

AN APPLICATION OF THE TRANSTHEORETICAL MODEL
TO THE EXERCISE BEHAVIOR OF INDIVIDUALS ACCESSING
HIV-RELATED SERVICES

by

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(Under the Direction of MARK WILSON)

ABSTRACT

The purpose of the study was to examine: 1) the distribution of the stages of change for exercise among individuals accessing HIV-related services, 2) the differences between TTM constructs (decisional-balance, processes of change, and self-efficacy) explained by the stages of change among individuals accessing HIV-related services, and 3) whether the TTM constructs accurately predict the stages of change for exercise better than chance alone.

Cross-sectional survey data were collected from 208 individuals accessing HIV care related services from February – April, 2006 in Atlanta, GA. Participants completed and returned questionnaires for each TTM construct (decisional-balance, self-efficacy, behavioral and experiential processes of change) along with a measure of physical activity MET level.

Participants had been living with an HIV diagnosis for an average of 11.75 ($SD = 6.59$) years. The majority of the sample self-identified as male (87.0%), African-American or Black (84.6%), single (69.2%), and homosexual (54.8%). The

ages of the participants ranged from 22 to 63 years with an average age of 42.6 years ($SD = 7.1$).

Univariate analyses revealed significant differences between the TTM constructs and the stages of change for exercise ($p < .05$). The largest proportion of variance was derived from the behavioral processes of change ($\eta^2 = .22$), followed by self-efficacy ($\eta^2 = .15$), the experiential processes of change ($\eta^2 = .14$), and decisional-balance ($\eta^2 = .11$). There were no significant differences between stages of change for physical activity level (METs). Predictive discriminant analysis revealed that participants in precontemplation were accurately classified 48% of the time, contemplators 25% of the time, preparers 70% of the time, and individuals in maintenance were accurately classified 63% of the time. None of the individuals in action were classified correctly. The overall stage of change classification accuracy was 48%.

This was one of the first studies to examine the TTM for exercise behavior among individuals accessing HIV-care related services. Overall, the results are consistent with other studies in healthy populations; therefore, stage-matched exercise interventions based on this model can be developed for individuals accessing HIV-related care services.

INDEX WORDS: Transtheoretical Model, Exercise, Behavioral Processes of Change, Experiential Processes of Change, Self-Efficacy, Physical Activity, HIV/AIDS

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DEDICATION

I would like to dedicate this dissertation to my loving husband, Dan, for his love and support throughout my academic endeavors. I love you, baby! I would also like to dedicate this to my parents for their endless love, support, and encouragement. Thanks for always believing in me! You both are my educational role models and I hope to be as successful as you both have been in your careers! I love you, Mom and Dad!

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CHAPTER 1

INTRODUCTION

While recent advancements in Human Immunodeficiency Virus (HIV) and Acquired Immunodeficiency Syndrome (AIDS) treatments allow individuals to live longer, healthier lives, many of the highly active antiretroviral therapy (HAART) cause physical and mental side effects that affect quality of life (National Institutes of Health, 2005a). Therefore, researchers and health care professionals are beginning to acknowledge the importance of self-care behaviors to prevent and manage the complications associated with HIV/AIDS.

One of the self-care behaviors receiving attention is exercise. Results of clinical trials suggest that regular aerobic exercise is associated with physiological and psychological benefits in individuals living with this disease. However, few studies have examined the factors influencing the exercise behavior of individuals living with HIV/AIDS, making it difficult to develop appropriate interventions.

The transtheoretical model (TTM) of behavior change was developed to assess how people intentionally change their behavior (Prochaska & DiClemente, 1983). Prochaska and DiClemente posited that individuals engaging in a new behavior go through a sequence of stages: 1) precontemplation, 2) contemplation, 3) preparation, 4) maintenance, and 5) action. To that end, it is important to identify the stage of change an individual is in at the beginning of an intervention in order to tailor the intervention specifically to that person's motivational readiness.

Initially, the central focus of the TTM was on understanding how people change for smoking cessation. In recent years, the focus has expanded to include a wide variety

of health behaviors in a variety of settings (Prochaska & Velicer, 1997). However, the TTM has never been used to examine the exercise behavior of individuals living with HIV/AIDS.

Statement of the Purpose

The purpose of the study was to examine: 1) the distribution of the stages of change for exercise among individuals accessing HIV-related services, 2) the differences between TTM constructs (decisional-balance, processes of change, and self-efficacy) explained by the stages of change among individuals accessing HIV-related services, and 3) whether the TTM constructs accurately predict the stages of change for exercise. If the variation in the TTM constructs is accounted for by the stages of change, and the constructs predict the stages of change beyond chance alone, then stage-matched exercise interventions based on this model can be developed for individuals living with HIV/AIDS.

Background and Significance

As of December 2003, there were an estimated 1,039,000 to 1,185,000 adults, adolescents, and children living with HIV and 43,171 persons living with AIDS in the United States (Centers for Disease Control and Prevention, 2005a). This is the largest number of individuals living with HIV/AIDS ever reported by the Centers for Disease Control and Prevention (CDC), and this increase has been linked directly to improvements in treatment and HIV/AIDS care. For example, between 1995 and 2001, HIV-related deaths declined by more than eighty-three percent in the United States (Joint United Nations Programme on HIV/AIDS, 2003). Therefore, the course of HIV infection has changed drastically since the introduction of HAART in 1996. Before the advent of

HAART, the life expectancy for individuals living with HIV was approximately ten years following infection. However, for the approximately sixty-five percent of individuals living with HIV in the United States who are prescribed HAART treatment (Centers for Disease Control and Prevention, 2003), HIV is considered a chronic disease. To that end, HIV is beginning to be treated and monitored like other chronic conditions, such as diabetes, heart disease, and hypertension.

While individuals have the potential to live longer and healthier on HAART, there are side effects that affect quality of life, both psychologically and physically. Some of the common physical side effects include fatigue, anemia, digestive problems, diarrhea, skin rashes, neuropathy, bone problems and body fat redistribution (National Institutes of Health, 2005b). In fact, five to seventy-five percent of individuals receiving HAART have changes in lipid metabolism and lipodystrophy after an average of ten to twelve months on therapy (Sullivan & Nelson, 1997).

Psychological symptoms such as anxiety, depression, and significant emotional distress have been associated with both early and late stages of HIV disease (Atkinson & Grant, 1994; Burnam et al., 2001; Perkins et al., 1994; Treisman, Angelino, & Hutton, 2001). Initially following an HIV diagnosis, individuals often experience an increase in psychological distress, such as depression and anxiety (Griffin & Rabkin, 1996); but, over time these symptoms decrease as psychosocial adjustment to the disease increases (Judd, Cockram, Komiti, Hoy, & Bell, 2000; Reece, Basta, & Koers, 2004). As the HIV disease progresses and physical and psychological symptoms become more apparent, individuals are likely to experience an increase in depression and other psychological

distress (Law, Martin, Andres, & Mapou, 1993; Richardson et al., 2002; Rotheram-Borus, 2000).

Physical activity is associated with physiological changes such as increased cardiovascular functioning as well as increased lean body mass and muscular strength in healthy populations. Furthermore, it is linked to increased immune functioning and psychological well-being via improved mood states and increased coping skills (American College of Sports Medicine, 2005). Therefore, in the decade following the first identified cases of AIDS, researchers conducted clinical exercise trials in order to determine if the aforementioned benefits could slow or reverse the side effects of HIV disease.

Current research suggests that exercise produces benefits in individuals living with HIV that are similar to those experienced in the general population. For example, aerobic exercise is positively associated with physiological benefits such as increased cardiovascular functioning (LaPerriere et al., 1991; MacArthur, Levine, & Birk, 1993; Stringer, Berezovskaya, O'Brien, Beck, & Casaburi, 1998) lean body mass, and muscular strength (Perna et al., 1999; Rigsby, Dishman, Jackson, MacLean, & Raven, 1991; Wagner, Rabkin, & Rabkin, 1998) in individuals living with HIV/AIDS. Furthermore, research indicates that exercise decreases depression and anxiety and increases overall quality of life in individuals living with this disease (Agin et al., 2001; LaPerriere et al., 1991; Neidig, Smith, & Brashers, 2003; Rojas, Schlicht, & Hautzinger, 2003; Stringer et al., 1998; Wagner et al., 1998). As a result, current HIV exercise recommendations state that moderate to high intensity aerobic and resistance training, if prescribed by trained professionals, is safe and effective for individuals living with HIV/AIDS (Stringer, 1999).

Exercise is becoming an increasingly popular self-care behavior used to prevent and manage the symptoms related to HIV/AIDS and HAART therapy. The use of exercise has been cited as the most common form of complementary and alternative therapy among individuals living with HIV (Duggan, Peterson, Schutz, Khuder, & Chakraborty, 2001), and walking is the preferred form of physical activity among individuals living with this disease (Clingerman, 2003). However, there is still little existing research about the exercise behavior of individuals living with HIV/AIDS. Therefore, more research needs to be conducted in this population in order to develop appropriate exercise interventions.

The transtheoretical model (TTM) of behavior change was developed to assess how people intentionally change behavior (Prochaska & DiClemente, 1983). This theory posits that individuals change their behavior by moving sequentially through five changes of change. The movement through the five stages is influenced by three constructs: 1) decisional-balance, 2) processes of change, and 3) self-efficacy. To that end, if an individual's stage of change is accurately assessed, then an intervention can be tailored to an individual's specific motivation to change.

While this theory has been applied across a wide range of health behaviors, in a variety of settings, exercise behavior has been examined primarily among healthy individuals in worksite (Cardinal, 1997a; Herrick, Stone, & Mettler, 1997; Marcus et al., 1998; Marcus, Rakowski, & Rossi, 1992b; Marcus, Selby, Niaura, & Rossi, 1992c; Marcus & Simkin, 1993; Marcus, Simkin, Rossi, & Pinto, 1996), university settings (Cardinal, 1995b; Cardinal, 1997b), and community settings (Fahrenwald & Walker, 2003; O'Hea, Wood, & Brantley, 2003; Rodgers, Courneya, & Bayduza, 2001; Sarkin,

Johnson, Prochaska, & Prochaska, 2001; Tai-Seale, 2003). Results from these studies suggest that the TTM is effective at increasing the stage of change (Marcus et al., 1992a; Marcus et al., 1998; Woods, Mutrie, & Scott, 2002) and predicting the stage of change (Cardinal, Kosma, & McCubbin, 2004) for exercise among individuals in these diverse settings. However, few studies have examined the validity of the TTM for exercise behavior in special populations (Cardinal et al., 2004; O'Hea et al., 2003; Sarkin et al., 2001). To date, only one study has examined the validity of the TTM among individuals living with a chronic disease (Hellman, 1997) and no published studies have reported applying the TTM for exercise behavior among individuals living with HIV/AIDS.

Therefore, the purpose of this study was to examine 1) the distribution of the stages of change for exercise among individuals accessing HIV-related services, 2) the differences in the TTM constructs (decisional-balance, processes of change, and self-efficacy) explained by the stage of change for exercise among individuals accessing HIV-related services, and 3) whether the TTM constructs significantly predict the stages of change for exercise better than chance alone.

Research Questions

This study was designed to answer the following research questions:

1. Are there differences in decisional-balance scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the decisional-balance scores is explained by the stages of change?

- a. Are there differences in pro scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the pro scores is explained by the stages of change?
 - b. Are there differences in con scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the con scores is explained by the stages of change?
2. Are there differences in self-efficacy scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the self-efficacy scores is explained by the stages of change?
3. Are there differences in the experiential processes of change across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the experiential processes of change is explained by the stage of change?
4. Are there differences in the behavioral processes of change across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the behavioral processes of change is explained by the stage of change?
5. Is there a relationship between physical activity level and the stages of change for exercise?
6. Do the TTM constructs (decisional-balance, self-efficacy, experiential processes of change, and behavioral processes of change) predict stage of change for exercise better than chance alone?

Definition of Terms

The following terms are defined to clarify their use in this study:

Acquired Immune Deficiency Syndrome (AIDS). The most severe manifestation of infection with the Human Immunodeficiency Virus (HIV). The CDC lists numerous opportunistic infections and cancers that, in the presence of an HIV infection, constitute an AIDS diagnosis. In addition, a CD4 count at or below 200 cells per microliter of blood for people with HIV infection constitute an AIDS diagnosis (Centers for Disease Control and Prevention, 1992).

AIDS Survival Project (ASP). A community-based organization in Atlanta, Georgia which provides the information and support needed for individuals living with HIV/AIDS to lead healthy, productive lives.

AIDS Treatment Initiatives (ATI). A community-based organization in Atlanta, Georgia which provides nutrition and exercise counseling for low-income individuals living with HIV/AIDS.

Atlanta AIDS Interfaith Network. A community-based AIDS service organization which provides support services and education to people infected with and affected by HIV/AIDS in Atlanta, Georgia. Their educational programs are particularly designed for use in faith communities promoting HIV/AIDS prevention and awareness.

Highly Active Antiretroviral Therapy (HAART). The current treatment for the human immunodeficiency virus (HIV) infection. HAART uses a combination of several antiretroviral drugs. The drugs inhibit the ability of the virus to multiply in the body, and slow down the development of AIDS.

Human Immunodeficiency Virus (HIV). The virus that causes AIDS. This virus is passed from one person to another through blood-to-blood and sexual contact, as well as from mother to child through pregnancy, delivery, or breastfeeding (Centers for Disease Control and Prevention, 2005c).

Metabolic Equivalent (MET). A method of measuring physical activity level in which one MET equals the oxygen (energy) used by the body while at rest (reading a book, watching TV) (Centers for Disease Control and Prevention, 2005b).

Positive Impact, Inc (PI). A community-based organization in Atlanta, Georgia which provides free mental health services to low-income individuals living with HIV/AIDS.

Regular Exercise. According the Centers for Disease Control and Prevention, regular exercise refers to 30 minutes or more of moderate activity on 5 or more days of the week or 20 minutes of more of vigorous activity on 3 days a week (Centers for Disease Control and Prevention, 2005b).

Self-Care Behavior. Self-care behavior involves the range of activities individuals undertake to enhance health, prevent disease, evaluate symptoms, and restore health. These activities are undertaken by lay people on their own behalf, either separately or in participation with professionals. Self-care includes decisions to do nothing, self-determined actions to promote health or treat illness, and decisions to seek advice in lay, professional, and alternative care networks, as well as evaluation of and decisions regarding action based on that advice (Dean, 1981).

CHAPTER 2

REVIEW OF LITERATURE

The Transtheoretical Model of health behavior has been widely used to assess the motivational readiness of individuals to change a behavior. The model was originally developed based on smoking cessation, but in recent years has been widely applied to a multitude of health behaviors, including exercise. Therefore, the purpose of this chapter is to review the relevant TTM and exercise literature. For organizational purposes, the chapter will be divided into the following categories: 1) The Transtheoretical Model of Behavior Change, 2) Constructs of the Transtheoretical Model, 3) Efficacy of the Transtheoretical Model for Behavior Change, 4) The Transtheoretical Model and Exercise, and 5) Conclusions.

The Transtheoretical Model of Behavior Change

James Prochaska and Carlo DiClemente first introduced the TTM in 1982 in an attempt to understand how people intentionally change their behavior with and without psychotherapy (Prochaska et al., 1983; Prochaska, DiClemente, & Norcross, 1992).

Before this model was developed, studies revealed that people change their behaviors without therapy, but the studies did not focus on how people change on their own (Prochaska et al., 1992). This model emerged from a comparative analysis of the leading psychotherapy and behavior change theories of the time and the integration of more than 300 theories of psychotherapy (Prochaska & Velicer, 1997). In early studies on smoking cessation, research participants explained that they used processes at different times in

attempts to quit smoking, thus implying that behavior change unfolds through a series of stages. Therefore, as the name implies, the TTM was developed from a synthesis and integration of different theories in an effort to understand how people change (Prochaska, Redding, & Evers, 2002).

Initially, the central focus of the TTM was on understanding the processes of change for smoking cessation. However, in recent years, the focus has expanded to include alcohol and substance abuse, anxiety and panic disorders, delinquency, eating disorders, obesity, high-fat diets, AIDS prevention, mammography screening, medication compliance, unplanned pregnancy prevention, pregnancy and smoking, radon testing, sedentary lifestyles, sun exposure, and physicians practicing preventive medicine (Prochaska et al., 1997).

Prochaska and DiClemente (1982) originally proposed two dimensions needed to assess behavior modification in smoking. The first dimension, or construct, was labeled the stages of change since it was originally postulated that individuals progress through different stages (Prochaska & DiClemente, 1982). These stages were identified in a study comparing the processes used by smokers quitting on their own and those used by smokers in two treatment programs. The results yielded four reliable and well-defined components called precontemplation, contemplation, action, and maintenance (McConaughy, DiClemente, Prochaska, & Velicer, 1983). However, after seven years of working with a four stage model, research revealed that there were five distinct stages. Therefore, currently, the five stages of change include: precontemplation, contemplation, preparation, action, and maintenance (Prochaska et al., 1992). There is a sixth stage,

termination; however it has not received as much attention as the other five stages and is often omitted from studies (Prochaska et al., 1997).

The second dimension, called processes of change, provides information on how a person can make progress toward change. These processes were first identified in the aforementioned comparative analysis of the leading systems of psychotherapy. The processes were selected by examining change techniques across different theories. There are currently ten processes receiving the most empirical and theoretical support and they will be discussed later in this chapter (Prochaska et al., 1992).

The decisional-balance construct stems from research done by Janis and Mann in 1977, who believed that decision-making involves taking into consideration all potential gains and losses of the situation. A decision is then made based on whether there is more to gain or lose from changing a behavior. In 1985, Velicer, DiClemente, Prochaska, and Brandenburg constructed a 24-item decisional-balance measure to study the decision-making process across the stages of change for smoking cessation. They found that the scales were successful in identifying the stage of change that the individuals were in at the time (Prochaska et al., 1994).

The fourth construct, self-efficacy, was adopted from Bandura's self-efficacy theory (Bandura, 1977). The concept refers to the confidence that people have to engage in the healthy behavior and resist temptations to engage in the unhealthy behavior across different situations (Prochaska et al., 2002).

Constructs of the Transtheoretical Model

Stages of Change. Precontemplation is the stage in which people are not seriously thinking about changing their behavior, at least not in the next six months (Prochaska et

al., 1992). People might be in this stage because they are uninformed or underinformed about the consequences of their behavior (Prochaska et al., 1997). When precontemplators enter therapy, they often do so because of pressure from others. Usually they feel coerced into changing the addictive behavior by a spouse, co-worker, parent or court system (Prochaska et al., 1992). In the past, traditional action-oriented programs have not addressed precontemplators' needs (Prochaska et al., 1997).

Contemplation is the stage in which people intend to change in the next six months (Prochaska et al., 1992). Individuals are aware that a problem exists and are seriously thinking about changing, but have not made the commitment to do so. It is in this stage where individuals weigh the pros and cons of quitting the problem behavior. It is their struggle between the positive evaluations of the addictive behavior and the amount of time and effort it will take to overcome the problem (Prochaska et al., 1992). People can remain contemplators for a long period of time and are often characterized as procrastinators (Prochaska et al., 1997).

Preparation, originally called decision-making (Prochaska et al., 1992) is the stage in which people intend to change their behavior in the next thirty days (Prochaska et al., 1997). Individuals in this stage typically have made some modifications in their behavior. For example, a person whom intends to quit smoking may reduce the amount of cigarettes smoked each day, or may develop a plan of action, join a smoking cessation class, or buy a self-help book (Prochaska et al., 1997). Although originally part of the model, this stage was excluded from the stages of change after Prochaska and DiClemente erroneously interpreted the data to suggest there were only four stages. After

seven years of omission, the preparation stage was again included in the stages construct (Prochaska et al., 1992).

Action is the stage in which people have made specific modifications in their lifestyle in the last six months. Action involves the most overt behavior changes and requires the most time and energy. People often equate action with behavior change and as a result, overlook the effort needed to maintain the changes following the action (Prochaska et al., 1992).

Maintenance is the stage in which people are working to prevent relapse. Traditionally, maintenance was viewed as a static stage. However, maintenance is a continuation of a behavior, not an absence of a behavior. In fact, in some behaviors maintenance can be considered to last a lifetime (Prochaska et al., 1997).

There is a sixth stage, called termination, during which individuals have zero temptation to do the problem behavior. No matter what the behavior, the individuals are 100% sure they will never return to the behavior. Since termination may not be practical for the majority of people, it has not been included in much of the research surrounding the TTM (Prochaska, 1991).

Most people who try to modify problem behaviors do not succeed on their first attempt. For example, with smoking, most successful changers make an average of three to four attempts before they become maintainers. Since relapse is not the exception in addictive behaviors, the original linear stage model was changed to reflect a spiral. The spiral pattern illustrates how people actually move through the stages. In this pattern, people can progress from precontemplation to maintenance, but also can relapse and regress to an earlier stage. Each time a person relapses through the stages, they learn

from their mistakes and are more likely to try different strategies the next time they attempt to change (Prochaska et al., 1992).

Processes of Change. The second construct, the processes of change, focuses on activities and events that create successful modification to a problem or behavior. They are the “covert and overt activities that people use to progress through the stages” (Prochaska et al., 1997, p.39). The processes of change fall into two groups: experiential and behavioral. The experiential processes include the cognitive and affective approaches useful in getting an individual ready to make a behavior change. The behavioral processes provide the tools needed for the person to take the action. There are currently ten processes of change receiving the most theoretical and empirical support (Prochaska et al., 1997). The following table provides the definitions for each of the processes of change as well as strategies for operationalizing each of the processes of change.

Table 2.1

Processes of Change Definition and Application to Interventions

Process of Change	Definition	Interventions
<i>Experiential</i>		
Consciousness raising	Involves increased awareness about the causes, consequences, and cures for a problem behavior.	Increase awareness by providing information, feedback, confrontations, and bibliotherapy.
Dramatic relief	Involves experiencing and releasing feelings about possible consequences of the unhealthy behavior.	Psychodrama, grieving losses, and role-playing are techniques that can be used to produce an emotional response.
Environmental reevaluation	Involves assessing how one's problems affect one's social and physical environment.	Empathy training, family interventions and documentaries can help lead to reevaluation.
Self-reevaluation	Involves changing how one thinks about his/herself with respect to the unhealthy behavior.	Value clarifications, role models, and imagery are all helpful for reevaluation.
Social liberation	Involves noticing social changes that help support personal change.	Advocacy, empowerment, procedures and policies can increase opportunities for people who are deprived or repressed.

<i>Behavioral</i>		
Contingency management	Provides consequences for taking steps in a particular direction. Usually come in the form of rewards and not punishments.	Self-rewards or rewards by others for making changes.
Helping relationships	Combine caring, trust, openness, and acceptance as well as support for the health behavior change.	Social support and self-help groups can help build these relationships.
Self-liberation	Involves choosing and making a commitment to behavior change.	New Year's resolutions, public testimonies, and multiple choices can enhance self-liberation or willpower.
Counterconditioning	Requires the learning of a healthier behaviors that can substitute for problem behaviors	Stress management, relaxation techniques, desensitization, assertion, and positive self-statements provide healthy substitutions.
Stimulus Control	Avoiding or countering stimuli that elicit problem behaviors.	Restructuring one's environment and avoiding high risk cues that help prevent the occurrence of problem behaviors.

Decisional-Balance. Decisional-balance is a construct that reflects the individual's relative weighing of the pros and cons of changing (Prochaska et al., 1997). The balance between the pros and cons varies across each of the five stages of change. In precontemplation, individuals believe the cons of the problem outweigh the pros. In the action and maintenance stages the opposite occurs and individuals view the cons as more important than the pros. Therefore, somewhere in the preparation or action stage, the pros and cons of the problem behavior cross over (Prochaska et al., 1994).

Expectancy Outcomes and Self-Efficacy. This construct has two parts, confidence and temptation. Confidence is the situation-specific confidence that people have when they can cope with high-risk situations without relapsing to their unhealthy or high-risk behavior. This construct was integrated from Bandura's self-efficacy theory. Temptation reflects the intensity or urges to engage in a specific behavior in the middle of a difficult situation. The most common types of tempting situations are emotional distress, positive social situations, and cravings (Prochaska et al., 1997).

Efficacy of the Transtheoretical Model for Behavior Change

The TTM has been applied to numerous health behaviors because it allows researchers and practitioners the ability to tailor interventions to match an individual's stage of change. Furthermore, the TTM allows for the measurement of change from one stage to another. During short interventions, individuals may not report a change in behavior, but may move from one stage to the next, indicating a change in motivation. To that end, even if an intervention does not create behavior change, the stage movement suggests that a change in behavior might occur in the future.

While the TTM is good at detecting change in motivation to make a change in behavior, recent review articles indicate there is limited evidence to support the use of the TTM for individual behavior change (Adams & White, 2003; Adams & White, 2005; Bunton, Baldwin, Flynn, & Whitelaw, 2000; Sutton, 2001; Weinstein, Rothman, & Sutton, 1998). The limited support for the model is based on methodological issues, including threats to internal and external validity as well as conceptual problems. For example, staging individuals is crucial for program delivery, but few validated algorithms exist creating a threat to internal validity (Adams et al., 2005; Bunton et al., 2000). The excessive emphasis on the individual, limits generalizability to others, thus creating a threat to external validity. Furthermore, the model does not address the environmental or social determinants of behavior that may affect individual behavior change (Bunton et al., 2000). Conceptually, appropriateness of the linearity of stages has been questioned. For example, some smokers quit cold turkey and bypass most of the stages, yet the TTM does not account for this skip in stages. Or, for example, the processes of change for exercise are used in tandem rather sequentially as the original model posits, indicating that

exercise readiness should be seen as a continuous variable rather than as discrete stages (Rosen, 2000). The TTM also suggests that stage progression is a significant outcome, but this is not always associated with behavior change (Adams et al., 2005). Finally, the TTM is used to target interventions for individuals that have “change potential” compared to those that are not thinking about changing, therefore excluding those that may need the intervention most (Bunton et al., 2000).

Riemsma et al. (2002) conducted a recent systematic review of evaluations of interventions based on the TTM to assess the effectiveness of the TTM on individual behavior change (Riemsma et al., 2002). The review included a total of 37 evaluations of interventions aimed at smoking cessation, physical activity, dietary change, screening mammography, treatment and alcohol use. Of the 37 studies reviewed, 17 studies showed no significant outcomes, 8 trials were inconclusive, 10 reported positive outcomes for the stage-based intervention, and two others did not report behavioral outcomes (Riemsma et al., 2002). This review reported that only one of out six studies (17%) with less than 500 participants showed significant effects favoring the stage-based versus the non-stage based intervention group, and only two out of eight (25%) showed significant results compared to a control group. Among the larger studies of 500 participants or more, only four out of fourteen studies (29%) reported significant outcomes for stage-based compared to non-stage based interventions and another four out of fourteen (29%) reported significant findings when compared to no intervention control group.

Riemsma et al. (2002) reported that studies set in schools or workplaces appear to have the least effective results, while studies in the community were more encouraging.

Among the studies set in the community, four out of ten (40%) reported significant outcomes when compared to a non-stage based intervention and two out of five (40%) when compared with no intervention group. Furthermore, the five studies among low-income or disadvantaged populations showed no significant outcomes.

The overall consensus of the review articles is that there is little evidence to suggest that TTM interventions are more effective than non-stage based interventions to change individual behavior. However, this conclusion is due to the fact that the TTM has been applied in a less than rigorous manner. Therefore, there is a need for more long-term well-designed randomized control trials (RCTs) that include individualized tailored interventions created from valid stage assessments. These interventions should include frequent reassessments to assure that the intervention being delivered is stage matched (Riemsma et al., 2002).

Despite the consensus that stage-matched interventions do not provide any “added value” for behavior change, these interventions are still useful for increasing awareness about a health issue and increasing motivation for behavior change. Behavior change usually takes longer to occur than the outcome measurements of an intervention; therefore, it is hard to measure behavior change as a result of an intervention. To that end, a change in motivation to make a behavior change does not indicate a change in behavior, but might signify an increase in awareness about a particular behavior and ultimately lead to behavior change in the future.

The Transtheoretical Model and Exercise

Development of the TTM Scales. In the early 1990’s, Marcus and her colleagues applied the TTM to exercise behavior in worksite settings. These studies focused on

adapting TTM instruments for exercise behavior from existing measures for smoking cessation. Marcus et al. (1992) conducted two studies to develop and test a stage of change algorithm and a self-efficacy scale for exercise behavior. The first study used a four-item staging algorithm and a five-item self-efficacy scale with an internal consistency of .82 in a sample of 917 worksite participants, 77% of whom were men. They found that scores on the self-efficacy items differentiated employees at different stages and accounted for 25% of the variance between the stages. In the follow-up study, they tested a five-item staging algorithm along with the five item self-efficacy scale in a sample of 429 employees, 85% of whom were women. The results were similar with the employees being differentiated at different stages based on their self-efficacy scores. In addition, 28% of the variance in the self-efficacy scores was accounted for by the stages. More specifically, participants in precontemplation had significantly lower self-efficacy scores than all other stages. Individuals in contemplation or action were significantly lower than individuals in action or maintenance. Finally, participants in action had significantly lower levels of self-efficacy than individuals in maintenance (Marcus et al., 1992c). While the self-efficacy differentiated the stages of change, no concurrent criterion validity, such as self-report physical activity, was assessed during the study.

In 1995, Cardinal developed the Stages of Exercise Scale (SOES) to classify individuals into the five stages of change for exercise. The sample consisted of 178 female adults who were employed full-time in a university setting. The majority of the sample was African-American (62%) and had at least some college education (77%). The staging algorithm had five items each corresponding to a rung on a ladder and each rung represented one of the five stages of change. Cardinal used the Seven Day Physical

Activity Recall (7-PAR) to measure energy expenditure and the Leisure Time Exercise Questionnaire to measure exercise behavior in order to assess concurrent criterion validity for the staging algorithm. Results revealed significant between group differences for exercise behavior, energy expenditure, and maximal oxygen consumption. While it appears that construct validity was supported in this study, the generalizability of the findings are limited due to the sample of only women. Furthermore, the physical activity measures were all self-report and maximal oxygen consumption was estimated and not tested directly.

To date, the aforementioned staging algorithms for exercise have demonstrated concurrent criterion validity when compared to the Seven-Day Physical Activity Recall, a valid and reliable measure of physical activity, as well as the Leisure Time Exercise Questionnaire for exercise behavior (Cardinal, 1995b; Fahrenwald et al., 2003; Marcus et al., 1993). They have also demonstrated construct validity when compared to Body Mass Index (BMI), (Cardinal, 1997b, Sarkin et al., 2001) max VO₂, exercise behavior (Sarkin et al., 2001), exercise relapse (Cardinal, 1995a; Cardinal, 1997b), and barriers to exercise (Tai-Seale, 2003). This is important since the premise of the TTM is based on accurately staging an individual based on their exercise motivation or behavior.

While the above staging algorithms have been most widely used and have demonstrated construct validity, one of the limitations of the TTM is the lack of consistent stage assessment among studies (Nigg & Riebe, 2002). During the past fifteen years several algorithms have been used to assess stage of change for exercise behavior, including: 1) a yes/no interview format (Courneya, Nigg, & Estabrooks, 1998), 2) one item with five responses (Marcus et al., 1992c), 3) five-point ordered categorical scale

(Cardinal, 1995b), 4) a 24-item scale (Marcus et al., 1992c), and 5) other staging algorithms that are not theoretically consistent with the TTM (Hellman, 1997). Since accurate staging and theoretical consistency are of interest, the interview format and the one-item with five responses are recommended (Nigg et al., 2002; Reed, Velicer, Prochaska, Rossi, & Marcus, 1997).

Marcus et al. (1992) conducted a study to develop a decisional-balance scale among 778 participants in a worksite setting. The sample was predominately female (54%), white (95%) married (70%), and held white collar jobs (75%). They tested an 11-item algorithm for the stages of change and a 16-item decisional-balance scale containing 10 items assessing the pros for exercise and 6 assessing the cons. Results revealed significant differences on the pro scale by stage, with 16% of the variance in the pros accounted for by the stages. The cons also varied significantly by stage, with 12% of the variance in the cons accounted for by the stages. Marcus et al. found that pros were significantly higher for individuals in maintenance compared to precontemplation and contemplation. Individuals in action had significantly higher pros compared to precontemplation, contemplation, and preparation. Finally, individuals in preparation had significantly higher levels of pros in precontemplation and individuals in contemplation had significantly higher pros than those in precontemplation. Similarly, individuals in maintenance had significantly lower levels of cons than those in action. Individuals in action or maintenance had significantly lower levels of cons for those in preparation. Participants in maintenance had significantly lower levels of cons in contemplation than precontemplation. Finally, all stages were significantly different from all other stages for overall decisional-balance (pros minus cons). Generalizability is

limited given that the study was cross-sectional in nature, the data was collected via self-report, there was no actual measure of exercise behavior, and the sample was homogenous.

Prochaska et al. (1994) conducted a reanalysis of decisional-balance across 12 health behaviors. For exercise behavior, they reanalyzed the data from the aforementioned Marcus et al. (1992) study. The authors found that internal validity is strongly supported for decisional-balance across the 12 health behaviors.

TTM Application in Worksite Settings. Marcus et al. (1996) conducted a study in which stages of change were measured at baseline and six months later. The sample included 314 employees at two worksites. The majority of the sample was female (66%), white (93%), married (60%), and earning \$30-40,000 annually. Four patterns emerged from the data: adopters (those that progressed from one stage to the next), relapsers (those who regressed from original stage), stable sedentary, and stable active. Results indicated that adopters significantly increased their process of change use for nine of the ten processes and relapsers significant decreased their use of all of the behavioral processes and one of the experiential processes. Furthermore, 70% of adopters moved from one stage to the next and 76% of the relapsers regressed from their original stage of change. Limitations to the study were sample of convenience, self-report data, and no actual report of exercise behavior.

Cardinal (1997) conducted a study to compare the stages of change at baseline to seven months following baseline for individuals in contemplation and preparation. The sample consisted of 66 women from a single worksite. The women were 79% African-American and 79% non-college grads. The results showed no increase in the stage of

change for those in preparation compared to those in contemplation. Baseline stage of change was a significant predictor of stage of exercise at baseline and 7 months, but in the opposite direction of prediction. Those individuals in contemplation were more likely to increase than those in preparation. The small sample size of only women hinders generalizability of the study findings.

Herrick et al. (1997) conducted a cross-sectional study to examine differences in self-efficacy and decisional-balance across the five stages of change and four health behaviors, including exercise. The sample consisted of 393 employees from a government worksite. The sample was predominately white (85%), male (64%), college educated (88%) with a median household income between \$40,000 and \$59,999. Results revealed significant differences on a linear composite of pros, cons, and self-efficacy. Furthermore, 28% of the variance in self-efficacy and decisional-balance was accounted for by the stages of change. Univariate analyses indicated that self-efficacy scores were higher in action and maintenance stages for all four health behaviors, including exercise. Limitations to this study include the convenience sample consisting of predominately white, overeducated, middle-class men.

Application of the TTM in University Settings. Cardinal (1995) completed a study to conduct behavioral and biometric comparisons between individuals in preparation, action, and maintenance exercise stages. The sample included 74 undergraduates, 42% female and 58% male. No individuals were staged in contemplation or preparation. The scale was able to significantly differentiate between subjects classified by stage on energy expenditure (METs), induced sweating, Physical Activity Rating Scale (PAR), relapse,

and energy consumption. The small sample size limits statistical power of the analyses, thus potentially biasing the results.

Cardinal (1997) conducted a cross-sectional study to determine the construct validity of the stages of change for exercise behavior. The sample consisted of 235 employees on a university campus; 74% were women, 59% were white, and 62% were married. Results indicated that self-efficacy increased in a linear fashion from contemplation to maintenance as the theory posits. However, precontemplators were found to have the second highest self-efficacy behind individuals in maintenance. While this finding was unexpected, the author suggested it may be due to the small number of precontemplators in the study as well as the fact that precontemplators may perceive themselves as capable of exercising, but are just not motivated or interested in doing so. While these results are encouraging, there are some limitations affecting the generalizability of the study. First of all, the sample predominately consisted of white, married, women, making it difficult to generalize to other populations. Second, the study recruited participants via convenience sampling. Therefore, those individuals who volunteered to participate in the study may have been more interested in exercise than those that did not participate.

Application of the TTM among Community Settings. Rodgers et al. (2001) conducted a study to examine the differences in the processes of change and self-efficacy for exercise in three populations: high school ($n = 168$), undergraduates ($n = 215$), and employed adults ($n = 63$). There were main effects of stage for self-efficacy and main effects of population for self-efficacy, indicating that the self-efficacy construct of the TTM performs well across a variety of health populations.

Sarkin et al. (2001) conducted a study to validate the utility of the TTM constructs in an overweight sample. A sample of 670 healthy adults, 53% female, and 93% white with a mean BMI of 30.6 were recruited by a private marketing research company. The total number of moderate and vigorous activity minutes was significantly associated with stage of exercise change, thus providing evidence for construct validity. Furthermore, significant differences were found for pros, cons, and self-efficacy across the stages of change. These relationships among the constructs were similar to other populations, providing preliminary evidence of the validity of applying the TTM for exercise in an overweight population. However, this study was a cross-sectional study in which the data were self-report. Furthermore, since participants responded via mail, the participants who responded may have been more interested in exercise than those who did not respond, thus potentially creating bias in the sample.

O’Hea et al. (2003) was the first to test the gender differences across three health behaviors, including exercise. The sample recruited from medical clinics ($n = 554$) was predominately female (81%), African-American (59%), unemployed (60%), and low-income with an average annual salary of \$5,000. There were significant differences between the percentages of males and females in each of the five stages. There were significantly more females in the contemplation stage and significantly more males in the maintenance stage. Significant differences were found among the pros and cons of decisional-balance. Males reported significantly fewer pros than females did as well as fewer cons than females did for exercise behavior. This was one of the first studies to test the TTM in a low-income predominately minority sample.

Fahrenwald & Walker (2003) conducted a study to test the utility of the TTM for exercise among WIC mothers. The sample consisted of 30 women; the majority who were white (97%) and married (73%). Stage of change was significantly related to the METs measured on the Seven Day PAR. The women in precontemplation had significantly lower scores on self-efficacy than those in maintenance. There was a significant linear trend for pros across the stages. Women in preparation and action stages had significantly higher mean pro scores than the women in precontemplation. The mean con scores did not differ significantly by stage. Furthermore, the crossover of pros exceeding cons occurred in the preparation stage. Nine of the ten behavioral processes were significant by stage and two experiential processes were significant by stage. However, the sample size of 30 severely limits the statistical power for ANOVA; therefore, the results should be interpreted with caution.

Tai-Seale (2003) conducted a study to identify the proportion of rural Midwesterners at different stages of change for exercise. The sample consisted of 418 adults; the majority of whom were female (66%), white (89%), had some college education (53%), and had a median income of \$35,000 annually. The results revealed that the rural sample had three times the number of people (47%) in precontemplation than the national estimate (14%). Furthermore, a third fewer individuals in the rural sample (11%) were in preparation compared to the national estimate (29%). Fewer individuals in the rural sample were in maintenance (21%) compared to the national estimate (36%). While these results are disturbing, this sample was selected via systematic random sampling and interviewed over the phone. Therefore, the participants

had to own a home telephone in order to be included, limiting a true representation of the population.

Application of the TTM to Individuals with Physical Disabilities. Cardinal (2004) conducted a study to examine the theorized associations of the TTM constructs among individuals with physical disabilities. This cross sectional study recruited a sample of 322 adults; the majority of whom used an assistive device (wheelchair or artificial limb) (84%), were female (62%), and white (92%). The results indicated that all major constructs were associated with the stages of change for exercise behavior. The largest proportion of variance was derived from the behavioral processes of change (40%), followed by self-efficacy (30%), the pros for exercise (19%), the cognitive processes of change (16%), and the cons for exercise behavior (15%). Direct discriminant analyses were conducted and stage classification probabilities revealed maintenance (91.3%), precontemplation (73.8%), and contemplation (48.3%) were the most reliably predicted stages. The least reliably predicted stages were preparation (23.8%) and action (5.3%). The overall classification accuracy across the stages was 69.9%. While these results seem impressive, the author indicated that for power analysis 200 participants were needed to participate. Those 200 individuals needed to be divided equally per cell, or 40 people per stage, in order use one-way ANOVAs. However, in three stages the author reported less than 40 individuals per stage, thus reducing statistical power and potentially making the aforementioned results not significant.

Conclusions

The existing studies applying the TTM to exercise behavior suggest that self-efficacy, decisional-balance, and the processes of change have similar relationships with

the stages of change as they do across other health behaviors. Furthermore, the studies that assessed the concurrent validity with actual exercise behavior suggested the staging algorithm adequately stages individuals based on their exercise behavior. However, all the studies reviewed were cross-sectional in design and the majority was conducted among worksite and university settings. Furthermore, across all studies in this review which reported gender and ethnicity, 79.2% of the participants were white and 57.7% were females; therefore limiting generalizations to males and other ethnic minorities. Finally, only one study assessed the utility of the TTM in a population with a physical disability and none assessed the applicability in individuals with a chronic disease. Linking the results from this review of literature with the recent review articles (Adams et al., 2003; Adams et al., 2005; Jeffery, Wing, Thorson, & Burton, 1998; Sutton, 2001; Weinstein et al., 1998), it is apparent that more randomized control trials need to be conducted to determine the efficacy of the TTM as well as to test the applicability of this model among men, ethnic minorities, and individuals living with health challenges.

Since exercise has been linked physiological and psychological benefits in individuals living with HIV/AIDS, it seems apparent that exercise interventions need to be developed to meet the needs of these individuals. To date, no studies have applied the TTM for exercise behavior in an HIV population. However, if the relationships between the constructs for exercise behavior are the same for individuals living with HIV as they are in other populations, then stage-matched interventions can be developed to meet the needs of this unique population.

CHAPTER 3

METHODOLOGY

Introduction

The purpose of the study was to examine: 1) the distribution of the stages of change for exercise among individuals accessing HIV-related services, 2) the differences between TTM constructs (decisional-balance, processes of change, and self-efficacy) explained by the stages of change among individuals accessing HIV-related services, and 3) whether the TTM constructs accurately predict the stages of change for exercise. If the variation in the TTM constructs is accounted for by the stages of change, and the constructs significantly predict the stages of change beyond chance alone, then stage-matched exercise interventions based on this model can be developed for individuals living with HIV/AIDS. For organizational purposes, this chapter is presented under the following headings: 1) research questions, 2) research design, 3) sample, 4) power analysis, 5) data collection and management, 6) study instruments, and 7) data analysis.

Research Questions

This study was designed to answer the following research questions:

1. Are there differences in decisional-balance scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the decisional-balance scores is explained by the stages of change?

- a. Are there differences in pro scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the pro scores is explained by the stages of change?
 - b. Are there differences in con scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the con scores is explained by the stages of change?
2. Are there differences in self-efficacy scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the self-efficacy scores is explained by the stages of change?
3. Are there differences in the experiential processes of change across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the experiential processes of change is explained by the stage of change?
4. Are there differences in the behavioral processes of change across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the behavioral processes of change is explained by the stage of change?
5. Is there a relationship between physical activity level and the stages of change for exercise?
6. Do the TTM constructs (decisional-balance, self-efficacy, experiential processes of change, and behavioral processes of change) predict stage of change for exercise better than chance alone?

Research Design

This study employed a cross-sectional design in which data were collected from four community-based organizations serving individuals living with HIV/AIDS in Atlanta, Georgia. The purpose and details of the study were presented to the Executive Directors at all four agencies in November 2005. After further consultation about the data collection process each organization granted approval for conducting the study. This study was approved by the Institutional Review Board (IRB) at the University of Georgia (Appendix A).

Sample

Four sites were selected for participation in this study based on the following: 1) each agency served only individuals living with HIV/AIDS, 2) all four agencies are located in the same building in Atlanta, Georgia, and 3) the agencies served different populations of individuals living with HIV/AIDS.

Atlanta Interfaith AIDS Network. Atlanta Interfaith AIDS Network provides faith-based support groups for individuals living with HIV/AIDS. Their mission is to bring resources of faith and spirituality to those touched by HIV/AIDS. Their educational programs are particularly designed for use in faith communities promoting HIV/AIDS prevention, awareness, and compassionate nonjudgmental response.

AIDS Survival Project. AIDS Survival Project is run primarily by people living with HIV and their mission is to promote self-empowerment and enhanced quality of life for HIV-affected individuals through advocacy, education, peer support, and treatment activism.

AIDS Treatment Initiatives. AIDS Treatment Initiatives provides nutritional counseling and exercise training for individuals living with HIV/AIDS.

Positive Impact, Inc. Positive Impact, Inc. has been in existence for over ten years and provides mental health care to individuals, living with or affected by HIV/AIDS, who do not have health insurance or access to private mental health care.

All of the participants in this study were volunteers and clients of Atlanta Interfaith AIDS Network, AIDS Survival Project, AIDS Treatment Initiatives, and/or Positive Impact, Inc. The inclusion criteria for participation in this study:

- 1) All participants were 18 years or older,
- 2) All participants had a verified HIV diagnosis, and
- 3) All participants spoke fluent English.

Participants were recruited from February 16 to April 14, 2006 using word of mouth advertising as well as posting signs in each of the data collection sites. In exchange for their participation, participants were given \$5 in cash.

Power Analysis

In order to detect a medium effect (Cohen's f) of .25, with power = .80 and the significance level = .05, a total sample size of 200 individuals, or 40 individuals per stage was needed (Cohen, 1977). However, since part of this study is to examine and classify individuals into the stages of change for exercise, the researcher did not know a priori the number of individuals in each stage. Based on a US based representative sample of the TTM stages for exercise, it is estimated that 14% of the sample would fall into precontemplation, 14% in contemplation, 29% in preparation, 7% in action, and 36% in maintenance (Centers for Disease Control and Prevention, 1999). Based on the US

sample, it was estimated that at least 600 individuals were needed to recruit at least 40 participants in each stage (see Table 3.1). However, since participants were recruited from an exercise facility for individuals living with HIV (AIDS Treatment Initiatives), the potential for capturing a higher number of individuals in the action stage, or exercising for less than six months, might be greater than the general population. Therefore, the researcher determined that a total of 300 participants would likely be sufficient to recruit 40 participants per stage.

If the researcher was not able to recruit 40 participants in each of the stages, the planned analyses would still be conducted as planned. If no significant differences were observed between groups, an indication of lack of power, then one or more of the groups would be collapsed to form a fewer number of groups. Collapsing the stages of change for exercise was done in studies assessing the physical activity level of patients in physician's offices (Project PACE). In the PACE studies, the five stages were collapsed to form the following three stages: 1) precontemplators, 2) contemplators, and 3) actives (Patrick et al., 1994). However, if significant differences were observed between groups, without achieving 40 participants in each cell, then power was adequate to detect the effect and the aforementioned power analysis is not salient.

Table 3.1

<i>Sampling Strategy</i>			
	US Distribution of Stages of Change for Exercise	# Participants Needed per 300	Estimated # of Participants Needed Per Group
Precontemplation	14%	42	40
Contemplation	14%	42	40
Preparation	29%	87	40
Action	7%	21	40
Maintenance	36%	108	40
Total	100%	300	200

Data Collection and Management

At Positive Impact, Inc. and AIDS Treatment Initiatives, data collection continued throughout the two month period, while data collection at Atlanta Interfaith AIDS Network and AIDS Survival Project were only collected on certain days and times. However, since all agencies are in the same building, clients from AIDS Survival Project and AIDS Treatment Initiatives were able to complete the questionnaire at Positive Impact or AIDS Treatment Initiatives at anytime during the two-month period.

Positive Impact, Inc. At Positive Impact, a sign was posted in the waiting room inviting clients to complete a questionnaire while waiting to see their mental health counselor. The sign instructed the clients to ask the individual who worked at the front desk about completing a questionnaire. Only the front desk person was authorized to pass out or collect questionnaires. Once the participant returned the questionnaire to the front desk person, the participant was given \$5 in cash for participation. The questionnaires were stored in a locked storage box that was only accessible to the researcher. The storage box was emptied by the researcher a minimum of once per week.

AIDS Treatment Initiatives. At AIDS Treatment Initiatives, a sign was posted at the front desk inviting clients to participate in the study. The sign instructed clients to ask one of the two staff members about completing a questionnaire. Once the questionnaire was completed, one of the staff members paid the participant \$5 in cash and placed the completed questionnaire in a locked storage box. The questionnaires were stored in a locked storage box that was only accessible to the researcher. The storage box was emptied by the researcher a minimum of once per week.

AIDS Survival Project. At AIDS Survival Project, the researcher spent one day at the organization collecting data from the participants. A sign was posted in the organization one week before the session. On the day of data collection, AIDS Survival Project clients, or clients from the other agencies in the building, were able to come to the AIDS Survival Project to complete the questionnaire. If individuals were not clients of AIDS Survival Project, they were instructed to show HIV verification to the researcher in order to participate. The researcher was in the room with the participants, so once a participant completed the survey the researcher gave the participant \$5 in cash for participation. All completed questionnaires were stored in a locked storage box only accessible to the researcher.

Atlanta Interfaith AIDS Network. At Atlanta Interfaith AIDS Network, the researcher spent two full days collecting data from clients at Atlanta Interfaith Network. On both days, clients were able to complete a questionnaire before or after attending their support group meeting. The researcher sat in the room with the participants, so once the participants completed the questionnaires they were given \$5 in cash for their

participation. The completed questionnaires were stored in a locked storage box only accessible to the researcher.

All the data collected were entered in an SPSS database on the researcher's computer. The computer was password protected and all data stored in the computer was void of identifying information. All instruments will be kept for one year and then destroyed.

Study Instruments

Decisional-balance for Exercise. This ten-item scale assessed the pros and cons for exercise. Five items assessed the pros and five assessed the cons for exercise. An example of a pro item is "I would have more energy for my family and friends if I exercised regularly," and an example of a con item is "I would feel embarrassed if people saw me exercising." Each item was assessed on a five point Likert scale (1 = not at all important, 2 = a bit important, 3 = somewhat important, 4 = quite important and 5 = extremely important) (Nigg, Rossi, Norman, & Benisovich, 1998). See Appendix B for an entire copy of the study instrument.

International Physical Activity Questionnaire. This seven item instrument assessed physical activity in the past seven days. The items assessed the number of days, and hours per day, an individual spent engaging in vigorous and/or moderate physical activity, walking, and sitting. The hours spent in each activity were converted to a Metabolic Equivalent (MET) Level in order to determine their level of physical activity in the past seven days (Craig et al., 2003).

Processes of Change for Exercise. This thirty-item scale assessed the processes of change. Fifteen items assessed the behavioral processes of change (i.e., contingency

management, counterconditioning, helping relationships, self-liberation, and stimulus control) and fifteen items assessed the cognitive processes of change (i.e., consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation). An example of a behavioral process item is “My friends encourage me to exercise” and an example of a cognitive process item is “I read articles about exercise in an attempt to learn more about it.” Each item was assessed on a five point Likert scale (1 = never, 2 = seldom, 3 = occasionally, 4 = often, and 5 = repeatedly). The internal consistency of the ten process measures ranged from .64 to .86 (Nigg, Norman, Rossi, & Benisovich, 1999).

Self-Efficacy for Exercise. This six item measure assessed perceived self-efficacy, or the confidence in one’s ability, to perform regular exercise. This scale assessed six different components that predict exercise behavior: negative affect, excuse making, exercising alone, inconvenient to exercise, resistance from others, and bad weather. An example of an item for negative affect is, “I am confident that I can participate in regular exercise when I am under a lot of stress.” An example of an item for excuse making is, “I am confident that I can participate in regular exercise when I feel I don’t have the time.” Each item was assessed on a 5-point Likert scale (1 = not at all important, 2 = a bit important, 3 = somewhat important, 4 = quite important and 5 = extremely important) (Marcus et al., 1992c). The internal consistency of these measures was .82 (Rossi, Benisovich, Norman, & Nigg, 2000).

Stages of Change for Exercise (Short-Form). A one-item staging algorithm for exercise stages of change that has demonstrated concurrent validity with the 7-day physical activity recall questionnaire (Marcus et al., 1992c). The item asks, “Do you

exercise regularly according to the definition provided?” A response of “Yes, I have been for more than 6 months,” categorized individuals in the Maintenance stage. A response of “Yes, I have been for less than 6 months,” classified an individual in the Action stage. A response of “No, but I intend to in the next 30 days,” categorized individuals in the Preparation stage. A response of “No, but I intend to in the next six months,” classified individuals in the Precontemplation stage. A response of “No, and I do not intend to in the next 6 months,” categorized individuals in the Precontemplation stage.

Demographic Information. Demographic information was collected for each participant, including: race, ethnicity, gender, age, sexual orientation, employment status, educational background, marital status, parental status, HIV/AIDS status, living situation, HIV/AIDS diagnosis, CD4 count, viral load, overall health status, and whether or not participants took HIV medications.

Data Analysis

The Expectation Maximum algorithm for multiple imputations of missing data, in Liseral Statistical Software, was used to calculate missing values for variables in the processes of change, self-efficacy, and decisional-balance scales. Once the data were complete, composite scores were created for each of the following scales: 1) pros, 2) cons, 3) self-efficacy, 4) consciousness raising, 5) dramatic relief, 6) environmental reevaluation, 7) self-reevaluation, 8) social liberation, 9) counterconditioning, 10) helping relationships, 11) reinforcement management, 12) self-liberation, 13) stimulus control, 14) experiential processes, 15) behavioral processes, and 16) decisional-balance. The experiential processes composite score was created by summing the five experiential

processes (consciousness raising, dramatic relief, environmental reevaluation, self-reevaluation, and social liberation). The behavioral processes composite score was created by summing the five behavioral processes (counterconditioning, helping relationships, reinforcement management, self-liberation, and stimulus control). The decisional-balance score was created by subtracting the con scores from the pro scores. Finally, the weekly metabolic equivalent level (METs) composite score was created by adding the weekly METs for walking score, the weekly METs for moderate physical activity score, and the weekly METs for vigorous physical activity score.

Outliers were observed by examining box plots for decisional-balance, the decisional-balance pro scores, the decisional-balance con scores, self-efficacy, behavioral processes of change and experiential processes of change by stage of change. After the outlier scores and the questionnaires for each of the outliers were examined, scores were deleted and the missing values were replaced with the Expectation Maximum algorithm for multiple imputations of missing data. Box plots were reexamined for outliers following the imputation of the missing data.

Descriptive statistics were used to describe the sample based on demographic information. Based on the response to the staging algorithm, participants were classified into one of the five stages of change for exercise: 1) precontemplation, 2) contemplation, 3) preparation, 4) action, or 5) maintenance. Chi-square analyses were used to determine if there were significant relationships between the categorical demographic variables and the stages of change. One-way Analysis of Variance (ANOVA) was used to test if significant relationships existed between the stage of change and the continuous demographic variables.

To assess internal consistency of the decisional-balance scale, the decisional-balance pro scores, the decisional-balance con scores, self-efficacy, and processes of change scales, Cronbach's alpha coefficients were computed.

One-way Analysis of Variance (ANOVA) and Analysis of Variance of Covariance (ANCOVA) were performed to assess the relationship between stage of exercise and each of the dependent variables (decisional-balance, self-efficacy, behavioral processes of change, experiential processes of change, and weekly MET level) and answer research questions 1-5. Both ANOVA and ANCOVA analyses were performed to determine whether or not the control variables could be ruled out as potential explanation of the findings (Becker, 2005)

In order to conduct ANOVA and ANCOVA analyses, the researcher examined the data set in order to determine if the following assumptions were met or violated. The three ANOVA assumptions are that 1) the units of analysis are independent of one another, 2) the population distributions are normal, and 3) the variability across populations are equal. The two additional ANCOVA assumptions include that 1) there is a linear relationship between the covariate and the dependent variables and 2) the covariate is independent of the independent variable and not highly correlated with any other covariates (Keppel, 1991).

The normality assumption was tested by examining the box plots for each of the dependent variables as well as to examine the results of the Shapiro Wilks *W* test of normality, which is appropriate for sample sizes under 2000 (Keppel, 1991).

In order to test the homogeneity of variance assumption, Levene's test was examined for each of the analyses. Since Levene's test is powerful and often sensitive to

violations of normality, the assumption of equal variances was also tested using the $F_{\max}$ test. According to the $F_{\max}$ test, as long as the ratio between the smallest cell size and the largest cell size is less than 4 and the ratio between the largest variance and the smallest variance is fewer than 3, then the assumption is met (Sokol & Rohlf, 1981).

A covariate was selected if it was significantly related to the dependent variable and not significantly related to the stage of change (independent variable). Once the covariates were determined, each model was tested separately and the results were compared to the one-way ANOVAs that were conducted. The one-way ANOVAs were conducted for each of the TTM constructs, with the stage of change as the grouping variable and the TTM construct as the outcome variables. If the variances were equal across groups, then the Bonferonni post hoc comparisons were computed. If variances were unequal, then the Games Howell post hoc comparisons were computed in order to adjust for the unequal variances (Keppel, 1991).

Predictive Discriminant Analysis (PDA) was used to estimate the predictive power of a set of variables. Therefore, this analysis was used to determine whether the TTM constructs predicted an individual's stage of change better than chance alone. The predictor variables included scores for 1) self-efficacy, 2) decisional-balance, 3) the behavioral processes of change, and 4) the experiential processes of change. The outcome variables were the five stages of change: 1) precontemplation, 2) contemplation, 3) preparation, 4) action, and 5) maintenance.

There are two assumptions in PDA: 1) multivariate normality, and 2) equal variance-covariance matrices. In order to check the multivariate normality, the normality of each variable distribution was checked by examining the corresponding box plot. As

long as one of the distributions was satisfied with multivariate normality, then one can proceed as if the assumption is met (Huberty & Olejnik, unpublished). Box's test was examined to determine if the covariance matrices were equal.

Since the covariance matrices were unequal, based on Box's test, a quadratic classification was applied and SAS was used for the data analysis. The probability that individuals were classified into each stage was based on prior probabilities based on the national estimate: 14% in precontemplation, 14% in contemplation, 29% in preparation, 7% in action, and 36% in maintenance.

The hit rate, or the number of individuals classified into the "correct" stages, was calculated using an external cross-validation classification analysis, the "Leave One Out" method. This method developed a prediction model based on N-1 and then tested the classification prediction equation on the one person left out of the analysis. This analysis was repeated for each person in the sample and then the hit rate was calculated based on the number of people correctly predicted into their known stages.

The overall expected hit rate (chance) was calculated and then the observed hit rate was compared to the expected hit rate to see if there was a statistically significant difference between chance alone and the prediction equation. Finally, "improvement over chance" was calculated to determine how much better the prediction of stages was over chance alone. In addition to the overall hit rates, an expected and observed hit rate were compared for each stage and the "improvement over chance" calculation was conducted for each stage as well. Therefore, an expected and overall hit rate was calculated for each stage as well as all five stages together. If the stages were predicted better than chance alone, then it can be assumed that the staging algorithm accurately

staged individuals based on their responses on the other constructs. In addition to the hit rates, prediction equations for future participants were created based on the quadratic classification functions for each of the stages and constructs.

The decisional-balance, decisional-balance pro scores, decisional-balance con scores, self-efficacy, experiential processes of change and behavioral processes of change raw composite scores were converted to T-scores for the descriptive statistics. The scores were standardized so they could be compared across constructs. However, raw scores were used for ANOVA, ANCOVA and predictive discriminant analysis because the transformation altered the means and standard deviations of the variables.

All ANOVA, ANCOVA and descriptive statistics were conducted using version 14.0 of the Statistical Package for the Social Sciences (SPSS) and all discriminant analyses were conducted using SAS statistical software.

CHAPTER 4

RESULTS

A total of 229 questionnaires were administered to individuals who received HIV-related services from one or more of the four data collection sites. Thirty (13.2%) questionnaires were collected from Atlanta Interfaith AIDS Network, 36 (15.7%) were collected from AIDS Survival Project, 98 (42.7%) were collected from Positive Impact, Inc., and 65 (28.4%) were collected from AIDS Treatment Initiatives. Of the 229 questionnaires, 21 were excluded from analyses because individuals did not provide HIV verification before completing the questionnaire. To that end, the final sample consisted of 208 participants.

Outliers

Box plots for each dependent variable were examined for outliers. For self-efficacy, there were 3 outliers; 1 in preparation and 2 in action. For the experiential processes of change, there were 2 outliers; one in contemplation and one in action. For the behavioral processes of change, there were no outliers. There was one outlier in precontemplation for decisional-balance, one outlier in action for the decisional-balance pro scores, and two outliers in maintenance for the decisional-balance con scores. The outliers for each of the TTM constructs were deleted and new scores were imputed through the Liseral Maximum Likelihood algorithm. After rerunning the box plots, no outliers were present for the TTM constructs. There were numerous outliers for the weekly METs, a measure of physical activity level; one in precontemplation, 3 in contemplation, 5 in preparation, 4 in action, and 7 in maintenance. Outliers were not

deleted for the METs level because the researcher believed that the outliers could be the actual physical activity level for some of the participants.

Internal Consistency

Reliability of scales was assessed using Cronbach's Alpha. The Cronbach's Alpha for the pro subscale for decisional-balance was .82 and .76 for the cons subscale for decisional-balance. The subscales for the experiential processes of change ranged from .59 to .78. Social liberation and dramatic relief both had internal consistency scores of .59, environmental reevaluation had a score of .63, consciousness raising had a score of .78, and self-reevaluation of .79. The subscales for the behavioral processes of change ranged from .73 to .85; stimulus control had a score of .73, self-liberation and reinforcement management both had scores of .74, counter-conditioning had a score of .75 and helping relationships had a score of .85. The internal consistency subscale for self-efficacy was .76.

Stages of Change

Based on the participants' responses to the one item stage of change measure, 23 (10.8%) participants were classified in the precontemplation stage, 32 (16.8%) in the contemplation stage, 33 (15.6%) in the preparation stage, 49 (23.6%) in the action stage, and 71 (33.5%) in the maintenance stage. Table 4.1 compares the stages of change estimates for regular moderate exercise in the United States (Centers for Disease Control and Prevention, 1999) and this sample. There were more individuals in precontemplation and preparation in the national sample compared to the participants in this study and there were more participants in this study in contemplation, action, and maintenance than compared to the national sample. To that end, 57.1% of the participants in this HIV

positive sample are in action or maintenance compared to 43% of individuals in the national sample.

Table 4.1

<i>Proportion of Adults in Stages of Change for Exercise (N = 208)</i>		
	Individuals Accessing HIV-Care (%)	U.S. Estimate (%)
Stage of Change		
Precontemplation	10.8	14
Contemplation	16.5	14
Preparation	15.6	29
Action	23.6	7
Maintenance	33.5	36

Participant Demographics

The number of participants at each stage of change across 10 demographic variables and the relationship between the stages and each of the demographic variables is presented in Table 4.2. The majority of the sample self-identified as male (87.0%), African-American or Black (84.6%), single (69.2%), and homosexual (54.8%). Over half (54.3%) of the sample rented or owned their own home, 53.4% of the sample was unemployed due to disability, and 85.1% of the sample held at least a high school diploma. The ages ranged was from 22 to 63 years with an average age of 42.6 years ($SD = 7.1$). There was a significant relationship between stage of change and whether a participant received services from AIDS Treatment Initiatives, $\chi^2(4) = 12.19$, $p = .02$, or from AIDS Survival Project, $\chi^2(4) = 10.35$, $p = .04$. This significant relationship indicates that the two aforementioned variables should not be used as covariates since a

covariate should not be significantly related to the independent variable (stages of change) yet should be related to the dependent variable (Keppel, 1991). If a covariate is related to the independent and the dependent variable, an interaction is usually present and the variable should not be used as a covariate. None of the other demographic variables were significantly related to the stages of change for exercise indicating that the other variables could be potential covariates if a relationship existed with the dependent variables.

Covariates were selected if they were significantly related to the dependent variables and not related to the stages of change. Even though receiving services at AIDS Treatment Initiatives (ATI) was significantly related to the stages of change and to the self-efficacy dependent variable, the researcher decided to use the ATI variable as a covariate. Theoretically it seemed appropriate receiving services from an organization that provides exercise counseling could account for some of the variance in the self-efficacy scores. However, when entered into the model, no interaction was present so the variable was kept as a covariate for the self-efficacy scores.

Table 4.2.

Relationship between Demographic Variables and Stage of Change

Receive Services from: (<i>n</i> = 208)			
Positive Impact	117 (56.3)	2.88	.58
AIDS Treatment Initiatives	77 (37.0)	12.18	.01
AIDS Survival Project	102 (49.0)	10.35	.04
Atlanta Interfaith AIDS Network	66 (31.7)	5.13	.74
Age (<i>n</i> = 201)	42.68 <i>SD</i> =7.05	0.63	.64
Gender (<i>n</i> = 208)		7.90	.44
Female	24 (11.5)		

Male	181 (87.0)		
Transgender	3 (1.4)		
Ethnicity (<i>n</i> = 208)		17.97	.59
Black	176 (84.6)		
American Indian	1 (0.5)		
Native Hawaiian	1 (0.5)		
White	26 (12.5)		
Hispanic	1 (0.5)		
Other	3 (1.4)		
Relationship Status (<i>n</i> = 208)		19.13	.26
Married	9 (4.3)		
Divorced	21 (10.1)		
Single	144 (69.2)		
Significant Other	31 (14.9)		
Widow/Widower	3 (1.4)		
Children in Home (<i>n</i> = 208)		12.66	.12
Yes	24 (11.5)		
Sexual Orientation (<i>n</i> = 205)		13.22	.35
Heterosexual	53 (25.5)		
Homosexual	114 (54.8)		
Bisexual	28 (13.5)		
Unsure/Questioning	10 (4.9)		
Missing	3 (1.4)		
Education (<i>n</i> = 208)		24.47	.15
Grades 1-6	2 (1.0)		
Grades 7-11	29 (13.9)		
High School Grad.	59 (28.4)		
Some College	74 (35.6)		
College Graduate	37 (17.8)		
Graduate Work	7 (3.4)		
Employed (<i>n</i> = 207)		17.76	.81
Full-time	18 (8.7)		
Part-time	20 (9.6)		
Unemployed, Looking for Work	32 (15.4)		
Unemployed, Disabled	113 (54.3)		
Unemployed, Volunteer Work	13 (6.3)		
Unemployed, Retired	3 (1.4)		
Other/Missing	9 (4.2)		
Living Situation (<i>n</i> = 208)		22.86	.12
Rent/Own	113 (54.3)		
Live with Family	13 (6.3)		
Live with Friends	21 (10.1)		
Residential Treatment Facility	21 (10.1)		
No Housing	40 (19.2)		

Health Status

The number of participants at each stage of change across seven health status variables and the relationship between the stages is presented in Table 4.3. Results indicated that participants had been living with an HIV diagnosis for an average of 11.75 ($SD = 6.59$) years, but ranged from as recent as 2 months prior to the beginning of the study to 25 years before the study began. For those participants who had also received an AIDS diagnosis, the average time since AIDS diagnosis was 6.59 ($SD = 4.86$) years, but ranged from as recent as 1 month prior to the start of the study to 20 years before the study began.

Not all participants responded to the question about their CD4 count; therefore, only 154 of the participants are included in the analysis. However, the CD4 count of the 154 participants ranged from 3 to 1,697 with an average of 433.77 ($SD = 267.00$). Only 129 of the participants reported a viral load. The viral load count ranged from undetectable (viral load < 50) to 555,000 with an average of 23,108 ($SD = 67,459$).

Viral load and CD4 count are important indicators of overall health status in individuals living with HIV/AIDS. Viral load is the amount of HIV virus in a blood sample, reported as number of HIV RNA copies per mL of blood plasma. The VL provides information about the number of cells infected with HIV and is an important indicator of HIV progression and how well treatment is working. The CD4 count is one of the most useful indicators of the health of the immune system and the progression of HIV/AIDS. A CD4 cell count is used by health care providers to determine when to begin, interrupt, or halt anti-HIV therapy; when to give preventive treatment for opportunistic infections; and to measure response to treatment. A normal CD4 cell count

is between 500 and 1,400 cells/mm³ of blood, but an individual's CD4 count can vary. In HIV-infected individuals, a CD4 count at or below 200 cells/mm³ is considered an AIDS-defining condition (National Institutes of Health, 2004).

Table 4.3

<i>Relationship between Health Status Variables and Stage of Change</i>			
Variable	Total or Average (%)	χ^2 F	p
Years Living with HIV (n = 208)	11.75 SD=6.59	1.32	.87
AIDS Diagnosis (n = 208)		7.27	.12
Yes	86 (41.7)		
Years Living with AIDS (n = 208)	6.59 SD=4.86	0.63	.64
T-Cell Count (n = 154)	433.77 SD=267.00	0.31	.87
Viral Load (n = 129)	23,108 SD=67,459	1.69	.16
Taking HIV Medications (n = 208)		3.00	.56
Yes	115 (54.2)		
Overall General Health (n = 202)		25.89	.06
Excellent	33 (15.6)		
Very Good	72 (34.4)		
Good	58 (27.8)		
Fair	35 (17.0)		
Poor	4 (1.9)		
Missing	6 (3.3)		

Testing of ANOVA Assumptions

The first assumption of independence was met because participants only completed the survey once. To test the second assumption of normality, box plots were examined for each dependent variable. The box itself contains the middle 50% of the data, while the top line represents the 75th percentile of the data set and the bottom line represents the 25th percentile of the data set. The line in the middle of the box represents the median score and the “whiskers” at the end of the lines contain the maximum and minimum scores. If the median score is not perfectly centered in the box, then the data are skewed. If the median score is high in the box, the data are positively skewed and if they median score is low in the box, then the data are negatively skewed.

The box plots in this data set indicated that the contemplation, preparation and maintenance groups were negatively skewed for decisional-balance and that action was positively skewed (Figure 4.1). For the decisional-balance con scores, the precontemplation group was slightly positively skewed (Figure 4.2). For the decisional-balance pro scores the precontemplation, contemplation, preparation, and action groups were slightly positively skewed (Figure 4.3). For the experiential processes of change action and maintenance were slightly negatively skewed (Figure 4.4). The behavioral processes of change were slightly negatively skewed for precontemplation and positively skewed for maintenance (Figure 4.5). The self-efficacy scores were positively skewed for precontemplation and action and negatively skewed for preparation (Figure 4.6). The METs weekly scores were extremely negatively skewed.

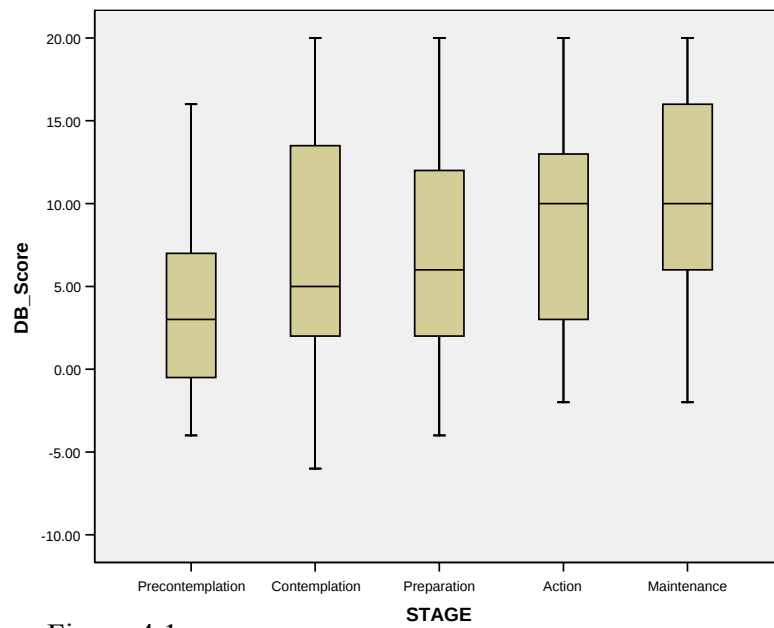


Figure 4.1

Box Plot for Decisional-Balance Scores

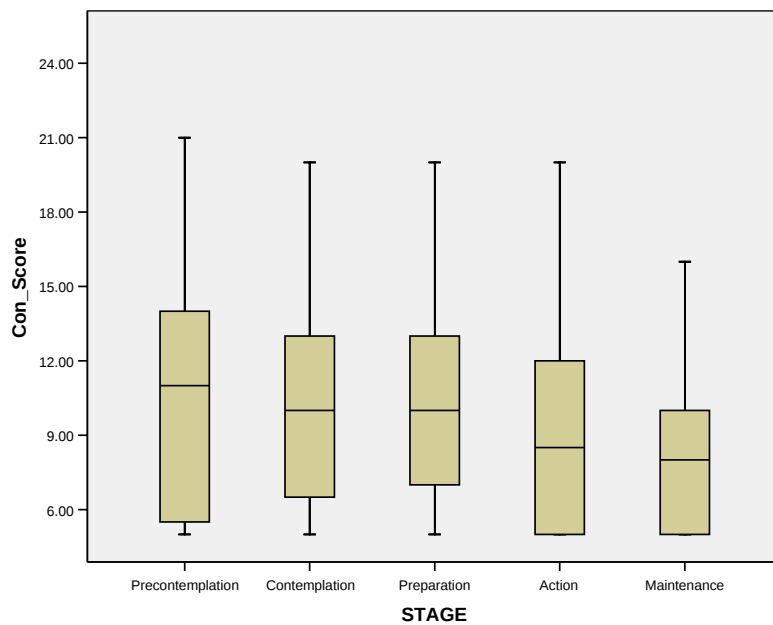


Figure 4.2

Box Plot for Decisional-Balance Con Scores

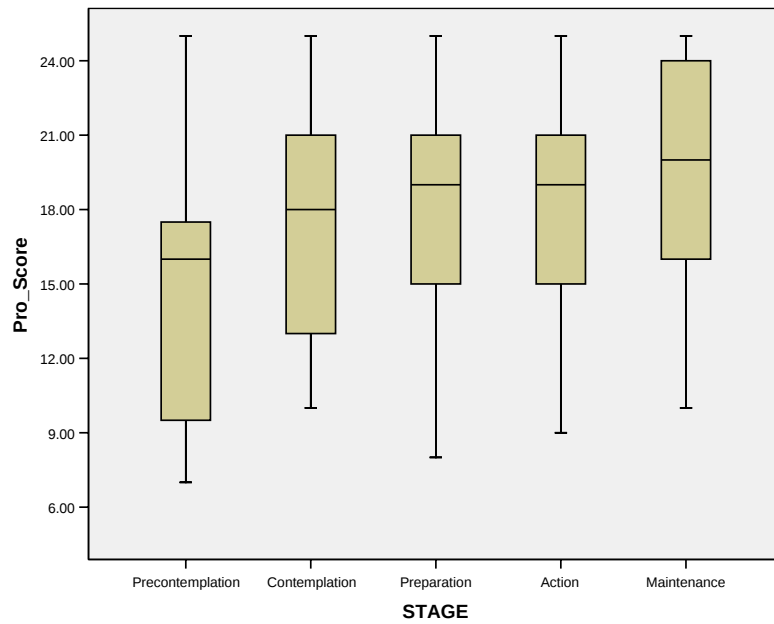


Figure 4.3

Box Plot for Decisional-Balance Pro Scores

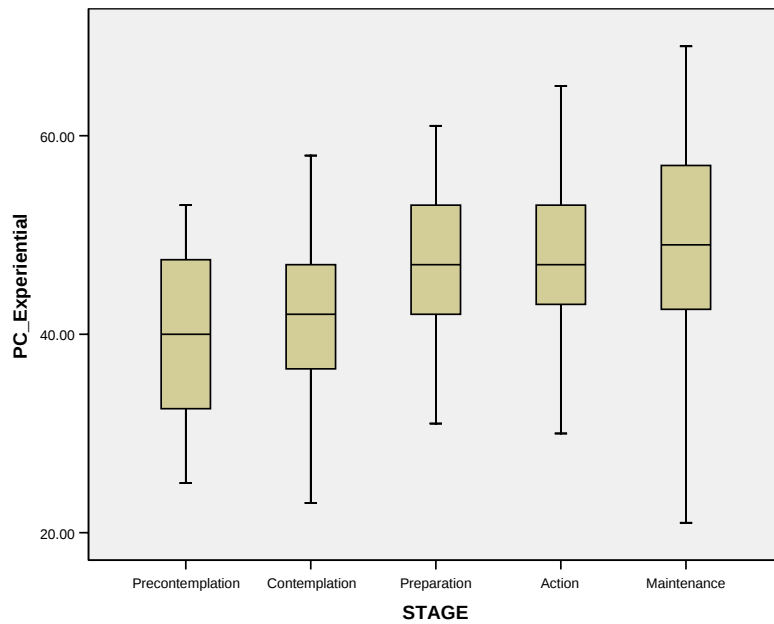


Figure 4.4

Box Plot for Experiential Processes of Change

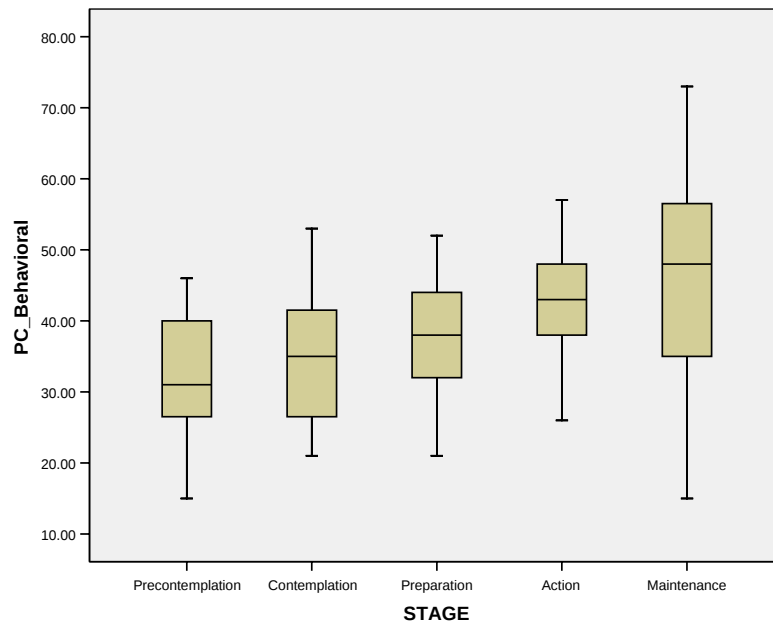


Figure 4.5

Box Plot for Behavioral Processes of Change

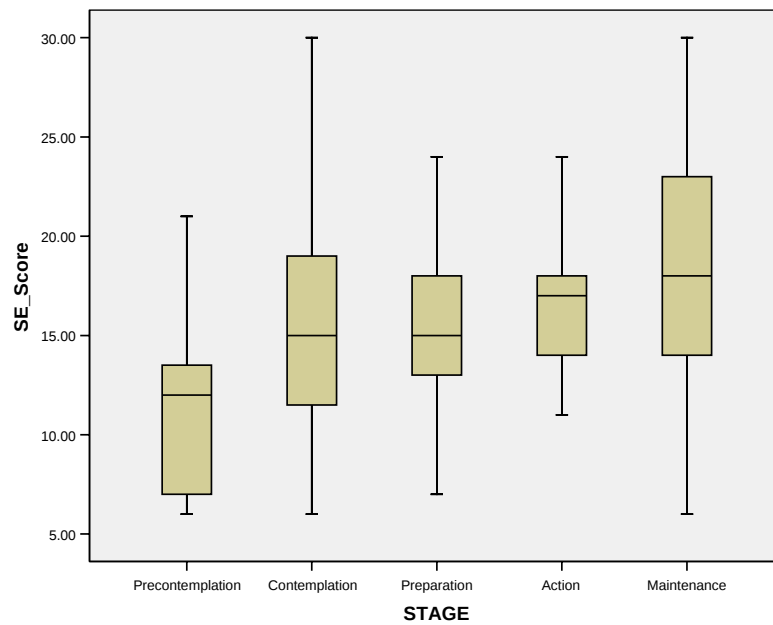


Figure 4.6

Box Plot for Self-Efficacy Scores

The Shapiro Wilk test of normality (Green & Salkind, 2003) indicated that the only groups (stages) that violated the normality assumption were the action, $W(49) = .95$, $p = .03$ and maintenance stages for the decisional-balance scores, $W(71) = .96$, $p = .02$, maintenance for the pro decisional-balance scores, $W(71) = .92$, $p = .00$, and action for self-efficacy, $W(49) = .95$, $p = .04$. All the groups violated the normality assumption for the con decisional-balance score; precontemplation, $W(23) = .90$, $p = .03$, contemplation, $W(32) = .91$, $p = .01$, preparation, $W(33) = .92$, $p = .02$, action, $W(49) = .88$, $p = .00$, and maintenance, $W(71) = .90$, $p = .00$. All the groups violated the assumption for the weekly METs scores; $W(20) = .79$, $p = .00$, contemplation, $W(30) = .75$, $p = .00$, preparation, $W(27) = .76$, $p = .00$, action, $W(47) = .78$, $p = .00$, and maintenance, $W(68) = .64$, $p = .00$. Even though the groups were slightly skewed, the robustness of ANOVA analyses yielded results that were minimally biased.

To further test the normality assumption, skewness and kurtosis were examined for each of the aforementioned dependent variables. All of the skewness and kurtosis values were within -1 to +1 values, indicating normality among each the stages of change across dependent variables (Huck, 2004). The only group that violated this assumption was the maintenance group for the weekly METs dependent variable. This group had a skewness of 2.87 and kurtosis of 9.15, indicating non-normality for this group.

Levene's test was rejected for the decisional-balance scores, $F(4, 207) = 1.12$, $p = .35$, the decisional-balance pro scores, $F(4, 203) = 1.21$, $p = .31$, and for the experiential processes of change scores, $F(4, 207) = 1.52$, $p = .20$. Levene's test was not rejected for the self-efficacy scores, $F(4, 207) = 4.25$, $p = .00$, the behavioral processes of change, $F(4, 179) = 7.51$, $p = .00$, and the decisional-balance con scores, $F(4, 203) = 4.09$, $p =$

.00. Levene's test was not rejected for the weekly METs scores, $F(4, 187) = 3.61, p = .01$.

Levene's test was a powerful test and sensitive to non-normality; therefore, the assumption of equal variances was also tested using the $F_{\max}$ test (Keppel, 1991). The sample size ratio from largest group to smallest group was 71:23 or 3.00:1, which met the criteria for the $F_{\max}$ test. The largest variance for the behavioral processes of change scores was 176.38 and the smallest was 54.16, yielding a ratio of 3.25:1, which was slightly larger than 3:1; and therefore did not meet the criteria for $F_{\max}$ test. The largest variance for the self-efficacy scores was 31.28 and the smallest was 11.70, yielding a ratio of 2.67:1, which was less than 3:1 and met the criteria for the $F_{\max}$ test. The largest variance for the decisional-balance con scores was 23.98 and the smallest was 9.01, yielding a ratio of 2.66:1, which was less than 3:1 and met the criteria for the $F_{\max}$ test. The largest variance for the weekly METs scores was 154,803,364 and the smallest was 26,728,900, yielding a ratio of 5.79:1, which was greater than 3:1 and did not meet the criteria for the $F_{\max}$ test. Since unequal variances were assumed for the self-efficacy scores, experiential processes of change, the decisional-balance con scores, and the METs, Welch's test for unequal variances was computed for each of the aforementioned ANOVA tests.

Testing ANCOVA Assumptions

Self-Efficacy. Univariate analyses indicated there were two variables that were significantly related to the self-efficacy dependent variable: viral load and whether or not the participants received services from AIDS Treatment Initiatives (provide exercising counseling and training). However, when the viral load variable was entered into the

model, there was an interaction between viral load and self-efficacy. The other covariate that was entered in the model to test the significance between the stages of change and self-efficacy was whether or not the participants received services from AIDS Treatment Initiatives (provide exercising counseling and training). The interaction between this covariate and the stages of change was not significant, $F(4, 198) = 2.38, p = 2.07$), but the covariate was significantly related to self-efficacy, $F(1, 202) = 7.92, p = .00$; thus meeting both assumptions. Therefore, the only covariate used was whether individuals had received services from ATI.

Experiential Processes of Change. Univariate analyses revealed there was only one variable that were significantly related to the experiential processes of change: living situation. The interaction between living situation and the stages of change was not significant, $F(4, 199) = .46, p = .76$, but the covariate was significantly related to the experiential processes of change, $F(1, 202) = 10.13, p = .02$; therefore meeting both assumptions. Therefore, the only covariate used was living situation.

Behavioral Processes of Change. Univariate analyses revealed there were four variables that were significantly related to the behavioral processes of change: age, relationship status, living situation, and overall health status. However, when relationship status was entered in the model there was an interaction with the stages of change. Similarly, there was an interaction between the health status variable and the stages of change. When the living status variable was entered into the model, there was no relationship with the dependent variable. Finally, the age variable was entered as a covariate and was related to the dependent variable, but not the stages of change. The interaction between age and stage of change was not significant, $F(4, 198) = .28, p = .90$,

but the age covariate was significantly related to the behavioral processes of change, $F(1, 202) = 6.77, p = .01$. Therefore, the only covariate used was age.

Decisional-Balance Scores. Univariate analyses revealed there were two variables that were significantly related to the decisional-balance scores: living situation and taking HIV medications. However, when each of the covariates was entered in the ANCOVA model, the only covariate that was significantly related to the dependent variable was living situation. The interaction between living situation and the stages of change was not significant, $F(4, 198) = 1.42, p = .23$, but the living situation covariate was significantly related to decisional-balance, $F(1, 202) = 9.21, p = .00$. Therefore, the only covariate used was living situation.

Decisional-Balance Pro Scores. Univariate analyses revealed there was only one variable that was significantly related to the decisional-balance pro scores: living situation. The covariate that was entered in the model to test the significance between the stages of change and decisional-balance pro scores was living situation. The interaction between living situation and the stages of change was not significant $F(4, 198) = 1.13, p = .34$, but the living situation covariate was significantly related to the decisional-balance pro scores, $F(1, 202) = 6.23, p = .01$. Therefore, the covariate used was living situation.

There was no good covariate for the relationship between stages and physical activity level (METs) or for the relationship between stages of change and the decisional-balance con scores.

Predictive Discriminant Analysis Assumptions

Since at least one of the dependent variables met the assumptions for normality, then it met the assumption for multivariate normality as well. Box's Test for

homogeneity of variance/covariance matrices was not rejected, $\chi^2(40) = 73.99$, $p = .00$, indicating unequal variance/covariance matrices. The violation of this assumption indicated the need for the use of a quadratic classification rule.

Research Question One

Are there differences in decisional-balance scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the decisional-balance scores is explained by the stages of change?

- a. **Are there differences in pro scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the pro scores is explained by the stages of change?**
- b. **Are there differences in con scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the con scores is explained by the stages of change?**

Descriptive Statistics for the Decisional-Balance Scores. Table 4.4 presents the means and standard deviations for each of the TTM constructs, including the decisional-balance pros scores, decisional-balance con scores, and the decisional-balance (pros minus cons) score. Each of the scores was presented as T-scores so they could be compared across constructs.

Table 4.4

TTM Scores for the Five Stages of Change (N = 208)

	PC (23)	C (32)	P (33)	A (49)	M (71)
	<i>M (SD)</i>				
Pro Scores	43.36 (11.50)	48.88 (9.32)	49.86 (9.85)	50.21 (9.12)	52.62 (9.73)
Con Scores	52.88 (11.96)	51.66 (10.83)	52.02 (10.28)	49.61 (10.21)	47.65 (8.21)
Decisional-Balance Scores	42.24 (7.84)	48.15 (10.81)	48.64 (9.79)	50.40 (9.33)	53.40 (9.26)
Self-Efficacy Scores	40.86 (7.97)	46.77 (8.84)	48.21 (7.21)	50.56 (6.10)	53.53 (10.39)
Experiential Processes of Change Scores	42.02 (8.53)	45.26 (8.20)	50.75 (7.87)	51.07 (8.38)	53.04 (10.51)
Behavioral Processes of Change Scores	41.92 (7.98)	44.33 (8.12)	47.43 (6.47)	51.31 (6.39)	54.84 (11.42)

The decisional-balance con scores were highest for the precontemplation group, ($M = 52.88$, $SD = 11.96$), and lowest for the maintenance group, ($M = 47.65$, $SD = 8.21$).

The decisional-balance pro scores were highest in the maintenance group, ($M = 52.62$, $SD = 9.73$), and lowest in the precontemplation group, ($M = 43.36$, $SD = 11.50$). The crossover for pros and cons scores occurred in between the preparation and action stage, but closer to the action stage than the preparation stage. Figure 4.7 illustrates the decisional-balance con scores and the decisional-balance pro scores across the five stages of change.

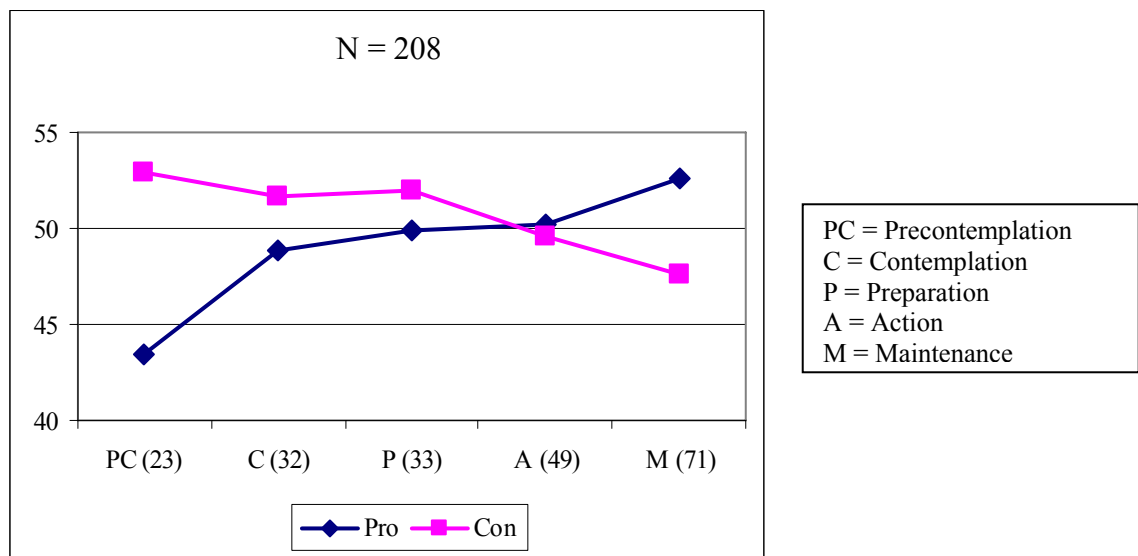


Figure 4.7

Decisional-Balance Pros and Cons across the Five Stages of Change

ANCOVA Results for Decisional-Balance Scores. The covariate that was entered in the ANCOVA model to test the significance between stages of change and decisional-balance was living situation. One-way ANCOVA tests revealed significant differences among the decisional-balance composite scores across the five stages of change, $F(4, 202) = 6.20, p = .00, \eta^2 = .10$. There were also significant differences among the decisional-balance pro scores across the five stages of change, $F(4, 202) = 3.97, p = .00, \eta^2 = .07$. There were no covariates for the decisional-balance con scores, so no ANCOVA analyses were computed.

ANOVA Results for the Decisional-Balance Scores. One-way ANOVA tests revealed significant differences between the decisional-balance composite score across the five stages of change, $F(4, 203) = 6.28, p = .00, \eta^2 = .11$ (.01 = small effect, .06 =

medium effect, .14 = large effect as defined by Cohen), indicating that 11% of the variance in the decisional-balance scores was accounted for by the stages of change. There were also significant differences between the decisional-balance pro scores, $F(4, 203) = 4.07, p = .00, \eta^2 = .05$ and decisional-balance con scores across the five stages, $F(4, 203) = 2.47, p = .04, \eta^2 = .04$. Results of the Welch's test for unequal variances revealed the same result for the decisional-balance cons scores $F(4, 75) = 2.67, p = .04$, which indicated that the aforementioned ANOVA tests could be interpreted as valid. Table 4.5 provides a comparison between the ANOVA and ANCOVA results for the decisional-balance scores as well as for each of the other dependent variables.

Table 4.5

ANOVA and ANCOVA Results for Relationship between Stage and TTM Constructs (N = 208)

Variable	ANOVA Results			ANCOVA Results		
	F	p	η^2	F	p	η^2
Decisional-Balance	6.28	.00	.11	6.11	.00	.10
Pros	3.97	.00	.07	3.87	.01	.07
Cons	2.22	.04	.04	-	-	-
Processes of Change						
Experiential	8.13	.00	.14	7.80	.00	.13
Behavioral	14.02	.00	.22	14.06	.00	.21
Self-Efficacy	9.05	.00	.15	7.91	.00	.13

Research Question Two

Are there differences in self-efficacy scores across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the self-efficacy scores is explained by the stages of change?

Descriptive Statistics for Self Efficacy Scores. Refer to Table 4.4 for the means and standard deviations for the self-efficacy scores across each of the five stages of change. The self-efficacy scores for the precontemplation group were ($M = 40.86$, $SD = 7.97$) compared to ($M = 53.53$, $SD = 10.39$) for the maintenance group. As illustrated in Figure 4.8, the self-efficacy scores increased linearly from precontemplation to maintenance, with the largest increase occurring from the precontemplation stage to the contemplation stage.

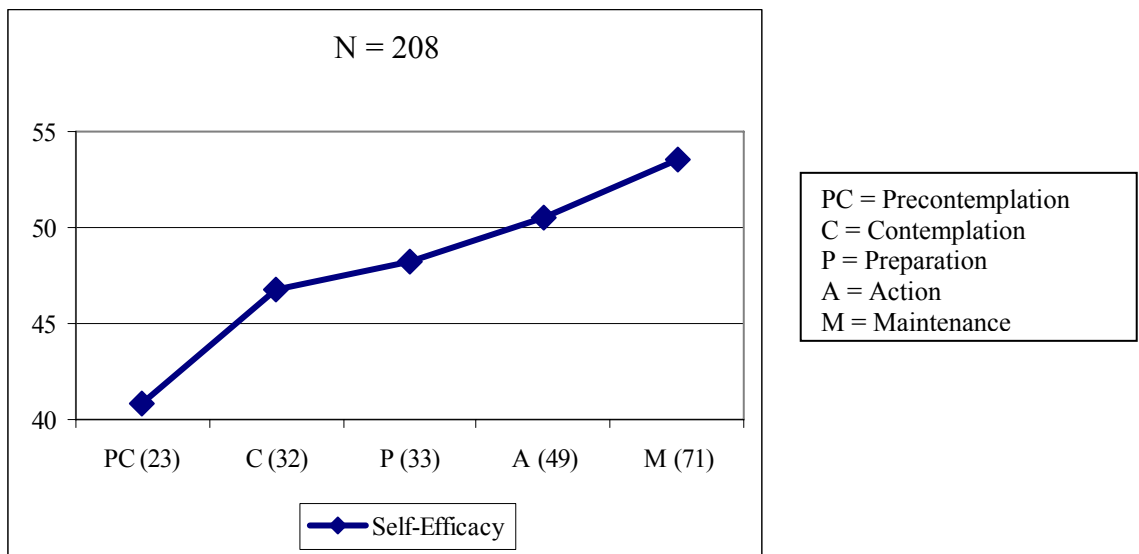


Figure 4.8

Self-Efficacy across the Five Stages of Change

ANCOVA Results for the Self-Efficacy Scores. The covariate that was entered into the model to test the significance between the stages of change and self-efficacy was whether or not the participants received services from AIDS Treatment Initiatives (provide exercising counseling and training). One-way ANCOVA tests indicated

significant differences on the composite score of self-efficacy across the five stages of change, $F(4, 202) = 7.91, p = .00, \eta^2 = .13$, showing that 13% of the variation in the self-efficacy scores was accounted for by the stage of change.

ANOVA Results for the Self-Efficacy Scores. There were significant differences on the composite score for self-efficacy across the five stages of change, $F(4, 203) = 9.41, p = .00, \eta^2 = .15$, indicating that 15% of the variance in the self-efficacy scores was accounted for by the stages of change, which is defined as a large effect by Cohen (1977). Results of the Welch's test for unequal variances revealed the same result $F(4, 80) = 9.99, p = .00$, which indicated that the ANOVA tests could be interpreted as valid. Refer to Table 4.5 for a comparison between the ANOVA and ANCOVA results for the self-efficacy scores as well as for each of the other dependent variables.

Research Question Three

Are there differences in the experiential processes of change across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the experiential processes of change is explained by the stage of change?

Descriptive Statistics for Experiential Processes of Change. Refer to table 4.4 for the means and standard deviations for the experiential processes of change across each of the five stages of change. The mean score for the experiential processes was ($M = 42.02, SD = 8.52$) for precontemplation and ($M = 53.04, SD = 10.51$) for maintenance. Figure 4.9 shows the experiential and behavioral processes across the five stages of change. The experiential process scores increased linearly from precontemplation to preparation, and then moderately increased from preparation to action and then linearly from action to

maintenance. The largest increase in scores occurred between the precontemplation and contemplation stages.

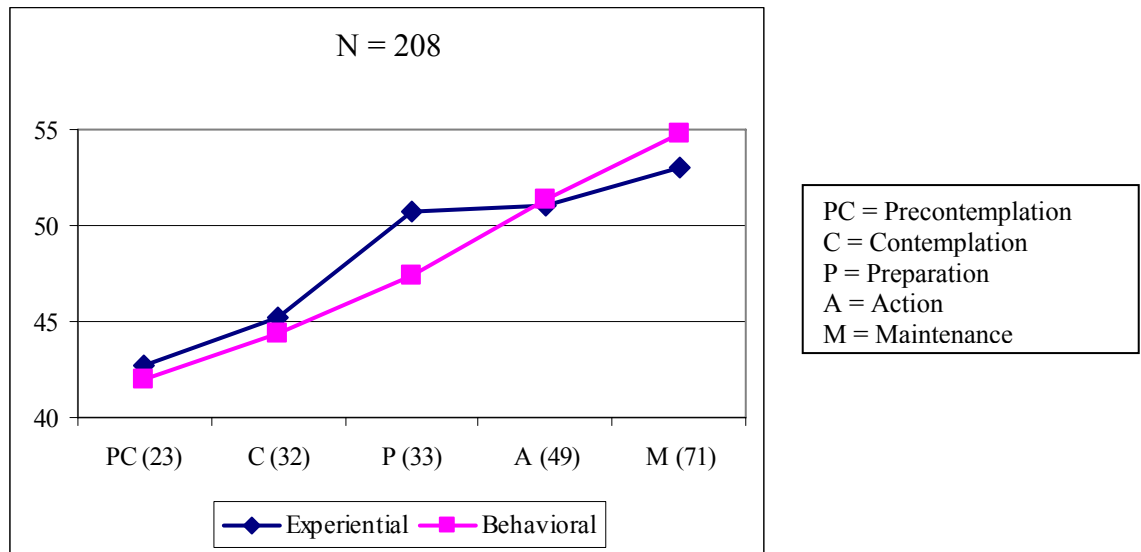


Figure 4.9

Experiential and Behavioral Processes across the Five Stages of Change

ANCOVA Results for the Experiential Processes of Change Scores. The covariate that was entered in the model to test the significance between the stages of change and the experiential processes of change was living situation. One-way analysis of covariance for the experiential processes of change revealed significant differences across the stages of change $F(4, 202) = 7.80, p = .00, \eta^2 = .13$, indicating that 13% of the variance in the experiential scores was accounted for by the stage of change.

ANOVA Results for the Experiential Processes of Change Scores. There were significant differences on the experiential processes of change across the five stages of change, $F(4, 203) = 8.13, p = .00, \eta^2 = .14$, indicating that 14% of the variance in the

experiential processes of change scores was due to the stages of change. Refer to Table 4.5 for a comparison between the ANOVA and ANCOVA results for the experiential processes of change scores as well as for each of the other dependent variables.

Research Question Four

Are there differences in the behavioral processes of change across the five stages of change for exercise among individuals accessing HIV-related services? If so, what amount of variance in the behavioral processes of change is explained by the stage of change?

Descriptive Statistics for Behavioral Processes of Change. Refer to table 4.4 for the means and standard deviations for the behavioral processes of change across each of the five stages of change. The mean score for the behavioral processes was ($M = 41.92$, $SD = 7.98$) for precontemplation and ($M = 54.84$, $SD = 11.42$) for maintenance. Figure 4.9 shows the experiential and behavioral processes across the five stages of change. The behavioral process scores increased linearly from precontemplation to maintenance.

ANCOVA Results for Behavioral Processes of Change. The covariate that was entered in the model to test the significance between the stages of change and the behavioral processes of change was age. There were significant differences on the composite scores of the behavioral processes of change across the five stages of change $F(4, 202) = 14.06$, $p = .00$, $\eta^2 = .21$, indicating that 21% of the variance in the behavioral processes of change was accounted for by the stage of change.

ANOVA Results for Behavioral Processes of Change. There were significant differences between the stages of change for the behavioral processes of change composite scores, $F(4, 203) = 14.02$, $p = .00$, $\eta^2 = .22$, which far exceeds a large effect

according to Cohen (1977). Results of the Welch's test for unequal variances revealed the same result, $F(4, 82) = 13.21, p = .00$, which indicated that the ANOVA results were valid. Refer to Table 4.5 for a comparison between the ANOVA and ANCOVA results for the behavioral processes of change scores as well as for each of the other dependent variables.

Research Question Five

Is there a relationship between physical activity level and the stages of change for exercise?

Descriptive Statistics for Physical Activity Level (METs). Table 4.6 presents the means and standard deviations for vigorous, moderate, walking, and weekly total METs expended by participants in each of the five stages of change. Twenty-three participants (11.1%) engaged in low levels of physical activity (less than 600 METs per week), 70 (33.6%) engaged in moderate levels of physical activity (600 – 2,999 METs per week), and 99 (47.6%) were performing high levels of physical activity (more than 2,999 per METs per week). The average weekly METs were lower for individuals in contemplation than precontemplation, but increased from preparation to action and from action to maintenance. The average weekly METs for maintenance were double the amount of those in precontemplation. Figure 4.4 presents the average vigorous, moderate, walking, and total METs by stage of change.

Table 4.6

<i>Physical Activity (METs) Scores for the Five Stages of Change</i>					
	PC	C	P	A	M
	(23)	(32)	(33)	(49)	(71)
	Mean (SD)				
Vigorous METs	512.72 (1666.55)	605.00 (1411.94)	500.00 (1286.11)	1247.50 (2326.98)	3721.16 (7026.58)
Moderate METs	1417.71 (3022.29)	407.10 (958.00)	1134.19 (2324.10)	1095.00 (2014.17)	2011.34 (3582.74)
Walking METs	2502.23 (2960.93)	3253.25 (4992.07)	3086.68 (3340.04)	2563.82 (3220.93)	3282.92 (3504.06)
Weekly METs	4554.83 (5170.20)	4319.25 (5517.88)	4890.48 (5789.82)	4956.16 (5378.03)	9099.68 (12442.17)

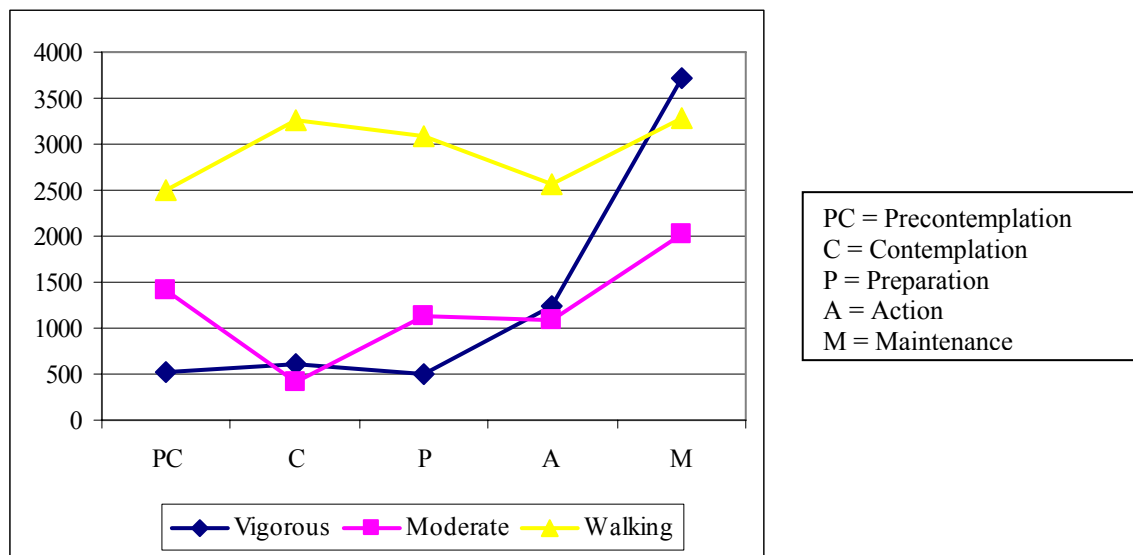


Figure 4.10

MET Levels across the Five Stages of Change

Table 4.7 presents the frequency and proportion of individuals in each stage that met the physical activity requirements for low level of activity (less than 600 weekly

METs), moderate level of physical activity (more than 600 weekly METs, but less than 3,000 METs), and high level of physical activity (more than 3,000 weekly METs).

Table 4.7

Level of Physical Activity Scores for the Five Stages of Change (N = 208)

	PC	C	P	A	M
	23	32	33	49	71
	(%)	(%)	(%)	(%)	(%)
Low Level (less than 600 weekly METs)	3 (13.04)	7 (21.88)	6 (18.18)	3 (6.12)	4 (5.63)
Moderate Level (600-2,999 weekly METs)	8 (34.78)	11 (34.40)	11 (33.33)	22 (44.90)	17 (23.94)
High Level (3,000+ weekly METs)	9 (39.13)	12 (37.50)	10 (30.3)	21 (42.86)	47 (66.20)
Missing	3 (13.04)	2 (6.05)	6 (18.18)	3 (6.12)	3 (4.22)

ANOVA Results for Physical Activity Level (METs). The overall omnibus test revealed significant differences between the stages of change and the weekly METs (physical activity level), $F(4, 189) = 2.70, p = .03$, but Welch's test for unequal variances revealed contradictory findings; therefore there were no differences between the stages and MET level, ($p = .13$) . No ANCOVA results were performed because there were no covariates related to MET level.

Research Question Six

Do the TTM constructs (decisional-balance, self-efficacy, experiential processes of change, and behavioral processes of change) predict stage of change for exercise better than chance alone?

Classification Results. The 5x5 classification table is presented in Table 4.8. The five separate-group hit rates are given in parentheses on the main diagonal. The total group hit rate was 42% which was statistically better than chance alone ($z = 6.79$), or 25% better than what may be expected by chance. The precontemplation group hit rate was 48% which was statistically better than chance alone ($z = 4.69$), or 40% better than what may be expected by chance. The hit rate for the contemplation group was 25%, but the hit rates were no better ($z = 1.80$) than what may be expected by chance. The hit rate for the preparation group was 70% which was statistically better than chance alone ($z = 5.15$), or 58% better than what may be expected by chance alone. The hit rate for the action group was 0, meaning that no individuals in action were predicted by the TTM constructs. Finally, the maintenance group hit rate was 63%, which was statistically significant ($z = 4.66$), or 42% better than what may be expected by chance alone.

Table 4.8

<i>Quadratic Leave One Out Group Classification Results (N = 208)</i>						
	Predicted Group					Total
	PC	C	P	A	M	
Actual Group						
PC	11 (.48)	0	10	0	2	23
C	6	8 (.25)	11	0	7	32
P	2	1	23 (.70)	0	7	33
A	1	1	22	0 (0.0)	25	49
M	6	3	17	0	45 (.63)	71
Total	26	13	83	0	86	208

Classification Rules for New Scores. The Quadratic Classification Functions (QCFs) are presented in tables 4.9 – 4.13 for precontemplation through maintenance. Based on the QCFs, classification equations were developed that would help predict a new individual's stage based on their overall decisional-balance, self-efficacy, experiential processes of change, and behavioral processes of change composite scores. In order to determine which stage a new individual should be classified in, the scores for self-efficacy (X_1), decisional-balance, (X_2), experiential processes of change (X_3), and behavioral processes of change (X_4) are entered into all five equations and the equation with the highest score becomes the stage to which the individual should be classified.

Table 4.9

<i>Quadratic Classification Functions for Precontemplation</i>						
Stage	Type	Name	SE	DB	Exp PC	Beh PC
	Quadratic	SE	-.05			
		DB	-.00	-.02		
		Exp PC	.01	.01	-.01	
		Beh PC	.01	-.00	.01	-.00
	Quadratic	Linear	-.10	.01	.51	.12
	Quadratic	Constant	-20.33	-20.33	-20.33	-20.33

$$Z = -20.33 - .10X_1 + .01X_2 + .51X_3 + .12X_4 - .05 X_1^2 - .02 X_2^2 - .01 X_3^2 - .01 X_4^2 - .00 X_1 X_2 + .01 X_1 X_3 + .01 X_1 X_4 + .01 X_2 X_3 + .01 X_2 X_4 + .01 X_3 X_4$$

Table 4.10

<i>Quadratic Classification Functions for Contemplation</i>						
Stage	Type	Name	SE	DB	Exp PC	Beh PC
	Quadratic	SE	-.02			
		DB	.01	-.01		
		Exp PC	.00	.00	-.02	
		Beh PC	.01	-.01	.01	-.01
	Quadratic	Linear	.25	-.01	.60	.01
	Quadratic	Constant	-24.27	-24.27	-24.27	-24.27

$$Z = -24.27 + .25X_1 - .01X_2 + .60X_3 + .01X_4 - .02 X_1^2 - .01 X_2^2 - .02 X_3^2 - .01 X_4^2 + .01 X_1 X_2 + .00 X_1 X_3 + .01 X_1 X_4 - .00 X_2 X_3 - .01 X_2 X_4 + .01 X_3 X_4$$

Table 4.11

<i>Quadratic Classification Functions for Preparation</i>						
Stage	Type	Name	SE	DB	Exp PC	Beh PC
	Quadratic	SE	-.04			
		DB	.00	-.02		
		Exp PC	.01	.01	-.02	
		Beh PC	.01	-.00	.00	-.01
	Quadratic	Linear	.05	-.38	.82	.34
	Quadratic	Constant	-33.11	-33.11	-33.11	-33.11

$$Z = -24.27 + .05X_1 - .38X_2 + .60X_3 + .82X_4 - .04 X_1^2 - .02 X_2^2 - .02 X_3^2 - .01 X_4^2 + .00 X_1 X_2 + .01 X_1 X_3 + .01 X_1 X_4 + .01 X_2 X_3 - .00 X_2 X_4 + .00 X_3 X_4$$

Table 4.12

<i>Quadratic Classification Functions for Action</i>						
Stage	Type	Name	SE	DB	Exp PC	Beh PC
	Quadratic	SE	-.05			
		DB	-.00	-.02		
		Exp PC	.00	.01	-.02	
		Beh PC	.01	-.00	.01	-.02
	Quadratic	Linear	.76	-.27	.51	.34
	Quadratic	Constant	-34.08	-34.08	-34.08	-34.08

$$Z = -34.08 + .76X_1 - .27X_2 + .51X_3 + .34X_4 - .05X_1^2 - .02X_2^2 - .02X_3^2 - .02X_4^2 - .00X_1X_2 + .00X_1X_3 + .01X_1X_4 - .01X_2X_3 - .00X_2X_4 + .01X_3X_4$$

Table 4.13

<i>Quadratic Classification Functions for Maintenance</i>						
Stage	Type	Name	SE	DB	Exp PC	Beh PC
	Quadratic	SE	-.03			
		DB	.01	-.02		
		Exp PC	-.00	.01	-.01	
		Beh PC	.01	-.00	.01	-.01
	Quadratic	Linear	.37	-.27	.60	-.15
	Quadratic	Constant	-21.80	-21.80	-21.80	-21.80

$$Z = -21.80 + .37X_1 - .27X_2 + .60X_3 - .15X_4 - .03X_1^2 - .02X_2^2 - .01X_3^2 - .02X_4^2 - .01X_1X_2 + .01X_1X_3 - .00X_1X_4 + .01X_2X_3 - .00X_2X_4 + .01X_3X_4$$

Post Hoc Comparisons

Since the results between the ANCOVA and ANOVA were similar and the covariates only accounted for 1-2% of the variance between the stages, post-hoc analyses were conducted on the one-way ANOVA tests. Therefore, Games Howell post-hoc comparisons, which adjusted for unequal variances (Keppel, 1991), were computed for the self-efficacy, behavioral process, decisional-balance con scores, and the weekly

METs, while the Bonferonni post-hoc comparisons were computed for the decisional-balance pro scores and behavioral processes of change.

Post-hoc comparisons revealed significant differences between the individual stages of change for each of the TTM constructs. Table 4.14 presents the post-hoc comparisons between the stages for each construct.

Table 4.14

<i>Post Hoc Comparisons for TTM Constructs</i>		
	Post Hoc Comparisons	
Decisional-Balance Scores [^]	Pc < A, M	Pc = Precontemplation C = Contemplation P = Preparation A = Action M = Maintenance
Pro Scores [^]	Pc < M	
Con Scores*	No differences	
Self-Efficacy*	Pc < C , P, A, M	
Experiential Processes [^]	Pc < P, A, M	
	C < M	
Behavioral Processes*	Pc < A, M	
	C < A, M	
	P < M	
* Games-Howell adjustment for unequal variances		
[^] Bonferroni adjustment		

Nonparametric Results

Since there were no significant differences between the stages of change for the weekly METs, the researcher re-examined the ANOVA assumptions. Since the weekly METs variable violated the Levene's test and the $F_{\max}$ test for homogeneity of variances, the Wilks test for normality, and had skewness and kurtosis values above 1, the researcher decided to employ the Kruskal-Wallis test of equal medians. The Kruskal-Wallis test is a non-parametric test that is equivalent to the one-way ANOVA, but is based on the chi-square distribution and compares medians instead of means (Green et

al., 2003). In the case of non-normality and unequal variances, the Kruskal-Wallis test is a more powerful test than ANOVA (Green et al., 2003). The results of the omnibus test were significant, $\chi^2(4) = 12.82$, $p = .01$. Therefore, post hoc comparisons using a chi-square pairwise test were computed. None of the pairwise comparisons between each of the stages were significant, thus yielding the same result as the ANOVA analyses.

CHAPTER 5

DISCUSSION

Summary

The purpose of the study was to examine: 1) the distribution of the stages of change for exercise among individuals accessing HIV-related services, 2) the differences between TTM constructs (decisional-balance, processes of change, and self-efficacy) explained by the stages of change among individuals accessing HIV-related services, and 3) whether the TTM constructs significantly predicted the stages of change for exercise.

The participants in this study were 208 individuals who accessed HIV-related care services from four HIV-related service organizations in Atlanta, GA, during the spring of 2006. All participants completed a questionnaire consisting of the transtheoretical model (TTM) scales (stages of change, decisional-balance, processes of change, and self-efficacy), the International Physical Activity Questionnaire (IPAQ) as well as health status and demographic variables. All data for the study were collected from February 15, 2006 to April 14, 2006.

The data were analyzed using four statistical methods: 1) Analysis of Covariance (ANCOVA), 2) Analysis of Variance (ANOVA), 3) predictive discriminant analysis, and 4) descriptive analyses. ANCOVA was used to test for differences in the TTM constructs across the five stages of change for exercise, while controlling for demographic variables that accounted for additional variance in the TTM constructs. ANOVA was also conducted to test for the differences in the TTM constructs across the five stages of

change, but without controlling for the demographic covariates. Predictive discriminant analysis was used to determine whether the independent variables of decisional-balance, experiential processes of change, behavioral processes of change, and self-efficacy predicted the dependent grouping variable, the stage of change for exercise. Finally, descriptive statistics were used to describe the sample as well as provide a frequency distribution for the stages of change for exercise. The Statistical Package for the Social Sciences (SPSS Version 14.0) was used for all the analyses, except the predictive discriminant analysis which was analyzed using SAS.

This study found that the proportion of individuals accessing HIV-related care services in each of the stages of change for exercise differs from a representative national sample. Nearly 60% of the participants in this sample were in the action or maintenance stages for exercise compared to 42% in the action and maintenance stages (Centers for Disease Control and Prevention, 1999).

The decisional-balance pro scores in this study were highest in maintenance and lowest in precontemplation, which is consistent with other studies (Herrick et al., 1997; Prochaska et al., 1994). However, the only significant differences were detected between precontemplation and maintenance. This study found a decreasing trend for con scores from precontemplation to contemplation, an increase in cons in preparation and then a decrease from preparation to action and maintenance. However, the overall decisional-balance scores (pros minus the cons) increased linearly from precontemplation to maintenance. Furthermore, the precontemplation decisional-balance scores were significantly lower than the action and maintenance stages, which have been found in other studies (Marcus et al., 1992b). In this study, the crossover point, the point in which

the pro scores for decisional-balance become higher than the con scores for decisional-balance, occurred between the preparation and action stages, which is consistent with past research (Herrick et al., 1997; Prochaska et al., 1994). The amount of variance in the decisional-balance scores that was accounted for by the stages of change was .11, which is larger than a medium effect size, but smaller than a large effect size (Cohen, 1977).

The self-efficacy scores in this study had a positive linear trend from precontemplation to maintenance. Furthermore, the precontemplation group had significantly lower scores than each of the other four groups, which is similar to previous findings (Marcus et al., 1992c; Sarkin et al., 2001). The proportion of variance in the self-efficacy scores accounted for by the stages of change was .13 which is close to a large effect size (Cohen, 1977) and similar to results from other studies (Sarkin et al., 2001).

The results in this study indicated that the experiential process of change increased linearly from precontemplation to preparation, leveled off from preparation to action, and increased from action to maintenance. The proportion of variance in the experiential processes of change accounted for by the stages of change was .14, which is a large effect (Cohen, 1977). In addition, the behavioral processes of change increased linearly from precontemplation to maintenance, indicating that the experiential and behavioral processes increased together, which has been found in other physical activity studies (Rosen, 2000). The largest proportion of variance in this study was derived by the behavioral process of change ($\eta^2 = .22$), which has also been observed in other studies (Cardinal et al., 2004).

There were no significant differences between the stages of change for exercise and physical activity level, a finding that is not consistent with other studies measuring concurrent validity (Cardinal, 1995a; Fahrenwald et al., 2003; Sarkin et al., 2001).

The predictive discriminant analysis revealed that the stages were accurately classified 42% of the time, which was statistically better than chance alone. However, a 42% hit rate is lower than previous studies which achieved an overall hit rate between 50 to 69.6% (Cardinal et al., 2004; Hellman, 1997). The precontemplation stage in this study had a hit rate of 48% which was statistically better than chance alone. The contemplation stage in this study had a hit rate of 25%, which was not statistically better than chance. The preparation stage had the highest hit rate, 70%, which was statistically better than chance. None of the individuals in the action stage were classified correctly, which is consistent with only a 5.3% hit rate in action experienced by Cardinal et al. (2004). Finally, in this study, the maintenance stage had a hit rate of 65%, which was also statistically better than chance alone.

Conclusions

This was one of the first studies to examine the TTM for exercise behavior among individuals accessing HIV-related care services. The results of this study provide preliminary support for the use of the TTM for assessing exercise in individuals accessing HIV-related care services. As the behavioral and experiential processes of change, self-efficacy, and decisional-balance were important concomitants of stage of change for exercise behavior, the results offer further support for the internal validity of the TTM. Furthermore, each of the stages of change was differentiated by the variation

in the scores on the TTM constructs and the effect sizes were medium to large, as defined by Cohen (1977).

The findings from this study are unique given the study population. Few researchers have conducted behavioral physical activity research among low-income minorities who are enrolled in HIV-related services at community-based organizations (CBOs). The researcher speculates that little research has been done in this population because access to the population is difficult. Therefore, in order for researchers to reach this population, they should partner with community-based organizations in order to develop and implement interventions that are mutually beneficial to both parties.

The researcher who conducted this study worked at Positive Impact, Inc. for over two years prior to data collection. Since Positive Impact, Inc. shares their building with the three other study sites, and the organizations work collaboratively in many ways, the researcher was able to gain access to collect data at the other study sites. In addition, it was agreed upon that the researcher would disseminate the findings to each of the organizations as well as share information about intervention development based on these findings. To that end, the findings of the study are not only important for future use of the TTM, they are also important to the four agencies, the future programming at each of these sites, and most importantly the well-being of their clients.

This study found that the proportion of individuals accessing HIV-related care services in each of the stages of change for exercise differs from a representative national sample. Nearly 60% of the participants in this sample were in the action or maintenance stages for exercise compared to 42% in the national sample (Centers for Disease Control and Prevention, 1999). While there were homeless participants, who the researcher

speculated may spend a lot time walking, homelessness was not significantly related with stage of exercise or physical activity level (METs). However, a potential explanation for the high proportion of individuals in the action and maintenance stages might be related to “gateway behavior,” which suggests that being involved in care services at one or more of the study sites in this study might facilitate learning about HIV disease and self-care behaviors that may slow or reverse the symptoms of HIV or HAART medication. To that end, individuals in this study may have been more likely to have been in the action or maintenance stages for performing self care behaviors compared to other individuals living with HIV who were not engaged in care services.

Concurrent validity for the stages of change was not established since there was no significant relationship between physical activity level (METs) and the stages of change. However, this may be due to the fact that the staging algorithm asked individuals to consider “planned” physical activity when answering the question about their stage of exercise behavior, while the IPAQ questions asked about “all” physical activity that an individual participated in during the past seven days (see Appendix B for instrument).

Another possible explanation for the lack of concurrent validity between the stages of change and physical activity may be due to the perception of walking as not “planned” physical activity. Based on unpublished data, 47% of the clients from Positive Impact reported using public transportation as their main mode of transportation (Reece, unpublished data). Therefore, it is possible that many of the individuals in this study walked daily to MARTA stops or stations or used walking as their primary mode of transportation. To that end, regardless of stage of change, individuals in this study may

have reported higher levels of walking as a primary or secondary mode of transportation. Therefore, participants may have self-identified in precontemplation if they did not intend to begin performing continuous regular exercise in the next six months, but they may have accumulated an hour or more of walking per day (see Table 4.6).

The predictive discriminant analysis only classified individuals into the correct stages 42% of the time, indicating that 58% of the classified were incorrectly. This suggests that participants were either self-identified into the wrong stage or that they did not answer the TTM questions in a consistent manner with the stage they chose. As previously mentioned, individuals may have self-identified with the wrong stage based on their perceptions of “planned” exercise versus “all” activity. Those individuals that did not perceive walking as “planned” exercise may have self-identified as precontemplators if they did not intend to begin “planned” regular activity. However, they may have been meeting CDC’s physical activity guidelines by accumulating at least 30 minutes of walking a day on most days of the week.

The predictive discriminant analysis did not classify anyone correctly into the action stage in this study, which is consistent with another study in which only 5% of participants were accurately classified into the action stage (Cardinal et al., 2004). This finding may be due to the fact that physical activity is not an addictive behavior. The TTM was initially developed to explain the processes smokers undertake as they quit smoking. When an individual enters the action stage for smoking cessation there is an actual definitive day when the smoking behavior ends. For physical activity, individuals may engage in walking daily, but might be in contemplation stage for performing regular physical activity. Therefore, there is not a clear demarcation of when the regular physical

activity began or what one considers physical activity. Furthermore, the length of the action stage may not be appropriate for physical activity. Individuals who just began engaging in regular “planned” exercise may still think like a person in preparation, while a person who has been in the action stage for five months may think more like a person in maintenance. Perhaps individuals proceed cognitively from preparation to maintenance or are in the action stage briefly; not the posited six months.

One other possible explanation for the lack of accurately classified individuals in the action stage may be due to the evolving definition of physical activity. Originally, physical activity was only defined as continuous exercise for 20-30 minutes, 3-5 times a week (Centers for Disease Control and Prevention, 2005b). However, currently, while continuous activity is preferred, an accumulation of at least 30 minutes of activity on most days of the week is considered regular physical activity. The staging question; however, asked only about “planned” moderate or vigorous physical activity. Therefore, if an individual accumulated an hour of walking throughout the day, but did not engage in “planned” physical activity, such as running on the treadmill, then the individual might have self-identified as precontemplation for regular “planned” activity. Furthermore, the TTM construct questions asked about attitudes toward exercise, which are not specific to “planned” exercise. For example, an individual who did not engage in regular “planned” activity still might have been aware of the benefits of physical activity and may have answered the following item as being extremely important, “Regular exercise would help me have a positive outlook on life.” Therefore, it is possible that individuals may have answered the TTM questions in a manner that was inconsistent with the stage they chose, thus effecting stage prediction.

Limitations

There are several limitations to this study, including that participants in this study were volunteers who were self-enrolled in mental health care at Positive Impact, Inc., nutrition counseling and personal training at AIDS Treatment Initiatives, support groups at AIDS Survival Project in Atlanta, Georgia, and faith-based support groups at Atlanta Faith AIDS Network. It is possible that these individuals were inherently different from those individuals that did not participate in the study. As a result, the generalizability of the study's results is limited to persons similar to this sample.

The individuals in this sample were all seeking out publicly funded HIV-related services and may be inherently different from other individuals living with HIV who are not accessing publicly funded services.

The individuals in this sample chose to receive services at one or more of the study sites, which provide different services than other HIV-related agencies in Atlanta. Therefore, individuals in this sample may be different from those individuals choosing to receive services from agencies other than the four study sites.

The sample was predominately African-American, male, homosexual, unemployed and well-educated. Therefore, the results may be generalizable to individuals accessing HIV-related care in other large cities with a high HIV prevalence rate, but they are not generalizable to all individuals living with HIV.

The study employed a cross-sectional design; therefore, no causal or temporal statements can be made about the relationship between the stages of change for exercise and the other TTM constructs (decisional-balance, self-efficacy, and the behavioral and experiential processes of change). Furthermore, there may be something special about

the particular point in time when individuals in this sample completed the questionnaire. Individuals were coming to these agencies for services and perhaps may have been sick or seeking out treatment education or information on exercise and nutritional supplements. To that end, a cross-sectional design may have given a distorted picture of the typical exercise behavior that this population engages in on a regular basis.

It is possible that participants may have completed the questionnaire at more than one data collection site, thus biasing the results of the study. The study tried to prevent individuals completing the questionnaire at multiple data collection sites, but it could have happened unbeknownst to the researcher.

Participants were asked to disclose information on a self-report questionnaire about their health status and exercise behavior. It is possible that some participants did not answer the questions truthfully, affecting the results of the study.

The measures of reliability and validity for the instruments used in this study were developed in healthy populations and have not been tested in individuals living with HIV; therefore potentially biasing the results of the study.

Implications for Practice

The study findings indicate, based on the staging algorithm that over 40% of the sample was not engaging in “planned” regular physical activity. However, it was also found that only 12% of the sample was getting less than moderate or high levels of physical activity as measured by total weekly METs. Since there was a misconception about what constitutes physical activity among this study sample, it will be important to develop an intervention to help individuals reconceptualize what constitutes physical activity. While walking is great physical activity, regular moderate and vigorous

activities are needed to reap the full benefits of physical activity, such as increased cardiovascular health. Given the health benefits associated with increased cardiovascular health, especially among individuals living with HIV, it seems appropriate that these findings be used to develop a stage-matched exercise intervention based on the TTM constructs.

Individuals accessing HIV-related care at the study sites in this study are a unique population. Some individuals return for care weekly, while others are transient and may drop out of care for months at a time. Therefore, given the unique characteristics of this population, it is important that the TTM intervention be a one time stage-matched intervention in order to target the individual on the day they receive services.

Mental health care is increasingly becoming an important part of the HIV care system and an increasing amount of clients are engaging in mental health care. Individuals often seek out mental health care in order to increase quality of life and decrease anxiety and depression. These outcomes are also benefits of regular physical activity. Therefore, a combination of mental health counseling and a brief physical activity intervention might impact the aforementioned outcomes better than counseling alone. Perhaps the notion of “gateway” behavior can be used to secure funding since these individuals are already accessing care. These individuals are already accessing care, so perhaps they may be more interested in learning about self-care treatment options, including exercise.

Many mental health clinicians are familiar with the TTM because motivational readiness, or the stages of change, is often discussed in therapy. Therefore, mental health counselors would be the perfect individuals to deliver a stage-matched intervention with

clients in a similar manner to Project PACE (Patrick et al., 1994). Project PACE was an intervention based on the TTM which was conducted in physicians' offices by physicians. Patients completed a one-item staging question while waiting for their appointment, then, based on their response; the physician delivered a 3-5 minute intervention tailored to the individual's motivational readiness to change. The message included information that would facilitate an increase 1) in the pros or benefits of exercise, 2) in self-efficacy for exercise, and 3) in the use of the behavioral and experiential processes of change.

In order to test whether the PACE protocol is effective in this population, an intervention using an experimental design will be employed. Clients will be randomly assigned to get the intervention plus mental health therapy while the control group will receive mental health counseling only. Individuals in the intervention group will complete a staging question and then, based on their response, the clinician will deliver a 3-5 minute tailored message to their client. It would be most effective if the clinician could use motivational interviewing to help assess the validity of the staging question. Since there were misconceptions about what constitutes physical activity, the clinician could help assess their client's stage as well to determine if their self-reported stage was similar to their actual physical activity level. Then, based on their physical activity level, they could deliver a tailored message that would assess what activity the individual is currently doing and how to get them to increase or maintain what they are already doing. If the client is engaging in no or low levels of physical activity, then the message could focus on how the benefits of physical activity are similar to the benefits of therapy.

In addition, participants in the intervention condition will be asked to keep a physical activity diary. They will be responsible for recording all their activity in minutes. These minutes will then be computed to determine the actual physical activity of each of the individuals in the intervention group.

In order to conduct the aforementioned study, the clinicians will have to be trained on the PACE protocol and the intervention. In order to do this, the researcher will schedule a full day workshop during which the researcher will teach the clinicians about the intervention and allow for them to practice delivering the tailored messages. The training will also teach them how to help their clients complete the exercise diary since they will most likely be their point of contact for the intervention. In order to assess an effect, a pre and post-test questionnaire containing variables assessing the TTM constructs will be used. In addition, the exercise diaries will be used as the measure of physical activity instead of the seven day physical activity questionnaire that was used to conduct the current study.

The Project PACE protocol could be used at other HIV-related organizations as well, but might have to be further adapted. For organizations that do not have the capability to deliver the message in person, an employee could pass out pamphlets that are stage matched. An individual could answer the staging question for physical activity, and based on their response, a stage-matched pamphlet could be passed out to them. For example, if an individual is in precontemplation, then the pamphlet could focus on the benefits of exercise for an individual living with HIV. Or, if a person is in preparation, then the brochure could focus on easy ways to increase physical activity or provide a referral to an organization that focuses on exercise prescriptions for individuals living

with HIV. In other words, the face-to-face stage-matched intervention would be replaced with a stage-matched pamphlet.

The Project PACE protocol could also be delivered as a technology-driven intervention. If an organization had the capability, they could have a computer with a touch screen in the lobby or waiting room. While the individual is waiting for an appointment, they would complete a short assessment and stage-based intervention. For example, first the individual would be asked the staging question and then based on the response the computer would deliver a stage-matched message about exercise and HIV. The message might only last 3-5 minutes, but might serve to move individuals along the stage of change continuum for exercise as well as to increase the individual's self-efficacy for computer use.

While this study included participants who were primarily low-income and did not have health insurance, there are individuals living with HIV who have private insurance and not able to access services from the four agencies mentioned in this study. For these individuals, it might be more appropriate to seek information about self-care behaviors from their physicians. A similar PACE protocol study could be done among physicians for their HIV positive patients. There are also many individuals living with HIV who are not seeking care, but they may be inherently different from the individual in this study, so these recommendations are designed for individuals who are already engaged in care services.

Finally, regardless of the intervention that is implemented, it is important the clinicians at the agencies know the clinical exercise guidelines for individuals living with HIV. There are exercises that are contraindicated at later stages of the disease and it

would be necessary that individuals know these limitations. Since community-based organizations are familiar with creating useful care networks via collaboration with other agencies, it would seem appropriate to initiate linkages with exercise facilities.

Individuals with degrees in exercise science have the expertise needed to adapt exercise prescriptions to individuals living with certain diseases, including HIV. For many individuals the cost of an exercise membership may not be possible, but for those that can afford it, it would be advantageous for staff at Positive Impact to refer a client to a personal trainer that would be able to provide an exercise prescription that is appropriate and safe for an individual living with HIV.

Implications for Research

Since this is one of the first studies that tested the TTM constructs in individuals accessing HIV-related care services, more research needs to be conducted to further test the validity of the TTM in this population. First of all, concurrent validity of physical activity level and the stages of change needs to be assessed. The wording on the IPAQ and the staging question may have caused confusion in this sample; therefore, perhaps changing the word “planned” in the TTM staging question to “all” activity would have yielded a significant relationship between the stages and the physical activity level. Otherwise, the use of a pedometer, or other device to measure physical activity (etc. accelerometer) might be beneficial to measure the actual physical activity of the participants instead of relying on self-report exercise behavior.

More studies need to be conducted among individuals living with HIV to see if construct validity is supported for the TTM. The relationship between the stages and the constructs in this study were similar to those posited by the theory as well as those found

in other exercise studies. However, this study did not look at differences between the stages for each of the processes of change. While the composite score patterns were consistent with other studies, it would be beneficial to determine which of the processes are used at each stage of change.

Even though the internal consistency coefficients were tolerable for all constructs, except for the behavioral processes of change, it would be beneficial to establish reliability for the scales using test-retest reliability. Since participants were paid to complete the questionnaires, it could be assumed that some of the participants completed the questionnaire quickly without reading the questions. Using a test-retest method, the reliability of the scores could be assessed one or two weeks later to see if their responses are consistent.

More studies need to conduct predictive discriminant analyses to see whether individuals are classified into the proper stage. One of the criticisms of the TTM is the inability to accurately stage participants and this statistical analysis that can predict the accuracy of the stage classification based on the responses to the TTM constructs. Furthermore, once the prediction equations are developed, they should be tested using new participants to determine if the prediction equations can accurately classify new individuals.

While the TTM constructs patterns were consistent with other studies, it may be beneficial to develop new TTM instruments for this population. Some of the items were not appropriate for individuals who were homeless or unemployed. Therefore, it would be advantageous to conduct interviews with individuals in this population to determine

what items were applicable and which ones were not and then develop a new instrument for each construct based on the data collected in the interviews.

Interventions based on the TTM need to be developed, implemented, and evaluated to determine if the interventions are able to increase motivational readiness for exercise and/or increase the physical activity level among individuals living with HIV. Since interventions are conducted in a prospective manner, they might be able to more accurately establish the 6-month time frame in which the action and maintenance stages are based; perhaps being able to distinguish a temporal relationship between the stages of change and the other TTM constructs.

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APPENDIX A

Informational Letter

02/09/2006

Dear Participant:

I am a graduate student under the direction of Dr. Mark Wilson in the Department of Health Promotion and Behavior at The University of Georgia. I invite you to participate in a research study entitled *An Application of the Transtheoretical Model of Behavior Change to the Exercise Behavior of Individuals Living with HIV*. The purpose of this study is to examine the factors associated with exercise behavior among individuals living with HIV. However, it is not a requirement that you currently exercise to complete the questionnaire.

In order to participate in this study, you must meet the following criteria:

- 18 years of age or older
- Living with HIV/AIDS
- Speak fluent English
- You **DO NOT** need to be currently performing regular exercise to participate

Your participation will involve completing an anonymous questionnaire and should only take about 10-15 minutes to complete.

Your involvement in the study is voluntary, and you may choose not to participate or to stop at any time without penalty or loss of benefits. The results of the research study may be published, but your name will not be used. In fact, the published results will be presented in summary form only. Your identity will not be associated with your responses in any published format.

The findings from this project may be used to develop programs aimed to increase physical activity in individuals living with HIV/AIDS. Benefits to participation include the self-satisfaction of knowing that you are helping to further the HIV/AIDS knowledge base. There are no known risks or discomforts associated with this research. Once you complete this questionnaire, place it in the attached envelope and give it to the person at the front desk of this agency. At this time, the front desk person will give you \$5 in cash for your time.

If you have any questions about this research project, please feel free to me: Tania Basta at (706) 583-0692 or send an e-mail to tbasta@uga.edu or my faculty advisor, Mark Wilson at (706) 582-4364 or send an email to mwilson@uga.edu. Questions or concerns about your rights as a research participant should be directed to the University of Georgia Institutional Review Board, 612 Boyd GSRC, Athens, Georgia 30602-7411; telephone (706) 542-3199; email address irb@uga.edu.

By completing and returning this questionnaire in the envelope provided, you are agreeing to participate in the above described research project.

Thank you for your consideration! Please keep this letter for your records.

Sincerely,

Tania B. Basta, MPH

University of Georgia
Institutional Review Board
Approved: 2-14-06
Expires: 2-13-07

APPENDIX B

SECTION ONE

The following statements assess how much you currently exercise in your leisure time (exercise done outside of a job). **Regular Exercise** is any *planned* physical activity (e.g., walking, jogging, bicycling, swimming, dancing, tennis, rowing, weight lifting, etc.) performed to increase physical fitness. Exercise can be vigorous activity or moderate activity. **Vigorous activity** is hard physical effort that makes you breathe much harder than normal and should be performed *3 or more times* per week for *20 or more minutes* per session. **Moderate activity** is moderate physical effort that makes you breathe somewhat harder than normal and should be performed *30 or more minutes* a day, *5 or more days* per week.

Do you exercise regularly according to the definition above?

Please mark only ONE of the five statements.

1. ☐ No, and I do not intend to begin exercising regularly in the next 6 months.
2. ☐ No, but I intend to begin exercising regularly in the next 6 months.
3. ☐ No, but I intend to begin exercising regularly in the next 30 days.
4. ☐ Yes, I have been, but for less than 6 months.
5. ☐ Yes, I have been for more than 6 months.

SECTION TWO

We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the **last 7 days**. **Please answer each question even if you do not consider yourself to be an active person.** Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport.

Think about all the **vigorous** activities that you did in the **last 7 days**. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

- | | |
|----|---|
| 1. | During the last 7 days , on how many days did you do vigorous physical activities like heavy lifting, digging, aerobics, or fast bicycling?

_____ days per week

☐ No vigorous physical activities Skip to question 3 |
| 2. | How much time did you usually spend doing vigorous physical activities on one of those days?

_____ hours per day
_____ minutes per day

☐ |

Don't know/Not sure

Think about all the **moderate** activities that you did in the **last 7 days**. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal. Think only about those physical activities that you did for at least 10 minutes at a time.

3. During the **last 7 days**, on how many days did you do **moderate** physical activities like carrying light loads, bicycling at a regular pace, or doubles tennis? Do not include walking.

_____ **days per week**

☐

No moderate physical activities



Skip to question 5

4. How much time did you usually spend doing **moderate** physical activities on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐

Don't know/Not sure

Think about the time you spent **walking** in the **last 7 days**. This includes at work and at home, walking to travel from place to place, and any other walking that you might do solely for recreation, sport, exercise, or leisure.

5. During the **last 7 days**, on how many days did you do **walk** for at least 10 minutes at a time?

_____ **days per week**

☐

No walking



Skip to question 7

6. How much time did you usually spend **walking** on one of those days?

_____ **hours per day**

_____ **minutes per day**

☐

Don't know/Not sure

The last question is about the time you spent **sitting** on weekdays during the **last 7 days**. Include time spent at work, at home, at school and during leisure time. This may include time spent sitting at a desk, visiting friends, reading, driving a car, or sitting or lying down to watch TV.

7. During the **last 7 days**, on how many days did you do **sitting** on a weekday?

_____ **hours per day**

_____ **minutes per day**

☐

Don't know/Not sure

SECTION THREE

The following experiences can affect the exercise habits of some people. Think of similar experiences you may be currently having or have had **during the past month**. Then rate how frequently the event occurs by circling the appropriate number. *Please answer using the following 5-point scale:*

	1 Never	2 Rarely	3 Occasionally	4 Often	5 Repeatedly
1. I read articles to learn more about exercise.	1	2	3	4	5
2. I get upset when I see people who would benefit from exercise but choose not to exercise.	1	2	3	4	5
3. I realize that if I don't exercise regularly, I may get ill and be a burden to others.	1	2	3	4	5
4. I feel more confident when I exercise regularly.	1	2	3	4	5
5. I have noticed that many people know that exercise is good for them.	1	2	3	4	5
6. When I feel tired, I make myself exercise anyway because I know I will feel better afterwards.	1	2	3	4	5
7. I have a friend who encourages me to exercise when I don't feel up to it.	1	2	3	4	5
8. One of the rewards of regular exercise is that it improves my mood.	1	2	3	4	5
9. I tell myself that I can keep exercising if I try hard enough.	1	2	3	4	5
10. I keep a set of exercise clothes with me so I can exercise whenever I get the time.	1	2	3	4	5
11. I look for information related to exercise.	1	2	3	4	5
12. I am afraid of the results to my health if I do not exercise.	1	2	3	4	5
13. I think that by exercising regularly I will not be a burden to the healthcare system.	1	2	3	4	5
14. I believe that regular exercise will make me a healthier, happier person.	1	2	3	4	5
15. I am aware of more and more people making exercise a part of their lives.	1	2	3	4	5
16. Instead of taking a nap after work, I exercise.	1	2	3	4	5
17. I have someone who encourages me to exercise.	1	2	3	4	5
18. I try to think of exercise as a time to clear my mind as well as a workout for my body.	1	2	3	4	5
19. I make commitments to exercise.	1	2	3	4	5
20. I use my calendar to schedule my exercise time.	1	2	3	4	5
21. I find out about new methods of exercising.	1	2	3	4	5
22. I get upset when I realize that people I love would have better health if they exercised.	1	2	3	4	5
23. I think that regular exercise plays a role in reducing health care costs.	1	2	3	4	5
24. I feel better about myself when I exercise.	1	2	3	4	5
25. I notice that famous people often say that they exercise regularly.	1	2	3	4	5
26. Instead of relaxing by watching TV or eating, I take a walk or exercise.	1	2	3	4	5

27	My friends encourage me to exercise.	1	2	3	4	5
28	If I engage in regular exercise, I find that I get the benefit of having more energy.	1	2	3	4	5
29	I believe that I can exercise regularly.	1	2	3	4	5
30	I make sure I always have a clean set of exercise clothes.	1	2	3	4	5

SECTION FOUR

Read the following items and fill in the circle the number that best expresses how each item relates to you in your leisure time. Please answer using the following 5-point scale:

1	2	3	4	5
Not at all Confident	Somewhat Confident	Moderately Confident	Very Confident	Completely Confident

I am confident I can participate in regular exercise when:

1.	It is raining or snowing or icy.	1	2	3	4	5
2.	I am under a lot of stress.	1	2	3	4	5
3.	I feel I don't have the time.	1	2	3	4	5
4.	I have to exercise alone.	1	2	3	4	5
5.	I don't have access to a place for exercise.	1	2	3	4	5
6.	I am spending time with friends.	1	2	3	4	5

SECTION FIVE

Read the following items and indicate how important each statement is with respect to your decision to exercise or not to exercise in your leisure time. *Please answer using the following 5-point scale:*

1	2	3	4	5
Not at all important	Somewhat important	Moderately important	Very important	Extremely important

1.	I would have more energy for my family and friends if I exercised regularly.	1	2	3	4	5
2.	I would feel embarrassed if people saw me exercising.	1	2	3	4	5
3.	I would feel less stressed if I exercised regularly.	1	2	3	4	5
4.	Exercise prevents me from spending time with my friends.	1	2	3	4	5
5.	Exercising puts me in a better mood for the rest of the day.	1	2	3	4	5
6.	I feel uncomfortable or embarrassed in exercise clothes.	1	2	3	4	5
7.	I would feel more comfortable with my body if I exercised regularly.	1	2	3	4	5
8.	There is too much I would have to learn to exercise.	1	2	3	4	5
9.	Regular exercise would help me have a more positive outlook on life.	1	2	3	4	5

10. Exercise puts an extra burden on my significant other.

1 2 3 4 5

SECTION SIX

Please mark the appropriate response or fill-in the requested information.

1. **Where did you complete this questionnaire today?**

- ☐ Positive Impact
- ☐ AIDS Treatment Initiatives
- ☐ AIDS Survival Project
- ☐ Atlanta Interfaith AIDS Network

2. **Is this the first time you have received services at this organization?**

- ☐ Yes
- ☐ No

3. **Which of the following organizations do you receive services from (Check all that apply)?**

- ☐ Positive Impact
- ☐ AIDS Treatment Initiatives
- ☐ AIDS Survival Project
- ☐ Atlanta Interfaith AIDS Network

4. **What is your age_____?**

5. **What is your gender?**

- ☐ Female
- ☐ Male
- ☐ Transgender
- ☐ Other

6. **What is your ethnicity?**

- ☐ Black or African-American
- ☐ Asian
- ☐ American Indian
- ☐ Native Hawaiian or other Pacific Islander
- ☐ Alaska Native
- ☐ White
- ☐ Hispanic
- ☐ Other _____

7. **What is your relationship status?**

- ☐ Married
- ☐ Divorced

	☐ Single ☐ Significant Other/Partner ☐ Widow/Widower
8.	Do you have children living in your home? ☐ Yes ☐ No
9.	Which of the following terms best describes your sexual orientation? ☐ Heterosexual/Straight ☐ Homosexual/Gay/Lesbian ☐ Bisexual ☐ Unsure/Questioning
10.	What is the highest level of education you finished? ☐ Grades 1-6 ☐ Grades 7-11 ☐ High School Graduate ☐ Some College ☐ College Graduate ☐ Some Graduate Work
11.	Are you currently employed? ☐ Employed full time (35+ hours per week) ☐ Employed part-time ☐ Unemployed, looking for work ☐ Unemployed, disabled ☐ Unemployed, volunteer work ☐ Unemployed, retired ☐ Other, specify _____
12.	Which of the following currently describes your housing situation? ☐ Rent/Own my own home ☐ Live with family ☐ Live with friends ☐ Residential treatment facility ☐ No current housing
13.	Have you been diagnosed with HIV? ☐ Yes Date of Diagnosis _____Month _____Day _____Year
14.	Have you been diagnosed with AIDS? ☐ Yes Date of Diagnosis _____Month _____Day _____Year
15.	Have you had your <u>T-Cell</u> count measured in the past 12 months? ☐ Yes ☐ No Most Recent Count _____ Date of Test _____Month _____Year ☐ Unsure
16.	Have you had your <u>Viral Load</u> count measured in the past 12 months?

	☐ Yes ☐ No Most Recent Count _____ Date of Test ____ Month ____ Year ☐ Unsure
17.	Are you currently taking any medications for your HIV? ☐ Yes ☐ No
18.	How would you rate your overall health right now? ☐ Excellent ☐ Very Good ☐ Good ☐ Fair ☐ Poor

Please put this completed survey in the attached envelope and return it to the individual at the front desk. Once you have completed and turned-in the questionnaire, you will be given the \$5 for your time.

Thanks for your participation! As a reminder, you may not complete this questionnaire more than once!