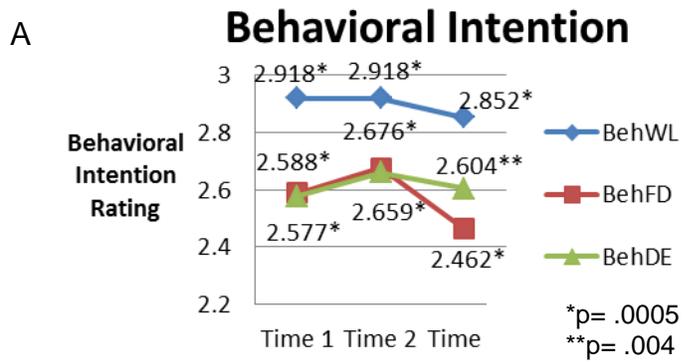


Figure 5-5. Significance between WL, and both FD and DE for behavioral intention and attitudinal ambivalence. A) Behavioral intention. B) Attitudinal ambivalence.

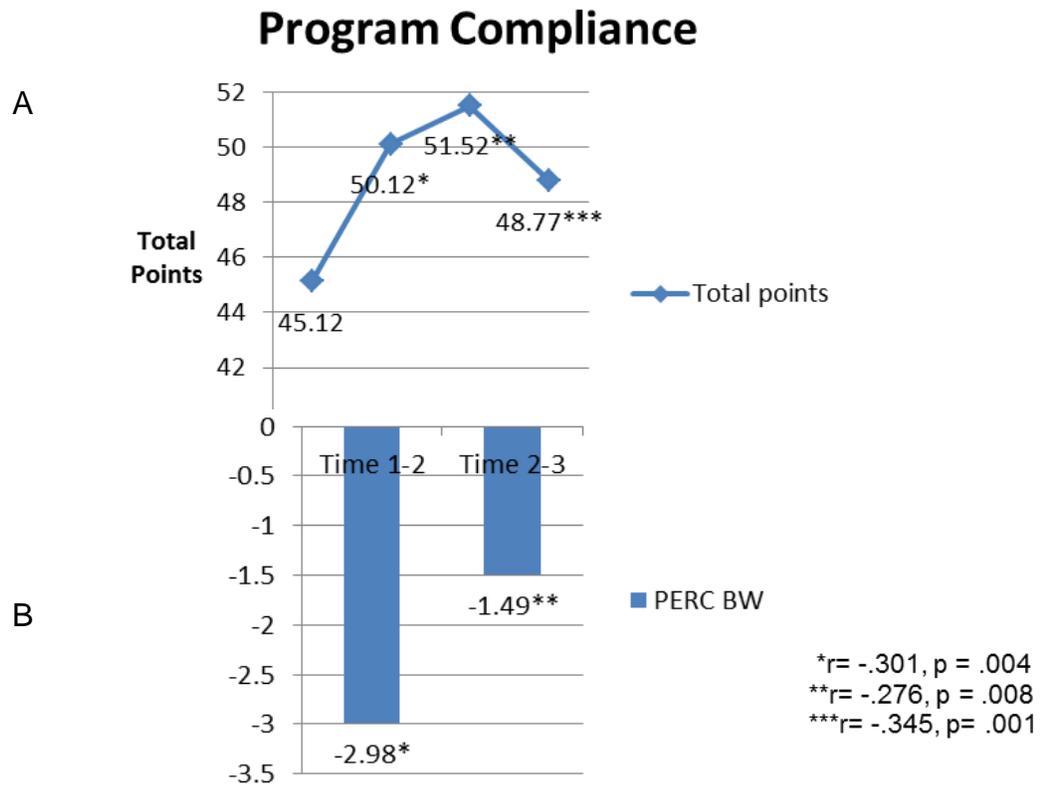


Figure 5-6. The relationship between Program Compliance and Percent change in body weight. A) Program compliance B) Percent body weight

SOC/BEH/AMB

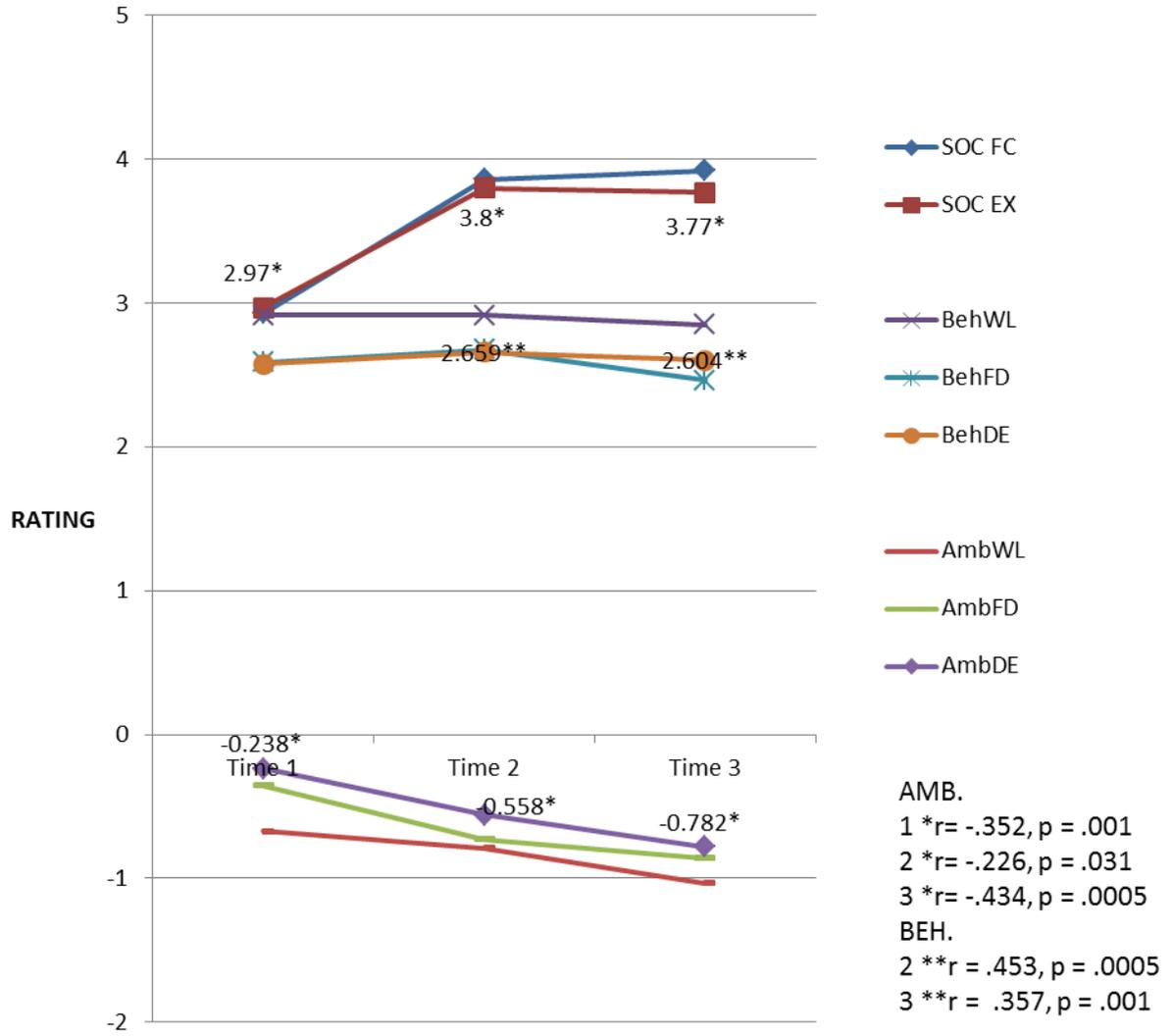


Figure 5-7. Associations between stage of change, behavioral intention and ambivalence

APPENDIX A
IRB INFORMED CONSENT FORM



INFORMED CONSENT FORM
to Participate in Research, and
AUTHORIZATION
to Collect, Use, and Disclose
Protected Health Information (PHI)

INTRODUCTION

Name of person seeking your consent: _____

Place of employment & position: _____

This is a research study of Changes in Health-related Quality of Life, and behavior during a healthy lifestyle change

Could participating in this study offer any positive benefits to you? Yes, as described on page 110.

Could participating cause you any discomforts or are there any risks to you? Yes, as described on page 110.

Please read this form which describes the study in some detail. I or one of my co-workers will also describe this study to you and answer all of your questions. Your participation is entirely voluntary. If you choose to participate you can change your mind at any time and withdraw from the study. You will not be penalized in any way or lose any benefits to which you would otherwise be entitled if you choose not to participate in this study or to withdraw. If you have questions about your rights as a research subject, please call the University of Florida Institutional Review Board (IRB) office at (352) 846-1494. If you decide to take part in this study, please sign this form on page 114.

GENERAL INFORMATION ABOUT THIS STUDY

1. Name of Participant ("Study Subject")

2. What is the Title of this research study?

ASSOCIATIONS BETWEEN HEALTH-RELATED QUALITY OF LIFE, BEHAVIORAL INTENTION AND AMBIVALENCE IN OBESE ADULT PATIENTS DURING STAGES OF A HEALTHY LIFESTYLE/WEIGHT LOSS PROGRAM

3. Who do you call if you have questions about this research study?

Jeff Gilliam; phone number: (352) 222-9545

4. Who is paying for this research study?

The sponsor of this study is the University of Florida

5. Why is this research study being done?

The purpose of this research study is to determine behavioral relationships related to progression through a healthy lifestyle/weight loss program.

You are being asked to be in this research study because you have been referred as a patient to participate in the Healthy Lifestyle/ Weight Loss program.

<p>WHAT CAN YOU EXPECT IF YOU PARTICIPATE IN THIS STUDY?</p>

6. What will be done as part of your normal clinical care (even if you did not participate in this research study)?

You will receive an orthopedic evaluation and physical therapy treatment and will be instructed on a Healthy Lifestyle/weight loss program as part of your normal clinical care.

7. What will be done only because you are in this research study?

You will be required to fill out questionnaires that provide information regarding your attitude toward weight loss, exercise and a food diary.

If you have any questions now or at any time during the study, please contact Jeff Gilliam in question 3 of this form.

8. How long will you be in this research study?

8 weeks

9. How many people are expected to take part in this research study?

80

<p style="text-align: center;">WHAT ARE THE RISKS AND BENEFITS OF THIS STUDY AND WHAT ARE YOUR OPTIONS?</p>
--

10. What are the possible discomforts and risks from taking part in this research study?

Other possible risks to you may include: There are no risk additional because of involvement in this research study.

Researchers will take appropriate steps to protect any information they collect about you. However, there is a slight risk that information about you could be revealed inappropriately or accidentally. Depending on the nature of the information, such a release could upset or embarrass you, or possibly affect your insurability or employability. Questions 17-21 in this form discuss what information about you will be collected, used, protected, and shared.

This study may include risks that are unknown at this time.

Participation in more than one research study or project may further increase the risks to you. If you are already enrolled in another research study, please inform Jeff Gilliam (listed in question 3 of this consent form) or the person reviewing this consent with you before enrolling in this or any other research study or project.

Throughout the study, the researchers will notify you of new information that may become available and might affect your decision to remain in the study.

If you wish to discuss the information above or any discomforts you may experience, please ask questions now or call the PI or contact person listed on the front page of this form.

11a. What are the potential benefits to you for taking part in this research study?

Potential benefits for taking part in this research study, may be increased awareness regarding obstacles affecting long-term success in the areas of weight loss and improved level of fitness.

11b. How could others possibly benefit from this study?

Findings from this study will contribute to information necessary to help those that are overweight/obese make behavioral changes essential to achieve long-term weight loss.

11c. How could the researchers benefit from this study?

In general, presenting research results helps the career of a scientist. Therefore, Jeff Gilliam may benefit if the results of this study are presented at scientific meetings or in scientific journals.

Jeff Gilliam may benefit if the results of this study are presented at scientific meetings or in scientific journals.

12. What other choices do you have if you do not want to be in this study?

You will receive the same treatment intervention if you do not want to be in this study.

13a. Can you withdraw from this study?

You are free to withdraw your consent and to stop participating in this study at any time. If you do withdraw your consent, you will not be penalized in any way and you will not lose any benefits to which you are entitled. Yes, you are free to withdraw from this study at any time, and may continue to receive all the benefits that you normally would had you not participated in this research study.

If you decide to withdraw your consent to participate in this study for any reason, please contact Jeff Gilliam at 352 222-9545. They will tell you how to stop your participation safely.

If you have any questions regarding your rights as a research subject, please call the Institutional Review Board (IRB) office at (352) 846-1494.

13b. If you withdraw, can information about you still be used and/or collected?

Because the information that is gathered from this research study may benefit others in the future, could we use your information in the event that you withdraw from this research study?

13c. Can the Principal Investigator withdraw you from this study?

You may be withdrawn from the study without your consent for the following reasons:

If you have any health problems, which arise during this study, you may be required to withdraw from this study.

WHAT ARE THE FINANCIAL ISSUES IF YOU PARTICIPATE?

14. If you choose to take part in this research study, will it cost you anything?

There are no costs related to participation in this research study.

15. Will you be paid for taking part in this study?

No, subjects of this research study are not paid.

16. What if you are injured because of the study?

Please contact the Principal Investigator listed in question 3 of this form if you experience an injury or have questions about any discomforts that you experience while participating in this study.

17. How will your health information be collected, used and shared?

If you agree to participate in this study, the Principal Investigator will create, collect, and use private information about you and your health. This information is called protected health information or PHI. In order to do this, the Principal Investigator needs your authorization. The following section describes what PHI will be collected, used and shared, how it will be collected, used, and shared, who will collect, use or share it, who will have access to it, how it will be secured, and what your rights are to revoke this authorization.

Your protected health information may be collected, used, and shared with others to determine if you can participate in the study, and then as part of your participation in the study. This information can be gathered from you or your past, current or future health records, from procedures such as physical examinations, x-rays, blood or urine tests or from other procedures or tests. This information will be created by receiving study treatments or participating in study procedures, or from your study visits and telephone calls. More specifically, the following information may be collected, used, and shared with others:

Body weight, body mass index, age, food and exercise logs, questionnaires.

This information will be stored in locked filing cabinets or on computer servers with secure passwords, or encrypted electronic storage devices.

Some of the information collected could be included in a "limited data set" to be used for other research purposes. If so, the limited data set will only include information

that does not positively identify you. For example, the limited data set cannot include your name, address, telephone number, social security number, photographs, or other codes that link you to the information in the limited data set. If limited data sets are created and used, agreements between the parties creating and receiving the limited data set are required in order to protect your identity and confidentiality and privacy.

18. For what study-related purposes will your protected health information be collected, used, and shared with others?

Your PHI may be collected, used, and shared with others to make sure you can participate in the research, through your participation in the research, and to evaluate the results of the research study. More specifically, your PHI may be collected, used, and shared with others for the following study-related purpose(s):

Once this information is collected, it becomes part of the research record for this study.

19. Who will be allowed to collect, use, and share your protected health information?

Only certain people have the legal right to collect, use and share your research records, and they will protect the privacy and security of these records to the extent the law allows. These people include the:

- the study Principal Investigator, Jeff Gilliam and research staff associated with this project.
- other professionals at the University of Florida or Shands Hospital that provide study-related treatment or procedures
- the University of Florida Institutional Review Board (IRB; an IRB is a group of people who are responsible for looking after the rights and welfare of people taking part in research).

The study Principal Investigator: Jeff Gilliam and research staff associated with this project.

20. Once collected or used, who may your protected health information be shared with?

Your PHI may be shared with:

- the study sponsor *University of Florida*
- United States and foreign governmental agencies who are responsible for overseeing research, such as the Food and Drug Administration, the Department of Health and Human Services, and the Office of Human Research Protections
- Government agencies who are responsible for overseeing public health concerns such as the Centers for Disease Control and federal, state and local health departments
- Malcom Randall VA Medical Center (Gainesville)
- Your insurance company for purposes of obtaining payment

Otherwise, your research records will not be released without your permission unless required by law or a court order. It is possible that once this information is shared with authorized persons, it could be shared by the persons or agencies who receive it and it would no longer be protected by the federal medical privacy law.

21. If you agree to take part in this research study, how long will your protected health information be used and shared with others?

Your PHI will be used and shared with others 2 years.

You are not required to sign this consent and authorization or allow researchers to collect, use and share your PHI. Your refusal to sign will not affect your treatment, payment, enrollment, or eligibility for any benefits outside this research study. However, you cannot participate in this research unless you allow the collection, use and sharing of your protected health information by signing this consent and authorization.

You have the right to review and copy your protected health information. However, we can make this available only after the study is finished.

You can revoke your authorization at any time before, during, or after your participation in this study. If you revoke it, no new information will be collected about you. However, information that was already collected may still be used and shared with others if the researchers have relied on it to complete the research. You can revoke your authorization by giving a written request with your signature on it to the Principal Investigator.

SIGNATURES

As an investigator or the investigator's representative, I have explained to the participant the purpose, the procedures, the possible benefits, and the risks of this research study; the alternative to being in the study; and how the participant's protected health information will be collected, used, and shared with others:

Signature of Person Obtaining Consent and Authorization

Date

You have been informed about this study's purpose, procedures, possible benefits, and risks; the alternatives to being in the study; and how your protected health information will be collected, used and shared with others. You have received a copy of this Form. You have been given the opportunity to ask questions before you sign, and you have been told that you can ask questions at any time.

You voluntarily agree to participate in this study. You hereby authorize the collection, use and sharing of your protected health information as described in sections 17-21 above. By signing this form, you are not waiving any of your legal rights.

Signature of Person Consenting and Authorizing

Date

APPENDIX B
SF-36 HEALTH SURVEY

INSTRUCTIONS: This survey asks 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.

Please answer every question by marking the answer as indicated. If you are unsure about how to answer a question please give the best answer you can.

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

(circle one)

Excellent	.....	1
Very good	.....	2
Good	.....	3
Fair	.....	4
Poor	.....	5

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

(circle one)

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

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

(circle one number on each line)

Activities	Yes, limited a lot	Yes, limited a little	No, not limited at all
Vigorous activities, such as running, lifting heavy objects, participating in strenuous sports.	1	2	3
Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf	1	2	3
Lifting or carrying groceries	1	2	3
Climbing several flights of stairs	1	2	3
Climbing one flight of stairs	1	2	3
Bending, kneeling or stooping	1	2	3
Walking more than a mile	1	2	3
Walking half a mile	1	2	3
Walking one hundred yards	1	2	3
Bathing or dressing yourself	1	2	3

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

(circle one number on each line)

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

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

(circle one number on each line)

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

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, neighbours or groups?

(circle one)

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

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

(circle one)

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

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

(circle one)

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

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

	All of the time	Most of the time	A good bit of the time	Some of the time	A little of the time	None of the time
Did you feel full of life?	1	2	3	4	5	6
Have you been a very nervous person?	1	2	3	4	5	6
Have you felt so down in the dumps that nothing could cheer you up?	1	2	3	4	5	6
Have you felt calm and peaceful?	1	2	3	4	5	6
Did you have a lot of energy?	1	2	3	4	5	6
Have you felt downhearted and low?	1	2	3	4	5	6
Did you feel worn out?	1	2	3	4	5	6
Have you been a happy person?	1	2	3	4	5	6
Did you feel tired?	1	2	3	4	5	6

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

(circle one)

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

11. How TRUE or FALSE is each of the following statements to you?

(circle one number on each line)

	Definitely true	Mostly true	Don't know	Mostly false	Definitely false
I seem to get ill more easily than other people	1	2	3	4	5
I am as healthy as anybody I know	1	2	3	4	5
I expect my health to get worse	1	2	3	4	5
My health is excellent	1	2	3	4	5

APPENDIX C
GRIFFIN INDEX

$$\text{AMBIVALENCE} = (\text{POSITIVE} + \text{NEGATIVE})/2 - |\text{POSITIVE} - \text{NEGATIVE}|$$

APPENDIX D
POSITIVE ATTITUDINAL AMBIVALENCE ASSESSMENT FORM

Below are questions to assess your positive attitudes toward a subject. Please circle the statement which best describes your response to the question.

Positive Scale for Weight Loss

1. Think about your attitude toward or evaluation of weight loss. That is an intentional reduction of your body weight through diet, exercise or both.

Considering only the favorable qualities of weight loss and ignoring the unfavorable characteristics, *how favorable is your evaluation* of weight loss?

Not at all Favorable	Slightly Favorable	Quite Favorable	Extremely Favorable
-------------------------	-----------------------	--------------------	------------------------

2. Think about your feelings or emotions when I mention weight loss.

Considering only your feelings of satisfaction toward weight loss and ignoring your feelings of dissatisfaction, *how satisfied do you feel* about weight loss?

Not at all Satisfied	Slightly Satisfied	Quite Satisfied	Extremely Satisfied
-------------------------	-----------------------	--------------------	------------------------

3. Think about your *thoughts or beliefs* when I mention weight loss.

Considering only the beneficial qualities of weight loss and ignoring the harmful characteristics, *how beneficial do you believe* weight loss to be?

Not at all Beneficial	Slightly Beneficial	Quite Beneficial	Extremely Beneficial
--------------------------	------------------------	---------------------	-------------------------

Positive Scale for Daily Exercise

1. Think about your attitude toward or evaluation of daily exercise. That is exercising 30-40 minutes a day 6-7 days per week.

Considering only the favorable qualities of daily exercise and ignoring the unfavorable characteristics, *how favorable is your evaluation* of daily exercise?

Not at all Favorable	Slightly Favorable	Quite Favorable	Extremely Favorable
-------------------------	-----------------------	--------------------	------------------------

2. Think about your *feelings or emotions* when I mention daily exercise.

Considering only your feelings of satisfaction toward daily exercise and ignoring your feelings of dissatisfaction, *how satisfied do you feel* about daily exercise?

Not at all Satisfied	Slightly Satisfied	Quite Satisfied	Extremely Satisfied
-------------------------	-----------------------	--------------------	------------------------

3. Think about your *thoughts or beliefs* when I mention daily exercise.

Considering only the beneficial qualities of daily exercise and ignoring the harmful characteristics, how beneficial do you believe daily exercise to be?

Not at all Beneficial	Slightly Beneficial	Quite Beneficial	Extremely Beneficial
--------------------------	------------------------	---------------------	-------------------------

Positive Scale for Food Diary

1. Think about your attitude toward or evaluation of a food diary. That is recording all of your daily food intakes.

Considering only the favorable qualities of a food diary and ignoring the unfavorable characteristics, *how favorable is your evaluation* of a food diary?

Not at all Favorable	Slightly Favorable	Quite Favorable	Extremely Favorable
-------------------------	-----------------------	--------------------	------------------------

2. Think about your *feelings or emotions* when I mention a food diary.

Considering only your feelings of satisfaction toward a food diary and ignoring your feelings of dissatisfaction, *how satisfied do you feel* about a food diary?

Not at all Satisfied	Slightly Satisfied	Quite Satisfied	Extremely Satisfied
-------------------------	-----------------------	--------------------	------------------------

3. Think about your *thoughts or beliefs* when I mention food diary.

Considering only the beneficial qualities of food diary and ignoring the harmful characteristics, *how beneficial do you believe* a food diary to be?

Not at all Beneficial	Slightly Beneficial	Quite Beneficial	Extremely Beneficial
--------------------------	------------------------	---------------------	-------------------------

APPENDIX E
NEGATIVE ATTITUDINAL AMBIVALENCE ASSESSMENT FORM

Below are questions to assess your negative attitudes toward a subject. Please circle the statement which best describes your response to the question.

Negative Scale for Weight Loss

1. Think about your attitude toward or evaluation of weight loss. That is an intentional reduction in your body weight through diet, exercise or both.

Considering only the unfavorable qualities of weight loss and ignoring the favorable characteristics, *how unfavorable is your evaluation* of weight loss?

Not at all Unfavorable	Slightly Unfavorable	Quite Unfavorable	Extremely Unfavorable
---------------------------	-------------------------	----------------------	--------------------------

2. Think about your *feelings or emotions* when I mention weight loss.

Considering only your feelings of dissatisfaction toward weight loss and ignoring your feelings of satisfaction, *how dissatisfied do you feel* about weight loss?

Not at all Dissatisfied	Slightly Dissatisfied	Quite Dissatisfied	Extremely Dissatisfied
----------------------------	--------------------------	-----------------------	---------------------------

3. Think about your *thoughts or beliefs* when I mention weight loss.

Considering only the harmful qualities of weight loss and ignoring the beneficial characteristics, *how harmful do you believe weight loss* to be?

Not at all harmful	Slightly harmful	Quite harmful	Extremely harmful
-----------------------	---------------------	------------------	----------------------

Negative Scale for Daily Exercise

1. Think about your attitude toward or evaluation of daily exercise. That is exercising 30-40 minutes a day 6-7 days per week.

Considering only the unfavorable qualities of daily exercise and ignoring the favorable characteristics, *how unfavorable is your evaluation* of daily exercise?

Not at all unfavorable	Slightly unfavorable	Quite unfavorable	Extremely unfavorable
---------------------------	-------------------------	----------------------	--------------------------

2. Think about your *feelings or emotions* when I mention daily exercise.

Considering only your feelings of dissatisfaction toward daily exercise and ignoring your feelings of satisfaction, *how dissatisfied do you feel* about daily exercise?

Not at all dissatisfied	Slightly dissatisfied	Quite dissatisfied	Extremely dissatisfied
----------------------------	--------------------------	-----------------------	---------------------------

3. Think about your *thoughts or beliefs* when I mention daily exercise.

Considering only the harmful qualities of daily exercise and ignoring the beneficial characteristics, *how harmful do you believe* daily exercise to be?

Not at all harmful	Slightly harmful	Quite harmful	Extremely harmful
-----------------------	---------------------	------------------	----------------------

Negative Scale for Food diary

1. Think about your attitude toward or evaluation of a food diary. That is recording all of your daily food intakes.

Considering only the unfavorable qualities of a food diary and ignoring the favorable characteristics, *how unfavorable is your evaluation* of a food diary?

Not at all unfavorable	Slightly unfavorable	Quite unfavorable	Extremely unfavorable
---------------------------	-------------------------	----------------------	--------------------------

2. Think about your *feelings or emotions* when I mention a food diary.

Considering only your feelings of dissatisfaction toward a food diary and ignoring your feelings of satisfaction, *how dissatisfied do you feel* about a food diary?

Not at all dissatisfied	Slightly dissatisfied	Quite dissatisfied	Extremely dissatisfied
----------------------------	--------------------------	-----------------------	---------------------------

3. Think about your *thoughts or beliefs* when I mention a food diary.

Considering only the harmful qualities of food diary and ignoring the beneficial characteristics, *how harmful do you believe* a food diary to be?

Not at all harmful	Slightly harmful	Quite harmful	Extremely harmful
-----------------------	---------------------	------------------	----------------------

APPENDIX F
BEHAVIORAL INTENTION FORM

Below is a list of statements involving 3 categories: ***weight loss, daily exercise, food diary***. There are two statements made about each category. Your choices are from -3 to +3. Circle the number that best indicates what your intent/plan is regarding each category in the future. The future pertains to the time that you are participating in the Healthy Lifestyle/Weight loss program.

1. I intend to *lose weight* in the future. definitely do not -3, -2, -1, 0, 1, 2, 3
definitely do
2. I plan to *lose weight* in the future. definitely do not -3, -2, -1, 0, 1, 2, 3
definitely do
3. I intend to do *daily exercise* in the future. definitely do not -3, -2, -1, 0, 1, 2,
3 definitely do
4. I plan to do *daily exercise* in the future. definitely do not -3, -2, -1, 0, 1, 2, 3
definitely do
5. I intend to do a *food diary* in the future. definitely do not -3, -2, -1, 0, 1, 2, 3
definitely do
6. I plan to do a *food diary* in the future. definitely do not -3, -2, -1, 0, 1, 2, 3
definitely do

APPENDIX G
STAGES OF CHANGE ASSESSMENT FORM

You will be presented with two categories, (exercise and food choices). For each category you will be presented with five statements. Put an **X** in the box beside the statement that best describes where you are in terms of exercise or food choices.

The **first category** is **exercise**. For regular moderate exercise, frequency will be set at 5 to 7 days per week for 30 to 40 minutes. Moderate intensity will be described as not being painful, increased breathing, however able to carry on a conversation while exercising, with a light sweat

- I currently do not *exercise* and I'm not thinking about starting.
 - I currently do not *exercise*, but I am thinking about starting.
 - I currently *exercise* but not on a regular basis.'
 - I currently *exercise* regularly but I have only begun to do so in the last six months
 - I currently *exercise* regularly and I have done so for longer than six months'.
-

The **second category** is **food choices**. Criteria for food choices will be set for five areas: including eating high fiber foods at a frequency of 1) 5-9 servings for fruits and vegetables daily, 2) 2-3 servings of beans and whole grains; partaking of high calcium foods 3) 2-3 servings of fat-free dairy; getting enough protein and avoiding high fat foods from 4) eating lean meats only and avoiding high fat and fried foods, and condiments; avoiding high sugar items like 5) high sugar drinks or foods like sugary sodas and deserts

- I currently do not make good *food choices* and I'm not thinking about starting.
- I currently do not make good *food choices*, but I am thinking about starting.
- I currently make good *food choices* but not on a regular basis.'
- I currently make good *food choices* regularly but I have only begun to do so in the last six months
- I currently make good *food choices* regularly and i have done so for longer than six months'.

APPENDIX J.
FLYER

You May be Eligible to Participate in a Research Study Involving Healthy Lifestyle Changes and Weight Loss

The Research is being performed by Jeff Gilliam who is
Clinical Positiveor of ReQuest Physical Therapy

Contact Information: (352) 373-2116

Affiliation: This study is through the
Health Education and Behavior Department
College of Health and Human Performance
University of Florida

Purpose: This research is designed to study health
related quality of life and behaviors related to healthy
lifestyle changes and weight loss.

General Eligibility Criteria: Subjects who are referred by
a physician with a primary orthopedic diagnosis and a
secondary diagnosis of overweight
Your insurance should cover your treatment.

Location: The Research Study will be carried out within
the ReQuest Physical Therapy Facility

Time Commitment: The study is for 8 full weeks at 2-3
visits per week.

REFERENCE LIST

- Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, 50, 179-211.
- Alsio, J., Olszewski, P. K., Levine, A. S., & Schioth, H. B. (2012). Feed-forward mechanisms: addiction-like behavioral and molecular adaptations in overeating. *Frontiers in Neuroendocrinology*, 33(2), 127-139.
- Anderson, J. W., Konz, E. C., Frederich, R. C., & Wood, C. L. (2001). Long-term weight-loss maintenance: a meta-analysis of US studies. *American Journal of Clinical Nutrition*, 74, 579-584.
- Andersen, R. E., Crespo, C. J., Bartlett, S. J., Bathon, J. M., & Fontaine, K. R. (2003). Relationship between body weight gain and significant knee, hip, and back pain in older Americans. *Obesity Research*, 11(10), 1159-1162.
- Armitage, C. J. (2006). Evidence that implementation intentions promote transitions between the stages of change. *Journal of Consulting and Clinical Psychology*, 74(1), 141-151.
- Armitage, C. J., & Arden, M. A. (2007). Felt and potential ambivalence across the stages of change. *Journal of Health Psychology*, 12(1), 149-58.
- Armitage, C. J., & Conner, M. (2000). Attitudinal ambivalence: a test of three key hypotheses. *Personality and Social Psychology Bulletin*, 26, 1421-1432.
- Armitage, C. J., & Conner, M. (2001). Efficacy of the theory of planned behavior a meta-analytic review. *British Journal of Social Psychology*, 40, 471-499.
- Armitage, C. J., Povey, R., & Arden, M. A. (2003). Evidence for discontinuity patterns across the stages of change: A role for attitudinal ambivalence. *Psychology and Health*, 18(3), 373-386.
- Armitage, C. J., Sheeran, P., Conner, M., & Arden, M. A. (2004). Stages of change or changes of stage? Predicting transitions in transtheoretical model stages in relation to healthy food choices. *Journal of Consulting and Clinical Psychology*, 72(3), 491-499.
- Avena, N. M. (2007). Examining the addictive-like properties of binge eating using an animal model of sugar dependence. *Experimental Clinical Psychopharmacology*, 15(5), 481-491.
- Bagozzi, R. P., & Dholakia, U. (1999). Goal setting and goal striving in consumer behavior. *Journal of Marketing*, 63, 19-32.
- Bandura, A. (1992). Self-efficacy mechanism in human agency. *American Psychologist*, 37, 122-147.

- Baron, J., & Spranca, M. (1997). Protected values. *Organizational Behavior and Human Decision Processes*, 70(1), 1-16.
- Becker, M. H. (1990). Theoretical models of adherence and strategies for improving adherence. Shumaker, S.A. Schron, Eleanor B., Ockene, Judith K., Parker, Christine T., Probstfield, Jeffrey L., Wolle, Joan M. (Eds.) *The Handbook of Health Behavior Change*, Springer Publishing Co. New York, NY 5-43.
- Becker, M. H., & Joseph, J. G. (1988). AIDS and behavioral change to reduce risk: A Review. *American Journal of Public Health*, 78, 394-410.
- Berthoud, H. R., Lenard, N. R., & Shin A.C., (2011). Food reward, hyperphagia, and obesity. *American Journal of Physiology and Regulatory Integrative and Comparative Physiology*, 300, R1266-R1277.
- Bish, C. L., Blanck, H. M., Maynard, L. M., Serdula, M. K., Thompson, N. J., & Khan, L. K., (2007). Health-related quality of life and weight loss practices among overweight and obese US adults, 2003 behavioral risk factor surveillance system. *Medscape General Medicine*. 14, 9(2), 35. Retrieved from <http://www.medscape.com/viewarticle/555511>.
- Blackburn, G. L. (2005). Teaching, learning, doing: best practices in education. *American Journal of Clinical Nutrition*, 82, 218S-221S.
- Blissmer, B., Riebe, D., Dye, G., Ruggieroe, L., Greene, G., & Caldwell, M. (2006). Health-related quality of life following a clinical weight loss intervention among overweight and obese adults: intervention and 24 month follow-up effects. *Health Quality Life Outcomes*, 17(4), 43-48.
- Breckler, S. J. (1994). A comparison of numerical indexes for measuring attitudinal ambivalence. *Educational and Psychological Measurement*, 54, 350-365.
- Brownell, K. D., & Marlatt, G. A., Lichtenstein, E., & Wilson, G. T. (1986). Understanding and preventing relapse. *American Psychology*, 41, 765-782.
- Butryn, M. L., Phelan, S., Hill, J. O. & Wing, R. R. (2007). Consistent self-monitoring of weight: a key component of successful weight loss maintenance. *Obesity*, 15(12), 3091-3096.
- Byas, A. (2013). Obesity is classified as a disease. *Digital Journal*. Retrieved from <http://digitaljournal.com/article/353856>
- Cai, L., Lubitz, J., Flegal, K. M., & Pamuk, E. R., (2010). The predicted effects of chronic obesity in middle age on medicare costs and mortality. *Medical Care*, 48(6), 510-517.

- Center for Disease Control and Prevention Chronic Disease Prevention and Health Promotion: Health consequences of obesity promotion (2007). NIH publication, Bethesda, MD, <http://www.cdc.gov/chronicdisease/resources/publications/AAG/obesity.htm>
- Chapman, J., & Armitage, C. J. (2009). Evidence that boosters augment the long-term impact of implementation intentions on fruit and vegetable intake. *Psychological Health, 27*, 1-17.
- Christensen, R., Astrup, A., & Bliddal, H. (2005). Weight loss: the treatment of choice for knee osteoarthritis? A randomized trial. *Osteoarthritis Cartilage, 13*(1), 20-7.
- Cifuentes, M., & Green, L. A., (2004). Obesity trial: knowledge without systems. *British Medical Journal, 328*(7438), E272-E274.
- Coggon, D., Reading, I., Croft, P., McLaren, M., Barrett, D., & Cooper, C. (2001). Knee osteoarthritis and obesity. *International Journal of Obesity and Related Metabolic Disorders, 25*(5), 622-627.
- Cohen, J. (1988). *Statistical Power Analysis for the Behavioral Sciences* (2nd ed.). Hillsdale, N. J., Lawrence Erlbaum Associates. 21-23.
- Corica, F., Corsonello, A., Apolone, G., Lucchetti, M., Melchionda, N., Marchesini, G. & Quovadis Study Group. (2006). Construct validity of the Short Form-36 Health Survey and its relationship with BMI in obese outpatients. *Obesity, 14*(8), 1429-1437.
- Dansinger, M. L., Gleason, J. A., Griffith, J. L., Selker, H. P., & Schaefer, E.J. (2005). Comparison of the Atkins, Ornish, Weight Watchers, and Zone diets for weight loss and heart disease risk reduction: a randomized trial. *JAMA, 293*, 43-53.
- Dohm, F. A., Beattie, J. A., Aibel, C., & Striegel-Moore, R. H. (2001). Factors differentiating women and men who successfully maintain weight loss from women and men who do not. *Journal of Clinical Psychology, 57*(1), 105-117.
- Doll, H. A., Petersen, S. E., & Stewart-Brown, S. L. (2000). Obesity and physical and emotional well-being: associations between body mass index, chronic illness, and the physical and mental components of the SF-36 questionnaire. *Obesity Research, 8*(2), 160-170.
- Elfhag, K., & Rossner, S. (2005). Who succeeds in maintaining weight loss? A conceptual review of factors associated with weight loss maintenance and weight regain. *Obesity Reviews, 6*, 67-85.
- Epping-Jordan, M. P., Watkins, S. S., Koob, G. F. & Markou, A. (1998). Dramatic decreases in brain reward function during nicotine withdrawal. *Nature, 393*(6680), 76-79.

- Fairbank, J. C. T., & Pynsent, P.B. (2000) The Oswestry Disability Index. *Spine*, 25(22), 2940-295
- Fegal, K. M., Carroll, M. D., Ogden, C. L., & Curtin, L. R. (2010). Prevalence and trends in obesity among US adults. *JAMA*, 303, 235-241.
- Felson, D. T., Anderson, J. J., Naimark, A., Walker, A. M., & Meenan, R. F.(1988). Obesity and knee osteoarthritis. *The Framingham Study. Annals of Internal Medicine*, 109(1), 18-24.
- Ferris, F. D., von Gunten, C. F., & Emanuel, L. L. (2001). Knowledge: Insufficient for Change. *Journal of Palliative Medicine*, 4(2),145-147.
- Field, A. E., Coakley, E. H., Must, A., Spadano, M. A., & Laird, N. (2001). Impact of overweight on the risk of developing common chronic diseases during a 10-year period. *Archives of Internal Medicine*, 161, 1581-1586.
- Finkelstein, E. A., Trogdon, J. G., Brown, D. S., Allaire, B. T., Dellea, P. S., & Kamal-Bahl, S. J. (2008). The lifetime medical cost burden of overweight and obesity: implications for obesity prevention. *Obesity*, 16(8), 1843-1848.
- French, S. A., Jeffery, R. W., Folsom, A. R., McGovern, P., & Williamson, D. R. (1996). Weight loss maintenance in young adulthood; Prevalence and correlations with health behavior and disease in a population-based sample of women aged 55-69 years. *International Journal of Obesity*, 20, 303-310.
- French, S. A., Story, M., & Jeffery, R. W. (2001). Environmental influences on eating and physical activity. *Annual Review in Public Health*, 22, 309-335.
- Fujioka, K. (2010). Benefits of moderate weight loss in patients with type 2 diabetes. *Diabetes Obesity Metabolism*, 12(3):186-94.
- Gelber, A. C., Hochberg, M. C., Mead, L.A., Wang, N.Y., Wigley, F.M., & Klag, M. J. (1999).Body mass index in young men and the risk of subsequent knee and hip osteoarthritis. *American Journal of Medicine*, 107(6), 542-8.
- Gilden, A. T., & Wadden, T. A. (2005). Systematic review: an evaluation of major commercial weight loss programs in the United States. *Annals of Internal Medicine*. 142, 56-66.
- Godin, G., Kok, G. (1996). The theory of planned behavior: a review of its applications to health-related behaviors. *American Journal of Health Promotion*, 11(2), 87-98.
- Grant, J. E., Brewer, J. A., & Potenza, M. N. (2006). The neurobiology of substance and behavioral addictions. *CNS Spectr.*, 11(12), 924-30.
- Grilo, C. M., Shiffman, S., & Wing, R. R. (1993). Coping with dietary relapse crises and their aftermath. *Addictive Behaviors*, 18(1):89-102.

- Grundy, S. M., Cleeman, J. I., Daniels, S. R., Donato, K. A., & Eckel, M. D., Robert H., (2005). Diagnosis and Management of the Metabolic Syndrome. *American Heart Association, Inc.*, 112, 285-290.
- Gudbergesen, H., Boesen, M., Lohmander, L. S., Christensen, R., Henriksen, M., Bartels, E. M., & Bliddal, H. (2012). Weight loss is effective for symptomatic relief in obese subjects with knee osteoarthritis independently of joint damage severity assessed by high-field MRI and radiography. *Osteoarthritis Cartilage*, Jun, 20(6), 495-502.
- Herbert, C. P. (1996). Giving information: usually necessary, but often insufficient to achieve behavior change. *Patient Education and Counseling*, 29, 229-230.
- Hill, J. O., Wyatt, H. R., Reed, G. W., & Peters, J. C. (2003) Obesity and the environment: where do we go from here? *Science*, 299(7), 853-855.
- Honas, J. J., Early, J. L., Frederickson, D. D., & O'Brien, S. O. (2003). Predictors of attrition in a large clinic-based weight-loss program. *Obesity Research*, 11,(7), 888-894.
- Hunt, W. A., Barnett, L. W., & Branch, L. G. (1971). Relapse rates in addiction programs. *Journal of Clinical Psychology*, 4, 455-456.
- Imayama, I., Alfano, C. M., Kong, A., Foster-Schubert, K. E., Bain, C. E., Xiao, L., McTiernan, A., (2011). Dietary weight loss and exercise interventions effects on quality of life in overweight/obese postmenopausal women: a randomized controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*, 8, 118.
- Jakicic, J. M., Clark, K., Coleman, E., Donnelly, J. E., Foreyt, J., Melanson, E., Volek, J., & Volpe, S. L., (2001). Appropriate Intervention , Strategies for Weight Loss and Prevention of Weight Regain for Adults. *Medicine and Science in Sports Exercise*, 33(12), 2145-2156.
- Jeffery, R. W., Epstein, L. H., Wilson, G. T., Drewnowski, A., Stunkard, A. J., & Wing, R. R., (2000). Long-term maintenance of weight loss: current status. *Health Psychology*, 19(1), 5-16.
- Jette, A. M., Smith, K., Haley, S. M., & Davis, K. D. (1994). Physical therapy episodes of care for patients with low back pain. *Physical Therapy*, 74,(2), 101-110.
- Johnson, P. M., & Kenny, P. J. (2010). Dopamine D2 receptors in addiction-like reward dysfunction and compulsive eating in obese rats. *Nature Neuroscience*, 13(5), 635-641.
- Kaukua, J., Pekkarinen, T., Sane, T., & Mustajoki, P., (2003). Health-related quality of life in follow-up study. *International Journal of Obesity and Related Metabolic Disorders*, 27(9), 1072-1080.

- Koepp, M. J., Gunn, R. N., Lawrence, A. D., Cunningham, V. J., Dagher, A., Jones, T., Grasby, P. M. (1998). Evidence for striatal dopamine release during a video game. *Nature*, 393(6682), 266-268.
- Koob, G. F. (1992). Drugs of abuse: anatomy, pharmacology and function of reward pathways. *Trends in Pharmacological Science*, 13(5), 177-184.
- Kral, J. G., Sjostrom, L. V., & Sullivan, M. B. (1992). Assessment of quality of life before and after surgery for severe obesity. *American Journal of Clinical Nutrition*, 55(2 Suppl), 611S-614S.
- Kramer, F. M., Jeffery, R. W., Forster, J. L. & Snell, M. K. (1989). Long-term follow-up of behavioral treatment for obesity: patterns of weight regain among men and women. *International Journal of Obesity*, 13(2), 123-136.
- Kreek, M. J. (1996). Cocaine, dopamine and the endogenous opiod system. *Journal of Addictive Disease*, 15, 73-96.
- Kushi, L. H., Byers, T., Nestle, M., McTiernan, A., Doyle, C., Bandera, E. V., the American Cancer Society 2006 Nutrition and Physical Activity Guidelines Advisory Committee. (2006). American cancer society guidelines on nutrition and physical activity for cancer prevention: reducing the risk of cancer with healthy food choices and physical activity. *CA Cancer Journal for Clinicians*. 56, 254-281.
- Layman, D. K., Evans, E. M., Erickson, D., Seyler, J., Weber, J., Bagshaw, D., & Kris-Etherton, P. (2009). A Moderate-Protein Diet Produces Sustained Weight Loss and Long-Term Changes in Body Composition and Blood Lipids in Obese Adults. *The Journal of Nutrition*, 139, 514-521
- Lidar, Z., Behrbalk, E., Regev, G. J., Salame, K., Keynan, O., Schweiger, C., & Keidar, A. (2012). Invertebral disc height changes after weight reduction in morbidly obese patients and its effect on quality of life and radicular and low back pain. *Spine*, 37(23), 1947-1952.
- Lim, L. L., Seubsman, S. A., & Sleight, A. (2008). Thai SF-36 health survey: tests of data quality, scaling assumptions, reliability and validity in healthy men and women. *Health Quality Life Outcomes*, 18, 6-52.
- Lisspers, J., Sundin, O., Ohman, A., Hofman-Bang, C., Ryden, L. & Nygren, A. (2005). Long-term effects of lifestyle behavior change in coronary artery disease: effects on recurrent coronary events after precutaneous coronary intervention. *Health Psychology*, 24(1),41-48.
- Logue, E. E., Jarjoura, D. G., Sutton, K. S., Smucker, W. D., Baughman, K. R., & Capers, C. F., (2004). Longitudinal relationship between elapsed time in the action stages of change and weight loss. *Obesity Research*, 12(9), 1499-1508.

- Lopez-Garcia, E., Banegas, Banegas, Jr., Gutierrez-Fisac, J.L., Perez-Regadera, A.G., Ganan, L.D. & Rodriguez-Artalejo, F. (2003). Relation between body weight and health-related quality of life among the elderly in Spain. *International Journal of Obesity Related Metabolism Disorders*, 27(6), 701-709.
- Lorig, K. & Laurin, J. (1985). Some notions about assumptions underlying health education. *Health Education Quarterly*, 12(3), 231-243.
- Malik, V. S., Schulze, M. B., & Hu, F. B. (2006). Intake of sugar-sweetened beverages and weight gain: a systematic review. *American Journal of Clinical Nutrition*. 84, 274-288.
- Mathus-Vliegen, E. M., de Weerd, S., & de Wit, L. T. (2004). Health-related quality-of-life in patients with morbid obesity after gastric banding for surgically induced weight loss. *Surgery*, 135(5), 489-497.
- McHorney, C. A., Ware, J. E., & 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.
- Messier, S. P., Loeser, R. F., Miller, G. D., Morgan, T. M., Rejeski, W. J., Sevick, M. A., ...Williamson, J.D. (2004). Exercise and dietary weight loss in overweight and obese older adults with knee osteoarthritis: the Arthritis, Diet, and Activity Promotion Trial. *Arthritis Rheumatism*, 50(5), 1501-1510.
- Miguez, M. C., Becona, E. (2008). Abstinence from smoking ten years after participation in a randomized controlled trial of self-help program. *Addictive Behaviors*, (10), 1369-1374.
- Miller, G. D., (2010). Improved nutrient intake in older obese adults undergoing a structured diet and exercise intentional weight loss program. *Journal of Nutrition for Healthy Aging*, 14(6), 461-466.
- Muraven, M., & Baumeister, R. F. (2000). Self-Regulation and Depletion of Limited Resources: Does Self-Control Resemble a Muscle? *Psychological Bulletin*, 126(2), 247-259.
- Muraven, M., Gagne, M., & Rosman, H. (2008). Helpful Self-Control: Autonomy Support, Vitality, and Depletion. *Journal of Experimental Social Psychology*, 44(3), 573-585.
- Muraven, M., Tice, D. W., & Baumeister, R. F. (1998). Self-control as a limited resource: Regulatory depletion patterns. *Journal of Personality and Social Psychology*, 74, 774-789.
- National Center for Health Statistics Death and Mortality. (2006). NIH publications, Bethesda, MD, <http://www.cdc.gov/nchs/fastats/deaths.htm>.

- National Heart, Lung and Blood Institute. (1998). Clinical guidelines on the identification, evaluation, and treatment of overweight and obesity in adults: the evidence report. *Obesity Research*, 6, 51S-209S.
- Newlin, D. B. & Strubler, K. A. (2007). The habitual brain: an “adapted habit” theory of substance use disorders. *Substance Use Misuse*, 42(2-3), 503-526.
- Oliveria, S. A., Felson, D. T., Cirillo, P. A., Reed, J. I., & Walker, A. M. (1999). Body weight, body mass index, and incident symptomatic osteoarthritis of the hand, hip, and knee. *Epidemiology*, 10(2), 161-166.
- Paans, N., van den Akker-Scheek, I, Dilling R.G., Bos M., van der Meer K, Bulstra, S.K, Stevens, M. (2013). Effect of exercise and weight loss in people who have hip osteoarthritis and are overweight or obese: a prospective cohort study. *Physical Therapy*, Feb 93(2), 137-146.
- Page, R. M., Cole, G. E. (1984-1985). Fishbein’s model of behavioral intentions: a framework for health education research and curriculum development. *International Quarterly of Community Health Education*, 5, 321-329.
- Pelchat, M.L. (2009). Food addiction in humans. *Journal of Nutrition*, 139(3), 620-622.
- Pettman, T. L., Misan, G., Owen, K., Warren, K., Coates, A. M., Buckley, J. D., Howe, P. R. C. (2008). Self-management for obesity and cardio-metabolic fitness: description and evaluation of the lifestyle modification program of a randomized controlled trial. *International Journal of Behavioral Nutrition and Physical Activity*, 5, 53.
- Phelan, S., Hill, J. O., Lang, W., Dibello, J. R., & Wing, R. R. (2003). Recovery from relapse among successful weight maintainers. *American Journal of Clinical Nutrition*, 78(6), 1079-1084.
- Pieters, R., Baumgartner, H., & Allen, D. (1995). A means-end chain approach to consumer goal structures. *International Journal of Research in Marketing*, 12, 227-244.
- Population Studies Center (2011), Institute for Social Research, University of Michigan,,Ann Arbor, Michigan,
<http://www.psc.isr.umich.edu/dis/census/Features/tract2zip/index.html>
- Potenza, M. N. (2008). Review. The neurobiology of pathological gambling and drug addiction: an overview and end findings. *Philosophical Transactions of the Royal Society of London B Biological Sciences*, 12, 3181-3189.
- Prochaska, J. O., & DiClemente, C. C. (1982). Transtheoretical therapy: Toward a more integrative model of change. *Psychotherapy: Theory, Research and Practice*, 19, 276-288.

- Prochaska, J. O., & Velicer, W. F. (1997). The transtheoretical model of health behavior change. *American Journal of Health Promotion, 12*, 38-48.
- Prochaska, J. O., Velicer, W. F., Rossi, J. S., Goldstein, M. G., Rakowski, W. et. al. (1994). Stages of change and decisional balance for 12 problem behaviors. *Health Psychology, 13*, 39-46.
- Ravussin, E., & Bogardus, C. (1989). Relationship of genetics, age, and physical fitness to daily energy expenditure and fuel utilization. *American Journal of Clinical Nutrition, 49*, 968-975.
- Recnik, G., Kralj-Iglic, V., Iglic, A., et al. (2009). The role of obesity , biomechanical constitution of the pelvis and contact joint stress in the progression of hip osteoarthritis. *Osteoarthritis Cartilage, 17*(7), 879-882.
- Renzaho, A., Wooden, M., & Houg B. (2010). Associations between body mass index and health-related quality of life among Australian adults. *Quality Life Research, 19*(4), 515-520.
- Rice, D. P., & Fineman, N. (2004). Economic implications of increased longevity in the United States. *Annals of Review in Public Health. 25*, 457-473.
- Riddle, D. L., & Stratford, P. W., (2013). Body weight changes and corresponding changes in pain and function in persons with symptomatic knee osteoarthritis: a cohort study. *Arthritis Care and Research, 65*(1), 15-22.
- Rippe, J. M., Price, J. M., Hess, S. A., Kline, G., DeMers, K. A., Damitz, S., et al. (1998). Improved psychological well-being, quality of life, and health practices in moderately overweight women participating in a 12-week structured weight loss program. *Obesity Research, 6*, 208-218.
- Rocha, B. A., Scearce-Levie, K., Lucas, J. J., Hiroi, N., Castanon, N., Crabbe, J. C., Nestler, E. J., & Hen, R. (1998). Increased vulnerability to cocaine in mice lacking the serotonin-1B receptor. *Nature, 393*(6681), 175-178.
- Rosen, C. S. (2000). Integrating stage and continuum models to explain processing of exercise messages and exercise initiation among sedentary college students. *Health Psychology, 19*(2), 172-180.
- Ross, K. M., Milsom, V. A., Rickel, K. A., Debraganza, N., Gibbons, L. M., Murawski, M. E., & Perri, M. G., (2009). The contributions of weight loss and increased physical fitness to improvements in health-related quality of life. *Eating Behaviors, 10*(2), 84-88.
- Sarkin, J. A., Johnson, S. S., Prochaska, J. O., & Prochaska, J. M., (2001). Applying the transtheoretical model to regular moderate exercise in an overweight population: validation of a stages of change measure, *Preventive Medicine, 33*, 462-469.

- Schifter, D. E. & Ajzen, I. (1985). Intention, perceived control, and weight loss: an application of the theory of planned behavior. *Journal of Personal and Social Psychology*, 49(3), 843-851.
- Shay, L. E., Seibert, D., Watts, D., Sbrocco, T., & Pagliara, C., (2009). Adherence and weight loss outcomes associated with food-exercise diary preference in a military weight management program. *Eating Behaviors*, 10(4), 220-227.
- Shiffman, S., Gnys, M., Richards, T.J., Paty, J.A., Hickox, M., & Kassel, J.D. (1996). Temptations to smoke after quitting: a comparison of lapsers and maintainers. *Health Psychology*. 15(6), 455-461.
- Shiffman, S., Paty, J.A., Gnys, M., Kassel, J.A., & Hickox, M. (1996). First lapses to smoking: within-subjects analysis of real-time reports. *Journal Consult Clinical Psychology*, 64(2), 366-379.
- Silverman, D., Perakyla, A. & Bor, R. (1992). Discussing safer sex in HIV counseling: assessing three communication formats. *AIDS Care*, 4(1), 69-82.
- Sparks, P., Conner, M., Rhiannon, J., & Shepherd, P. R. (2001). Ambivalence about health-related behaviors: An exploration in the domain of food choices. *British Journal of Health Psychology*, 6, 53-68.
- Stacy, A. & Greene, PhD., & Paul, G. (2007). Motivational Interviewing Improves Weight Loss in Women with Type 2 Diabetes, *Diabetes Care*, 30 (5), 1081.
- Stalonas, P. M., Perri, M. G. & Kerzner, A. B. (1984). Do behavioral treatments of obesity last? A five-year follow-up investigation. *Addictive Behaviors*, 9(2), 175-183.
- Steuart, G. W. (1967). To know is not to do: the problem of health behavioral change. *Journal of Occupational Medicine*, 9(12), 601-604.
- Sullivan, P. W., Ghushchyan, V., & Ben-Joseph, R. H. (2008).The effect of obesity and cardiometabolic risk factors on expenditures and productivity in the United States. *Obesity*. 16(9), 2155-2162.
- Teixeira, P. J., Going, S. B., Houtkooper, L. B., Cussier, E. C., Metcalfe, L. L., Blew, R. M., Sardina, L. B., & Lohman, T. G. (2004). Pretreatment predictors of attrition and successful weight management in women. *International Journal of Obesity and Related Metabolic Disorders*, 28(9), 1124-1133.
- Thompson, M. M., & Zanna, M. P. (1995). The conflicted individual: personality-based and domain-specific antecedents of ambivalent social attitudes. *Journal of Personality*. 63(2), 259-288.

- Thompson, M. M., Zanna, M. P. & Griffin, D. W. (1995). Let's not be indifferent about (attitudinal) ambivalence. In R.E. Petty & J.A. Krosnick (Eds.) *Attitude strength: Antecedents and consequences*, 4, 361-386. Mahwah, NJ: Lawrence Erlbaum.
- Trasande, L., & Chatterjee, S. (2009). The impact of obesity on health service utilization and costs in childhood. *Obesity*, 17(9), 1749-1754.
- Tsai, A. G. & Wadden, T. A. (2005). Systematic review: an evaluation of major commercial weight loss programs in the United States. *Annals of Internal Medicine*, 142(1), 56-66.
- Tucker, L. A. & Thomas, K. S. (2009). Increasing Total Fiber Intake Reduces Risk of Weight and Fat Gains in Women. *The Journal of Nutrition* *Nutritional Epidemiology*, 139, 576-581.
- Tur, J. J., Escudero, A. J., Romaguera, D., & Burguera, B. (2013). How can we predict which morbidly obese patients will adhere to weight loss programs based on life style changes? *Endocrinology and Nutrition*, 60(6), 297-302.
- Ul-Haq, Z., Mackay, D. F., Fenwick E., & Pell J. P. (2013). Meta-analysis of the associations between body mass index and health related quality of life among adults, assessed by the SF-36. *Obesity*, 21(3), E322-E327.
- Ureda, J. R. (1980). The effect of contract witnessing on motivation and weight loss in a weight control program. *Health Education Quarterly*, 7(3), 163-85.
- Vallis, M., Ruggiero, L., Greene, G., Jones, H., Zinman, B., Rossi, S., Edwards, L., Rossi, J. S., & Prochaska, J. O. (2003). Relation to demographic, eating-related, health care utilization, and psychosocial factors. *Diabetes Care*, 26, 1468-1474.
- van Harreveld, F., van der Pligt, J., & de Liver, Y. N. (2009). The agony of ambivalence and ways to resolve it: introducing the MAID model. *Perspectives in Social Psychological Review*, 13(1), 45-61.
- Visram, S., Crosland, A., & Cording, H. (2009). Triggers for weight gain and loss among participants in a primary care-based intervention. *British Journal of Community Nursing*, 14(11), 495-501.
- Volkmar, F. R., Stunkard, A. J., Woolston, J., & Bailey, R. A. (1981). High attrition rates in commercial weight reduction programs. *Archives of Internal Medicine*, 141, 426-428.
- Wadden, T. A., Foster, G. D., & Letizia, K. A. (1994). One year behavioral treatment of obesity: comparison of moderate and severe caloric restriction and the effects of weight maintenance therapy. *Journal of Consulting Clinical Psychology*, 62, 165-171.

- Wang, Y., Beydoun, M. A., Liang, L., Caballero, B., & Kumanyika, S. K. (2008). Will all Americans become overweight or obese? Estimating the progression and cost of the US obesity epidemic. *Obesity, 16*(10), 2323-2330.
- Wang, Y., & Beydoun, M. D. (2007). The obesity epidemic in the United States—gender, age, socioeconomic, racial/ethnic, and geographic characteristics: a systematic review and meta-regression analysis. *Epidemiological Review, 29*, 6-28.
- Wang, Y. C., Colditz, G. A. & Kuntz, K. M. (2007). Forecasting the obesity epidemic in the aging U.S. Population. *Obesity, 15*(11), 2855-2865.
- Ware, J. E., & Sherbourne, C.D. (1992). The MOS 36-Item Short-Form Health Survey (SF-36). *Medical Care, 30*(6), 473-483.
- West, D. S., DiLillo, V., Bursac, Z., Gore, S. A. & Greene, P. G. (2007). Motivational interviewing improves weight loss in women with type 2 diabetes. *Diabetes Care, 30*(5), 1081-1087.
- West, S. L. & O'Neal, K. K. (2004). Project D.A.R.E. outcome effectiveness revisited. *American Journal of Public Health, 94*(6), 1027-1029.
- Wilson, P. M., & Rodgers, W.M. (2004). The relationship from perceived autonomy support, exercise regulations, and behavioral intentions in women. *Psychology of Sport and Exercise, 5*, 229-242.
- Wing, R. R., & Phelan, S. (2005). Long-term weight loss maintenance. *American Journal of Clinical Nutrition, 82*, 222-225.
- Yeung, T. S., Wessel, J., Stratford, P. & Macdermid, J. (2009). Reliability, validity, and responsiveness of the lower extremity functional scale for inpatients of an orthopaedic rehabilitation ward. *Journal of Orthopedic Sports Physical Therapy, 39*(6), 468-477.
- Zimmerman, G. L., Olsen, C. G., & Bosworth, M. F. (2000). A 'stages of change' approach to helping patients change behavior. *American Family Physician, 61*(5), 1409-1416.

BIOGRAPHICAL SKETCH

Jeffery Don Gilliam received his initial undergraduate education at the University of North Carolina at Greensboro, where he earned a Bachelor of Science degree in physical education with a teaching certification; and a second Bachelor of Science degree in community health education. He later worked as a fitness therapist at Charter Hills Hospital and then as an employee health educator at Wesley Long Hospital (both located in Greensboro, North Carolina). He then went back to school at East Carolina University where he earned a Bachelor of Science degree in physical therapy. After practicing physical therapy a number of years, Jeff returned to graduate school at the University of Florida (Gainesville, Florida) where he earned a Master of Health Science degree in physical therapy, in the orthopedic track.

During the 1990s, Jeff became interested in the association of obesity with many of the medical problems he was observing in the physical therapy clinic. After extensive graduate-level course work in nutrition, biochemistry, and exercise physiology, he began incorporating a healthy lifestyle program into his outpatient physical therapy practice. He later designed a cognitive and behavioral program for adults, adolescents, and teens as well as a children's program to facilitate healthy lifestyle changes along with weight loss. He is currently clinical director of ReQuest physical therapy and director of Physicians' Choice for Weight Loss, a behavioral program designed to promote a healthy lifestyle and facilitate weight loss. Jeff has concentrated his studies in the department of health education and behavior at the University of Florida, where he researched behavioral changes as patients progressed through stages of a healthy lifestyle/weight loss program.