# UNDERSTANDING ADHERENCE TO THE TYPICAL ANTI-HYPERTENSIVE TREATMENT REGIMEN: AN EXPANDED SELF-REGULATION THEORY BASED PREDICTION MODEL

By

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Hypertension is one of the most diagnosed diseases in America, endangering the health of over 50 million American adults, and killing nearly 47,000 Americans in 2001. Theoretically grounded in Kanfer's Self-Regulation Model, the goal of this research was to explore motivation to be healthy, perceived behavioral control, and social support as possible predictors of self-reported adherence to the three typical components of the anti-hypertensive medical regimen (i.e., modified diet, increased exercise, and medication). Kanfer's Self-Regulation Model was expanded to include social-support satisfaction, indicated by the discrepancy between social support perceived and that desired by participants. An additional aim of this research was to explore the contribution of depressive symptoms to the prediction of adherence to the typical anti-hypertensive medical regimen.

Data were collected from 97 African American and 71 Caucasian American low-income hypertensive patients recruited from a primary care clinic in Northeast Florida. Assessment batteries and a pre-stamped return envelope were hand-delivered to each patient by physicians and nurses during a routine visit to the clinic. The hypotheses set forth were tested separately for African Americans and Caucasian Americans, based on the "difference model" research approach. Ultimately, all hypotheses were largely supported.

Variables associated with the expanded self-regulation model were effective at predicting adherence to all three components of the anti-hypertensive medical regimen in both African American and Caucasian American patients. Social-support satisfaction was generally a stronger predictor of adherence than perceived social support alone, thus suggesting the importance of individually-determined quality of support rather than traditionally-defined quantity of support. Depressive symptoms were largely effective in independently predicting adherence, and generally added significantly to the prediction of adherence above and beyond the contributions of the variables constituting the expanded self-regulation model.

Limitations of the research and implications of the study regarding counseling interventions to promote treatment adherence among hypertensive patients are discussed.

# CHAPTER 1
# INTRODUCTION

Fifty million is an almost unfathomable number that most people can only contemplate in their dreams. Unfortunately, this number has been thrust into both the medical and psychology fields as it becomes apparent that over 50 million American adults could be diagnosed with hypertension. This estimate comes from reports that hypertension, or high blood pressure, could affect nearly 27.6% of the United States adult population (American Heart Association [AHA], 2004; AHA 2003; Seventh Joint National Committee on High Blood Pressure [JNC-7], 2003). With one-quarter of the American population meeting the criteria for hypertension, it becomes apparent why this illness has become one of the most studied in health-related literature and the focus of the current research. The purpose of this dissertation was to explore possible psychosocial predictors of self-reported adherence to the three main aspects of the typical medical regimen used in the treatment of hypertension: diet, exercise, and medication taking.

In addition to the sheer number of individuals who may meet the criteria for hypertension, there are several additional reasons that hypertension has been thrust into the focus of medical and psychological research. One such reason is the long-term effects that hypertension has on both the individual and society. According to the National Heart Lung and Blood Institute (NHLBI, 2002), untreated or undetected high blood pressure can lead to a myriad of health problems above and beyond the hypertension. For instance, an enlarged heart (which may lead to heart failure), aneurysms in the blood vessels of the brain (which may lead to stroke), narrowing of

blood vessels in the kidneys (which may lead to kidney failure), and hardening of the arteries (which can lead to heart failure, stroke, or kidney failure) are all caused by uncontrolled hypertension (JNC-7, 2003; United States Department of Health and Human Services [USDHHS], 1994). Indeed, end-point trials in the United States indicate that a reduction of 10 to 12 mm Hg in systolic blood pressure and 5 to 6 mm Hg in diastolic blood pressure are associated with a 38% decrease in incidence of stroke and a 16% reduction in incidence of coronary heart disease in hypertensive patients (Collins & Peto, 1994). Furthermore, there are long-term monetary consequences of having high blood pressure, as the American population spends billions of dollars each year on illnesses brought about by uncontrolled high blood pressure (AHA, 2004; NHLBI, 2002).

Another reason hypertension has become such a popular research topic is the number of people that it kills each year. In fact, in 2001, approximately 12.3% of all deaths in the U.S. were caused or contributed to by hypertension. Specifically, hypertension was listed as the primary cause in 46,765 American deaths and as a contributing cause in over 251,000 additional American deaths (AHA, 2004; Arias, Anderson, Hsiang-Ching, Murphy, & Kochanek, 2003). This death rate is further exacerbated by the fact that hypertension is underdiagnosed and undertreated. In fact, of the estimated fifty million people with hypertension, 30% are unaware of their condition; and, of those diagnosed, only about 34% are receiving adequate therapy and in control of their high blood pressure (AHA, 2004; Minino & Smith, 2001; JNC-7, 2003). While this represents an increase in the percentage of hypertensive patients in control of their hypertension between 1994 (27%) and 2003 (34%), it is still well below the Healthy People 2010 goal of 50% (JNC-7, 2003). Underdiagnosis and undercontrol of

hypertension can be linked to several factors, including the asymptomotology of hypertension, the difficulties associated with medical recommendations, and non-adherence to the anti-hypertensive medical regimen (the focus of the present study), which is almost always identified as the underlying and central factor.

Before going into further detail about the present study, it is important to define hypertension. There are, in fact, three possible classifications of hypertension, denoted by the underlying cause of high blood pressure readings. One classification is "white coat hypertension," where hypertension is found in patients only while they are undergoing blood pressure assessment. The second classification, "essential hypertension," is caused by physical conditions such as a narrowing of the arteries, an abnormally high volume of blood in the body, or the heart beating too fast or too forceful. The third classification, "secondary hypertension," is where hypertension is a product of some other medical condition, such as kidney disease. For the present study, as in most studies of hypertension, only patients with essential or secondary hypertension were investigated.

In addition to the three classifications of hypertension, there are two "stages" of hypertension used by doctors to differentiate more severe cases of high blood pressure from less-severe cases. Stage-one hypertension is defined as having a systemic blood pressure (SBP) between 140 and 159, or a diastolic blood pressure (DBP) between 90 and 99. Stage-two hypertension, which is of significantly greater threat to patients' health, is defined as having a SBP reading greater than 160, or a DBP reading greater than 100. Through the use of such stage denotations, physicians can recommend anti-hypertensive techniques most suited to patients' needs. However, most studies that investigate

hypertension generally set aside the distinction between the stages, and define hypertension as either a mean SBP $\geq$ 140 mm Hg, a mean DBP $\geq$ 90 mm Hg (stage one hypertension or higher) or being under current treatment for hypertension with a physician-prescribed medical regimen (Burt, Whelton, Roccella, Brown, Cutler, Higgins, Horan, & Labarthe, 1995).

Regardless of the classification or stage, the treatment for hypertension is relatively constant across patients; with the major difference being when and if medication is prescribed. In fact, hypertension is relatively easy to treat and entails a somewhat universal medical regimen proposed as most effective by the Seventh Joint National Committee on Hypertension (JNC-7, 2003). Such a medical regimen involves both medication and nonpharmacological therapy such as weight reduction, moderation of salt and alcohol intake, and increased physical activity (Fodor, Cutler, Irvine, Ramsden, Tremblay, & Chockalingam, 1998; JNC-7, 2003). In fact, there is ample research showing the effectiveness of a three-part anti-hypertensive medical regimen involving medication, diet, and exercise. While benefits of each component have been independently supported, the additive effects of these three recommendations are generally far more effective at lowering blood pressure (AHA, 2004; Fodor et al., 1998; Fishman, 1995; JNC-7, 2003). Moreover, using a combination-therapy technique encourages the use of lower doses of anti-hypertensive medications, which often have dose-dependent side effects and adverse reactions (Moser & Black, 1998). Because the most-often prescribed medical regimen involves such a combination technique, the present study focused on each of the three major components of the anti-hypertensive medical regimen: diet, exercise, and medication.

While the medical regimen for treating hypertension is effective for most patients, it has already been noted that undercontrol and underdiagnosis of hypertension pose a great problem that is often entrenched in poor adherence to the medical regimen. In fact, if the anti-hypertensive medical regimen is not closely followed, there will be little or no reduction in blood pressure. However, most hypertensive patients are asymptomatic and the prescribed medical regimen often requires major lifestyle changes, both of which are factors that increase nonadherence. As such, estimates vary as to how many patients actually comply with their anti-hypertensive medical regimen, but estimates range from as little as 15% compliance (Caldwell, 1978) to 60% (Shaw, Anderson, Maloney, Jay, & Fagan, 1995; Eraker, Kirscht, & Becker, 1984; JNC-7, 2003).

While the previously mentioned rates are most often presented for adherence to pharmacological recommendations, adherence to nonpharmacological recommendations for hypertension treatment is also low (Fodor et al., 1998; Swales, 1999). However, low adherence rates and the factors contributing to the low rates are often neglected in research investigating nonpharmacological anti-hypertensive treatment regimens. As such, the current study sought to promote an understanding of self-reported adherence to the major nonpharmacological and pharmacological components of the anti-hypertensive medical regimen (i.e., modified diet, increased exercise, and medication).

To adequately understand adherence to the anti-hypertensive medical regimen, it is necessary to explore this adherence using an appropriate theoretical model. The theoretical model chosen for the present study is Kanfer's self-regulation model (Kanfer, 1970; Kanfer, 1986; Kanfer & Goldstein, 1991). As applied to health promotion, the self-regulation model suggests that regulation of health behaviors (e.g., medication-taking

adherence, diet adherence, and exercise adherence) is determined by three variables: (1) perceived control over the behaviors; (2) motivation to be healthy and to perform the requisite behaviors; and (3) perceived social support for these behaviors from family, friends, and significant others (Kanfer & Gaelick-Buys, 1991). Kanfer's self-regulation model was expanded to include social-support satisfaction, as indicated by the discrepancy between perceived and desired social support from friends, family, and significant others. Depressive symptomology was also explored in the present study as a possible additional extension of Kanfer's self-regulation model.

The first component of Kanfer's self-regulation model, the level of control an individual perceives having over target behaviors, is a component that is common to several other health-behavior prediction models. According to Ajzen (1996), perceived control over one's behavior is conceptually similar to perceived self-efficacy. Several studies have investigated how perceived self-efficacy and perceived behavioral control impact the performance of various health behaviors, without a specific focus on a chronic illness (e.g., Povey, Conner, Sparks, James, & Shepherd, 2000; Walcott-McQuigg & Prohaska, 2001). However, little research on self-efficacy has focused upon patient populations with chronic disease. That being said, those studies that have focused on patients with chronic disease have consistently found a relation between self-efficacy and adherence to health-promoting behaviors (e.g, Brady, Tucker, Alfino, Tarrant, & Finlayson, 1997; Senecal, Nouwen, & White, 2000). A limited number of studies in recent years have focused specifically on the influence of self-efficacy on adherence to the antihypertensive medical regimen (e.g., Taylor, Bagozzi, & Gaither, 2001; Lennon, Hughes, Johnston, & McElnay, 2001). In keeping with most studies investigating the

role of self-efficacy in chronic disease medical regimen adherence, the present research utilized a measure of general health-specific self-efficacy.

The second component of Kanfer's self-regulation model, motivation to be healthy and to perform the requisite behaviors, was assessed in the present research by the degree to which participants intend to participate or intend to continue participating in specific health-promoting behaviors (i.e., autonomous motivation or self-determinism). Although most research on intrinsic motivation has focused on general exercise behavior, several other studies have focused on the effect of intrinsic motivation on adherence to specific components of medical regimens. For instance, Granlund, Brulin, Johansson, and Sojka (1998) found that motivation to exercise predicted adherence to an exercise-program among patients with chronic lower-back pain. Senecal, Nouwen, and White (2000) found that intrinsic motivation was associated with dietary adherence and life satisfaction among adult patients with insulin-dependent diabetes mellitus. Further, Williams, Rodin, Ryan, Grolnick, and Deci (1998) found that intrinsic motivation for adherence predicted long-term adherence to medication prescriptions among adult outpatients with various chronic conditions. For the present research, a general measure of motivation to perform health-promoting behaviors was used (The Health Self-Determinism Index; Cox, 1985; Cox, Cowell, Marion, & Miller, 1990; Cox, Miller, & Mull, 1987; Loeb, O'Neill, & Gueldner, 2001).

As mentioned earlier, the third component of Kanfer's self-regulation model proposes that perceived social support can predict participation in health-promoting behavior. Evidence is increasing that perceived social support has a direct and positive association with health status, and modifies the impact of psychosocial and physical

stress on the general health of individuals (Wilson & Ampey-Tornhill, 2001; Steptoe, 2000). However, recent research has reported that level of social support is not uniformly significant across all patient populations and chronic conditions (e.g., Wang, Bohn, Knight, Glynn, Mogun, & Avorn, 2002; Wilson & Ampey-Tornhill, 2001; Weiss & Hutchinson, 2000).

For hypertension, where the pharmacological and nonpharmacological recommendations are intrusive and can increase barriers to compliance, the role of social support becomes critically important to regimen adherence. In fact, it has become increasingly apparent that, through simple communication, role modeling, deliberate pressure, and other avenues of influence, the beliefs and behaviors of family and friends are particularly important influences in hypertensive therapy (Bosworth & Oddone, 2002; Fishman, 1995; Morisky, DeMuth, Field–Fass, Green, & Levine, 1985; Orth-Gomer & Unden, 1987; Sherbourne, Hays, Ordway, DiMatteo, & Kravitz, 1992; Shoenberg, 1998). Indeed, Byrd (2001) found some corroboration that family social support was particularly influential in the prediction of self-reported medication and diet adherence among African Americans, but not among Caucasian Americans. However, Byrd (2001) did not specifically measure social support from friends or significant others. Given the existing social-support literature, the present study investigated social support provided by family, friends, and significant others.

It has been asserted that traditional social-support conceptualizations ignore individual differences and preferences of patients (Melamed & Brenner, 1990). For instance, Lehman, Ellard, and Wortman (1986) found that 62% of bereaved individuals perceived at least one traditionally-defined supportive behavior as being unsupportive. In

terms of health-related social support, Peters-Golden (1982) found that providers of social support believed efforts at cheerfulness and compliments would be supportive to patients, though patients typically found these same behaviors to be unsupportive. Moreover, in a study with rheumatoid arthritis patients, Melamid and Brenner (1990) found a considerable degree of discrepancy between traditionally-defined social support behaviors and the degree to which patients believed the behaviors to be supportive, thus indicating a possible drawback to measuring only perceived social-support received. However, little (if any) research has specifically explored how social-support satisfaction – as indicated by discrepancies between desired and perceived social-support – relates to actual health behaviors, particularly in the study of hypertension. As such, the present research explored social support satisfaction as an expansion of Kanfer's self-regulation model in the prediction of self-reported adherence to the three components of the anti-hypertensive medical regimen.

In addition to the aforementioned variables, depression has recently become a focus in hypertension literature, as it has been found to be an independent predictor of hypertension development in both Caucasian American and African American patients (Jonas, Franks, & Ingram, 1997). In addition, depression has been linked to increased morbidity and mortality in those patients diagnosed with hypertension (Carney, Freedland, Eisen, & Rich, 1995). Moreover, higher levels of depressive symptoms have been linked to reduced adherence to medical recommendations of increased exercise (Williams & Lord, 1995), modified diet (Ciechanowski, Katon, Russo, Hirsch, 2003), and prescription medication (Carney et al., 1995). However, only a limited amount of research has explored the relationship between depression and adherence to anti-

hypertensive medical regimen. Wang, Bohn, Knight, Glynn, Mogun, and Avorn (2002) found that, after controlling for demographic variables (e.g., age, gender, and ethnicity) and co-morbid conditions, an increase in depressive-symptom severity was significantly associated with lower odds of medication adherence among hypertensive patients. Another such study revealed significant associations among depression, substance use, poor adherence, and poor blood pressure outcomes. Indeed, these researchers found that more than one-fourth of the sample presented with clinical depression; and that the level of depression was significantly correlated with poor medication adherence and poor dietary compliance (Kim, Han, Hill, Rose, & Roary, 2003).

Although several studies have found a relationship between higher levels of depression and lower levels of adherence to the anti-hypertensive medical regimen, a limited number of studies have also found an absence of such a relationship (e.g., Friend, Hatchett, Schneider, Wadhwa, 1997; McGee, Rushe, Sheil, Keogh, 1998). For instance, in a study conducted in Northern Ireland, Maguire, Hughes, and McElnay (2004) found no significant relationship between adherence and depressive symptomology. Obviously, the relationship between depression and adherence to the anti-hypertensive medical regimen has been both supported and challenged by past research. Because of such discrepancy, depression was included in the present research as an exploratory predictor and a possible extension to Kanfer's self-regulation theory (Kanfer, 1986; Kanfer & Gaelick-Buys, 1991).

While specific hypotheses and research questions are presented in the next chapter, the following study questions help to illustrate the general direction and purpose of this research:

1. Among patients with hypertension, does perceived social support (from family, friends, and significant others) predict self-reported adherence to each of the three components of a typical anti-hypertensive medical regimen?

2. Among patients with hypertension, is self-reported adherence to each of the three components of the typical anti-hypertensive medical regimen differentially predicted by (a) perceived level of social support received from family, friends, and significant others, and (b) the level of social support satisfaction, as indicated by the discrepancy between perceived social support and desired social support from family, friends, and significant others.

3. Among patients with hypertension, does perceived health-specific self-efficacy predict self-reported adherence to the anti-hypertensive medical regimen?

4. Among patients with hypertension, does motivation to perform adherence-specific behaviors or to continue performing adherence-specific behaviors predict self-reported adherence to the three components of a typical anti-hypertensive medical regimen?

5. Among patients with hypertension, will levels of depressive symptoms predict self-reported levels of adherence to the anti-hypertensive medical regimen and will the inclusion of depressive symptoms further enhance the expanded self-regulation theory-based model?

6. Among patients with hypertension, does family history of hypertension influence self-reported adherence to the three components of a typical anti-hypertensive medical regimen?

7. Among patients with hypertension, are there significant differences in self-reported levels of adherence to each of the three aspects of the anti-hypertensive medical regimen in association with age, gender, and ethnicity?

# CHAPTER 2
# REVIEW OF THE LITERATURE

## Introduction

Hypertension, often dubbed the "silent killer", is a deadly condition that possesses no warning signs. In fact, many people do not discover they have high blood pressure until they have some degree of trouble with their heart, brain, or kidneys (American Heart Association [AHA], 2004). However, whether known or not, it is estimated that one in five Americans and one in three American adults have some form of hypertension, indicating that over 50 million Americans have clinically significant high blood pressure, of which approximately 20 million are unaware of their hypertensive condition (AHA, 2004; Seventh Joint National Committee on High Blood Pressure [JNC-7], 2003). Fortunately, several life modifications have been repeatedly shown to decrease an individual's overall level of blood pressure and allow for the necessary long-term control of hypertension (JNC-7, 2003).

Life modifications included in an anti-hypertensive medical regimen routinely include a modified diet low in salt and fat, a reduced intake of alcohol and tobacco, a decrease in weight, an increase in the amount of exercise, and the use of some form of anti-hypertensive medication. Of course, for these techniques of lowering and maintaining blood pressure to be effective, a patient must adhere very closely to the medical advice given by the doctor. Yet, despite the medical importance of adhering to the regimen, it is not uncommon for most patients to ignore the advice of their physician and be noncompliant to the medical regimen so important for their health and survival. Therefore,

the major-purpose of the present research was to examine possible predictors of self-reported adherence to the three main aspects of an anti-hypertensive medical regimen; diet, exercise, and medication taking.

The primary predictors examined were based on Kanfer's self-regulation theory (Kanfer, 1986; Kanfer & Gaelick-Buys, 1991) – a theory that has been previously used to understand self-reported treatment adherence among patients with various chronic diseases. These variables included motivation to engage in healthy behaviors; self-efficacy in performing healthy behaviors; and perceived social support from family, friends, and significant others. A second goal of this research was to expand Kanfer's self-regulation model through the inclusion of patients' levels of social-support satisfaction as indicated by the discrepancy between perceived and desired social support from family, friends, and significant others. A third goal of this research was to explore the influence of depressive symptoms on adherence to each of the three aspects of the anti-hypertensive medical regimen in terms of (a) the ability of depressive symptoms to predict adherence and (b) the possibility of the inclusion of depressive symptoms to further expand Kanfer's self-regulation model (Kanfer, 1986; Kanfer & Gaelick-Buys, 1991).

## Operationalizing Hypertension

Before going into the detail of this study, it is important to briefly overview the classifications, stages, and definition of hypertension. There are, in fact, three possible classifications of hypertension denoted by the underlying cause of the high blood pressure readings. First, there is "white coat hypertension", which, as the name implies, is where hypertension is found in patients only while they are in the doctor's office. Those patients with white-coat-hypertension do not have high blood pressure outside of

the doctor's office and, as such, will likely not experience the same degree of difficulty or long-term effects that are found in patients with other classifications of hypertension. In white-coat-hypertension patients, psychological rather than medical treatment may be warranted (JNC-7, 2003).

However, hypertension is more often due to physical conditions such as a narrowing of the arteries, an abnormally high volume of blood in the body, or the heart beating too fast or too forcefully. Each of these conditions produces an increased amount of force against the walls of the arteries and, thus, compose the second classification of hypertension termed "essential hypertension" or "primary hypertension." The third classification of hypertension is identified as "secondary hypertension", denoting those cases where high blood pressure is caused by some other medical condition, such as kidney disease. As the name indicates, secondary hypertension may be best corrected through treating the overarching medical problem (JNC-7, 2003). For the present study, as in most studies of adherence and hypertension, only those patients diagnosed with essential or secondary hypertension were investigated, as their adherence to the medical regimen creates the most concern in the health care community.

Regardless of the classification of hypertension, an actual physiological measurement serves as the basis for whether or not the diagnosis of hypertension is applied. According to the JNC-7 (2003), it is medically important to differentiate between several different degrees of hypertension. These degrees of hypertension are separated based on measurements of both systolic blood pressure (SBP) and diastolic blood pressure (DBP). Because of the presence of white-coat hypertension and because an individual's blood pressure tends to fluctuate throughout the day, it is important for

the diagnosis of hypertension to be given based on the average of two or more blood pressure readings taken at each of two or more visits to the doctor (JNC-7, 2003). According to the JNC-7 (2003), there is both "prehypertension" and two degrees of hypertension, denoted as "stages" because untreated or uncontrolled hypertension can progress through these stages of severity as blood pressure increases (JNC-7, 2003).

It is important to distinguish between the two stages of hypertension because the treatment for the disease is often based on the stage at which a patient is diagnosed. Prehypertension is defined as having an SBP between 120 and 139 or a DBP between 80 and 89. Prehypertension is of less concern than hypertension, as it is usually treatable with less-complex nonpharmacological methods, or low-dosage pharmacological methods, to reduce blood pressure to optimal levels. Of more concern is stage-one hypertension, defined as a SBP reading of 140 to 159, or a DBP reading of 90 to 99. The highest degree of concern is for those patients with stage-two hypertension, defined as having a SBP greater than 160 or a DBP higher than 100, a condition that creates the greatest likelihood of immediate health concerns such as stroke, heart attack, and death (JNC-7, 2003).

To be diagnosed with hypertension at a particular stage only requires that the patient fall within the required range for either SBP or DBP (JNC-7, 2003). This idea (that only high DBP or high SBP, not both, is all that is required for the diagnosis of hypertension) has not always been the accepted belief in the medical community. However, the recognition that either DBP or SBP can provide the basis for a diagnosis of hypertension, first by the JNC-VI (1997) and now by the JNC-7 (2003), is now firmly established by research evidencing that SBP is at least as powerful as DBP in predicting

risk for cardiovascular disease and stroke (Benetos, Thomas, Bean, Gautier, Smulyan, & Guize, 2002; Deedwania, 2002; JNC-7, 2003).

While the degree of hypertension is important for many medical reasons and is included in a good deal of hypertension research, it is not the goal of the present study to explore the actual levels of diastolic and systolic blood pressure of the participants. Instead, the goal of this study is to investigate anti-hypertensive regimen adherence among patients who have been diagnosed as hypertensive and placed on some form of anti-hypertensive medical regimen. Indeed, most studies that investigate hypertension generally ignore the distinction between the stages and operationalize hypertension as a mean SBP $\geq$ 140 mm Hg, a mean DBP $\geq$ 90 mm Hg (stage-one hypertension or higher), or being under current treatment for hypertension with prescription medication (Burt et al., 1995; Deedwania, 2002). As such, for the present study, whether or not a patient is hypertensive was determined solely by the patient's personal physician.

**Importance of Hypertension Research: Rates and Effects**

While the diagnosis of hypertension may be more arbitrary than the general public would like, the simple fact remains that even a moderately high level of blood pressure increases one's risk for cardiovascular disease and death (Benetos, et al., 2002; JNC-7, 2003). As such, although defining hypertension and classifying the condition according to its causes are very important first steps in the study of the disease, it is also quite valuable to become aware of the reasons hypertension has become such an important research topic in the field of medicine. One such reason is that death rates associated with hypertension are striking.

According to the American Heart Association, of the 2,416,425 American deaths in 2001, high blood pressure was found to be the primary cause in 46,765 deaths and the contributing cause in over 251,000 deaths, meaning that hypertension contributed to or caused over 12.3% of all American deaths in 2001 alone (American Heart Association [AHA], 2004; Arias, Anderson, Hsiang-Ching, Murphy, & Kochanek, 2003). This rate represents an increase of nearly 80,000 hypertension-related deaths annually since 1997 (AHA, 2004). Furthermore, within the ten years between 1991 and 2001, the national death rate (number of deaths per 100,000 Americans) decreased, while the age-adjusted death rate from hypertension increased 36.4%, and the actual number of deaths due to hypertension rose 53.0%, indicating an increase in hypertension disproportionate to population growth (AHA, 2003; AHA 2004; Minino & Smith, 2001). Indeed, while the age-adjusted death rate for the United States reached a record low in 2001, dropping 0.6% from the previous year, the death rate for hypertension continued an upward trend and increased 4.6% from 2000 to 2001. This disproportionate increase is even more striking when taking into account the fact that the death rates for heart disease, stroke, diabetes, and suicide all decreased (AHA, 2004; Arias et al., 2003).

However, such death rates are even more astonishing when exploring differences among ethnic groups. For instance, while the overall death rate due to hypertension in 2001 was 16.6 (16.2 in 2000), the death rates due to hypertension were 13.7 (13.2 in 2000) for white males and 13.4 (13.2 in 2000) for white females. In comparison, they were 47.8 (46.3 in 200) for Black males and 38.9 (40.8 in 2000) for Black females; a drastic disparity (AHA, 2004; Arias et al., 2003).

Although ethnic disparities in the death rates due to hypertension are astounding, it is important to further elaborate on the fact that hypertension is disproportionately spread in association with age, gender, and ethnicity. In terms of gender and age, the proportions are only somewhat disproportionate. A higher percentage of men than women have high blood pressure before the age of 55. After age 55, the proportion switches such that more women than men have high blood pressure (AHA, 2003; AHA, 2004; Center for Disease Control and Prevention, 2000). Overall, however, men in comparison to women appear to be somewhat less at risk for death due to high blood pressure. In fact, 2001 statistics show that 40.4% of the total deaths due to hypertension were male while 59.6% of those deaths were female (Arias et al., 2003). Moreover, both men and women appear more at risk if they are older or obese, and women taking oral contraceptives are two to three times more likely to be diagnosed with hypertension than women who are not taking oral contraceptives (AHA, 2004; JNC-7, 2003).

While the differences in prevalence of hypertension attributable to age and gender are less obvious, the disproportionate spread of hypertension among ethnicities is more obvious and more complicated. In fact, the prevalence of hypertension in Blacks in the United States is among the highest in the world. When compared to whites, Blacks develop hypertension earlier in life, have much higher average blood pressures, have more severe levels of hypertension, and are less likely to undergo treatment to control their blood pressure until target organ disease has already occurred (CDC, 2000; JNC-7, 2003). As a result, compared with whites, Blacks have a 1.3 times greater rate of nonfatal stroke, a 1.8 times greater rate of fatal stroke, a 1.5 times greater rate of heart

disease death, and a 4.2 times greater rate of end-stage kidney disease (AHA, 2003; AHA, 2004; JNC-7, 2003).

However, while the above-mentioned differences between Blacks and whites are the most obvious, they are not the only ethnic differences. For instance, the estimated prevalence of hypertension for U.S. adults over the age of 20 is 32.2% for non-Hispanic white males and 29.5% for non-Hispanic white females; 41.6% for non-Hispanic Black males and 44.7% for non-Hispanic Black females; 34.5% for Mexican-American males and 29.9% for Mexican-American females; and 22.8% for Cuban-American males and 15.5% for Cuban-American females (AHA, 2004; National Center for Health Statistics, 2003). These statistics show an obvious difference between Blacks and both whites and Hispanics, with Blacks having a disproportionately higher risk of hypertension.

Although not as high as Black men and women, Native Americans between the ages of 45 and 74 also show higher prevalence rates with 26.8% of Native American men and 27.5% of Native American women having high blood pressure (AHA, 2004; JNC-7, 2003). The highest prevalence of hypertension has been reported in Japanese-American men, with a 73% prevalence rate, while the lowest prevalence is found in Asian/Pacific Islander Americans, where 9.7% of men and 8.4% of women have hypertension (AHA, 2004; Burt et al., 1995; National Center for Health Statistics, 2001). Another interesting finding, which indirectly relates to the present study, is that Blacks and whites in the Southeastern United States (the location of the present study) have a greater prevalence of hypertension and higher death rates from stoke than those in other regions of the U.S. (AHA, 2004).

Exploring death rates and rates of occurrence in different demographic categories provides a great deal of information pertaining to the importance of studying hypertension and adherence to anti-hypertensive therapy. However, in addition to statistical rates, it is also important to explore the long-term effects of having high blood pressure. These long-term effects, brought about or worsened by hypertension, accounted for over 297,000 American deaths in 2001 where hypertension was named as a primary or contributing factor. Furthermore, such long-term effects are estimated by the National Heart, Lung, and Blood Institute (NHLBI) to play a secondary role in approximately 700,000 additional deaths each year due to stroke, heart disease, and kidney disease (AHA, 2003; National Center for Health Statistics, 2001). Secondary causes are not typically recorded in decedent reports, so this is a very rough estimate, though still quite striking.

According to the NHLBI, untreated or undetected high blood pressure will lead to a myriad of health problems such as an enlarged heart (which may lead to heart failure), aneurysms in the blood vessels of the brain (which may lead to stroke), narrowing of blood vessels in the kidneys (which may lead to kidney failure), or hardening of the arteries (which can lead to heart failure, stroke, or kidney failure) (AHA, 2002; Benetos, et al., 2002; NHLBI, 2002; USDHHS, 1994). It is presently the case that more Americans die of cardiovascular disease than from any other cause, and hypertension has repeatedly been shown to be the most common risk factor for cardiovascular disease. Indeed, the Seventh Joint National Committee on Hypertension described the relationship between hypertension and cardiovascular disease as “continuous, consistent, and independent of other risk factors” (JNC-7, 2003). For instance, the Framingham Heart

Study (NHLBI, 1996) found that hypertension preceded the development of congestive heart failure in 91 percent of cases and was associated with a three-fold risk for the development of congestive heart failure. The study also found that one-half of individuals who have a first heart attack and two-thirds who have a first stroke have blood pressure higher than 160/95 (Stage 2 Hypertension as defined by JNC-6, 1997; NHLBI, 1996; AHA, 2002).

Such recognition of the importance and deadliness of hypertension has led to national and international programs in much of the developed world to encourage the detection and treatment of hypertension. Mortality rates for stroke and coronary heart disease have been declining in most developed nations over the last two decades, including the United States. As such, although improved control of hypertension is unlikely to be the sole cause of the observed improvement, it is almost certain that improved hypertension detection and management has played a role in the reduced incidence of stroke and heart disease (Swales, 1999). Indeed, end point trials in the United States indicate that a reduction of 10 to 12 mm Hg in systolic blood pressure and 5 to 6 mm Hg in diastolic blood pressure are associated with a 38% decrease in incidence of stroke and a 16% reduction in incidence of coronary heart disease in hypertensive patients (Collins & Peto, 1994). Although the confidence limits for many of the trials are wide, the reduction in stroke incidence represents a complete reversal of the excess risk of stroke attributable to blood pressure elevation. The impact on coronary heart disease probably falls somewhat short of this benefit, although the effect is still substantial (Benetos et al., 2002; Collins & Peto, 1994; Swales, 1999).

The long-term monetary costs of high blood pressure are also worthy of concern. The 2004 estimated cost to the American public of cardiovascular disease and stroke was $368.4 billion; hypertension accounted for $55.5 billion (15.1%) of this figure (AHA, 2004; NHLBI, 2004). When compared to the estimated cost of cancer ($15.6 billion) and HIV ($28.9 billion), it is obvious that hypertension is not only deadly, but also expensive (NHLBI, 2004). While some of the cost associated with hypertension is the result of lost productivity due to hypertension related morbidity and mortality ($14 billion; 25%), the largest proportion of the total cost is due to direct costs of living with hypertension. For instance, in 2001, there were nearly 10.5 million office visits to physicians wherein hypertension was the only reason for the visit and 486,000 hospitalization due to hypertension alone (AHA, 2004). In addition, hypertension was a primary diagnosis in over 35 million visits (4.3% of total number of visits), making it the most diagnosed disease in 2000, with diabetes ranked fourth (23.6 million visits; 2.9%) and heart disease ranked fifteenth (11 million visits; 1.4%) (Cherry & Woodwell, 2000). Moreover, the cost of anti-hypertensive medication is also quite high, accounting for an estimated $21.0 billion of the aforementioned estimated costs of hypertension in 2004, representing a 27% increase since 2000 (AHA, 2002; AHA, 2004; NHLBI, 2002). Fortunately, as already mentioned, gaining control over hypertension will result in reduced health risks and reduced costs.

Unfortunately, hypertension is not consistently diagnosed or treated by physicians. As mentioned, it is estimated that 32.8% of the United States adult, non-institutionalized population meets the criteria for diagnosis of hypertension (AHA, 2002; AHA, 2003; National Heart Lung and Blood Institute, 2002). This equates to over fifty

million adults with diagnosable high blood pressure; four times the presence of congenital heart disease (12 million), ten times the presence of stroke (4.6 million), and ten times the presence of heart failure (4.8 million) (AHA, 2003; AHA 2004; JNC-7, 2003; National Heart, Lung, and Blood Institute [NHLBI], 2002). However, astonishingly, over 30% of these individuals are unaware of their hypertensive condition and, of all those accurately diagnosed with hypertension, 11 percent are not on therapy, 25% are on inadequate therapy, and only 34 percent are receiving adequate therapy and in control of their high blood pressure (AHA, 2004; JNC-7, 2003; NHLBI, 2004). The reasons for such sub-optimal levels of detection and management of hypertension are complex, and it is unclear which factor, if any, is the most important determinant. However, researchers have proposed that the principle contributors may be grouped into four major categories: socioeconomic factors, professional shortcomings, patient noncompliance, and biological factors (Benetos et al., 2002; Burt et al., 1995; Swales, 1999). That being said, while improved management of hypertension begins with diagnosis, the most important component of managing hypertension may be adhering to an effective anti-hypertensive medical regimen. It is this latter component that is the focus of the present research.

## Anti-Hypertensive Therapy: The Medical Regimen

Although the effects of hypertension can affect different genders, age groups, and ethnic groups disproportionately, the treatment for hypertension is relatively constant among all these groups. In fact, while the cause of 90-95% of cases is unknown, hypertension is relatively easy to treat and entails a somewhat universal medical regimen (AHA, 2002; JNC-7, 2003). The most common medical regimen prescribed to

hypertension patients, and the one proposed as most effective by the Joint National Committee, involves more than pharmacological medication and includes such non-pharmacological therapy as weight reduction, moderation of salt and alcohol intake, and increased physical activity (Fodor, Cutler, Irvine, Ramsden, Tremblay, & Chockalingam, 1998; JNC-7, 2003). The present study focused on the three major components of the anti-hypertensive medical regimen: diet, exercise, and medication.

While there is ample research showing the effectiveness of these three components independently of one another, they have additive effects such that a combination of all three components is generally more effective than any single component (AHA, 2004; Fodor et al., 1998; Fishman, 1995; JNC-7, 2003; USDHHS, 1994). Aside from increased effectiveness, the rationale for such combination therapy is also to encourage the use of lower doses of drugs to reduce the patient's blood pressure, which has the benefit of minimizing dose-dependent side effects and adverse reactions common to many anti-hypertensive medications (Moser & Black, 1998). Because there is an additive effect of the three components of the medical regimen, it is sufficient to discuss them each separately while also advocating for their combined usage.

The first two components of the anti-hypertensive medical regimen, diet and exercise, are closely related and are often researched together. However, a great deal of research has examined the independent contribution of diet to high blood pressure and a positive association has been consistently shown, such that a poor diet usually equates to high blood pressure (Fodor et al., 1998; Wilson & Ampey-Tornhill, 2001). Many dietary factors have been recognized as relating strongly to blood pressure, including the amount and type of dietary fat, cholesterol, protein, fiber, and minerals such as potassium,

calcium, sodium, and magnesium (Fodor et al., 1998; USDHHS, 1994; Vogt, Appel, Obarzanek, Moore, Vollmer, Svetkey, Sacks, Lin, & Karanja, 1999; Windhauser, Evans, McCullough, Swain, Lin, Hoben, Plaisted, Karanja, & Vollmer, 1999). Nonetheless, the major factors resulting in elevated blood pressure are continuously shown to be a high sodium intake (i.e., salt), an excessive consumption of calories, and excessive alcohol consumption (Fishman, 1995; Fodor et al., 1998; Vogt et al., 1999; Windhauser et al., 1999; JNC-7, 2003). In terms of alcohol, it has been suggested that exceeding two drinks per day is an important factor in the development of hypertension (Fodor et al., 1998).

However, salt intake has been the most scrutinized dietary component in research and even a modest reduction in sodium intake has been shown to lead to a reduction in blood pressure of 4 to 8 mmHg under the levels seen with higher sodium intake (Fodor et al., 1998; Vogt et al., 1999). In fact, the JNC-7 emphasizes that encouraging a limit in alcohol intake to no more than two drinks per day and a limit in sodium intake to less than six grams of salt per day should be dietary recommendations included in all anti-hypertensive medical regimen (JNC-7, 2003). It appears that such dietary recommendations are already prevalent in anti-hypertensive medical regimen. According to the NHANES III, a large-scale study designed to provide estimates of the prevalence, awareness, treatment, and control of hypertension in the general population, 76% of the 9,901 hypertensive participants reported that their doctor recommended adherence to some type of non-pharmacological therapies. Moreover, of the non-pharmacological therapies recommended, a modified diet low in salt was the most common medical recommendation (Burt et al., 1995).

While it is generally accepted that reducing sodium intake and limiting alcohol consumption are the more important recommendations for an anti-hypertensive diet, other studies have examined additional dietary factors. Perhaps the best-known study exploring how these additional dietary considerations can affect and lower blood pressure is the DASH study. The DASH trial was a multicenter, controlled feeding study designed to compare the effects of three dietary patterns on blood pressure. As such, the diets were designed to achieve distinct differences in the intake of fiber, the minerals sodium, calcium, magnesium, and potassium, and the macronutrients protein, total fat, saturated fat, polyunsaturated fat, and monounsaturated fat (Windhauser et al., 1999). The DASH trial results showed: (a) a diet rich in fruits and vegetables lowered blood pressure compared with a diet similar to what many Americans eat; (b) a combination diet, which is one high in fruits and vegetables while also controlling the intake of minerals and macronutrients, almost doubled the blood pressure reduction of a diet simply high in fruits and vegetables; (c) the blood pressure reductions occurred within 2 weeks; and (d) the combination diet reduced blood pressure in men and women, younger and older persons, minorities and nonminorities, and persons with and without hypertension, but was particularly effective in the minority and hypertensive subgroups. Moreover, the magnitude of the effect on blood pressure of the combination diet among persons with stage 1 hypertension was similar to that observed in single drug anti-hypertensive therapy (Harsha, Lin, Obarzanek, Karanja, Moore, & Caballero, 1999; Vogt et al., 1999; Windhauser et al., 1999). Unfortunately, the DASH study was a laboratory controlled feeding study, so it is unclear how well free-living persons taught to consume a DASH diet will adhere to the diet. It is also unclear how the diet might interact with other

recommendations for blood pressure regulation, particularly weight loss and sodium reduction (Harsha et al., 1999).

Despite the problems with the DASH trial, the dietary recommendations to increase fruits, vegetables, and low-fat dairy foods are a significant complement to the battery of behavior changes currently available to persons who need to lower their blood pressure or prevent development of hypertension. Recent research has also investigated dietary changes that are more culturally sensitive and better align with the cultural beliefs of the specific target populations. For instance, in a study of 44 severely obese African American patients, the Duke University Rice Diet was modified to include decreased cost, culturally-sensitive recipes, addressing attitudes about exercise, and the inclusion of family members in weight loss efforts. A control group of African Americans who did not receive the culturally-sensitive modifications showed no improvement in blood pressure. However, findings indicated that the average reduction in blood pressure among the intervention group was 4.3 mmHg SBP and 2.4 mmHg DBP, which would drastically reduce the damaging effects of hypertension (Ard, Rosati, & Oddone, 2000; JNC-7, 2003). Another such study involved the creation of a comprehensive program with a behavioral component and culturally sensitive menus with the specific goal of lowing cholesterol and increasing the consumption of specific vitamins and minerals. Interestingly, while the findings did not indicate an increase in the target nutrients, the 12-week intervention resulted in lower cholesterol levels, reduced fat intake, and reduced sodium consumption (Shah, Adams-Huet, Kavanaugh, Coyle, & Lipsky, 2004).

Other studies have investigated the utilization of culturally-sensitive methods for engaging diverse cultures in health promoting lifestyles. For instance, the Eat for Life

program is a multicomponent intervention delivered through African American churches with a focus on increasing consumption of fruit and vegetables (Resnicow, Wallace, Jackson, et al., 2000). The program involved a video presentation, a culturally sensitive cookbook, health education materials, and motivational interviewing. Overall, the findings indicate a significant increase in the consumption of fruit and vegetables following the 6-month intervention period (Resnicow, Wallace, Jackson, et al., 2000). Regardless of the type of diet recommended by the primary care doctor, some recommendation for dietary change is an almost routine prescription for patients with hypertension. As such, self-reported adherence to dietary recommendations in general, rather than specific dietary recommendations that may not have been prescribed, should prove more useful to an overall investigation of self-reported adherence to the anti-hypertensive medical regimen.

While diet quickly becomes complicated due to the great deal of factors that appear to provide some reduction or effect on blood pressure, exercise is often much less complicated. As such, exercise is more self-explanatory than is diet and little research has been conducted to examine the distinctive effect of exercise on reducing blood pressure. However, it has been shown that increased levels of physical exercise are associated with reduced blood pressure levels, and a large body of evidence indicates that regular physical exercise has a significant preventive effect on subsequent cardiovascular events (Barlow, 1998; Fodor et al., 1998; Walcott-McQuigg & Prohaska, 2001). Moreover, while it is assumed that exercise alone would be effective in reducing blood pressure, it is understood that pairing exercise with a proper diet will likely result in the added benefit of weight loss, another common recommendation for lowering blood

pressure (Burt et al., 1995; JNC-7, 2003; Fishman, 1995). As such, the effects of exercise are almost always studied as part of a regimen including modified diet and usually recommended alongside dietary changes for blood pressure reduction. As with diet, the JNC-7 also recommends that every medical regimen designed to combat high blood pressure should include recommendations for the patient to become more active and exercise healthily (JNC-7, 2003). It is important to note, however, that there are no accepted recommendations as to the specific amount, duration, frequency, or type of exercise that hypertensive patients should engage in for blood pressure reduction. Indeed, it appears that any exercise is beneficial to hypertensive patients.

Whereas all patients with hypertension should unambiguously be encouraged to lose weight if obese, limit alcohol intake to no more than two drinks per day, limit sodium intake to less than 6 grams of salt per day, become more active if sedentary, and follow other healthy lifestyle habits, these non-pharmacological therapies are not always sufficient and pharmacological therapy may be necessary (Fishman 1995; National Heart, Lung, and Blood Institute, 1992; JNC-7, 2003; USDHHS, 1994; Fodor et al., 1998). In fact, the JNC-7 recognized that for those with stage two hypertension and those having comorbid renal disease, diabetes, cardiovascular disease, and/or having target organ damage, immediate pharmacological therapy is appropriate once the diagnosis is made and confirmed. For those with stage one hypertension who have no target organ damage or other risk factors, lifestyle modification alone is recommended but only for 12 months, after which pharmacology should be utilized unless goal blood pressure (<140 mm Hg for systolic and < 90 mm Hg for diastolic) is achieved with non-pharmacological methods. For those with stage one hypertension who have some risk factors, but no

clinical disease or target organ damage, lifestyle modification is recommended for only 6 months before pharmacology is implemented if goal blood pressure is not achieved. The JNC-7 emphasized lower blood pressure goals than those mentioned above for individuals with diabetes (< 130/85 mm Hg) and for those with renal insufficiency and at least one gram of proteinuria in 24 hours (< 125 / 75 mm Hg) (JNC-7, 2003).

While the JNC-7 provides directives for when pharmacology should be applied, it does not provide any indications as to which medication should be prescribed. There are, in fact, multitudes of anti-hypertensive medications, with the four primary categories being (a) diuretics, (b) sympathoplegic agents, (c) vasodilators, and (d) angiotensin inhibitors. The first type of anti-hypertensive medication, diuretics, lowers blood pressure by reducing sodium stores and blood volume, by having direct vasodilatory effects, and by limiting calcium-dependent smooth muscle contraction, each of which lowers arterial blood pressure.

The second class of anti-hypertensive medication, the sympathoplegic class, consists of 4 basic types of agents that exert their effects by (a) reducing sympathetic output from the brain stem vasopressor center by stimulating central $\alpha_2$-adrenoceptors, (b) competitively blocking nicotinic cholinoceptors on postganglionic sympathetic and parasympathetic neurons, (c) blocking release of norepinephrine from postganglionic neurons, or (d) antagonizing the interface of catecholamines with $\alpha_1$- and $\beta$-adrenoceptors. Adrenoceptors are distributed widely throughout the body. However, the $\alpha_1$ subtype predominates in vascular smooth muscle and, when stimulated, induces vasoconstriction; the $\beta$ subtype is found in the heart, kidney, and blood vessels and

mediates cardiac output, renin release, and peripheral vessel and renal tubule vasodilatation.

The third type of anti-hypertensive drugs consists of the two types vasodilators used for the long-term treatment of hypertension: (a) oral vasodilators and (b) calcium channel blockers. Vasodilators directly relax arterioles or indirectly inhibit contraction by opening potassium channels and stabilizing cell membranes at resting potential. The calcium channel blockers dilate peripheral arterioles by inhibiting calcium influx into arterial smooth muscle cells. The final type of anti-hypertensive medication, angiotensin-converting enzyme (ACE) inhibitors, block the conversion of angiotensin I to angiotensin II, thereby reducing its vasoconstrictive and sodium-retaining actions and limiting its metabolism of vasodilatory kinins. The ACE inhibitors lower blood pressure principally by reducing vascular resistance, and they tend to be most efficacious when plasma renin levels are high. The specificity of these drugs has important implications in the treatment of individuals in whom elevated blood pressure levels are supported by different underlying physiological mechanisms (Brownley, Hurwitz, & Schneiderman, 1999; JNC-7, 2003). However, it is beyond the scope of the present study to determine whether one type of medication is adhered to more than another type of medication. As such, given that the different types of anti-hypertensive medications are similar in their efficacy (JNC-7, 2003), the present research focused on overall self-reported adherence to any anti-hypertensive medication.

## Adherence to the Anti-Hypertensive Medical Regimen

As already emphasized, combating the effects of high blood pressure often includes a three-part medical regimen consisting of dietary changes, increase in exercise,

and pharmacological interventions. Unfortunately, the effectiveness of this medical regimen possesses an "Achilles heel" in that there will be little or no reduction of blood pressure if the patient does not carefully adhere to the regimen. Patient compliance or adherence can be defined as the extent to which a person's behavior follows medical or health advice, such as taking prescribed medication or following a recommended diet. For most diseases, including hypertension, it is generally accepted that patients are conforming well to medical prescriptions when they take 80 to 90% of their prescribed medication (Mallion, Baguet, Siche, Tremel, & de Gaudemaris, 1998). While this might seem to be a high cut-off, the importance of patient compliance to medication is of great concern in the medical community. In fact, in 1992, there were an estimated 125,000 deaths each year plus hundreds of thousands of hospitalizations due to patient noncompliance with medical therapy (Fishman, 1995).

While patient noncompliance is a well-recognized phenomenon, it is poorly understood and affects patients in all areas of health care. Estimates of nonadherence range from 20% among patients who are required to follow a short-term treatment for an acute symptomatic problem (i.e., 10-day treatment), to 50% for longer-term chronic conditions with symptoms (i.e., diabetes, renal disease), to 80% or more for long-term asymptomatic conditions (Sherbourne, Hays, Ordway, DiMatteo, & Kravitz, 1992; Rosenstock, 1988; DiMatteo, Sherbourne, Hays, Ordway, Kravitz, McGlynn, Kaplan, & Rogers, 1993). In addition, the problem of patient noncompliance is particularly acute when patients are required to take several medication doses per day (Cockburn, Gibberd, Reid, & Sanson-Fisher, 1987) or to carry out primary prevention efforts or significant

changes in life-style such as with hypertension and renal disease (Brownell, Marlatt, Lichtenstein, & Wilson, 1986).

Obviously, long-term asymptomatic conditions that might require life-style changes pose the greatest challenge due to high levels of patient noncompliance. Hypertension is one such condition where, although the treatment can be quite effective, the benefits are not immediately apparent to the patient because there are no symptoms for which immediate relief is desired, as in conditions such as asthma or psoriasis (Mallion et al., 1998). In fact, the majority of hypertension patients are asymptomatic, and, as such, it is not easy to convince them of the value of receiving treatment in order to prevent a hypothetical event ten to twenty years in the future. Thus, hypertension poses a particular problem with regard to compliance.

In terms of pharmacological treatments of hypertension, only a single element of the more complex regimen, it is generally accepted that it is necessary for patients to take more than 80% of their anti-hypertensive medications to maintain adequate blood pressure control (Shaw et al., 1995; Eraker, Kirscht, & Becker, 1984; Feldman, Bacher, Campbell, Drover, & Chockalingam, 1998). Estimates vary as to how many patients actually comply to this degree with their anti-hypertensive medicine, but estimates range from as little as 15% compliance (Caldwell, 1978) to 40% (Shaw et al., 1995; Eraker, Kirscht, & Becker, 1984). However, it is most often reported that between 40% and 50% of patients with high blood pressure do not adhere to the pharmacological therapy in their medical regimen (Shaw et al., 1995; Eraker, Kirscht, & Becker, 1984; Feldman et al., 1998; Rudd, 1995). Furthermore, past research has suggested that 50% of patients stop their own treatment one year after diagnosis and 75% of patients stop their own treatment

five years after diagnosis. This suggests that the longer patients go without symptoms, the less likely they are to continue taking medications that appear to have little, if any, observable benefits to them (Caldwell, 1978). It must also be noted that some patients take more medication than they are prescribed which, especially with hypertension medication, may cause increased side-effects that may eventually lead to the patient not taking them (Rudd, 1995; Shaw et al., 1995).

Noncompliance with hypertension medication is of great interest to medical doctors because it is almost impossible to maintain high-quality patient care while keeping costs at a minimum when patients do not use their medications as prescribed. In fact, many patients require extra care because of their medication noncompliance, a fact that results in additional costs of billions of dollars to hospitals and insurance companies each year (Shaw et al., 1995; Eraker, Kirscht, & Becker, 1984). Furthermore, patient noncompliance with anti-hypertensive medication has resulted in the finding that only approximately one half to one fourth of all hypertensive patients have their blood pressure under effective control (Richardson, Simons-Morton, & Annegers, 1993; Skaer, Sclar, Markowski, & Won, 1993).

Several studies have examined adherence to the anti-hypertensive medication treatment. One such study explored self-reported adherence and the ability to describe the medications and dosage schedule. The study found that, if patients could not accurately describe their medication or the dosage schedules, then they were not adhering properly to the medication regimen as prescribed by the doctor, either taking more or less medication than prescribed. In fact, among those patients who did not adhere to their prescribed medication regimen: 50% said they “always” took their blood pressure pills

but could not accurately describe the medications and dosage schedule; 37.5% said they did not always take their blood pressure pills but could accurately describe the medications and dosage schedule; and 12.5% said they did not always take their blood pressure pills and also could not accurately describe the medications and dosage schedule (Bartucci, Perez, Pugsley, & Lombardo, 1987). Although self-reported medication adherence can be incorrect due to recall error and conscious or unconscious distortion, several other researchers have compared self-reporting and pill count methods of assessing adherence and found close correlations between these methods (Hershey, Morton, Davis, & Reichgott, 1980; Nelson, Statson, Neutra, Solomon, & McArdley, 1978).

Another study exploring patient noncompliance, conducted by Shaw et al. (1995), involved the development of a questionnaire designed to determine the frequency of drug noncompliance in hypertensive patients and to identify any factors associated with noncompliance. The survey questions consisted of yes/no or specific short answers to provide concise data for analysis. Two sequential questions on the survey were used to assess the percentage of noncompliance: "Many people find it difficult to remember to take their medicine. How often do you miss a dose of <medication>?" and "Have you ever missed any doses on purpose?" In response to the first question, the study reported that 70% claimed to never miss a dose of medication, therefore showing high compliance. However, in response to the second question, 33% of the sample admitted to intentionally missing doses for a variety of reasons. According to the researchers, combining the two questions indicated that 46% of the total sample population admitted to missing doses of their medication either monthly, weekly, purposely, or a combination

of the three. Moreover, there was a greater degree of noncompliance among patients who use home remedies, such as herbs, as compared to those who do not. Interestingly, drug allergies, gender, marital status, race, education, living arrangement, presence of a person to remind the patient to take the medication, type of anti-hypertensive medication, length of time on the medication, or length of time since last physician visit were all found to be non-significant predictors of medication noncompliance (Shaw et al., 1995). The aforementioned studies provide important insight that self-reports of adherence can be useful, yet it is important to carefully choose a measure of adherence as the type of questions asked can have a direct effect on the results.

While adherence to pharmacological measures in treating hypertension are generally the focus of research in the medical field, adherence to non-pharmacological measures is beset by the same problems as adherence to drug treatment; yet the latter is often neglected in adherence research. Some of the problems with adhering to life-style modifications rest with the patients, such as their self-perceived health status and self-efficacy beliefs. Other problems pertain to environmental factors, such as lack of family support, and objective difficulties in accessing needed components for diet or exercise facilities. Still other problems rest with health care providers, either in terms of lack of training in behavioral modification, insufficiency of counseling time (for example in the physician's office), lack of interest, or the lack of belief that an intervention can be successful (Fodor et al., 1998; Karanja, Obarzanek, Lin, McCullough, Phillips, Swain, Champagne, & Hoben, 1999; Swales, 1999).

Much of the research on adherence to the nonpharmacological anti-hypertensive treatment methods have focused on dietary recommendations used to treat hypertension.

Unfortunately, many of these studies implement laboratory methods that are beyond the scope of hospital staffs, doctors, or clinic staffs in their efforts to provide healthcare to free-living people who are attempting to adhere to dietary regulations for hypertension treatment (Karanja et al., 1999, Vogt et al., 1999, Harsha et al., 1999, Windhauser et al., 1999). One such study, which found that 92% of patients reported adhering to the experimental diet, provided patients with the following: encouragement from clinical staff, free counseling, 24-hour access to dieticians, daily feedback when deviations from the study diet occurred, special procedures to deal with potential deviations from the study diet, intermittent reinforcement for adherence (i.e., gift certificates, newsletters, and t-shirts), parties and contests, and home visits. Moreover, at the end of the intervention, participants received monetary reimbursement for participation in the study (Karanja et al., 1999). The aforementioned study is a typical example of laboratory studies which often implement a wide range of behavior modification methods that are not practical enough to be used in real-world clinical settings.

Of particular interest to hypertension researchers is the effect that comorbidity has on adherence to the medical regimen. Indeed, health behaviors, resultant outcomes, and adherence are generally studied among individuals with only one particular diagnosis. However, comorbidity presents a situation where the health behaviors that affect optimal management (i.e., diet, exercise, and medication adherence) are clustered between diagnoses. That being said, it has been suggested that the behavioral clustering found in individuals having more than one lifestyle-related condition could increase motivation to make behavioral changes or could lead to the activation of resources in the health care environment (e.g., being referred to a dietician only if a hypertensive patient develops

diabetes). However, it has also been suggested that receiving another diagnosis could also lead to a sense of fatalism or actually make behavior change more difficult due to increased disability or dependence on others (e.g., the ability to exercise vigorously is limited or dietary choices are made by others) (Nothwehr & Perkins, 2002).

Regardless of the number of diagnoses, the component of the regimen being explored, or the adherence rates for specific components, several recommendations to increase treatment regimen compliance are common in the literature. Adherence to treatment requires a minimization of obstacles to the patient, such as complex regimens and the need for frequent visits to the doctor's office, as well as improved patient education and understanding (Saounatsou, Patsi, Fasoi, Stylianou, Kavga, Economou, Mandi, & Nicolaou, 2001). Patient understanding of the need for blood pressure control is extremely important because a common reason for treatment discontinuation is that the patient felt well and thought that she/he no longer required treatment (Swales, 1999).

## Theoretical Models for Explaining Treatment Adherence

As already mentioned, adherence to the medical regimen for the treatment of hypertension is of paramount importance for effectively controlling high blood pressure; yet, actual adherence rates are quite low for those with the disease. Because of the importance of treatment regimen adherence to effective blood pressure control, as well as the control of many other diseases, the literature has proposed several models of adherence.

One model for explaining adherence to health recommendations is the Health Belief Model (HBM), which hypothesizes that people will seek to avoid illness if they perceive the preventive action to be less negative than the illness itself (Sherbourne et al.,

1992; Courneya & McAuley, 1995). Most of the HBM research has sought to explain health behaviors as behaviors influenced by participants' self-reported estimations of the degree to which such behaviors would result in their own risk reduction (Courneya & McAuley, 1995). Other HBM research has sought to link adherence to health regimens to constructs such as perceptions of the susceptibility to a health problem, the severity of the health problem, and the barriers to health-protective actions (Spoth & Redmond, 1995). Regardless of the construct examined in HBM studies, the focus in these studies has always been on a single attitudinal perception of the participant. However, results of other research have made it clear that more than just attitudinal forces likely interfere with health actions – a fact that has lead to the development of several multivariate models.

One such multivariate model of adherence was utilized in the Medical Outcomes Study (MOS; DiMatteo et al., 1993; Sherbourne et al., 1992). The MOS used a multivariate model specifically designed to assess five major explanatory areas that have been consistently demonstrated as valuable in explaining adherence: (a) past behavior or habit, (b) health perceptions, (c) individual characteristics including coping style, (d) the presence of supports for (including social supports) and the absence of barriers to carrying out the prescribed behaviors, and (e) the quality of the practitioner-patient relationship, indexed by patient satisfaction with care delivered (Sherbourne et al., 1992; Stanton, 1987). There are several strengths of the multivariate model of adherence used in the MOS. These strengths are a longitudinal design, the use of multiple measures of adherence, and the use of patients suffering from three different types of chronic diseases (DiMatteo et al., 1993). However, while these strengths help make the multivariate

model of adherence used in the MOS a reliable and generalizable model of adherence, there are also some weaknesses of the model that make it less than ideal. Perhaps its most debilitating weakness is the complexity of the model in terms of the number of variables that it measures. This complexity creates the need for an extraordinarily large number of participants in order to have sufficient statistical power for data analyses. In fact, the MOS researchers collected data from over twenty thousand patients in order to perform initial statistical analyses (DiMatteo et al., 1993; Sherbourne et al., 1992).

Another well-known theoretical model of adherence is the Theory of Reasoned Action (TRA; Ajzen & Fishbein, 1980). The TRA was derived from the earlier mentioned Health Belief Model, adding an emphasis on subjective norms or the person's beliefs about what others want him or her to do. This addition is based on the premise that one's subjective norms and attitudes toward adhering should have an impact on intention and commitment with regard to carrying out a specific behavior (Sherbourne et al., 1992). The TRA is based on the assumption that behavior is determined by intention, and that intention, in turn, is predicted from attitudes, perceived control, and social (subjective) normative factors (Ajzen & Fishbein, 1980). Ajzen and Fishbein (1980) suggested that the attitude component of the model is a function of the beliefs held about the specific behavior, as well as the evaluation (value) of the likely outcomes of the behavior. Thus, the TRA conceptualizes adherence to regimens as the product of an expectancy-value interaction. The subjective norm component of the TRA consists of the beliefs of significant others and the extent that one wishes, or is motivated, to comply with these people and their beliefs. The TRA was initially developed to account for all behaviors, but it was realized that the theory was primarily useful in predicting behaviors

that are under volitional control. Therefore, a revised TRA – the Theory of Planned Behavior (TPB) – was introduced as an attempt to account for behavior under incomplete volitional control. In the case of physical exercise and other health-related behaviors such as smoking and weight control, volitional control may be incomplete.

The TPB is, essentially, the same as the TRA but with the addition of perceived behavioral control, which is defined as the perceived ease or difficulty of performing the behavior and is assumed to reflect past experience as well as anticipated impediments and obstacles (Smith & Biddle, 1999; Ajzen, 1996). More specifically, in the theory of planned behavior, Ajzen (1996) proposed that a person's intention to perform a behavior is the central determinant of that behavior, much like in the TRA. Intention is thought to capture certain motivational factors, such as how hard one is willing to try in performing a behavior and is, in turn, determined by three conceptually independent variables: attitudes; subjective norms; and perceived behavioral control. Essentially, the basic proposition of the TPB is that individuals will intend to perform a behavior that is not under complete volitional control when they evaluate it positively, believe that important others think they should perform it, and perceive it to be under their own control (Ajzen, 1996; Ajzen, 1988; Courneya & McAuley, 1995).

The theoretical model used to understand self-reported adherence to the hypertension medical regimen in the present study is Kanfer's self-regulation model (Kanfer, 1970; Kanfer, 1986; Kanfer & Goldstein, 1991). As applied to health promotion, the self-regulation model suggests that regulation of health behaviors (e.g., medication, diet, and exercise) is determined by three self variables: (1) motivation to be healthy and perform the requisite behaviors; (2) perceived control over the behaviors; and

(3) perceived social support for the behaviors from family, friends, and significant others (Kanfer & Gaelick-Buys, 1991).

Unlike the Theory of Planned Behavior discussed above, Kanfer's self-regulation model has not been extensively used in health research. That being said, the model has been successfully applied to predict health promoting behaviors important in treating one or more diseases (Halroyd & Creer, 1986). For instance, the model has been successfully applied in studies of various types of patients groups such as diabetic patients (Lehr, 1986) and hemodialysis patients (Kirschenbaum, Sherman, & Penrod, 1987; Tucker, Petersen, Herman, Fennell, Bowling, Pedersen, & Vosmik, 2001). Because of the empowerment of patients inherent in the self-regulation model, and the need for such empowerment for long-term treatment adherence, Kanfer's self-regulation model (Kanfer & Gaelick-Buys, 1991) was chosen to be the theoretical model for the present research. As such, predictor variables consistent with the theory were selected for investigation and are presented below.

**Perceived Behavioral Control as a Predictor of Adherence in Hypertension Therapy**

The first component of Kanfer's (Kanfer & Gaelick-Buys, 1991) self-regulation model that is theorized to predict health behaviors is the level of control an individual perceives they have over the target behaviors – a component that is common to several other health-behavior prediction models. According to Ajzen (1996), the author of the Theory of Planned Behavior, perceived control over one's behavior is conceptually similar to perceived self-efficacy. Several other researchers have supported the equivalence between perceived behavioral control and self-efficacy (Bandura, 1986; Courneya & McAuley, 1995; Povey, Conner, Sparks, James, & Shepherd, 2000) and, as

such, a great deal of research has been conducted to investigate the connection between self-efficacy and health promoting behaviors.

Most research that has investigated how perceived self-efficacy and perceived behavioral control impact the performance of various health behaviors has not focused on a specific chronic illness. For instance, Povey and colleagues (Povey, Conner, Sparks, James, & Shepherd, 2000) developed a perceived self-efficacy measure specifically for general, healthy dieting behaviors. Marcus and collegues (Marcus, Selby, Niaura, & Rossi, 1992) developed a short exercise-specific measure of perceived self-efficacy where individuals indicate how confident they are that they could exercise in different circumstances. Moreover, qualitative research has also shown a link between self-efficacy and health behaviors. For instance, Walcott-McQuigg and Prohaska (2001), using a focus group methodology to investigate factors that influence African American elders' adherence to exercise recommendations, found that self-efficacy was lowest in those who had not yet thought about exercising, higher in those who had contemplated beginning to exercise, and highest in those who had already begun an exercise routine. While there has been a plethora of research on self-efficacy as a predictor of health behaviors among non-patient samples in the general population (e.g., Sallis, Pinski, Grossman, Patterson, & Nader, 1992), very little research on self-efficacy has focused upon patient populations with chronic disease. That being said, those studies that have focused on patients with chronic disease have consistently found a relation between self-efficacy and adherence to health-promoting behaviors.

For instance, in a study of hemodialysis patients, Brady, Tucker, Alfino, Tarrant, and Finlayson (1997) found that higher fluid adherence efficacy expectation (i.e., self-

efficacy to adhere to the strict fluid restrictions placed upon renal disease patients) predicted better fluid adherence among end-stage renal disease patients. Such findings among renal disease patients has been supported by other researchers, such as that conducted by Rudman, Gonzales, and Borgida (1999), who found that, after age and side-effects complaints, self-efficacy and threat appraisal were the best predictors of compliance in renal transplant patients. In relation to rheumatoid arthritis, researchers have shown that self-efficacy is directly, not mediationally, related with adherence to the prescribed medical regimen (Barlow, 1998; Taal, Rasker, Seydel, & Wiegman, 1993).

Using a similar self-regulation model to the one in the present research, Senecal, Nouwen, and White (2000) found that self-efficacy was directly associated with dietary adherence among adults with diabetes mellitus. Self-efficacy has also been found to be a predictor of adherence to exercise programs among individuals with chronic back pain (Granlund, Brulin, Johansson, & Sojka, 1998) and those participating in cardiac rehabilitation programs (Bock, Albrecht, Traficante, Clark, Pinto, Tilkemeier, & Marcus, 1997). In addition to studies with adults, research with adolescents has found self-efficacy to be a significant influence upon the degree to which adolescents adhere to such medical regimens as insulin for diabetes mellitus (e.g., Palardy, Greening, Ott, Holderby, & Atchison, 1998).

As can be seen, research suggests a strong link between perceived self-efficacy for health promoting behaviors and adherence to the medical regimen to treat specific chronic diseases. Although hypertension contributes to the highest proportion of deaths of any chronic condition and is relatively easy to treat, only a few studies have focused on the influence of self-efficacy on adherence to the antihypertensive medical regimen.

One of these studies was conducted by Taylor, Bagozzi, and Gaither (2001) for the purposes of investigating gender differences in the self-regulation of hypertension. Results from this study suggested that perceived behavioral control, as measured by self-efficacy, had both direct and indirect effects on adherence efforts for men, but not for women (Taylor, Bagozzi, & Gaither, 2001).

Also using the Theory of Planned Behavior, Lennon, Hughes, Johnston, and McElnay (2001) investigated self-efficacy as a predictor of non-adherence to hypertension treatment, focusing specifically on medication adherence. These researchers used a single questionnaire designed by themselves to measure self-efficacy, and they assessed the other variables in the Theory of Planned Behavior (intentions, attitude, and subjective norms) via a face-to-face interview. With self-report as the measure of medication adherence, patients who reported adhering to their medication regimen also reported higher self-efficacy than those who reported non-adherence to the regimen. Indeed, although all variables were entered into a stepwise regression, only perceived behavioral control and intentions to adhere were found to be predictors of self-reported adherence with the prescribed medication. In keeping with most studies investigating self-efficacy in chronic disease medical regimen adherence, a measure of general health-specific self-efficacy was used in the present research.

**Motivation as a Predictor of Adherence in Hypertension Therapy**

The second component of Kanfer's self-regulation model that is believed to predict health-related behaviors is that of motivation to be healthy and to perform the requisite behaviors. Unlike perceived behavioral control and self-efficacy, motivation is a relatively unexplored predictor of health promoting behaviors, especially in individuals

with chronic diseases. According to Kanfer and Gaelick-Buys (1991), there are two important factors that must be present for an individual to begin or continue participation in behaviors: (1) be engaged or contemplate engagement in goal-directed behavior and (2) be responsive to either external or internal cues for behavior (though internal cues are considered to be more motivating). While such motivation is important in Kanfer's self-regulation model as applied to health promoting behaviors (Kanfer & Gaelick-Buys, 1991), very little research has investigated this specific element of motivation in relation to health behaviors. However, quite a bit of research has investigated how intrinsic motivation or self-determination influences non-medical exercise behavior.

For instance, past research has linked intrinsic motivation for physical activity to short-term participation in exercise (Frederick, Morrison, & Manning, 1996) and long-term adherence to exercise classes (Ryan, Frederick, Lepes, Rubio, & Sheldon, 1997). Although most research on intrinsic motivation has focused on general exercise behavior, several other studies have focused on the effect of intrinsic motivation on adherence to specific components of medical regimens. For instance, Granlund, Brulin, Johansson, and Sojka (1998) found that motivation to exercise predicted adherence to an exercise-program among patients with chronic lower back pain. In terms of diet adherence, Senecal, Nouwen, and White (2000) found that intrinsic motivation was associated with dietary adherence and life satisfaction among adult patients with insulin-dependent diabetes mellitus. Further, in terms of medication adherence, Williams, Rodin, Ryan, Grolnick, and Deci (1998) found that intrinsic motivation for adherence predicted long-term adherence to medication prescriptions among adult outpatients with various chronic conditions. However, not all studies have found significant results between motivation

and adherence to specific medical regimen prescriptions. For instance, in a study with hemodialysis patients with end stage renal disease, the authors found no relationship between motivation to be adherent to the fluid restrictions imposed during hemodialysis and outcome measures of fluid adherence (Brady, Tucker, Alfino, Tarrant, & Finlayson, 1997).

Such mixed results may be due to the fact that most studies measuring motivation to behave in regimen-specific ways must create questions or assessments to measure motivation. The reason for such practice is likely that there are no inventories that directly measure motivation or self-determinism to participate in treatment regimen-specific activities. This is particularly the case with illnesses where medical recommendations incorporate behaviors that are fairly unique and not typical health promoting behaviors. For instance, while reducing sodium and alcohol intake (components of the anti-hypertensive regimen) are common recommendations for overall healthy living with non-hypertensive patients, the strict fluid restrictions imposed on hemodialysis patients are not typically recommended to healthy adults and, outside of hemodialysis patients, would not be considered health promoting behaviors. However, in relation to hypertension, the typical anti-hypertensive medical regimen involving modified diet and increased exercise would be considered by most to be composed of health promoting behaviors that, regardless of hypertensive status, would lead to a healthier existence. Moreover, as mentioned in previous sections, because of the asymptomatic nature of hypertension, the motivation underlying adherence to all three components of the typical anti-hypertensive regimen is not generally symptom-reduction

or symptom-avoidance (as in such diseases as diabetes, arthritis, and renal disease), but more of a motivation to promote long-term healthy living.

That being said, there are currently only a limited number of measures of motivation for health-promoting behaviors. Perhaps the most common behavior for which validated assessments of motivation exist is that of general exercise behavior (i.e., leisure exercise as opposed to exercise prescribed for treatment of an illness). For instance, the Revised Motivation for Physical Activity Measure (Frederick & Ryan, 1994; original scale by Frederick & Ryan, 1993) and the 44-item Exercise Motivation Inventory (Markland & Hardy, 1993) are both lengthy measures used to measure the general construct of motivation as it relates to exercise behavior. However, while there are measures of general exercise motivation, there are few questionnaires to measure motivation to adhere to health-related exercise, diet, or medication regimens prescribed by physicians for asymptomatic chronic diseases. As mentioned, the lack of such validated and tested measures may be the cause of inconsistent results of past research on chronic diseases and adherence.

The Health Self-Determinism Index (HSDI; Cox, 1985; Cox, Cowell, Marion, & Miller, 1990; Cox, Miller, & Mull, 1987; Loeb, O'Neill, & Gueldner, 2001) is a measure that assesses motivation to perform health-promoting behaviors and, according to the authors of the scale, is effective in evaluating motivation in asymptomatic chronic conditions such as hypertension. The HSDI has four subscales (i.e., self-determined health judgments, self-determined health behavior, perceived competency in health matters, and internal-external cue responsiveness) and was used in the present research to

measure motivation to perform behaviors consistent with the anti-hypertensive medical regimen. The HSDI will be described in greater detail in the methods section.

**Social Support as a Predictor of Adherence in Hypertension Therapy**

The final component of the Self-Regulation Model, and the one that is the main focus of the present research, proposes that social support can predict behaviors such as adherence to a medical regimen. Evidence is mounting that social support has a direct and positive effect on health status and that it helps modify the impact of psychosocial and physical stress on the mental and physical health of individuals. Indeed, social support has been identified as a protective factor for a wide variety of health outcomes including hypertension and cardiovascular disease (Wilson & Ampey-Tornhill, 2001). For instance, Steptoe (2000) found that, when testing cardiovascular reaction to demanding situations that were either faced alone or in the presence of supportive individuals, blood pressure and heart rate reactions were reduced when people underwent such stressful experiences in the presence of supportive others.

Several pathways in which social support affects health outcomes, such as blood pressure, have been hypothesized. One such pathway suggests that social support may influence behavioral patterns that, in turn, affect biological responses or disease states. For example, significant others may encourage the adoption of healthy behaviors that reduce or prevent the incidence of illness. Indeed, several studies have demonstrated that dietary social support from family members may facilitate dietary compliance among African American adolescents (e.g., Wilson & Ampey-Tornhill, 2001). However, other studies have suggested that a mismatch between an individual's coping style and the type of social support he or she receives may not be beneficial and, in some cases, may have a negative

impact on performance of health promoting behaviors (Walcott-McQuigg & Prohaska, 2001).

Many settings conducive to the delivery of social support, such as worksites, physicians' offices, home visits by health workers, dental offices, and pharmacies, have received considerable attention in the literature (Fishman, 1995; Morisky, DeMuth, Field-Fass, Green, & Levine, 1985; Sherbourne et al., 1992). However, the usefulness of such settings of social support may be restricted for a variety of reasons – for instance, the impact of medical advice on a patient's adherence to a given regimen may be lessened because of the infrequency of contact with the formal provider system (Bland, Krogh, Winkelstein, & Trevisan, 1991; Fishman, 1995; Morisky et al., 1985; Siegrist, 1995). Moreover, for conditions such as hypertension where the pharmacological and nonpharmacological regimen possess intrusive characteristics that increase barriers to compliance, these common settings of health-related social support may not be sufficient. Although the hypertensive patient is not visibly sick, she/he needs consistent support from others in order to reinforce the importance of compliance behaviors and to define specific areas of responsibility for one's self and family.

Indeed, much of the existing literature suggests that supplemental forms of social support (i.e., family member behaviors and interventions) may significantly influence patient compliance and noncompliance (Morisky et al., 1985). In fact, there is now evidence that the patient's larger context of family and friends creates a social support system that offers a significant contribution to compliance and, subsequently, improved health. It has become increasingly apparent that, through simple communication, role modeling, deliberate pressure, and other avenues of influence, the family's beliefs and

behaviors may affect its members' health actions, whether positively or negatively (Fishman, 1995; Morisky et al., 1985; Sherbourne et al., 1992; Shoenberg, 1998). Moreover, it is generally accepted that, when focusing attention on patient noncompliance, recruitment of the patient's family to assist in compliance supervision may be useful for increasing compliance. Indeed, the family often plays a major role in the process of medical care. Whether the question is paying attention to a symptom, participating in a health promotion activity, or complying with a prescribed regimen, the family is a major player as family members provide encouragement for achieving such health goals, either through tangible or emotional assistance (Feldman et al., 1998; Fishman, 1995; Sherbourne et al., 1992). In fact, family social support is viewed as particularly important when an individual undertakes management regimens that are fairly complex and require major lifestyle changes, such as hypertension therapy (Orth-Gomer & Unden, 1987).

Although, as mentioned, family and significant other social support is particularly crucial for control of hypertension, there is only limited research on how this type of social support affects hypertension. However, it may be quite useful to review studies that do not specifically investigate hypertension as they provide useful information about adherence to specific treatments used in the medical regimen for treating hypertension, such as exercise and diet. One such study that investigated significant-other social support and exercise had participants join an exercise program at any time of the year for one year at a time either with their partner or without their partner. For each participant, the investigators developed an individualized exercise program, and arranged supervision for her/him for 49 weeks of the year. The study found that the mean monthly attendance

of the Married Pairs (54.2%) was significantly greater than that of the Married Singles (40.3%) throughout the entire year, regardless of gender. Also, the study found that there was a significant difference in length of adherence between the Married Pairs (11.8 months) and the Married Singles (8.9 months). In fact, only 6.3% of the Married Pairs dropped out whereas 43% of the Married singles dropped out. Moreover, the dropout rate of the Men and Women Married Pairs were similar, whereas the dropout rate of the Women Married Singles (60%) was twice as great as the Men Married Singles (31%). During an exit survey to determine reasons for dropout, the most frequent reason for dropout was family responsibilities in combination with lack of social support (Wallace, Raglin, & Jastremski, 1995). The aforementioned study gives evidence that it might be quite difficult for individuals, such as hypertension patients, to adhere to a recommendation for exercise without adequate support from their family, friends, or significant others.

In terms of dietary and weight loss recommendations, similar conclusions can be gained from a study on patients with kidney disease who were, like hypertension patients, advised to reduce sodium intake and lose weight (Cohen, Weinberger, Fineberg, Miller, Grim, & Luft, 1991). In this study, patients and their partners were randomly assigned to one of four experimental conditions: active or passive partner participation and either immediate or delayed home urine self-monitoring. The results indicated that patients in the delayed feedback condition had significantly higher baseline urine values than did those in the immediate feedback condition and that patients with passive partners weighed significantly more than did patients with active partners. The study suggested that patients who had partners that were more actively involved (such as preparing the

food, joining the patient in the diet, etc.) were able to comply more with the recommendations of reduced sodium intake and weight loss than were those patients with partners who were more passively involved (Cohen, et al., 1991). Several other studies have bolstered the findings that perceived levels of social support influence adherence to medical regimen components for such chronic diseases as chronic transfusion therapy (Treadwell & Weissman, 2001); chronic lung disease (Teichman, Burker, Weiner, & Egan, 2000); diabetes mellitus (La Greca & Bearman, 2002); and hemodialysis (Christensen, Wiebe, Smith, & Turner, 1994).

While there are numerous studies exploring how family or significant-other social support affects adherence to medical advice outside of the realm of hypertension, there are also quite a few studies that specifically explore how such social support affects adherence to the anti-hypertensive medical regimen (e.g., Bosworth & Oddone, 2002). One such study assigned patients either to a control group or to an experimental group where the patient's family was trained in techniques for offering social support to the patient. It was found that the experimental group of patients had a longer program continuation after the study was concluded, a greater overall weight control at the end of a five-year follow up, a higher proportion of group members being within two pounds of their ideal weight, and a significant reduction in blood pressure. Indeed, individuals assigned to the family support intervention were significantly more likely to have their blood pressure under control (77%) compared to individuals not assigned to this intervention (51%). Moreover, within the family support group, striking improvements were evident in medication-taking and appointment-keeping behavior, two very important aspects to controlling hypertension. Similarly, examination of long-term

effects at the two- and five-year points demonstrated that blood pressure control, appointment keeping, and weight control were significantly improved or maintained for only the family support intervention patients (Morisky et al., 1985).

Another study, the Buffalo Blood Pressure Study, is one of the few large-scale investigations of the relationship between social support and blood pressure in an adult population. This study, although not a controlled experiment, found that a high level of significant-other social support is associated with lower systolic and diastolic blood pressure for both men and women. Moreover, this finding was found to hold true after adjusting for age, body weight, smoking, and education (Siegrist, 1995). Numerous other studies have helped to confirm the connection between perceived social support, dietary adherence, weight control, and improved health status among hypertensive patients (Botelho et al., 1996; Shaw, Chan, & Lam, 1997). For example, Earp and Ory (1979) found that those who lived with significant others or family were more likely to maintain recommended blood pressure control than those who lived alone. Further, Orth-Gomer and Unden (1987) concluded that individuals with hypertension who perceived minimal social support were more likely to die more prematurely than those who indicated that they felt extensive support (Shoenberg, 1998).

Clearly, quite a bit of research both within and outside the realm of hypertension has suggested that the amount of social support a patient receives influences the degree to which they comply with medical regimens designed to treat chronic conditions. However, several studies have found that level of social support is not uniformly significant across all patient populations. For instance, a study of gender and family support on dietary compliance in adolescents found that girls who were compliant

reported higher levels of dietary support than boys who were compliant. Moreover, boys who were compliant reported lower levels of dietary support from family members than boys who were not compliant (Wilson & Ampey-Tornhill, 2001). Such findings, as well as others that support the results, suggest that family support may be beneficial for girls, though could lead to lower compliance when provided to boys. Weiss and Hutchinson (2000) found that support from family, friends, and significant others can make chronically ill patients feel assaulted and bombarded with warnings about their vulnerability. Indeed, while warnings and social support can be beneficial if carefully regulated, it is possible that such support and warnings can lead to lower adherence when individuals begin ignoring or passive-aggressively resisting the support providers. A small percentage of studies exploring social support and adherence found there to be no relationship between the two constructs (e.g., Wang, Bohn, Knight, Glynn, Mogun, & Avorn, 2002).

Obviously, with such mixed results, it appears that past research using assessments of social support levels may be failing to measure a critical element of social support. Some researchers have suggested that any type of social support needs to be qualified, in addition to quantified. In fact, it has been shown that, while a single item measure of quantified social support from close friends and relatives did not predict adherence, a measure of the adequacy and quality of broadly-defined interpersonal relationships was a significant predictor of adherence (Sherbourne et al., 1992). Thus, it appears that the quality of the relationship, rather than quantity of supports, may be a more significant influence on adherence to medical regimens.

Indeed, traditional measures of social support – even those carefully designed using patient-centered methods such as focus groups – assess only whether patients endorse statements about types of social support found to be statistically important in small samples of research participants. Such a method of assessing social support indicates only the level of normalized social support that a patient receives and, in so doing, ignores individual differences in the type and amounts of social support desired. In other words, statistical significance is used to presume individual significance. However, it is the individual differences that patients bring with them that present the most challenges in designing effective interventions to increase adherence to medical regimens – the goal of most research that investigates adherence. As such, while the primary purpose of the present research is to explore the relationship between variables within Kanfer's self-regulation model and adherence to the anti-hypertensive medical regimen, a secondary purpose is to investigate whether the currently accepted method of assessing the level of social support perceived is as important or effective as assessing the discrepancy between the levels of social support received and that which is desired. Investigating such discrepancies helps to indicate level of social support perceived and satisfaction with social support perceived, and provides a research basis for possible social support interventions that can be individually tailored for each patient.

Such an idea of discrepancy between social support perceived and that which is desired is a novel idea in the study of hypertension adherence. That being said, such an idea of exploring the discrepancy between what patients desire and what they actually receive is not an entirely novel idea in psychological and medical literature – though the focus variable and the method employed in the present research appears entirely novel.

For instance, Montgomery, Harding, and Fahey (2001), in an interview-based observational study with 52 hypertensive patients, investigated the impact of patient preferences on anti-hypertensive treatment recommendations. The results suggested that individual patient preferences should be taken into consideration when treating hypertension, as shared decision making impacts whether patients were recommended for antihypertensive medication. Moreover, involving patients in the decisions about treating their hypertension may also increase adherence to the medical regimen as they feel they have more interest in the regimen. Although the aforementioned study does not specifically address social support, it merits mentioning, as it is the only study in the hypertension adherence literature that advocates for the inclusion of patient preferences.

Indeed, despite a thorough review of the medical and psychological literature, only one study was found that explored both desired and received social support in chronic illness. As with the present researcher, Melamed and Brenner (1990) stated that the existing conceptualizations of social support were inadequate to describe the communication of support between the support provider and the support recipient. In order to study social support in chronically ill patients, Melamed and Brenner (1990) took into account both the perspectives of those providing the support as well as those of the recipients. The researchers conceptualized social support from an interaction-based model where the requests for support from recipients and the fulfillment of those requests by supporters create mutually reinforcing experiences that, in turn, create expectancies for social support. Findings from the study, which involved 35 rheumatoid arthritis patients and their spouses who had been married for an average of 34 years, revealed a great deal of disconfirmed expectancies for support.

Specifically, the researchers asked the patient and their spouse about 21 different behaviors that the spouse could perform – behaviors typically considered supportive. The patients' perceptions of supportiveness indicated that, while most of the behaviors were perceived as supportive by the majority of patients, a large proportion of the patients indicated that the behaviors were neutral or unsupportive. For instance, 56% of patients reported that having their spouse take over the chores was supportive, while 27% found the behavior neutral, and 18% found the behavior to be unsupportive. Moreover, some behaviors were found to be neutral or unsupportive more than supportive among patients. For instance, encouraging the patient to engage in a hobby was found supportive by 31%, neutral by 57%, and unsupportive by 11%. Also, having the spouse ask if she/he could help in some way was found to be supportive in only 9% of patients, while 17% found it neutral, and 74% found it to be unsupportive. Such a study, although it only examined social support from long-term spouses, provided a clear indication that the level of support patients desire may be as important as the level of support they actually perceive receiving. As such, for the present research, both level of perceived social support (as traditionally measured) and the level of social support satisfaction, as indicated by the discrepancy between desired and perceived social support, were explored and investigated as predictors of self-reported diet, exercise, and medication adherence in patients with hypertension.

## Other Factors as Possible Predictors of Adherence in Hypertension

### Depression and Depressive Symptoms

Depression affects nearly 15 million people in the United States and can include such symptoms as sad mood, feelings of pessimism and helplessness, loss of interest in

enjoyable activities, decreased energy and fatigue, difficulty with memory, insomnia, drastic changes in eating patters, and cravings for salty or sugary foods (American Psychiatric Association, 2000). The National Health and Nutrition Examination Survey I Epidemiologic Follow-up Study (NHANES) followed 2,992 initially normotensive individuals for 7 to 16 years to investigate whether symptoms of anxiety and depression increased the risk of developing hypertension (Jonas et al., 1997). The NHANES follow-up found that high anxiety and depression were independent predictors of hypertension in both Caucasian and African American patients. In addition to being related to the development of hypertension, such depressive symptomology may also impact adherence to the medication, dietary, and exercise recommendations for the treatment of hypertension. Indeed, increasing evidence suggests that both depressive symptoms and major depression may be associated with increased morbidity and mortality from such illnesses as hypertension, diabetes, and heart disease (Carney, Freedland, Eisen, & Rich, 1995). Moreover, research has shown that depression is associated with a 50% increase in medical costs of chronic medical illness, even after controlling for severity of physical illness (Katon, 2003).

Several studies indicate that there are relationships between depression and several adherence variables including fluid restriction in hemodialysis patients (e.g., Friend, Hatchett, Schneider, Wadhwa, 1997; McGee, Rushe, Sheil, & Keogh, 1998), diet adherence in hemodialysis patients (Sensky, Leger, Gilmour, 1996), exercise adherence among older women (Williams & Lord, 1995), exercise adherence among patients with hypercholesterolemia (Lynch, Birk, Weaver, & Gohara, 1992), appointment adherence among breast cancer patients receiving chemotherapy (Ayres, Hoon, Franzoni, &

Matheny, 1994), antiretroviral adherence among patients with HIV (Wagner, Kanouse, Koegel, & Sullivan, 2003), and medication and diet adherence in hypertensive patients (Kim, Han, Hill, Rose, & Roary, 2003). Most such studies suggest a negative relationship between depression and adherence, such that higher levels of depression are related to lower adherence to medical regimens. For instance, in a sample of older women aged 60 to 85, Williams and Lord (1995) found that lower levels of depression predicted a higher likelihood for continued exercise participation after the end of the research trial. In patients with coronary artery disease, Carney et al. (1995) found that patients meeting criteria for depression adhered to their prescribed medication significantly less than similar patients who did not meet the criteria for depression. Among patients with type 1 and 2 diabetes, Ciechanowski et al. (2003) found depressive symptoms were associated with greater diabetes symptom reporting, poorer physical functioning, and less adherence to exercise and diet regimens.

However, only a handful of studies have investigated the relationship between depression and adherence to the anti-hypertensive medical regimen. One such study exploring adherence to prescribed antihypertensive medications utilized structured interviews about psychosocial and behavioral characteristics among 496 hypertensive patients (Wang, Bohn, Knight, Glynn, Mogun, &Avorn, 2002). Using a sophisticated technique of measuring medication adherence over 365-days (i.e., analyzing the quantity of drug(s) dispensed and the days' supply), the percentage of days that patients adhered to their regimen was computed. After controlling for demographic variables (e.g., age, gender, ethnicity) and co-morbid conditions, findings indicated that an increase in depressive symptom severity was significantly associated with lower odds of compliance.

The authors of the study claim this was the first report of a relationship between depressive symptoms and poor compliance with antihypertensive medication (Wang et al., 2002).

In another study of the relationship between depression and adherence to the anti-hypertensive medical regimen, Kim, et al. (2003) used the Center for Epidemiological Studies-- Depression Scale (CES--D) to examine the relationship between depression and adherence to medication and diet in 190 urban, hypertensive, Black men. Although no direct relationship between depression and the level of blood pressure was substantiated by a multivariate analysis, findings of descriptive analyses revealed statistically significant associations among depression, substance use, poor adherence, and poor blood pressure outcomes. Overall, these researchers found that (a) more than one-fourth of the sample presented with clinical depression and (b) level of depression was significantly correlated with poor medication adherence and poor dietary compliance (Kim et al., 2003). Although only a handful of studies corroborate such a relationship between depression and adherence to the anti-hypertensive medical regimen, the authors asserted that their findings demonstrate a need for interventions that address depression as an essential component of care for hypertensive patients. These findings and the assertion as to the importance of addressing depression in the treatment of hypertension provided direct support for the inclusion of depressive symptoms as an exploratory predictor in the present study.

Although much research has indicated a negative relationship between depression and adherence to medical regimens, a limited number of studies have found opposite relationships such that higher levels of depression are found to be related to higher levels

of adherence (e.g., Sensky, Leger, Gilmour, 1996). For instance, Ayres et al. (1994) found that patients with higher depression levels were more likely to keep appointments and adhere to their prescribed chemotherapy regimen than less depressed patients. Lynch et al. (1992) found that patients with greater feelings of depression were more compliant with scheduled exercise sessions utilized in the treatment of hypercholesterolemia. That being said, no studies were found that suggested higher levels of depression were related to increased adherence to the medical regimen among hypertensive patients.

In addition to research finding relationships between depression and adherence, a limited number of past studies have also found an absence of significant relationships between depression and adherence (e.g., Friend et al, 1997; McGee, et al., 1998). In one such study, medication adherence and depressive symptomology was assessed in 101 hypertensive patients (Maguire, Hughes, & McElnay, 2004). The study was conducted in 59 community pharmacies in Northern Ireland and medication adherence was measured by both self-report and medication records received from the participating pharmacies. The findings indicated that adherence was not significantly related to depressive symptomology (Maguire, Hughes, & McElnay, 2004). However, it is important to note that the study was not carried out in the United stated (i.e., the location of the present study) and only 12.9% of the sample was non-adherent, a number drastically lower than the generally accepted non-adherence rate of 60% (JNC-7, 2003).

Another study finding no relationship between depression and hypertension was conducted as part of the Coronary Artery Risk Development in Young Adults (CARDIA) study (Yan, Liu, Matthews, Daviglus, Ferguson, & Kiefe, 2003). The study, which included data from 3308 hypertensive patients, found impatience and hostility were

related to the incidence of hypertension after fifteen years, though depression and other psychosocial factors (e.g., anxiety) were not related to hypertension incidence. Findings were similar for blacks and whites, and were not affected by age, gender, ethnicity, blood pressure at the time of enrollment, or education. Moreover, findings held regardless of the presence of established hypertension risk factors such as obesity, alcohol consumption, and physical inactivity. Although this study did not specifically address adherence to the anti-hypertensive medical regimen, it suggests that, regardless of patients' levels of adherence, depression does not appear to impact the development of hypertension after fifteen years (Yan, Liu, Matthews, Daviglus, Ferguson, & Kiefe, 2003).

As can be seen, the relationship between depression and adherence to the anti-hypertensive medical regimen has been both supported and challenged by past research. Moreover, although recent research is challenging the statistical importance of depression in adherence to the anti-hypertensive medical regimen, past research has asserted that hypertensive patients' depressive symptoms should always be addressed to maximize adherence. Because of the discrepancy among findings from past research, depression was included in the present research as an exploratory predictor and a possible extension to Kanfer's self-regulation theory (Kanfer, 1986; Kanfer & Gaelick-Buys, 1991). To better relate to the existing literature (i.e., Kim et al., 2003), the present study used the CES-D to assess depressive symptoms.

**Family History of Hypertension**

It has been suggested by the Sixth Joint National Committee on Hypertension (JNC-VI, 1997) that blood pressure levels are correlated among family members. Lawler and colleagues (Lawler, Kline, Seabrook, Krishnamoorthy, Anderson, Wilcox, Craig,

Adlin, & Thomas, 1998) found that family history of hypertension doubled the risk that an individual will develop hypertension, independent of other associated factors such as weight, age, and smoking status. In fact, the JNC-VI attributes such correlation to common genetic background, shared environment, and lifestyle habits. Moreover, research shows that family history is a major risk factor of cardiovascular disease in people with hypertension (JNC-VI, 1997). As such, the present study explored whether there is a relationship between family history and self-reported adherence to the anti-hypertensive medical regimen.

**Other Demographic Variables**

Several demographic variables have also been found to be associated with adherence to the three components of the anti-hypertensive medical regimen. In a study of African American patients and Caucasian American patients diagnosed with hypertension, Byrd (2001) found (1) ethnic differences in levels of adherence to each of the three aspects of the anti-hypertensive regimen (i.e., medication taking, modified diet, and exercise adherence) with better medication adherence among African Americans and better diet adherence among Caucasian Americans, (2) gender differences in level of dietary adherence with males evidencing better exercise adherence and females evidencing better medication taking adherence, and (3) age differences in dietary adherence with older patients evidencing better adherence. Similar findings have been reported in other research with hypertensive patients (e.g., Marin-Reyes & Rodriguez-Moran, 2001) as well as in research with patients who have other illnesses, such as diabetes (Karter, Ferrara, Darbinian, Ackerson, & Selby, 2000).

It has also been suggested in the literature that there is a connection between socio-economic status, as measured by such variables as income and work status, and adherence to the medication, diet, and exercise components of the anti-hypertensive medical regimen (e.g., Caldwell, Theisen, Kaunisto, Reddy, Smythe, & Smith, 1983; Rose, Kim, Dennison, & Hill, 2000). For instance, Caldwell et al. (1983) specifically found that poor blood pressure control was associated with longer unemployment and lower income. Because of the limited but significant relationships that have been found between medical regimen adherence and age, gender, ethnicity, and socio-economic status, these relationships were also explored in the present research.

## Conclusions

As can be seen, hypertension is a deadly disease that often goes undiagnosed and, even when diagnosed, is often not controlled by the medical regimen prescribed. The most common medical regimen for treatment of hypertension involves a modified diet, an increase in exercise, and a prescription of some pharmacological therapy. However, the reason for the under-control of hypertension lies not with the specific medical regimen but with the noncompliance of patients to each of the three components of the anti-hypertensive medical regimen. For the present research, Kanfer's Self-Regulation Model (Kanfer & Gaelick-Buys, 1991) was expanded and used to investigate predictors of self-reported adherence to each aspect of the typical anti-hypertensive medical regimen (i.e., medication taking, modified diet, and exercise). Based on the expanded Self-Regulation Model, the present study explored the following four theory-based variables as predictors of self-reported adherence to the anti-hypertensive medical regimen as reported by African American and Caucasian American patients who have hypertension: (1) perceived social

support from family, friends, and significant others; (2) satisfaction with social support from family, friends, and significant others, as indicated by the discrepancy between perceived and desired social support; (3) health-related self-efficacy; and (4) motivation or self-determinism to be healthy and perform the requisite behaviors.

Limited research has investigated these theory-based variables as predictors of adherence to each of the three components of the typical anti-hypertensive medical regimen. Furthermore, no research has examined the relative influence on adherence to each of the three components of the typical anti-hypertensive medical regimen of (a) perceived social support received from family, friends, and significant others and (b) social support satisfaction as indicated by the discrepancy between desired and perceived social support received from family, friends, and significant others. In addition to the theory-based variables from the expanded Self-Regulation Model, depressive symptoms have been shown to be related to adherence with the medical regimens for several diseases, including hypertension. However, the support for depression as a predictor of adherence has been inconsistent and, as such, level of depressive symptoms was included in the present research as an exploratory predictor and as a possible further extension of Kanfer's Self-Regulation Model (Kanfer & Gaelick-Buys, 1991).

## The Present Study

The overarching goal of this research was to investigate motivation to be healthy, perceived behavioral control, and social support as possible predictors of self-reported adherence to the three components of the anti-hypertensive medical regimen (i.e., diet, exercise, and medication taking). A second goal of this research was to specifically investigate how the three investigated adherence variables are influenced by (1)

perceived levels of social support from friends, family, and significant others separately and (2) social support satisfaction, as indicated by the discrepancy between perceived and desired social support from friends, family, and significant others separately. A third goal of this research was to investigate depressive symptoms as exploratory predictors of self-reported adherence to the three components of the anti-hypertensive medical regimen.

The hypotheses set forth in this study were tested separately for each ethnic group included in the present study (i.e., African Americans and Caucasian Americans). The decision to test the research hypotheses by ethnic group is based on the "difference model" research approach proposed by Oyemade and Rosser (1980). According to Oyemade and Rosser (1980) and Jenkins (1989), the traditional "deficit model" research approach typically groups all ethnicities together and enters "ethnicity" as an independent variable. Such research often identifies differences in performance by African Americans and Caucasian Americans and reports lower performance by African Americans and the poor as deficiencies, using Caucasian American middle-class performance standards. Jenkins (1989) noted that such comparisons assume that all ethnic groups have been afforded the same opportunities through life, an assumption that cannot be made for the participants in the present research.

The "difference model" research approach, on the other hand, emphasizes the importance of recognizing cultural differences when investigating the academic, cognitive, and social behavior of African Americans and Caucasian Americans. It suggests performing data analyses separately for participants grouped according to ethnicity and/or other major culture related variables (Oyemade & Rosser, 1980). Thus,

in the present study, all hypotheses are proposed for both African American and Caucasian American participants and all data analyses to test these hypotheses were conducted on African Americans and Caucasian Americans separately.

Though a more detailed description of the study design will be provided in the following chapter, the hypotheses that were tested in the present research are set forth below:

1. Among African American (AA) and Caucasian American (CA) patients with hypertension, a significant and positive correlation will exist between each of the three measures of self-reported adherence to the anti-hypertensive medical regimen (i.e., medication taking adherence, modified diet adherence, and exercise adherence) and general health-based self-efficacy.
2. Among AA and CA patients with hypertension, a significant and positive correlation will exist between self-reported adherence to each of the three components of the anti-hypertensive medical regimen and motivation (self-determinism) to engage in health-promoting behaviors (i.e., health motivation).
3. Among AA and CA patients with hypertension, a significant and positive correlation will exist between self-reported adherence to each of the three components of the anti-hypertensive medical regimen and (a) perceived social support from family, (b) perceived social support from friends, and (c) perceived social support from significant others.
4. Among AA and CA patients with hypertension, a significant and positive correlation will exist between self-reported adherence to each of the three

components of the anti-hypertensive medical regimen and the levels of social support satisfaction, as indicated by the discrepancy between desired and perceived social support received specifically from (a) family, (b) friends, and (c) significant others.

5. Among AA and CA patients with hypertension, self-reported adherence to taking prescribed anti-hypertensive medication – an aspect of the anti-hypertensive medical regimen – will be predicted by (a) level of health-based self-efficacy, (b) level of motivation to engage in health-promoting behaviors, (c) levels of perceived social support from family, friends, and significant others separately, and (d) levels of social support satisfaction in relation to friends, family, and significant others separately.
6. Among AA and CA patients with hypertension, self-reported adherence to a prescribed modified anti-hypertensive diet – an aspect of the anti-hypertensive medical regimen – will be predicted by (a) level of health-based self-efficacy, (b) level of motivation to engage in health-promoting behaviors, (c) levels of perceived social support from family, friends, and significant others separately, and (d) levels of social support satisfaction in relation to friends, family, and significant others separately.
7. Among AA and CA patients with hypertension, self-reported adherence to prescribed exercise – an aspect of the anti-hypertensive medical regimen – will be predicted by (a) level of health-based self-efficacy, (b) level of motivation to engage in health-promoting behaviors, (c) levels of perceived social support from family, friends, and significant others separately, and (d)

levels of social support satisfaction in relation to friends, family, and significant others separately.

8. Among AA and CA patients with hypertension, level of satisfaction with social support from family will be a stronger predictor of each of the investigated adherence variables (medication taking adherence, modified diet adherence, and exercise adherence) than perceived level of social support from family.
9. Among AA and CA patients with hypertension, level of satisfaction with social support from friends will be a stronger predictor of each of the investigated adherence variables (medication taking adherence, modified diet adherence, and exercise adherence) than perceived level of social support from friends.
10. Among AA and CA patients with hypertension, level of satisfaction with social support from significant others will be a stronger predictor of each of the investigated adherence variables (medication taking adherence, modified diet adherence, and exercise adherence) than perceived level of social support from significant others.

In addition to stated hypotheses, three research questions will be explored:

1. Among AA and CA patients with hypertension, is having or not having a family history of hypertension and is the number of family members with hypertension significantly associated with self-reported levels of adherence to each of the three aspects of the anti-hypertensive medical regimen (i.e., medication taking adherence, diet adherence, and exercise adherence)?

2. Among AA and CA patients with hypertension, are there significant differences in self-reported levels of adherence to each of the three aspects of the anti-hypertensive medical regimen in association with age, gender, and ethnicity?
3. Among AA and CA patients with hypertension, will levels of depressive symptoms predict self-reported levels of adherence to each of the three aspects of the anti-hypertensive medical regimen and will the inclusion of depressive symptoms further enhance the prediction of adherence by the expanded self-regulation theory-based model?

# CHAPTER 3
# METHODS

## Participants

Participants were recruited exclusively at the Primary Internal Medicine Care Center at the University of Florida Health Science Center in Jacksonville, Florida. The clinic medical director, also a physician at the clinic, agreed to assist with the data collection process. This physician was asked to identify approximately 400 patients who met the inclusion criteria for participating in this research study as being: (1) over 18 years of age; (2) cognitively competent (i.e., able to read and write sufficiently enough to complete the research questionnaire packet, as judged by the physician); (3) diagnosed as hypertensive by their present physician at least three months prior to completing the inventories, and (4) either Caucasian American or African American.

In total, 360 patients were invited to participate in the research study over a period of six months. Of these patients, 193 returned their packets (53.6%). Of the returned packets, 16 (8.3%) were returned blank, five (2.6%) were returned with only limited demographic data completed (i.e., no study scales completed), three (1.6%) were returned with incomplete data (e.g., only three questions in the entire packet or only the first of all assessments completed), and one (0.5%) was returned from a patient identifying as Native American. As such, data from a total of 168 patients were used in the final research sample, resulting in a usable return rate of 46.7%.

As can be seen in Table 3.1, the final participant sample consisted of 97 (57.7%) African Americans and 71 (42.3%) Caucasian Americans. Specifically, the final sample

was composed of 24 (14.3%) African American males, 71 (43.3%) African American females, 25 (14.9%) Caucasian American males, and 46 (27.4%) Caucasian American females.

Table 3-1

Distribution of Gender by Ethnicity: Number, % of Ethnicity, % of Total Participants

| | African American | | | Caucasian American | | | Totals | |
|---|---|---|---|---|---|---|---|---|
| | n | % AA | % T | n | % CA | % T | n | %T |
| Male | 24 | 24.7 | 14.3 | 25 | 35.2 | 14.9 | 49 | 29.2 |
| Female | 73 | 75.3 | 43.5 | 46 | 64.8 | 27.4 | 119 | 70.8 |
| Totals | 97 | 100.0 | 57.7 | 71 | 100.0 | 42.3 | 168 | 100.0 |

Note: "%AA" and "%CA" indicate the percent based on the ethnicity total with "AA" being African American and "CA" being Caucasian American. "%T" indicates the percent of the total number of participants (n = 168).

In terms of participants' ages, shown in Table 3.2, the majority of participants were in the 50 – 59 (n=51, 30.4%) and 60 – 69 (n=53, 31.6%) age groups, with the minority of patients being younger than age 39 (n=5, 3%) and older than age 80 (n=5, 3%). The mean age for all participants was 59.59 years (sd = 11.29). A t-test indicated that the mean age of the African American participants (M=58.24 years, sd = 12.01) was not significantly different than that of the Caucasian American participants (M = 61.44, sd = 10.01; t = -1.827, p = .069). In addition, a t-test indicated that the mean age of male participants (M = 58.61, sd = 11.55) was not significantly different than that of female participants (M = 59.99, sd = 11.20; t = -719, p = .473).

Table 3-2

Distribution of Age by Ethnicity: Number, % of Ethnicity, % of Total Participants

| | African American | | | Caucasian American | | | Totals | |
|---|---|---|---|---|---|---|---|---|
| | n | % AA | % T | n | % CA | % T | n | %T |
| 20 - 29 | 1 | 1.0 | 0.6 | 0 | 0.0 | 0.0 | 1 | 0.6 |
| 30 - 39 | 2 | 2.1 | 1.2 | 2 | 2.8 | 1.2 | 4 | 2.4 |
| 40 - 49 | 17 | 17.5 | 10.1 | 6 | 8.5 | 3.6 | 23 | 13.7 |
| 50 - 59 | 33 | 34.0 | 19.6 | 18 | 25.4 | 10.7 | 51 | 30.4 |
| 60 - 69 | 23 | 23.7 | 13.7 | 30 | 42.3 | 17.9 | 53 | 31.6 |
| 70 - 79 | 17 | 17.5 | 10.1 | 14 | 19.7 | 8.3 | 31 | 18.5 |
| 80 - 88 | 3 | 3.1 | 1.8 | 1 | 1.4 | 0.6 | 4 | 2.4 |
| 89 or older | 1 | 1.0 | 0.6 | 0 | 0.0 | 0.0 | 1 | 0.6 |
| Totals | 97 | 100.0 | 57.7 | 71 | 100.0 | 42.3 | 168 | 100.0 |

Note: "%AA" and "%CA" indicate the percent based on the ethnicity total with "AA" being African American and "CA" being Caucasian American. "%T" indicates the percent of the total number of participants (n = 168).

In terms of socio-economic status, as shown in Table 3.3 below, most participants reported a household income less than $10,000 (n=64, 38.1%) or between $10,001 and $15,000 (n=35, 20.8%). The vast majority of patients (n=146, 86.9%) reported making less than $25,000, while a relatively small number of patients reported a household income greater than $40,000 (n=8, 4.8%) or between $35,001 and $40,000 (n=3, 1.8%). Crossbreak analysis (Chi Square) indicated no significant differences between the distributions of socio-economic status among African American and Caucasian American patient groups ($X^2$=12.174, p=.095).

Table 3-3

Distribution of Income by Ethnicity: Number, % of Ethnicity, % of Total Participants

| | African American | | | Caucasian American | | | Totals | |
|---|---|---|---|---|---|---|---|---|
| | n | % AA | % T | n | % CA | % T | n | %T |
| 0 – 10000 | 36 | 37.1 | 21.4 | 28 | 39.4 | 16.7 | 64 | 38.1 |
| 10001 – 15000 | 20 | 20.6 | 11.9 | 15 | 21.1 | 8.9 | 35 | 20.8 |
| 15001 – 20000 | 19 | 19.6 | 11.3 | 11 | 15.5 | 6.5 | 30 | 17.9 |
| 20001 – 25000 | 8 | 8.2 | 4.8 | 9 | 12.7 | 5.4 | 17 | 10.1 |
| 25001 – 30000 | 2 | 2.1 | 1.2 | 2 | 2.8 | 1.2 | 4 | 2.4 |
| 30001 – 35000 | 7 | 7.2 | 4.2 | 0 | 0.0 | 0.0 | 7 | 4.2 |
| 35001 – 40000 | 3 | 3.1 | 1.8 | 0 | 0.0 | 0.0 | 3 | 1.8 |
| 40001 or more | 2 | 2.1 | 1.2 | 6 | 8.5 | 3.6 | 8 | 4.8 |
| Totals | 97 | 100.0 | 57.7 | 71 | 100.0 | 42.3 | 168 | 100.0 |

Note: "%AA" and "%CA" indicate the percent based on the ethnicity total with "AA" being African American and "CA" being Caucasian American. "%T" indicates the percent of the total number of participants (n = 168).

All 168 participants (100%) indicated that medication was a component of their anti-hypertensive treatment. Because patients are likely prescribed more than just hypertensive medication, the total number of all prescribed medications was used to indicate the complexity of the overall medication regimen. A t-test indicated that, on average, African American patients did not report taking significantly more medications (M=5.35, sd=3.13) than Caucasian American patients (M=6.21, sd=2.76; t = -1.851, p=.066). In addition to medicine regimen complexity, asymptomology has also been linked to non-adherence. In the present sample, 44 (45.4%) African American participants

and 42 (59.2%) Caucasian American participants reported having no symptoms which they attribute to their high blood pressure.

Participants also provided data on their friends and family with hypertension, an indication of exposure to the illness in one's social circle. Eighty-two (84.5%) African American participants and 44 (62%) Caucasian American participants reported having family or friends with hypertension. Moreover, a t-test indicated that, on average, African American patients reported knowing significantly more family and friends with hypertension (M=3.63 people, sd=3.85) than did Caucasian American patients (M=1.96 people, sd=2.59; t = 3.170, p = .002). Such a finding is not surprising, given the large discrepancy in hypertension rates between African Americans and Caucasian Americans.

Table 3.4 presents the distribution of years with hypertension across ethnicity. Crossbreak analysis (Chi Square) indicated no significant difference between the distributions of years with hypertension among African American and Caucasian American participant groups ($X^2$=3.670, p=.055). It is notable, however, that 48 (49.5%) African American patients and 28 (39.4%) Caucasian American patients reported being diagnosed with hypertension more than 10 years prior to this study. Moreover, the vast majority of patients (n=139, 82.7%) reported a diagnosis more than one year before data collection, thus suggesting that participants have had sufficient opportunity to implement lifestyle changes and have likely developed a pattern of adherence/nonadherence.

Participants received no compensation for their participation in this research. Numerous measures were taken to protect the confidentiality of the participating patients. Moreover, all participants and data were treated in accordance with the Health Insurance

Portability and Accountability Act (HIPAA) and "The Ethical Standards and Code of Conduct for Psychologists" as spelled out by the American Psychological Association.

Table 3-4

Distribution of Years with Hypertension by Ethnicity

| | African American | | | Caucasian American | | | Totals | |
|---|---|---|---|---|---|---|---|---|
| | n | % AA | % T | n | % CA | % T | n | %T |
| 0 – 1 Years | 13 | 13.4 | 7.7 | 16 | 22.5 | 9.5 | 29 | 17.3 |
| 2 – 3 Years | 5 | 5.2 | 3.0 | 9 | 12.7 | 5.4 | 14 | 8.3 |
| 4 – 5 Years | 16 | 16.5 | 9.5 | 9 | 12.7 | 5.4 | 25 | 14.9 |
| 6 – 7 Years | 12 | 12.4 | 7.1 | 7 | 9.9 | 4.2 | 19 | 11.3 |
| 8 – 9 Years | 3 | 3.1 | 1.8 | 2 | 2.8 | 1.2 | 5 | 3.0 |
| 10 plus years | 48 | 49.5 | 28.6 | 28 | 39.4 | 16.7 | 76 | 45.2 |
| Totals | 97 | 100.0 | 57.7 | 71 | 100.0 | 42.3 | 168 | 100.0 |

Note: "%AA" and "%CA" indicate the percent based on the ethnicity total with "AA" being African American and "CA" being Caucasian American. "%T" indicates the percent of the total number of participants (n = 168).

## Assessment Packet Measures

All participants that chose to participate were presented with an assessment packet that consisted of ten questionnaires. Following is a discussion of each of these questionnaires.

### Demographic and Other Information Questionnaire

This questionnaire was completed by each patient participant to obtain demographic and background information including the following: age, gender, ethnicity, income, other illnesses for which patients are receiving treatment recommendations, length

of time since diagnosis of high blood pressure, and hypertension symptomotology. Items relating to the research questions were also incorporated in the demographic questionnaire (i.e., a question as to whether or not patients have a family history of hypertension and a question asking which and how many family members are/were known to be hypertensive). The demographic questionnaire was placed last in the assessment packet in order to decrease the influence of the demographic questions on responses to other study questionnaires.

**Self-Rated Abilities for Health Practices Scale (SRAHPS)**

This scale (Becker, Stuifbergen, Soo Oh, & Hall, 1993) was designed as a measure of general health-based self-efficacy. The instrument consists of 28 items that assess overall health-based self-efficacy as well as four separate subscales on exercise, well-being, nutrition, and other health practices. For each item, the respondent is asked to rate the degree of confidence she/he has in performing certain behaviors (e.g., "find health foods that are within my budget", "brush my teeth regularly", "do exercises that are good for me", and "use medication correctly."). This confidence is rated on a seven-point Likert-type scale with polar responses labeled "Not at All" and "Completely," while the other responses are not labeled. As such, scores on this instrument can range from 28 to 196, where lower scores indicate lower self-efficacy and higher scores indicate more self-efficacy to perform health behaviors. As mentioned in the previous chapter, such a general measure of health-related self-efficacy provided ample information and avoided the necessity for specific efficacy scales for each of the three health-behaviors being investigated. The internal consistency was reported by the original authors as .92 for the total score and .92, .81, .90, and .86 for the four subscales

of exercise, nutrition, psychological well being, and responsible health practices, respectively. Studach (2000) supported the internal consistency of this instrument, generating a Chronbach's alpha of .94. Becker and colleagues (1993) supported the construct validity of the scale by showing that it related significantly and positively to Sherrer's General Self-Efficacy Scale (Sherrer, Maddux, Mercandante, et al., 1982) and Walker's Health-Promoting Lifestyle Profile (Walker, Sechrist, & Pender, 1987). The internal consistency of the SRAHPS in the present research was .9562 for the total scale and .9519, .8395, .9301, and .8510 for the four subscales of exercise, nutrition, psychological well being, and responsible health practices, respectively.

**Health Self-Determinism Index (HDSI)**

The Health Self-Determinism Index (HSDI; Cox, 1985; Cox, Cowell, Marion, & Miller, 1990; Cox, Miller, & Mull, 1987) was developed to be a psychometric evaluation of motivation in relation to health behavior. The HSDI has been validated in two separate studies by the original authors (Cox, 1985; Cox, Miller, & Mull, 1987) as well as in other studies that used the HSDI in their research design (e.g., Loeb, O'Neill, & Gueldner, 2001). Over seven-hundred American adult participants have been used in the validation of the HSDI. In all instances, the multidimensionality of the HSDI was shown to consist of four subscales: (1) self-determined health judgments; (2) self-determined health behavior; (3) perceived competency in health matters; and (4) internal-external cue responsiveness. The original study (Cox, 1985) found the internal consistency of the HSDI total scale to be .84, with the consistency of the subscales being (respectively, as listed above) .75, .75, .67, and .69. The scale has been expanded for use with children as well as adults (Cox, Cowell, Marion, & Miller, 1990), though only the adult version will

be utilized in the present research. In order to complete the questionnaire, participants are presented with 17 statements regarding health self-determinism (e.g., "I need more willpower", "I do not take care of my health as well as others", "I know what I am doing when it comes to taking care of my health", and "Whatever a doctor suggests is okay."). Participants respond to each statement using a five-point Likert-scale with one being "Strongly disagree" and five being "Strongly agree". Scores on the HSDI range from 17 to 85, with higher scores indicating higher health-related motivation and lower scores indicating lower health-related motivation. Overall, the HSDI has been shown to be effective in identifying the construct of health motivation. For the present research sample, the internal consistency of the total scale was found to be .6499. Because this internal consistency did not surpass .80 and because the participant sample is relatively homogeneous, Cox (personal communication, March 23, 2003) cautions against splitting the measure into subscale scores. As such, the subscales will not be utilized in the present research.

**Multi-Dimensional Scale of Perceived Social Support (MSPSS)**

The MSPSS assesses individuals' perceptions of social support received from three separate sources: family, friends, and a significant other – each of which will be used in the present research. Although support from family and friends is common in social support literature, the inclusion of support from a significant other is a unique aspect of the MSPSS. Inclusion of significant other support makes the MSPSS particularly relevant to a study with hypertensive patients, as they are often older and typically live or are involved with partners or significant others. The MSPSS is a 12-item assessment utilizing a 7-point Likert-type response format where "1" is "very strongly

disagree" and "7" is " very strongly agree." Each of the three subscales (i.e., family, friends, and significant other) is assessed with four individual MSPSS items. Items include: "My family really tries to help me" (family subscale); "I have friends with whom I can share my joys and sorrows" (friends subscale); and "There is a special person who is around when I am in need" (significant other subscale). Scores on each subscale range from four to 28, with higher scores indicating a higher level of perceived social support received from the respective subscale (i.e., family, friends, significant other). The MSPSS was originally developed and theoretically grounded by Zimet, Dahlem, Zimet, and Farley (2000) and extended for use with adolescents by Canty-Mitchell and Zimet (2000). The authors of the scale suggest excellent internal consistency, with alphas of .91 for the total scale and .90 to .95 for the subscales. The authors have also shown good factorial, concurrent, and construct validity (Zimet, Dahlem, Zimet, & Farley, 1988). The internal consistency of the MSPSS in the present research was .9606 for the total scale and .9659, .9450, and .9325 for the three perceived support subscales of family, friends, and significant others, respectively.

In order to assess the degree to which participants desire the specific types of social support presented in the MSPSS, each question was modified to statements beginning with "I want" and participants were asked to rate the new statements on a 7-point Likert-scale with "1" being "very strongly do not want" and "7" being "very strongly want". The 12 items were presented in the same order as in the unmodified MSPSS and the composition of the three subscales (i.e., family, friends, and significant other) was maintained. Examples of modified items are as follows: "I want my family to really try and help me" (family subscale); "I want friends with whom I can share my joys

and sorrows" (friends subscale); and "I want a special person who is around when I am in need" (significant other subscale). Because of the nature and purpose of the modified questionnaire, each participant was presented with the modified MSPSS directly after the unmodified MSPSS. The instructions for the modified version of the MSPSS explained how it differed from the just completed MSPSS and requested that the modified version be completed without taking into account how they answered the original version. Specifically, the instructions were presented as follows: "We are interested in how much you DESIRE or WANT the following statements from your friends, family, and/or partners. The statements are similar to the previous survey, but please do not think about your answers on the previous survey when answering this one. Read each statement carefully. Indicate how you feel about each statement by circling the appropriate number." The internal consistency of the modified MSPSS in the present research was .9306 for the total scale and .8925, .9206, and .8949 for the three desired support subscales of family, friends, and significant others, respectively.

In order to assess social support satisfaction, as indicated by the discrepancy between perceived social support perceived and social support desired, each original question was compared to the modified counterpart (i.e., question one on the original MSPSS was compared to question one on the modified version). In each comparison, the absolute value of the difference between each perceived social support rating and each related desired social support rating was obtained. For example, if the perceived social support rating was "1" and the desired social support rating was "7", then the discrepancy would be the absolute value of "1" minus "7", which is "6." The discrepancy scores can range from "0" (indicating a match between perceived social support and desired social

support – no discrepancy) to "6" (indicating the highest level of discrepancy). Each participant had four discrepancy scores: (1) a total discrepancy score indicating the overall level of social support satisfaction; (2) a family support discrepancy score indicated level of family support satisfaction; (3) a social support from friends discrepancy score indicating level of friend support satisfaction; and (4) a significant other support discrepancy score indicating level of other support satisfaction. Each subscore was used in data analyses involving discrepancy scores. The internal consistency of the social support satisfaction scale scores in the present research were .9447 for the total scale and .8703, .8937, and .9069 for the three subscales of family, friends, and significant others, respectively.

**Center for Epidemiologic Studies—Depression Scale (CES-D)**

The CES-D (Radloff, 1997) was developed in 1977 by researchers at the National Institutes in Mental Health to measure multiple dimensions of affective symptomatology and current depressive symptoms within the last week. That being said, the scale was not developed to make a diagnosis, rather its purpose is to estimate symptom prevalence for clinical screening and research efforts (Engdahl, Page, & Miller, 1991; Radloff, 1997). The CES-D has 20-items which were pooled from several validated depression measures (e.g., Beck, Ward, Mendelson, Mock, & Erbaugh, 1961; Radloff, 1997). Though several short forms exist (e.g., Boston form, Iowa Form, CESD-10), past research expresses concern that the short forms may not be as valid and reliable as the original 20-item version (Carpenter, et al., 1998).

To complete the scale, participants are asked to rate how often they have had specific feelings in the past week (e.g., "I felt that I was just as good as other people," "I

felt depressed," "I felt fearful," "I did not enjoy life"). Each feeling is rated on a four-point likert-scale with "0" being "Rarely or none of the time (<1 day)", "1" being "Some or a little of the time (1-2 days)," "2" being "Occasionally or a moderate amount of the time (3-4 days)," and "3" being "Most or all of the time (5-7 days)." Four items are reversed scored, and represent positive affect. Overall, scores on this scale range from zero to 60, with higher scores representing higher levels of depressive symptomatology. As a screening tool, scores above 15 suggest mild to moderate depression and scores above 22 suggest the possibility of major depression. In the National Health and Nutrition Examination Survey (HANES), a national sample of 6,931 adults, the scale produced a mean score of 8.64 (Himmelfarb & Murrell, 1983). Although not mandatory, the scale can be separated into four factors: 1) depressive affect (seven items); 2) somatic symptoms (seven items); 3) positive affect (four items); and 4) interpersonal relations (two items).

The CES-D has been shown to have high internal consistency, ranging between 0.83 and 0.90 in past reliability studies (Hann, Winter, & Jacobsen, 1999; Himmelfarb & Murrell, 1983; Radloff, 1997). It has been shown to have test-retest reliability of r=0.51 after 2.5 weeks (Hann, Winter, & Jacobsen, 1999), 0.67 after four weeks, 0.59 after 8 weeks, and 0.49 after one year (Radloff, 1997). The scale has consistently shown good criterion validity when measured against such measures as the Diagnostic Interview Schedule (Beekman, et al., 1997), the Hospital Anxiety and Depression Scale (Beekman, et al., 1997), the Profile of Mood State Fatigue Scale (POMS-F; r=0.54; Hann, Winter, & Jacobsen, 1999), the State-Trait Anxiety Inventory (STAI-S; r=0.65; Hann, Winter, & Jacobsen, 1999), the Rockliff Depression Rating Scale (Radloff, 1997), the Raskin

Depression Rating Scale (r=0.54; Radloff, 1997), and the Hamilton Rating Scale (r=.69; Radloff, 1997). The scale has also been shown to have adequate discriminant validity when measured against the Bradburn Positive Affect scale (r= -0.55; Radloff, 1997). The internal consistency of the CES-D in the present research was .9530 for the total scale and .8882, .8425, .8624, and .8445 for the four subscales of depressive affect, somatic symptoms, positive affect, and interpersonal relations, respectively.

**Leisure-Time Exercise Scale (LTES: Exercise Adherence)**

Exercise adherence was assessed with a self-report measure as the present study did not have the means to assess exercise behavior with in-vivo assessment techniques. Exercise adherence is not commonly assessed with self-report measures and there is little research investigating exercise adherence among hypertensive patients with an acceptable self-report scale. However, though not specific to hypertension, past research has shown that exercise behavior can be adequately assessed through the use of self-report measures (Jacobs, Ainsworth, Hartman, & Leon, 1993). As such, the present study utilized the LTES (Godin, Jobin, & Bouillon, 1986), which is a self-report measure designed to measure participants' engagement in exercises that are strenuous, moderate, or mild.

Measuring adherence to the exercise component of the anti-hypertensive medical regimen is complicated by the fact that there is no specific amount or type of exercise recommended to patients, as the goal is only to increase physical activity. The LTES helps alleviate this complication as it provides a measure to assess merely whether patients are exercising while also allowing for the added exploration as to the type and amount of exercise they are engaging in. Moreover, although the measure is not specific to hypertension, it has been shown to have concurrent validity with values of body fat,

maximum oxygen intake, and muscular endurance. Godin et al. (1986) also showed the LTES to have a two-week test-retest reliability of 0.64.

To complete the scale, participants read the description of each level of exercise and then respond with how many times per week they exercise at the specified level for 20 minutes or more. There are three levels of exercise presented in the LTES (i.e., strenuous, moderate, and mild) – each of which is defined and examples of such exercise given [e.g., "Moderate exercise: not exhausting, light sweating (e.g., fast walking, baseball, tennis, easy bicycling, volleyball, badminton, easy swimming, popular folk dancing)"). The LTES is scored by weighting the scores for each level of exercise, which is done by multiplying the reported number of times engaged in mild exercise by one, by two for moderate exercise, and by three for strenuous exercise. The lowest possible score on the LTES is "0" (indicating no exercise for more than 20 minutes at a time); there is no upper limit, as there is no forced choice responses. The higher a patient's score, the higher the level of exercise in which they participated.

**Diet Adherence Scale (DAS)**

Objective methods for documenting and evaluating dietary adherence can be invasive and cumbersome for participants because the procedures may require collection of blood, urine, or stool. Subjective methods of measuring dietary adherence rely on oral and written self-reports. These methods are inherently limited because they rely on participant's honesty and accuracy in reporting. However, these methods have the advantage of being physiologically noninvasive and, therefore, more acceptable to many participants. Research has shown that, generally, anonymous measures of dietary adherence are comparable to the more invasive techniques of assessing adherence

(Windhauser, Evans, McCullough, Swain, Lin, Hoben, Plaisted, Karanja, & Vollmer, 1999). However, aside from questionnaires assessing only sodium intake, there are no acceptable questionnaires exploring adherence to the multiple dietary recommendations often given to hypertensive patients. Namely, no adherence measure assesses lowering sodium, reducing alcohol, reducing fat intake, and increasing potassium. As such, for the present study, questionnaire items were adapted from an adherence measure developed by Williams (1979).

The Williams (1979) inventory includes assessment of non-dietary variables that are not pertinent to the present research as well as specific items measuring adherence to the dietary recommendations of an anti-hypertensive medical regimen. The dietary adherence sub-scale will be used for the present research. Williams (1979) reported that the sub-scale had adequate alternate-form reliability as well as content validity. Questions included in the modified scale for the present research include questions such as: “Do you add salt to your food at the table?”, “Do you eat at fast food restaurants?”, Do you eat vegetables with meals?”, “Do you smoke cigarettes or cigars,” and “Do drink cocktails, wine, or beer before or after meals?”. Items are answered on a five-point Likert-type scale with “1” being “Almost Always” and “5” being “Almost Never”. Scores range from 13 to 65, with higher scores indicating better compliance to the typical dietary recommendations of an anti-hypertensive medical regimen. For the present research, the internal consistency of the DAS was found to be .5308.

**Morisky Medication Adherence Scale (MMA)**

This study will use self-report assessments of patient medication adherence instead of more expensive and cumbersome approaches such as collateral and

physiological measures. Self-report drug therapy adherence has repeatedly been shown to be comparable to other measures of adherence, such as pill-count, appointment keeping, pharmacy dispensing records, and other physiological measures (Choo et al., 1999; DiMatteo et al., 1993; Shaw et al., 1995; Sherbourne et al., 1992; Stephenson, Rowe, Haynes, 1993). As such, the present study will measure adherence to taking the medication recommended for the anti-hypertensive medical regimen with the four-item Morisky Medication Adherence Scale (MMA; Morisky, Green, & Levine, 1986).

The MMA was first designed as a 5-item scale measuring medication-taking behavior in outpatients being treated for high blood pressure (Green, Levine, & Deeds, 1975) but was later revised to the 4-item measure used in the present study (Morisky, Green, & Levine, 1986). The MMA uses strategic wording, through a focus on common ways that patients experience drug omissions, to help elicit accurate disclosures of nonadherence. The four questions used in the scale are: "Do you ever forget to take your medicine?"; "Are you careless at times about taking your medicine?"; "When you feel better do you sometimes stop taking your medicine?"; "Sometimes if you feel worse when you take the medicine, do you stop taking it?". Scores range from 0 to 4, where affirmative answers get no score, with a higher score representing a higher level of adherence. The scale has been found to have an internal consistency of 0.61 as measured by Cronbach's alpha reliability method. Subsequent work with the self-report compliance measure on a larger population suggests that it is easily implemented, maintains reliability, and demonstrates concurrent and predictive validity with regard to blood pressure control (Morisky et al., 1985). For the present research, the internal consistency of the MMA was found to be .6220.

**Supplemental Medication Adherence Scale (SMAS)**

In addition to the medication adherence questions from the Morisky scale discussed above, several questions were added to provide a more comprehensive measurement of medication adherence among patient participants. The Medical Outcomes Study (MOS; DiMatteo et al., 1993; Sherbourne et al., 1992), as discussed in the previous chapter, measured general adherence to medical regimens with a 5-question measure and measured specific adherence to medical advice with a 15-item measure. Because of the various diseases that the MOS focused upon (e.g., diabetes, hypertension, congestive heart failure), only a limited number of questions from the MOS measures are pertinent to the present study. As such, only four questions from the MOS general adherence measure were used as a supplemental medication adherence scale in this research, though they were slightly modified to relate specifically to medication adherence. Participants were provided with the following instructions for answering the questions: "How often was <u>each</u> of the following statements TRUE for you during the <u>past four (4) weeks</u>? Bubble in only one answer for each statement." The questions adapted from the MOS measure are as follows: (1) "I had a hard time taking my medicine as my doctor suggested…", (2) "I followed my doctor's suggestions about my medicine exactly…", (3) "I was unable to do what was necessary to take my medicine…", and (4) "I found it easy to take my medicine as my doctor suggested...". To obtain an adherence score from these questions, items one and three were reverse scored and responses to the four questions were averaged. Because of the conceptual relationship between the SMAS and the Morisky Medication Adherence Scale, a high correlation between the two scales will indicate they are measuring the same construct. As such, if a high correlation exists,

the two scales will be combined to create a measure of general medication adherence. For the present research, the internal consistency of the SMAS was found to be .6419.

**Marlowe-Crowne Social Desirability Index – Short Form**

This scale (MCSDS; Crowne & Marlowe, 1960) was given to all patients in order to assess their tendency to give socially desirable answers to questions rather than truthful responses. Originally, the Marlow-Crowne consisted of 33 items to which participants would answer either 'true' or 'false'. A short-form of the MCSD has been created which consists of only 20 true/false items and correlates .98 with the original 33 item long-form. Retained in the short-form are items such as "I can remember 'playing sick' to get out of something" and "There have been occasions when I felt like smashing things." Because the items consist of common behaviors and feelings that are either socially appropriate or socially unacceptable, those who are answering in a socially desirable way will, theoretically, not 'admit' to the negative behaviors and feelings and will endorse more positive behaviors and feelings. As such, individuals receive one point for endorsing uncommonly positive behaviors and feelings and one point for denying common negative behaviors and feelings. This results in a maximum possible score of 20 points on the short-form, where higher scores indicate a more socially desirable response set. In terms of reliability, Fraboni and Cooper (1989) have found a .80 to .84 test-retest reliability for adults. For the present research, the internal consistency of the MCSDS was found to be .8154.

## Procedures

The first stage of the present study was to recruit primary care physicians and hypertension clinics to assess their willingness to assist with data collection. Eighteen

primary care physicians were approached, all of whom declined to assist with the research, citing recent HIPAA changes and the more stringent controls over patient data. Because of the importance of adherence research with hypertensive patients, the Chief of Medicine Service at the University of Florida Health Science Center in Jacksonville and the director of the University of Florida Internal Medicine Clinic in Jacksonville both agreed to assist with the collection of data. As such, all data for this study was collected from patients attending the UF Internal Medicine Clinic in Jacksonville, Florida, with the assistance of 7 physicians and 6 nurses at the clinic. The UF Internal Medicine Clinic in Jacksonville serves approximately 7000 patients, of which 65% are females and 35% are males. The ethnic composition of patients served by the clinic includes approximately 59% African Americans, 35% Caucasian Americans, 0.01% Hispanic Americans, and 5% other ethnicities. In addition, 41% has charity or Medicaid insurance, 38% has Medicare, and 18% has managed care.

Those physicians and nurses assisting with the collection of data were asked by the Principle Investigator to identify patients meeting recruitment criteria described at the beginning of this chapter. In order to maximize the confidentiality of patients providing data for this research, questionnaire packets and all materials were hand delivered by the identifying physician or nurse to each potential participant during a routine healthcare visit at the clinic. Because the packets were not mailed, they were given to each participant in a pre-addressed and pre-stamped envelope for the return of completed packets to the Principle Investigator. Each packet contained a letter from the clinic director on clinic letterhead, a letter from the principal investigator on official letterhead, and a stapled packet of questionnaires.

The physician's cover letter (Appendix D) explicitly provided the following information: how the patient was identified for research participation, the importance of the described research for society, methods being implemented to ensure confidentiality of data, and a statement indicating that the researchers will not communicate to the physician whether or not the patient agreed to participate. The letter also described the purpose of the research as being to determine factors that might influence whether or not patients do what their doctors suggest for the treatment of high blood pressure. The letter also requested that, should the patient decide not to complete the questionnaire packet, the uncompleted research packet and envelope be returned to the physician or nurse who gave it to them or, alternatively, discard the packet. If patients knew others who might like to receive the packet, the physician's letter encouraged the patient to ask their physician or nurse for additional packets or invitation for their friends or family who expressed interest (See Appendix E). No postcards or additional packets were given out during the data collection.

Should the patient have agreed to participate, the physician's cover letter instructed them to read the letter from the principle investigator (PI), which was inserted in the packet after the physician's letter. The PI letter included information about the research, a request for the patient's participation, and instructions for participating in the research (See Appendix F). This cover letter replaced the traditional informed consent by including the required information that is typically found in an Informed Consent Form. Such a method of informed consent meant that patients were not required to sign any document to indicate their consent, as patients who return the completed questionnaire packet assumes consent, effectively eliminating the requirement for documentation of informed consent and ensuring anonymity of patient data.

The stapled set of questionnaires, placed after the two aforementioned letters in the research packet, consisted of a series of assessments placed in random order to prevent order effects, each with its own individual instructions as to how to answer the specific questions. There were two exceptions to the random ordering of questionnaires. First, the desired social support measure was always presented directly after the perceived social support measure. Second, the social desirability scale was always presented as the second to last questionnaire and the demographic questionnaire was always placed last to prevent possible priming or biasing of the responses to other questionnaires. Patients were reminded throughout the study (in the instructions to each questionnaire) that her/his answers would remain completely confidential and that no communication would take place about her/him between the researcher and the patient's physician.

It is anticipated that completing the questionnaires took between 20 and 40 minutes. After completing the questionnaires, patients were instructed to seal the stapled packet into the provided pre-addressed and pre-stamped envelope for return to the principle investigator. Alternatively, patients were given the option of giving the sealed envelope to the recruiting physician or nurse. Of the 193 packets returned, 21% were returned to the recruiting physician or nurse and 79% were returned through the mail. Of the unusable packets received, 100% were received through the mail. The letter from the principal investigator asked participants to return the completed questionnaire packet within seven days of its receipt.

Every effort was made to ensure no identifying information would be returned with the completed research packets. The pre-addressed and pre-stamped envelopes had both a mailing address and return address, thus ensuring patients would not feel it necessary to

provide their own return address. Also, there was no traditional informed consent and, as such, patients were not required to return a signed document. The completely anonymous data were stored in a locked filing cabinet within the medical records department at a mental health clinic in Middletown, Connecticut (i.e., the principle investigator's place of work).

In anticipation that some of the participants recruited for this research would not be able to read or write, the opportunity was afforded to patients to have the letters and questionnaires read to them by phone by the principle investigator or in person by a research assistant and their responses recorded by the person reading the questionnaires. However, no patient contacted the researcher for assistance. There was no direct incentive for participation in this research, though both the physician's and researcher's cover letters informed participants as to the importance of the research and how their responses could lead to the development of methods to help promote healthy living in other individuals with hypertension.

# CHAPTER 4
# RESULTS

This chapter is separated into seven sections. The first section presents the descriptive data for the major variables of interest in this study. In the second section, preliminary correlational analyses and their implications regarding the need for covariates in the main analyses in this study are discussed. The third section provides a discussion of preliminary analyses of variance (ANOVAs) and their implications for hypothesis testing in the present study. The fourth section reports results of correlational analyses performed to specifically test the first four research hypotheses. The fifth and sixth sections discuss the regressions used to test the final six research hypotheses, with three discussed in each section. The seventh and final section of this chapter is a discussion of the results of analyses to address the research questions. For all statistical analyses presented and discussed in this chapter, a probability level of $p<.05$ was used as the criterion for statistical significance.

## Descriptive Data for Major Variables of Interest

This section contains descriptive data for the expanded Kanfer's self-regulation theory based predictor variables [i.e., self-rated abilities, health self-determinism, perceived social support, and social support satisfaction (discrepancy between perceived and desired social support)], level of depressive symptomology, the control variable (i.e., social desirability), and the adherence measures (i.e., self-reported medication, exercise, and diet adherence). Scatter plots were first run to assure that there were no significant outliers that may have corrupted or invalidated the major data analyses. No outliers were

found. Table 4.1 presents the descriptive data for the predictor and control variables except for social support measures. Descriptive data for the social support measures are presented separately in Table 4.2. Table 4.3 presents descriptive data for the adherence variables.

Table 4-1

Descriptive Statistics for Predictor Variables and Social Desirability

| Scale Name | Min | Max | Mean | SD | Norm Mean |
|---|---|---|---|---|---|
| Self Rated Abilities Scale | 61 | 186 | 98.26 | 36.50 | 84.69[a] |
| Nutrition | 13 | 49 | 25.29 | 9.78 | 22.15 [a] |
| Psychological Well Being | 7 | 49 | 24.31 | 11.29 | 20.10 [a] |
| Physicial Activity / Exercise | 7 | 49 | 20.48 | 13.89 | 19.88 [a] |
| Responsible Health Practices | 21 | 49 | 28.19 | 7.45 | 22.55 [a] |
| CES Depression Scale | 0 | 51 | 15.21 | 12.62 | 10.49[b] |
| Depressive Affect | 0 | 20 | 5.48 | 5.00 | 3.10 [b] |
| Somatic Symptoms | 0 | 19 | 6.21 | 4.64 | 4.32 [b] |
| Interpersonal Difficulties | 0 | 5 | 0.92 | 1.41 | 0.47 [b] |
| Positive Affect | 0 | 12 | 2.60 | 3.05 | 2.52 [b] |
| Health Self-Determinism Index | 34 | 78 | 49.93 | 7.77 | 55.9[c] |
| Marlow-Crowne SSDI | 1 | 20 | 13.86 | 4.24 | N/A |

Note: [a] (Becker, Stuifbergen, Soo Oh, & Hall, 1993), [b] (Gatz & Hurwicz, 1990), [c] (Cox, 1985)

As can be seen in Table 4.1, participants tended to score along the entire range of each scale, though some important exceptions can be seen. Overall, participants scored higher on the Self-Rated Abilities for Health Practices subscales and total scale score

than the normative sample (Becker, Stuifbergen, Soo Oh, & Hall, 1993), suggesting that the present research sample endorsed higher levels of self-efficacy for engaging in health-promoting behaviors. Participants also tended to score high on the measure of health motivation (i.e., Health Self-Determinism Index) as indicated by the finding that the lowest score for this study was 34, while the lowest possible score is 17. However, the mean score was actually lower than that found with the norm sample, suggesting that the higher minimum score did not artificially increase the overall scale mean. Finally, the mean score on the measure of depression (i.e., CES-D) suggested that individuals participating in this research tended, on average, to endorse a number of symptoms indicative of mild depression (i.e., had CES-D scores between 15 and 21), possibly due to the higher age and lower income of the participant sample.

Table 4.2 presents descriptive data for the indices of perceived social support, desired social support, and social support satisfaction (as indicated by the discrepancy between perceived and desired social support) in relation to support from family, friends, and significant others. The distribution of levels of perceived social support and desired social support are similar, though a t-test indicated that overall desired social support was significantly higher than overall perceived social support ($M_{diff}$=4.37, $t$=-3.415, $p$=.001). T-tests also indicated that desired social support levels were significantly higher than perceived social support levels in relation to support from family ($M_{diff}$=1.62, $t$=-3.103, $p$=.002); support from friends ($M_{diff}$=0.93, $t$=-2.039, $p$=.043); and support from significant others ($M_{diff}$=1.53, $t$=-3.265, $p$=.001). These findings suggest that participants typically reported desiring a different level of social support than perceived from friends, family, and significant others. Overall, the descriptive data reveal no constants among

the variables and, thus, inclusion of them in further analyses should not add error or reduce power.

Table 4-2

Descriptive Statistics for Measures of Social Support

| Scale Name | Min | Max | Mean | SD | Norm Mean |
|---|---|---|---|---|---|
| Perceived Social Support TOTAL[b] | 13 | 84 | 65.04 | 16.95 | 69.60[a] |
| Family | 2 | 28 | 21.28 | 7.28 | 23.20[a] |
| Friends | 4 | 28 | 20.98 | 5.66 | 23.40[a] |
| Significant Others | 6 | 28 | 23.05 | 5.93 | 22.96[a] |
| Desired Social Support TOTAL | 26 | 84 | 69.41 | 11.26 | N/A |
| Family | 6 | 28 | 22.90 | 4.72 | N/A |
| Friends | 8 | 28 | 21.91 | 4.99 | N/A |
| Significant Others | 8 | 28 | 24.58 | 3.80 | N/A |
| Social Support Satisfaction TOTAL | 0 | 58 | 13.86 | 12.63 | N/A |
| Family | 0 | 26 | 4.93 | 5.11 | N/A |
| Friends | 0 | 21 | 4.34 | 4.43 | N/A |
| Significant Others | 0 | 22 | 4.45 | 4.81 | N/A |

Note: [a] (Zimet, Dahlem, Zimet, & Farley, 1988): Original normative means were averages across items, these were converted into sum of items for the purposes of this research.
[b] "Total" scores represent overall social support scores

Table 4.3, which presents descriptive statistics for the adherence variables, affords similar conclusions as Table 4.1 and 4.2. Specifically, the adherence measures appear to adequately cover the possible range of scores. However, as with the predictor and control variables, there are several important exceptions. Namely, the distribution of participants'

scores on both the Morisky and the supplemental medication adherence scales, as well as the dietary adherence scale, were slightly skewed, suggesting that many patients endorsed high medication and dietary adherence. Regardless, Table 4.3 indicates that, overall, participants' scores on the adherence scales are satisfactorily distributed among possible scores and suggest that the scales are adequate for inclusion in further analyses. Additionally, the means obtained from patients in the present study are only slightly different than the norm means for the adherence measures.

Table 4-3

Descriptive Statistics for Adherence (Criterion) Variables

| Variable Name | Min | Max | Mean | SD | Norm Mean |
|---|---|---|---|---|---|
| Morisky Medication Adherence | 0 | 4 | 3.15 | 1.05 | 2.31 |
| Supplemental Medication Adherence | 10 | 24 | 21.28 | 3.69 | N/A |
| General Medication Adherence [b] | 10 | 28 | 24.43 | 4.32 | N/A |
| Dietary Adherence | 29 | 56 | 44.76 | 6.01 | 40.50 |
| Exercise Adherence | 0 | 35 | 6.5 | 7.95 | 8.22[1] |

Note: [1] This figure from Byrd (2000) using hypertensive outpatients.
[b] "General Medication Adherence" is the sum of the Morisky and Supplemental Scales

## Preliminary Correlational Analyses

Preliminary correlational analyses were conducted to identify any significant relationships between social desirability, as measured by the Marlowe-Crowne Social Desirability Index, and the predictor and adherence variables of interest. There were no significant correlations between social desirability and any of the following: adherence scale scores (i.e., medication, diet, and exercise adherence), scores on the perceived social

support scales (i.e., family, friends, significant others), scores on the social support satisfaction scales (as indicated by the discrepancy between perceived and desired social support), scores on the CES depression scale, and scores on the health self-determinism index. However, social desirability was found to be significantly correlated with the total score on the self-rated abilities for health practices scale (SRA; $r=.263$, $p<.001$) and three of the subscales: SRA nutrition ($r=.326$, $p<.001$), SRA psychological well-being ($r=.241$, $p=.002$), and SRA responsible health practices ($r=.301$, $p<.001$). This pattern suggests that patients who scored higher on social desirability also tended to endorse higher health-based self-efficacy. This pattern of significant and insignificant correlations remained stable when independently controlling for age, gender, and ethnicity. As such, social desirability was controlled for in all analyses involving SRA scores.

A preliminary correlational analysis was also performed to examine the interrelations between the adherence measures. As shown in Table 4.4, exercise and dietary adherence were neither correlated with each other nor with the measures of medication adherence (i.e., Morisky medication adherence scale, supplemental medication adherence scale, and combined score from both medication adherence scales). However, the supplemental medication adherence scale was significantly and positively correlated with the Morisky medication adherence scale ($r=.707$, $p<.001$), such that patients appeared consistent in their self-report of medication adherence across the two scales. Because the three types of adherence (i.e., exercise, diet, and medication adherence) were not significantly correlated, there were no adjustments made to the planned statistical analyses to account for shared variance between these measures. Due to the high correlations between the medication adherence measures, the supplemental

medication adherence scale was combined with the Morisky medication adherence scale to indicate general medication adherence to the anti-hypertensive regimen. However, because the Morisky scale has established reliability and validity, it will also be included individually in all analyses involving medication adherence.

Table 4-4

Intercorrelations Among Scales of Adherence

| | Total MA | | S-MA | | M-MA | | DA | |
|---|---|---|---|---|---|---|---|---|
| Scale | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. |
| General MA | | | | | | | | |
| Supplemental MA | .987 | .000* | | | | | | |
| Morisky MA | .813 | .000* | .707 | .000* | | | | |
| Diet Adherence | .031 | .800 | .005 | .965 | .114 | .346 | | |
| Exercise Adherence | .029 | .809 | .030 | .806 | .021 | .864 | .172 | .153 |

Notes: "S-MA" denotes the supplemental medication adherence measure, "M-MA" denotes the Morisky medication adherence scale, "DA" denotes dietary adherence, and "EA" denotes exercise adherence
*p<.05, n=168

**Preliminary Analyses of Variance**

In addition to preliminary correlational analyses, a preliminary multivariate analysis of variance (MANOVA) was performed to explore possible differences between ethnicities in relation to scores on all variables of interest (i.e., medication adherence, diet adherence, exercise adherence, self-rated abilities, health self-determinism, perceived social support, social support satisfaction, depression, and social desirability), wherein ethnicity was entered as the independent variable and all other variables were entered as the dependent variables. Results suggested no significant differences between African

American (AA) and Caucasian American (CA) patients in terms of Morisky medication adherence ($MS_e$=1.101, F(1,166)=0.436, p=.510), general medication adherence (i.e., the sum of the Morisky and Supplemental medication adherence scales; $MS_e$=13.640, F(1,166)=0.410, p=.523), exercise adherence ($MS_e$=63.240, F(1,166)=0.949, p=.331), or diet adherence ($MS_e$=35.582, F(1,166)=3.368, p=.068).

There were also no significant differences between African American and Caucasian American patients in terms of overall levels of depression ($MS_e$=159.835, F(1,166)=0.482, p=.488) or in terms of the four depression subscale scores: depressive affect ($MS_e$=25.168, F(1,166)=0.001, p=.995), somatic symptoms ($MS_e$=21.527, F(1,166)=0.875, p=.351), interpersonal relations ($MS_e$=2.003, F(1,166)=0.203, p=.653), and positive affect ($MS_e$=25.474, F(1,166)=2.773, p=.098). However, there were several significant differences among the predictor variables in association with ethnicity. African American patients scored significantly higher on the Self-Rated Abilities total score ($M_{AA}$=155.4, $M_{CA}$=136.7, $MS_e$=1253.79, F(1,166)=11.430, p=.001), responsible health practices SRA subscale score ($M_{AA}$=44.18, $M_{CA}$=39.79, $MS_e$=51.13, F(1,166)=15.427, p<.001), exercise SRA subscale score ($M_{AA}$=33.04, $M_{CA}$=27.62, $MS_e$=186.87, F(1,166)=6.448, p=.012), and psychological well-being SRA subscale score ($M_{AA}$=39.03, $M_{CA}$=33.04, $MS_e$=94.15, F(1,166)=12.321, p=.001), thus suggesting that African American patients, on average, endorse higher levels of health-related self-efficacy than do Caucasian American patients.

African Americans, as compared to Caucasian Americans, also reported significantly higher overall perceived social support ($M_{AA}$=68.19, $M_{CA}$=60.75, $MS_e$=275.41, F(1,166)=8.237, p=.005). Specifically, African Americans, as compared to

Caucasian Americans, reported higher levels of perceived support from family ($M_{AA}$=22.71, $M_{CA}$=19.32, $MS_e$=50.47, F(1,166)=9.321, p=.003), and perceived support from significant others ($M_{AA}$=24.42, $M_{CA}$=21.17, $MS_e$=32.79, F(1,166)=13.234, p<.001). There were no significant ethnicity related differences in self-reported perceived support from friends. African Americans also desired significantly more social support than did Caucasian Americans ($M_{AA}$=71.77, $M_{CA}$=66.20, $MS_e$=119.92, F(1,166)=10.629, p=.001), specifically in terms of desired support from family ($M_{AA}$=24.02, $M_{CA}$=21.37, $MS_e$=20.677, F(1,166)=13.969, p<.001) and desired support from friends ($M_{AA}$=22.58, $M_{CA}$=20.99, $MS_e$=24.41, F(1,166)=4.253, p=..041), though desired support from significant others did not differ between the two groups. There were no significant differences between ethnic groups on family support discrepancy scores, suggesting African Americans and Caucasian Americans report, on average, similar differences between perceived and desired social support from family.

**Hypotheses One through Four: Correlational Analyses**

In addition to preliminary analyses, a series of analyses were performed to test the specific hypotheses outlined in chapter two. As mentioned in Chapter two, all research hypotheses were investigated using the difference model research approach (Oyemade & Rosser, 1980), wherein analyses were performed separately for each ethnic group. The above findings indicating ethnicity related differences in several study scales (i.e., self-rated abilities for health practices, perceived social support, and social support satisfaction) provide further support for analyzing the data in the present study separately by ethnic group. Further, all hypotheses were tested with a two-tailed alpha level of .05.

The first research hypothesis proposed that, among African American (AA) and Caucasian American (CA) patients with hypertension, a significant and positive correlation would exist between each of the three measures of self-reported adherence (i.e., medication, diet, and exercise adherence) and health-based self-efficacy. This hypothesis was partially supported in the present research. As mentioned above, health-based self-efficacy was assessed with the Self-Reported Abilities for Health Practices (SRAHP) scales and subscales. Five general measures were obtained from the SRAHP: general health-based self-efficacy, self-efficacy for healthy nutrition, self-efficacy for healthy exercise, self-efficacy for behaviors of psychological well-being, and self-efficacy for performing responsible health practices.

Based on preliminary analyses, the first hypothesis was tested with partial correlations, controlling for scores on the Marlow-Crowne Social Desirability Scale. Table 4.5 shows the partial correlation matrices for both African American and Caucasian American patients. As can be seen, among AA patients, Morisky medication adherence scores were significantly and positively correlated with self-efficacy for responsible health practices scores ($r=.252$, $p=.013$), indicating that AA patients who feel more able to perform general healthy behaviors are more likely to also adhere to their antihypertensive medication. In addition, significant and positive correlations were found between exercise adherence scores and general health-based self-efficacy scores ($r=.390$, $p<.001$), self-efficacy for healthy exercise scores ($r=.445$, $p>.001$), self-efficacy for behaviors of psychological well-being scores ($r=.262$, $p<.001$), and self-efficacy for performing responsible health practices scores ($r=.323$, $p=.001$), thus indicating that, in

general, African Americans who feel more able to engage in healthy practices report a higher level of exercise behavior.

Table 4-5

Partial Correlations of Self-Reported Abilities for Health Practices Scales and Adherence Scales controlling for Social Desirability

| | | Morisky MA[1] | | General MA | | Exercise Ad. | | Dietary Ad. | |
|---|---|---|---|---|---|---|---|---|---|
| | Sub-scale | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. |
| African American | Total | .179 | .081 | .109 | .290 | .390 | **.000** | .012 | .910 |
| | Nutrition | .126 | .222 | .126 | .221 | .143 | .155 | .167 | .104 |
| | Well-Being | .145 | .158 | .065 | .529 | .262 | **.000** | .018 | .864 |
| | Exercise | .138 | .180 | .096 | .352 | .445 | **.000** | -.106 | .303 |
| | RHP[2] | .252 | **.013** | .098 | .344 | .323 | **.001** | .048 | .642 |
| Caucasian American | Total | .246 | **.040** | .228 | .058 | .302 | **.011** | .306 | **.010** |
| | Nutrition | .174 | .149 | .113 | .351 | .162 | .179 | .298 | **.012** |
| | Well-Being | .282 | **.018** | .355 | **.002** | .014 | .908 | .112 | .314 |
| | Exercise | .107 | .379 | .058 | .634 | .555 | **.000** | .318 | **.007** |
| | RHP[2] | .298 | **.012** | .258 | **.021** | .207 | .085 | .281 | **.018** |

Notes: [1] "MA" denotes "Medication Adherence"
[2] "RHP" denotes the "Responsible Health Practices" subscale
Bold = $p<.05$, $\underline{n}_{AA}=97$, $\underline{n}_{CA}=71$

In terms of CA patients, table 4.5 indicates that general health-based self-efficacy score was significantly and positively correlated with scores on the Morisky medication adherence scale (r=.246, p=.040), exercise adherence scale (r=.302, p=.011), and diet adherence scale (r=.306, p=.010), suggesting that CA patients who feel more able to engage in general healthy behaviors were also more likely to adherence to all three

aspects of the anti-hypertensive regimen. More specifically, self-efficacy for healthy nutrition scores among CA patients were significantly and positively correlated with dietary adherence scores (r=.298, p=.012). In addition, self-efficacy for exercise scores were significantly and positively correlated with both exercise adherence scores (r=.555, p<.001) and dietary adherence scores (r=.318, p=.007). Further, self-efficacy for responsible health practices scores were significantly and positively correlated with Morisky medication adherence scores (r=.298, p=.012), general medication adherence scores (r=.258, p=.021), and dietary adherence scores (r=.281, p=.018). Finally, self-efficacy for psychological well-being scores were significantly and positively correlated with Morisky medication adherence scores (r=.282, p=.018) and general medication adherence scores (r=.335, p=.002). Thus, the first hypothesis was only partially supported.

Similar to the first hypothesis, the second hypothesis proposed, among AA and CA patients with hypertension, a significant and positive correlation would exist between self-reported adherence to each of the three components of the anti-hypertensive medical regimen and motivation (self-determinism) to engage in health-promoting behaviors. The second hypothesis was tested using Pearson product-moment correlation analyses and, as with the first hypothesis, results provided only partially support for the hypothesis. Among AA patients, there was no significant correlation between health self-determinism scores and exercise adherence scores (r=.204, p=.088), the Morisky medication adherence scores (r=.193, p=.107), or general medication adherence scores (r=.223, p=.062). However, a significant and positive correlation was found between health self-determinism (motivation) scores and dietary adherence scores (r=.326,

p=.006), suggesting that AA patients who were more motivated to engage in health-promoting behaviors were also more likely to adhere to a healthy diet. Among CA patients, there was no significant correlation between health self-determinism scores and dietary adherence scores (r=.132, p=.197), Morisky medication adherence scale scores (r=.132, p=.196) or general medication adherence scores (r=.063, p=.540). However, a significant and positive correlation was found between health self-determinism (motivation) scores and exercise adherence scores (r=.272, p=.007).

The third hypothesis proposed that, among AA and CA patients, there would be a significant and positive correlation between self-reported adherence to each of the three components of the anti-hypertensive medical regimen and (a) perceived social support from family, (b) perceived social support from friends, and (c) perceived social support from significant others. This hypothesis was analyzed using Pearson product-moment correlation analyses, as shown in Table 4.6. As with hypotheses one and two, the third hypothesis was only partially supported by the analyses. Among AA patients, levels of perceived social support from family was significantly and positively correlated with dietary adherence scores (r=.242, p=.017), Morisky medication adherence scores (r=.241, p=.017), and general medication adherence scores (r=.260, p=.010). Also, levels of perceived social support from significant others was significantly and positively correlated with Morisky medication adherence scores (r=.231, p=.023). Finally, levels of perceived social support from friends was significantly and positively correlated with exercise adherence scores (r=.266, p=.008).

Among CA patients, levels of perceived social support from family, friends, and significant others were each significantly and positively correlated with both Morisky

medication adherence scores (respectively: r=.301, p=.011; r=.511, p<.001; r=.337, p=.004) and general medication adherence scores (respectively: r=.410, p<.001; r=.507, p<.001; r=.439, p<.001). These findings suggest that CA patients who perceived more social support from family, friends, and significant others were more likely to adhere to their anti-hypertensive medication.

Table 4-6

Correlations of Perceived Social Support Scores and Adherence Ratings

| | | Morisky MA[1] | | General MA | | Exercise Ad. | | Dietary Ad. | |
|---|---|---|---|---|---|---|---|---|---|
| | Sub-scale | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. |
| African American | Total | .181 | .076 | .175 | .087 | .153 | .135 | .140 | .173 |
| | Family | .241 | **.017** | .260 | **.010** | -.029 | .776 | .242 | **.017** |
| | Friends | .074 | .472 | .116 | .256 | .266 | **.008** | -.050 | .629 |
| | Sign. Other | .231 | **.023** | .177 | .083 | .088 | .394 | .014 | .895 |
| Caucasian American | Total | .408 | **.000** | .489 | **.000** | -.061 | .614 | -.136 | .257 |
| | Family | .301 | **.011** | .410 | **.000** | .094 | .433 | -.198 | .098 |
| | Friends | .511 | **.000** | .507 | **.000** | -.201 | .093 | .001 | .990 |
| | Sign. Other | .337 | **.004** | .439 | **.000** | -.096 | .425 | -.152 | .206 |

Notes: [1] "MA" denotes "Medication Adherence"
Bold = p<.05, $\underline{n}_{AA}$=97, $\underline{n}_{CA}$=71

The fourth hypothesis proposed that, among AA and CA patients with hypertension, there would be a significant and positive correlation between self-reported adherence to each of the three components of the anti-hypertensive medical regimen and social support satisfaction as indicated by the levels of discrepancy between desired and

perceived social support received specifically from (a) family, (b) friends, and (c) significant others. Results of the Pearson product-moment correlation analyses to test hypothesis four are presented in Table 4.7. As with the previous three hypotheses, results only partially support the fourth hypothesis.

Table 4-7

Correlations of Social Support Satisfaction Scores and Adherence Ratings

| | | Morisky MA[1] | | General MA | | Exercise Ad. | | Dietary Ad. | |
|---|---|---|---|---|---|---|---|---|---|
| | Sub-scale | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. |
| African American | Total | -.419 | **.000** | -.324 | **.001** | -.305 | **.002** | -.213 | **.036** |
| | Family | -.430 | **.000** | -.428 | **.000** | -.226 | **.026** | -.229 | **.024** |
| | Friends | -.225 | **.026** | -.160 | .118 | -.291 | **.004** | -.059 | .569 |
| | Sign. Other | -.336 | **.001** | -.223 | **.028** | -.228 | **.024** | -.129 | .208 |
| Caucasian American | Total | -.531 | **.000** | -.547 | **.000** | -.137 | .254 | .125 | .301 |
| | Family | -.441 | **.000** | -.468 | **.000** | -.216 | .070 | .194 | .105 |
| | Friends | -.539 | **.000** | -.513 | **.000** | -.190 | .112 | -.030 | .804 |
| | Sign. Other | -.478 | **.000** | -.500 | **.000** | .019 | .876 | .169 | .159 |

Notes: [1] "MA" denotes "Medication Adherence"
Bold = $p<.05$, $\underline{n}_{AA}=97$, $\underline{n}_{CA}=71$

As can be seen, among AA patients, levels of social support satisfaction from family was significantly and negatively related with Morisky medication adherence scores ($r=-.430$, $p<.001$), general medication adherence scores ($r=-.428$, $p<.001$), exercise adherence scores ($r=-.226$, $p=.026$), and diet adherence scores ($r=-.229$, $p=.024$). These findings indicate that AA patients who reported less satisfaction with the social support

from their family (i.e., a greater discrepancy between desired and perceived social support) were less likely to adhere to all three aspects of the anti-hypertensive medical regimen. In addition, levels of social support satisfaction from significant others was significantly and negatively correlated with Morisky medication adherence scores ($r=-.336$, $p=.001$), general medication adherence scores ($r=-.223$, $p=.028$), and exercise adherence scores ($r=-.228$, $p=.024$). These findings indicate that AA patients who report less satisfaction with the social support from significant others were less likely to adhere to medication and exercise recommendations in the treatment of their hypertension. Finally, levels of social support satisfaction from friends was significantly and negatively correlated with Morisky medication adherence scores ($r=-.225$, $p=.026$) and exercise adherence scores ($r=-.291$, $p=.004$). This finding indicates that AA patients who reported less satisfaction with the social support from their friends were less likely to adhere to prescribed medication and less likely to exercise.

Among CA patients, there were no significant correlations between levels of social support satisfaction and either exercise adherence scores or dietary adherence scores. However, significant and negative correlations were found between levels of social support satisfaction from friends, family, and significant others with Morisky medication adherence scores (respectively: $r=-.441$, $p<.001$; $r=-.539$, $p<.001$; $r=-.478$, $p<.001$) and general medication adherence scores (respectively: $r=-.468$, $p<.001$; $r=-.513$, $p<.001$; $r=-.500$, $p<.001$). This finding suggests that CA patients who reported less satisfaction with the social support perceived from family, friends, and significant others were less likely to adhere to their anti-hypertensive medication.

**Hypotheses Five through Seven: Multiple Regressions**

Hypotheses Five through Seven were explored with a series of multiple regressions. The criterion variables for the regressions presented in this section were one of the following: medication adherence measured by the Morisky scale (i.e., Morisky medication adherence), medication adherence measured by the combined Morisky and supplemental scales (i.e., general medication adherence), dietary adherence, or exercise adherence. For each multiple regression, the predictor variables were identical as follows: level of motivation to engage in health-promoting behaviors (i.e., Health Self-Determinism Index score), self-efficacy to engage in health-related behaviors (i.e., Self-Rated Abilities for Health Practices subscale scores: Nutrition, Exercise, Psychological Well-Being, and Responsible Health Practices), perceived social support (i.e., family, friends, and significant others subscales), and social support satisfaction (i.e., discrepancies between subscale scores of desired and perceived social support from family, friends, and significant others). Each hypothesis in this section was tested separately for each ethnic group.

The fifth study hypothesis proposed that medication adherence scores, as indicated by Morisky medication adherence scores and general medication adherence scores, would be predicted by level of health-based self-efficacy; level of motivation to engage in health-promoting behaviors; levels of perceived social support from family, friends, and significant others; and levels of satisfaction with the social support received from friends, family, and significant others. For each ethnicity, two separate regressions were performed to test this hypothesis, one with Morisky medication adherence scores as the criterion and one with general medication adherence scores as the criterion. Results from these regressions can be found in Appendix A, Tables A.1 through A.4.

As can be seen from the tables, the multiple regression applied to the African American data with Morisky medication adherence scores as the criterion variable, as shown in Table A.1 (Appendix A), was significant ($R^2 = 0.358$, $F(11, 85) = 4.306$, $MS_e = 0.783$, $p < .001$). In addition the multiple regression applied to African American data with general medication adherence scores as the criterion variable, as shown in Table A.2 (Appendix A), was significant ($R^2 = 0.252$, $F(11, 85) = 2.597$, $MS_e = 14.961$, $p = .007$). Similar to the regressions for African American patients, the multiple regression applied to the Caucasian American data with Morisky medication adherence scores as the criterion variable, as shown in Table A.3 (Appendix A), was significant ($R^2 = 0.578$, $F(11, 59) = 3.912$, $MS_e = 0.532$, $p < .001$). Further, the multiple regression applied to Caucasian American data with general medication adherence as the criterion variable, as shown in Table A.4 (Appendix A), was significant ($R^2 = 0.491$, $F(11, 59) = 5.183$, $MS_e = 12.195$, $p < .001$). Overall, these results support the fifth hypothesis.

The sixth study hypothesis proposed that dietary adherence scores would be predicted by level of health-based self-efficacy; level of motivation to engage in health-promoting behaviors; levels of perceived social support from family, friends, and significant others; and levels of satisfaction with the social support received from friends, family, and significant others. One multiple regression for each ethnicity was performed to test this hypothesis, with dietary adherence scores as the criterion measure. Results from these regressions can be found in Appendix A, Table A.5 and Table A.6. As shown, the multiple regression applied to African American data with dietary adherence scores as the criterion variable, as indicated in Table A.5 (Appendix A), was significant ($R^2 = 0.313$, $F(11, 85) = 3.522$, $MS_e = 24.198$, $p < .001$). Further, the multiple regression

applied to Caucasian American data with dietary adherence scores as the criterion, as indicated in Table A.6 (Appendix A), was significant ($R^2 = 0.437$, $F(11, 59) = 4.159$, $MS_e = 27.805$, $p < .001$). As such, the sixth study hypothesis was supported by the results of the multiple regressions.

The seventh study hypothesis proposed that exercise adherence scores would be predicted by level of health-based self-efficacy; level of motivation to engage in health-promoting behaviors; levels of perceived social support from family, friends, and significant others; and levels of satisfaction with the social support received from friends, family, and significant others. As with hypothesis six, a single multiple regressions for each ethnicity was performed to test hypothesis seven, with exercise adherence scores entered as the criterion measure. Results from these regressions can be found in Appendix A, Table A.7 and Table A.8. As can be seen, the multiple regression applied to African American data with exercise adherence scores as the criterion variable, shown in Table A.7 (Appendix A), was significant ($R^2 = 0.406$, $F(11, 85) = 5.272$, $MS_e = 48.483$, $p < .001$). Further, the multiple regression applied to Caucasian American data with exercise adherence scores as the criterion, shown in Table A.6 (Appendix A), was significant ($R^2 = 0.578$, $F(11, 59) = 7.357$, $MS_e = 24.286$, $p < .001$). As such, results from the aforementioned multiple regressions provided support for the seventh study hypothesis.

**Hypotheses Eight through Ten: Stepwise Regressions**

This section presents results for hypotheses Eight through Ten. The ultimate purpose of the hypotheses tested in this section was to investigate whether social support satisfaction (as indicated by the discrepancy between desired and perceived social

support) is a better predictor than perceived social support alone. To test each hypothesis, four stepwise regressions were conducted for each ethnicity (eight regressions per hypothesis), with each regression having one of the following criterion variables: Morisky medication adherence scores, general medication adherence scores, dietary adherence scores, and exercise adherence scores. The predictor variables for each stepwise regression was one of the following pairs of variables: (a) level of perceived social support from family and level of satisfaction with social support from family; (b) level of perceived social support from friends and level of satisfaction with social support from friends; and (c) level of perceived social support from significant others and level of satisfaction with social support from significant others.

**Hypothesis Eight: Social Support from Family**

The eighth study hypothesis was as follows: The level of satisfaction with social support from family will be a stronger predictor than the level perceived social support from family for each of the investigated adherence variables (i.e., Morisky medication adherence, general medication adherence, modified diet adherence, and exercise adherence). To test this hypothesis, eight stepwise regressions were run (four for each ethnicity) with level of perceived social support from family and level of satisfaction with social support from family as independent variables and one of the four adherence variables as the criterion variable. Overall, this hypothesis was only partially supported.

The stepwise regression applied to African American data with Morisky medication adherence scores as the criterion variable, shown in Table 4.8, was significant with satisfaction with social support from family entered at the first step ($\underline{R}^2$=.266, F (1,95)=34.443, MSe=0.801, p<.001). The addition of perceived social support as a

predictor in step two of the stepwise regression did not result in a significant increase in $R^2$ ($\Delta R^2$=.000, F(1,94)=0.051, p=.822). This supports the eighth hypothesis in that satisfaction with family support was a stronger predictor of African American's self-reported Morisky medication adherence than perceived family support.

Table 4-8

Family Support Perceived versus Family Support Satisfaction in Prediction of Morisky Medication Adherence among African Americans – Stepwise Regression

| | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| Step | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -0.105 | .018 | -0.516 | -5.869 | .000 |
| | $R$=.516, $R^2$=.266, Adj $R^2$=.258, Standard Error of the Estimate=.895, $n$=97 | | | | | |
| 2 | Support Satisfaction | -0.108 | .024 | -0.533 | -4.603 | .000 |
| | Perceived Support | -0.004 | .019 | -0.026 | -0.266 | .882 |
| | $R$=.516, $R^2$=.266, Adj $R^2$=.251, Standard Error of the Estimate=.899, $n$=97 | | | | | |

Note: $\Delta R^2$=.000, F(1,94)=0.051, p=.822

In addition, the stepwise regression applied to African American data with general medication adherence scores as the criterion variable, shown in Table 4.9, was significant with satisfaction with social support from family entered at the first step ($R^2$=.183, F (1,95)=21.327, MSe=0.801, p<.001). The addition of perceived social support as a predictor in step two of the stepwise regression did not result in a significant increase in $R^2$ ($\Delta R^2$=.000, F(1,94)=0.055, p=.815). This supports the eighth hypothesis in that

satisfaction with family support was a stronger predictor of African American's self-reported general medication adherence than perceived family support.

Table 4-9

Family Support Perceived versus Family Support Satisfaction in Prediction of General Medication Adherence among African Americans – Stepwise Regression

| Step | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -0.353 | .076 | -0.428 | -4.618 | .000 |
| | $R$=.428, $R^2$=.183, Adj $R^2$=.175, Standard Error of the Estimate=3.822, $n$=97 | | | | | |
| 2 | Support Satisfaction | -0.368 | .101 | -0.447 | -3.659 | .000 |
| | Perceived Support | -0.002 | .080 | -0.029 | -0.234 | .815 |
| | $R$=.429, $R^2$=.184, Adj $R^2$=.176, Standard Error of the Estimate=3.841, $n$=97 | | | | | |

Note: $\Delta R^2$=.000, F(1,94)=0.055, p=.815

The stepwise regression applied to African American data with exercise adherence scores as the criterion variable, shown in Table 4.10, was significant with satisfaction with social support from family entered at the first step ($R^2$=.183, F (1,95)=5.927, MSe=68.692, p<.001) and with perceived social support from family entered at the second step ($R^2$=.184, F (2,94)=6.582, MSe=64.695, p<.001). Indeed, the addition of perceived social support as a predictor in step two of the stepwise regression resulted in a significant increase in $R^2$ ($\Delta R^2$=.064, F(1,94)=6.869, p=.010). As such, satisfaction with family support was a stronger predictor of exercise adherence scores,

though perceived social support from family adds a significant contribution to the prediction of African American's self-reported exercise adherence scores

Table 4-10

Family Support Perceived versus Family Support Satisfaction in Prediction of Exercise Adherence among African Americans – Stepwise Regression

| | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| Step | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -0.353 | .076 | -0.428 | -4.618 | .000 |
| | $R$=.242, $R^2$=.059, Adj $R^2$=.049, Standard Error of the Estimate=8.288, $n$=97 | | | | | |
| 2 | Support Satisfaction | -0.368 | .101 | -0.447 | -3.659 | .000 |
| | Perceived Support | -0.002 | .080 | -0.029 | -0.234 | .815 |
| | $R$=.350, $R^2$=.123, Adj $R^2$=.104, Standard Error of the Estimate=8.043, $n$=97 | | | | | |

Note: $\Delta R^2$=.064, F(1,94)=6.869, p=.010

Although the previous regressions supported the eighth hypothesis, the stepwise regression applied to African American data with dietary adherence scores as the criterion variable, as shown in Table 4.11, did not support the hypothesis. The stepwise regression was significant with perceived social support from family entering at the first step of the regression ($R^2$=.059, F (1,95)=5.914, MSe=29.671, p<.017). However, the addition of satisfaction with family support scores at the second step of the stepwise regression did not result in a significant increase in $R^2$ ($\Delta R^2$=.009, F(1,94)=0.906, p=.344). As such, satisfaction with social support from family was not a stronger

predictor of African American's self-reported dietary adherence scores than perceived social support from family.

Table 4-11

Family Support Perceived versus Family Support Satisfaction in Prediction of Dietary Adherence among African Americans – Stepwise Regression

| | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| Step | | B | Std. Error | Beta | t | Sig. |
| 1 | Perceived Support | 0.211 | 0.087 | .242 | 2.432 | .017 |
| | $R$=.242, $R^2$=.059, Adj $R^2$=.049, Standard Error of the Estimate=5.447, $n$=97 | | | | | |
| 2 | Perceived Support | 0.141 | 0.113 | .162 | 1.240 | .218 |
| | Support Satisfaction | -0.136 | 0.143 | -.124 | -0.952 | .344 |
| | $R$=.260, $R^2$=.068, Adj $R^2$=.048, Standard Error of the Estimate=5.450, $n$=97 | | | | | |

Note: $\Delta R^2$=.009, F(1,94)=0.906, p=.344

The stepwise regression applied to Caucasian American data with Morisky medication adherence scores as the criterion variable, shown in Table 4.12, was significant with satisfaction with support from family entering at the first step ($R^2$=.208, F (1,69)=18.084, MSe=0.854, p<.001). The addition of perceived social support from family as a predictor in step two did not result in a significant increase in $R^2$ ($\Delta R^2$=.004, F(1,68)=0.350, p=.556). Moreover, the stepwise regression applied to Caucasian American data with general medication adherence scores as the criterion variable, shown in Table 4.13, was significant with satisfaction with social support from family entering at the first step ($R^2$=.236, F (1,69)=21.298, MSe=15.668, p<.001). The addition of

perceived social support from family as a predictor in step two did not result in a significant increase in $R^2$ ($\Delta R^2$=.003, F(1,68)=0.249, p=.620). These findings support the eighth hypothesis in that satisfaction with family support was a stronger predictor than perceived family support in association with Caucasian American's self-reported Morisky medication adherence scores and general medication adherence scores.

Table 4-12

Family Support Perceived versus Family Support Satisfaction in Prediction of Morisky Medication Adherence among Caucasian Americans – Stepwise Regression

| | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| Step | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -.091 | .021 | -.456 | -4.252 | .000 |
| | $R$=.456, $R^2$=.208, Adj $R^2$=.196, Standard Error of the Estimate=.924, $n$=71 | | | | | |
| 2 | Support Satisfaction | -.107 | .034 | -.534 | -3.127 | .003 |
| | Perceived Support | -.013 | .022 | -.101 | -.591 | .556 |
| | $R$=.460, $R^2$=.212, Adj $R^2$=.189, Standard Error of the Estimate=.929, $n$=71 | | | | | |

Note: $\Delta R^2$=.004, F(1,69)=0.350, p=.556

The stepwise regression applied to Caucasian American data with exercise adherence scores as the criterion variable was not significant ($R^2$=.043, F (1,69)=3.093, MSe=47.138, p=.083). In addition, the stepwise regression applied to Caucasian American data with dietary adherence scores as the criterion variable was not significant ($R^2$=.039, F (1,69)=2.821, MSe=40.551, p=.098). These findings do not support the eighth hypothesis in that neither satisfaction with family support nor perceived family

support were significant predictors of Caucasian American's self-reported exercise adherence scores or dietary adherence scores.

Table 4-13

Family Support Perceived versus Family Support Satisfaction in Prediction of General Medication Adherence among Caucasian Americans – Stepwise Regression

| Step | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -0.424 | .092 | -0.486 | -4.615 | .000 |
| | $R$=.486, $R^2$=.236, Adj $R^2$=.225, Standard Error of the Estimate=3.959, $n$=71 | | | | | |
| 2 | Support Satisfaction | -0.368 | .147 | -0.421 | -2.505 | .015 |
| | Perceived Support | 0.047 | .095 | 0.084 | 0.499 | .620 |
| | $R$=.489, $R^2$=.239, Adj $R^2$=.216, Standard Error of the Estimate=3.980, $n$=71 | | | | | |

Note: $\Delta R^2$=.003, F(1,68)=0.249, p=.620

**Hypothesis Nine: Social Support from Friends**

The ninth study hypothesis was as follows: The levels of satisfaction with social support from friends will be a stronger predictor than levels of perceived social support from friends for each of the investigated adherence variables (i.e., Morisky medication adherence, general medication adherence, modified diet adherence, and exercise adherence). As with hypothesis eight, this hypothesis was tested with eight stepwise regressions (four for each ethnicity) where level of perceived social support from friends and level of satisfaction with social support from friends were independent variables and

one of the four adherence variables were the criterion variable. Overall, this hypothesis was only partially supported.

The stepwise regression applied to African American data with Morisky medication adherence scores as the criterion variable, shown in Table 4.14, was significant with satisfaction with social support from friends entered at the first step ($R^2$=.107, F (1,95)=11.414, MSe=0.974, p=.001). The addition of perceived social support as a predictor in step two of the stepwise regression did not result in a significant increase in $R^2$ ($\Delta R^2$=.003, F(1,94)=0.266, p=.607). This supports the ninth hypothesis in that satisfaction with friend support was a stronger predictor of African American's self-reported Morisky medication adherence than perceived friend support.

Table 4-14

Friend Support Perceived versus Friend Support Satisfaction in Prediction of Morisky Medication Adherence among African Americans – Stepwise Regression

| | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| Step | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -.086 | .025 | -.328 | -3.379 | .001 |
| | $R$=.328, $R^2$=.107, Adj $R^2$=.098, Standard Error of the Estimate=.987, $n$=97 | | | | | |
| 2 | Support Satisfaction | -.096 | .032 | -.366 | -2.994 | .004 |
| | Perceived Support | -.013 | .024 | -.063 | -.516 | .607 |
| | $R$=.331, $R^2$=.110, Adj $R^2$=.091, Standard Error of the Estimate=.991, $n$=97 | | | | | |

Note: $\Delta R^2$=.003, F(1,94)=0.266, p=.607

In addition, the stepwise regression applied to African American data with exercise adherence scores as the criterion variable, shown in Table 4.15, was significant

with satisfaction with social support from friends entering at the first step ($R^2$=.090, F (1,95)=9.420, MSe=66.394, p=.003). The addition of perceived social support from friends as a predictor in step two of the stepwise regression did not result in a significant increase in $R^2$ ($\Delta R^2$=.013, F(1,94)=1.319, p=.254). This also supports the ninth hypothesis in that satisfaction with friend support was a stronger predictor of African American's self-reported exercise adherence than perceived social support from friends.

Table 4-15

Friend Support Perceived versus Friend Support Satisfaction in Prediction of Exercise Adherence among African Americans – Stepwise Regression

| Step | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -0.642 | .209 | -.300 | -3.069 | .003 |
| | $R$=.300, $R^2$=.090, Adj $R^2$=.081, Standard Error of the Estimate=8.148, $n$=97 | | | | | |
| 2 | Support Satisfaction | -.460 | .262 | -.215 | -1.756 | .082 |
| | Perceived Support | .230 | .200 | .141 | 1.149 | .254 |
| | $R$=.321, $R^2$=.103, Adj $R^2$=.084, Standard Error of the Estimate=8.135, $n$=97 | | | | | |

Note: $\Delta R^2$=.013, F(1,94)=1.319, p=.254

The stepwise regression applied to African American data with general medication adherence scores as the criterion variable was not significant ($R^2$=.026, F (1,95)=2.490, MSe=17.428, p=.118). In addition, the stepwise regression applied to African American data with dietary adherence scores as the criterion variable was not significant ($R^2$=.003, F (1,95)=0.326, MSe=31.410, p=.569). These findings do not

support the ninth hypothesis in that neither satisfaction with social support from friends nor perceived social support from friends were significant predictors of African American's self-reported general medication adherence scores or dietary adherence scores.

The stepwise regression applied to Caucasian American data with Morisky medication adherence scores as the criterion variable, shown in Table 4.16, was significant with satisfaction with social support from friends entering at the first step ($R^2$=.302, F (1,69)=29.923, MSe=0.752, p<.001) and perceived social support from friends entering at the second step ($R^2$=.356, F (2,68)=18.783, MSe=0.705, p<.001). Indeed, the addition of perceived social support from friends as a predictor in step two of the stepwise regression resulted in a significant increase in $R^2$ ($\Delta R^2$=.053, F(1,68)=5.634, p=.020).

Table 4-16

Friend Support Perceived versus Friend Support Satisfaction in Prediction of Morisky Medication Adherence among Caucasian Americans – Stepwise Regression

| | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| Step | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -.114 | .021 | -.550 | -5.470 | .000 |
| | $R$=.550, $R^2$=.302, Adj $R^2$=.292, Standard Error of the Estimate=.867, $n$=71 | | | | | |
| 2 | Support Satisfaction | -.073 | .026 | -.356 | -2.795 | .007 |
| | Perceived Support | .050 | .021 | .302 | 2.374 | .020 |
| | $R$=.597, $R^2$=.356, Adj $R^2$=.337, Standard Error of the Estimate=.839, $n$=71 | | | | | |

Note: $\Delta R^2$=.053, F(1,68)=5.634, p=.020

Moreover, the stepwise regression applied to Caucasian American data with general medication adherence scores as the criterion variable, shown in Table 4.17, was significant with satisfaction with social support from friends entering at the first step ($R^2$=.264, F (1,69)=24.696, MSe=15.100, p<.001) and perceived social support from friends entering at the second step ($R^2$=.317, F (2,68)=15.774, MSe=14.212, p<.001). The addition of perceived social support from friends as a predictor in step two of the stepwise regression resulted in a significant increase in $R^2$ ($\Delta R^2$=.053, F(1,68)=5.309, p=.024). As such, satisfaction with social support from friends was a stronger predictor of both Morisky medication adherence scores and general medication adherence scores, though perceived social support from friends also added a significant contribution to the prediction of African American's self-reported Morisky medication adherence and general medication adherence scores.

Table 4-17

Friend Support Perceived versus Friend Support Satisfaction in Prediction of General Medication Adherence among Caucasian Americans – Stepwise Regression

| Step | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -0.462 | .093 | -.513 | -4.970 | .000 |
| | $R$=.513, $R^2$=.264, Adj $R^2$=.253, Standard Error of the Estimate=3.886, $n$=71 | | | | | |
| 2 | Support Satisfaction | -.287 | .118 | -.319 | -2.435 | .018 |
| | Perceived Support | .219 | .095 | .302 | 2.304 | .024 |
| | $R$=.563, $R^2$=.317, Adj $R^2$=.297, Standard Error of the Estimate=3.770, $n$=71 | | | | | |

Note: $\Delta R^2$=.053, F(1,68)=5.309, p=.024

The stepwise regression applied to Caucasian American data with exercise adherence scores as the criterion variable was not significant ($R^2$=.038, F (1,69)=2.747, MSe=47.365, p=.102). In addition, the stepwise regression applied to Caucasian American data with dietary adherence scores as the criterion variable was not significant ($R^2$=.001, F (1,69)=0.062, MSe=42.171, p=.804). These findings do not support the ninth hypothesis in that neither satisfaction with social support from friends nor perceived social support from friends were stronger predictors of Caucasian American's self-reported exercise adherence scores or dietary adherence scores.

**Hypothesis Ten: Social Support from Significant Others**

The tenth study hypothesis was as follows: The levels of satisfaction with social support from significant others will be a stronger predictor than levels of perceived social support from significant others for each of the investigated adherence variables (i.e., Morisky medication adherence, general medication adherence, modified diet adherence, and exercise adherence). As with the previous two hypotheses, this hypothesis was tested with eight stepwise regressions (four for each ethnicity) where level of perceived social support from significant others and level of satisfaction with social support from significant others were independent variables and one of the four adherence variables were criterion variable. Overall, this hypothesis was only partially supported.

The stepwise regression applied to African American data with Morisky medication adherence scores as the criterion variable, shown in Table 4.18, was significant with satisfaction with social support from significant others entering at the first step ($R^2$=.123, F (1,95)=13.372, $MS_e$=0.956, p<.001). The addition of perceived

social support from significant others as a predictor in step two of the stepwise regression did not result in a significant increase in $R^2$ ($\Delta R^2$=.001, F(1,94)=0.138, p=.711).

Table 4-18

Other Support Perceived versus Other Support Satisfaction in Prediction of Morisky Medication Adherence among African Americans – Stepwise Regression

| Step | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -.087 | .024 | -.351 | -3.657 | .000 |
| | $R$=.351, $R^2$=.123, Adj $R^2$=.114, Standard Error of the Estimate=.978, $n$=97 | | | | | |
| 2 | Support Satisfaction | -.079 | .033 | -.317 | -2.393 | .019 |
| | Perceived Support | .012 | .032 | .049 | 0.372 | .711 |
| | $R$=.353, $R^2$=.125, Adj $R^2$=.106, Standard Error of the Estimate=.982, $n$=97 | | | | | |

Note: $\Delta R^2$=.001, F(1,94)=0.138, p=.711

In addition the stepwise regression applied to African American data with general medication adherence scores as the criterion variable, shown in Table 4.19, was significant with satisfaction with social support from significant others entering at the first step ($R^2$=.050, F (1,95)=4.975, MSe=16.994, p=.028). Again, the addition of perceived social support from significant others as a predictor in step two of the stepwise regression did not result in a significant increase in $R^2$ ($\Delta R^2$=.001, F(1,94)=0.109, p=.742). Moreover, the stepwise regression applied to African American data with exercise adherence scores as the criterion variable, shown in Table 4.20, was significant with satisfaction with social support from significant others entering at the first step

($R^2$=.051, F (1,95)=5.147, MSe=69.227, p=.026). As before, the addition of perceived social support from significant others as a predictor in step two of the stepwise regression did not result in a significant increase in $R^2$ ($\Delta R^2$=.009, F(1,94)=0.938, p=.335). These findings support the tenth hypothesis in that satisfaction with social support from significant others was a stronger predictor than perceived social support from significant others in regards to African American's self-reported Morisky medication adherence scores, general medication adherence scores, and exercise adherence scores.

Table 4-19

Other Support Perceived versus Other Support Satisfaction in Prediction of General Medication Adherence among African Americans – Stepwise Regression

| Step | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -.224 | .100 | -.223 | -2.230 | .028 |
| | $R$=.223, $R^2$=.050, Adj $R^2$=.040, Standard Error of the Estimate=4.122, $n$=97 | | | | | |
| 2 | Support Satisfaction | -.192 | .138 | -.192 | -1.389 | .168 |
| | Perceived Support | .045 | .136 | .046 | 0.330 | .742 |
| | $R$=.226, $R^2$=.051, Adj $R^2$=.031, Standard Error of the Estimate=4.142, $n$=97 | | | | | |

Note: $\Delta R^2$=.001, F(1,94)=0.109, p=.742

The stepwise regression applied to African American data with dietary adherence scores as the criterion variable was not significant ($R^2$=.017, F (1,95)=1.606, MSe=30.994, p=.208). This finding does not support the tenth hypothesis in that neither satisfaction with social support from significant others nor perceived social support from

significant others were significant predictors of African American's self-reported dietary adherence scores.

Table 4-20

Other Support Perceived versus Other Support Satisfaction in Prediction of Exercise Adherence among African Americans – Stepwise Regression

| Step | | Unstandardized B | Unstandardized Std. Error | Standardized Beta | t | Sig. |
|---|---|---|---|---|---|---|
| 1 | Support Satisfaction | -.459 | .202 | -.227 | -2.269 | .026 |
| | $R$=.227, $R^2$=.051, Adj $R^2$=.041, Standard Error of the Estimate=8.320, $n$=97 | | | | | |
| 2 | Support Satisfaction | -.644 | .278 | -.318 | -2.314 | .023 |
| | Perceived Support | -.265 | .274 | -.133 | -.968 | .335 |
| | $R$=.247, $R^2$=.061, Adj $R^2$=.041, Standard Error of the Estimate=8.323, $n$=97 | | | | | |

Note: $\Delta R^2$=.009, F(1,94)=0.938, p=.335

The stepwise regression applied to Caucasian American data with Morisky medication adherence scores as the criterion variable, shown in Table 4.21, was significant with satisfaction with support from significant others entering at the first step ($R^2$=.238, F (1,69)=21.521, MSe=0.822, p<.001). The addition of perceived social support from significant others as a predictor in step two did not result in a significant increase in $R^2$ ($\Delta R^2$=.030, F(1,68)=2.751, p=.102).

Moreover, the stepwise regression applied to Caucasian American data with general medication adherence scores as the criterion variable, shown in Table 4.22, was significant with satisfaction with social support from significant others entering at the

first step ($R^2$=.250, F (1,69)=22.959, MSe=15.385, p<.001). The addition of perceived social support from significant others as a predictor in step two did not result in a significant increase in $R^2$ ($\Delta R^2$=.000, F(1,68)=0.004, p=.949). These findings support the tenth hypothesis in that satisfaction with social support from significant others was a stronger predictor than perceived social support from significant others in association with Caucasian American's self-reported Morisky medication adherence scores and general medication adherence scores.

Table 4-21

Other Support Perceived versus Other Support Satisfaction in Prediction of Morisky Medication Adherence among Caucasian Americans – Stepwise Regression

| | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| Step | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -.091 | .020 | -.488 | -4.639 | .000 |
| | $R$=.488, $R^2$=.238, Adj $R^2$=.227, Standard Error of the Estimate=.907, $n$=71 | | | | | |
| 2 | Support Satisfaction | -.152 | .042 | -.814 | -3.657 | .000 |
| | Perceived Support | -.052 | .032 | -.369 | -1.658 | .102 |
| | $R$=.517, $R^2$=.267, Adj $R^2$=.246, Standard Error of the Estimate=.895, $n$=71 | | | | | |

Note: $\Delta R^2$=.030, F(1,69)=2.751, p=.102

The stepwise regression applied to Caucasian American data with exercise adherence scores as the criterion variable was not significant ($R^2$=.012, F (1,69)=0.818, MSe=48.674, p=.369). In addition, the stepwise regression applied to Caucasian American data with dietary adherence scores as the criterion variable was not significant ($R^2$=.029, F (1,69)=2.030, MSe=41.002, p=.159). These findings do not support the tenth

hypothesis in that neither satisfaction with social support from significant others nor perceived social support from significant others were stronger predictors of Caucasian American's self-reported exercise adherence scores or dietary adherence scores.

Table 4-22

Other Support Perceived versus Other Support Satisfaction in Prediction of General Medication Adherence among Caucasian Americans – Stepwise Regression

| Step | | Unstandardized | | Standardized | | |
|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | t | Sig. |
| 1 | Support Satisfaction | -0.407 | .085 | -.500 | -4.792 | .000 |
| | $R$=.500, $R^2$=.250, Adj $R^2$=.239, Standard Error of the Estimate=3.922, $n$=71 | | | | | |
| 2 | Support Satisfaction | -.418 | .184 | -.512 | -2.274 | .026 |
| | Perceived Support | -.009 | .139 | -.014 | -.064 | .949 |
| | $R$=.500, $R^2$=.250, Adj $R^2$=.228, Standard Error of the Estimate=3.951, $n$=71 | | | | | |

Note: $\Delta R^2$=.000, F(1,68)=0.004, p=.949

**Research Questions: Additional Analyses**

In addition to the research hypotheses, several research questions were posed to explore variables that did not fit into the self-regulation model used as the theoretical basis for this research. The first research question was as follows: Among AA and CA patients, is having or not having a family history of hypertension and the number of family members with hypertension significantly associated with self-reported levels of adherence to the three aspects of the anti-hypertensive medical regimen (i.e., Morisky medication adherence, general medication adherence, diet adherence, and exercise

adherence). This research question was investigated with a two-way multivariate analysis of variance (MANOVA) and a Pearson product-moment correlation analysis for each ethnicity. The MANOVA was run with ethnicity and family history of hypertension as the independent variables with the dependent variables being the adherence ratings (i.e., Morisky medication adherence scores, general medication adherence scores, diet adherence scores, and exercise adherence scores). Results of the MANOVA indicated that African American patients who reported having other family members with hypertension reported engaging in significantly more exercise ($M$=7.92, sd=4.30) than AA patients who did not report a family history of hypertension ($M$=2.20, sd=3.69, $F(1,95)=6.035$, $MS_e=68.619$, $p=.016$). There were no significant differences in self-reported Morisky medication adherence scores, general medication adherence scores, or dietary adherence scores in association with family history of hypertension among AA patients. Moreover, among AA patients, Pearson product-moment correlation analysis indicated that the number of family members with hypertension was not significantly related to exercise adherence ($r=.051$, $p=.637$), dietary adherence ($r=.153$, $p=.156$), Morisky medication adherence ($r=.045$, $p=.679$), or general medication adherence ($r=-.049$, $p=.650$).

Among Caucasian American (CA) patients, no significant differences were found between CA patients reporting family history of hypertension and those without such history in terms of Morisky medication adherence scores ($F(1,69)=1.366$, $MS_e=1.057$, $p=.247$), general medication adherence scores ($F(1,69)=0.294$, $MS_e=20.417$, $p=.590$), dietary adherence scores ($F(1,69)=0.339$, $MS_e=49.010$, $p=.563$), or exercise adherence scores ($F(1,69)=0.052$, $MS_e=42.177$, $p=.820$). Further, among CA patients, Pearson

product-moment correlation analysis indicated that the number of family members with hypertension was not related to exercise adherence ($r$=-.085, $p$=.513), dietary adherence ($r$=-.043, $p$=.741), Morisky medication adherence ($r$=.115, $p$=.378), or general medication adherence ($r$=.197, $p$=.127).

The second research question was as follows: Among AA and CA patients, are there significant differences in self-reported levels of adherence to the three aspects of the anti-hypertensive medical regimen in association with age, gender, and ethnicity? A Pearson product-moment correlation analysis investigating the relationship of age and adherence revealed, among AA patients, a significant positive relationship between age and dietary adherence scores ($r$=.343, $p$=.001), such that older AA patients tended to have better dietary adherence. Age was not significantly correlated with any adherence measure among CA patients, though a marginally significant relationship was found between age and general medication adherence scores among CA patients ($r$=.229, $p$=.055), suggesting that adherence to the anti-hypertensive medication regimen among CA patients increased as age increased.

A single two-way multivariate analysis of variance (MANOVA) was performed to investigate the associations of the adherence measures with ethnicity and gender. For this MANOVA, the independent variables entered were ethnicity and gender while the dependent variables entered were adherence scores (i.e., Morisky medication adherence scores, general medication adherence scores, dietary adherence scores, and exercise adherence scores). Among all patients, a significant difference in exercise adherence scores was the only significant main effect found for gender, with male patients ($M$=9.381, sd=1.098) reporting a significantly higher levels of exercise than female

patients (M=5.313, sd=0.724, F(1,164)=9.567, MSe=59.089, p=.002). No significant differences were found between male and female patients in terms of Morisky medication adherence scores (F(1,164)=0.516, p=.474), general medication adherence scores (F(1,164)=1.954, p=.185), or dietary adherence scores (F(1,164)=0.695, p=.406). No significant main effects were found between African American and Caucasian Americans in terms of Morisky medication adherence scores (F(1,164)=0.038, p=.846), general medication adherence scores (F(1,164)=0.142, p=.697), dietary adherence scores (F(1,164)=2.034, p=.156), or exercise adherence scores (F(1,164)=2.454, p=.119).

Results also revealed no significant interaction effects of ethnicity and gender in association with Morisky medication adherence scores (F(1,164)=2.688, p=.103), exercise adherence scores (F(1,164)=0.919, p=.339), or dietary adherence scores (F(1,164)=0.152, p=.697). However, a significant interaction between gender and ethnicity was found in association with general medication adherence (F(1,164)=4.394, p=.038). Follow-up t-tests indicate the only significant difference between the four ethnic/gender groups (i.e., AA males, AA females, CA males, CA females) was that African American males reported significantly higher general medication adherence than that reported by African American females (t=2.749, p=.007).

The third and final research question was as follows: Among AA and CA patients with hypertension, will levels of depressive symptoms predict self-reported levels of adherence to each of the three aspects of the anti-hypertensive medical regimen and will the inclusion of depressive symptoms further enhance the prediction of adherence by the expanded self-regulation theory-based model? This research question was explored with both preliminary Pearson product-moment correlation analysis and hierarchical

regressions. As shown in Table 4.23, AA patients' overall level of depressive symptomology was significantly and negatively correlated with Morisky medication adherence scores ($r$=-.437, $p$<.001), exercise adherence scores ($r$=-.285, $p$=.005), and dietary adherence scores ($r$=-.223, $p$=.028), indicating that higher overall levels of depression were associated with lower medication, exercise, and dietary adherence among AA patients with hypertension. In addition, significant correlations were found between AA patients' self-reported Morisky medication adherence scores and each of the following four depression subscale scores: depressive affect scores ($r$=-.464, $p$<.001), somatic symptoms scores ($r$=-.388, $p$<.001), interpersonal difficulties scores ($r$=-.284, $p$=.005), and positive affect scores ($r$=.312, $p$=.002). Significant correlations were also found between exercise adherence scores and each of the following three depression subscale scores: depressive affect scores ($r$=-.268, $p$=.008), somatic symptoms scores ($r$=-.300, $p$=.003), and positive affect scores ($r$=.212, $p$=.038). Finally, significant correlations were found between AA patients' self-reported dietary adherence scores and each of the following two depression subscale scores: depressive affect scores ($r$=-.213, $p$=.036) and somatic symptoms scores ($r$=-.229, $p$=.024).

Pearson product-moment correlation analyses applied to CA patients revealed that, as shown in Table 4.24, overall level of depressive symptomology was significantly and negatively associated with Morisky medication adherence scores ($r$=-.235, $p$=.049) and general medication adherence scores ($r$=.381, $p$=.001), suggesting that higher levels of depression were associated with lower medication adherence among CA patients with hypertension. Moreover, significant correlations were found between CA patients' self-reported Morisky medication adherence scores and the depressive affect subscale scores

($r$=-.233, $p$=.050). Significant correlations were also found in CA patients' self-reported general medication adherence scores and each of the following four depression subscale scores: depressive affect scores ($r$=-.338, $p$=.004), somatic symptoms scores ($r$=-.393, $p$=.001), interpersonal difficulties scores ($r$=-.387, $p$=.001), and positive affect scores ($r$=.246, $p$=.039). Finally, although the correlation between overall depression score and dietary adherence scores was not significant, dietary adherence scores among CA patients was significantly and positively correlated with the interpersonal difficulties subscale scores ($r$=.238, $p$=.046), suggesting that higher levels of difficulties in interpersonal relationships were associated with higher dietary adherence in CA patients with hypertension.

Table 4-23

Correlations between Adherence Ratings and Depression Scales

| | | Depressive Affect | | Somatic Symptoms | | Interpersonal Difficulties | | Positive Affect | | Depression Total Score | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. | Corr. | Sig. |
| African American | Morisky MA | **-.461** | **.000** | **-.388** | **.000** | **-.284** | **.005** | **.312** | **.002** | **-.437** | **.000** |
| | General MA | -.095 | .354 | -.113 | .270 | -.035 | .737 | .070 | .487 | -.100 | .330 |
| | Exercise Ad. | **-.268** | **.008** | **-.300** | **.003** | -.163 | .111 | **.212** | **.038** | **-.285** | **.005** |
| | Dietary Ad. | **-.213** | **.036** | **-.229** | **.024** | -.071 | .490 | .195 | .056 | **-.223** | **.028** |
| Caucasian American | Morisky MA | **-.233** | **.050** | -.218 | .068 | -.213 | .074 | .162 | .176 | **-.235** | **.049** |
| | General MA | **-.338** | **.004** | **-.393** | **.001** | **-.387** | **.001** | **.246** | **.039** | **-.381** | **.001** |
| | Exercise Ad. | -.136 | .259 | -.173 | .150 | -.017 | .890 | -.020 | .870 | -.111 | .355 |
| | Dietary Ad. | -.017 | .887 | .184 | .124 | **.238** | **.046** | -.046 | .701 | .103 | .395 |

Notes: [1] "MA" denotes "Medication Adherence"
Bold = $p<.05$, $n_{AA}$=97, $n_{CA}$=71

In addition to correlations, eight hierarchical regressions were performed to specifically evaluate (a) the independent ability of the depression subscale scores to predict adherence scores to the anti-hypertensive medical regimen and (b) the ability of the depression subscale scores to significantly improve the prediction of adherence variables after the expanded self-regulation theory-based predictor variables were included in the regression equation. To accomplish this, the depression subscale scores were entered into the hierarchical regression as independent variables at the first level and the theory-based predictor variable scores from section five were entered into the regression as independent variables at the second level. For each ethnicity, four separate hierarchical regressions were completed, with each containing only one of the adherence scores as the criterion variable (i.e., Morisky medication adherence scores, general medication adherence scores, dietary adherence scores, or exercise adherence scores). The depression scale total score was excluded from the regression analyses due to the high correlations between the total score and the four subscale scores: depressive affect ($r$=.944, $p$<.001), somatic symptoms ($r$=.910, $p$<.001), interpersonal difficulties ($r$=.674, $p$<.001), and positive affect ($r$=.895, $p$<.001). Results from the hierarchical regressions are shown in Tables B.1 through B.8 in Appendix B.

The first level of the hierarchical regression applied to the African American data with Morisky medication adherence scores as the criterion variable and depression subscale scores as the predictor variables, shown in Table B.1 (Appendix B), was significant ($R^2$ = 0.229, $F$(4,92)=6.816, MSe=0.869, $p$<.001). Moreover, the inclusion of the depression subscale scores in the prediction of African American's self-reported Morisky medication adherence scores resulted in a significant increase in $R^2$ over the

regression incorporating only the self-regulation theory-based predictors ($R^2_1$=.358, $R^2_2$=.504, $\Delta R^2$=.146, $F(4,81)$=5.950, $p$<.001). In other words, the depression subscale scores significantly increased the prediction of Morisky medication adherence scores beyond the inclusion of only the expanded self-regulation model variables.

In addition, shown in Table B.3 (Appendix B), the first level of the hierarchical regression applied to African Americans with exercise adherence as the criterion variable and depression subscale scores as the predictor variables was marginally significant ($R^2$ = 0.095, $F(4,92)$=2.417, MSe=68.191, $p$=.054). That being said, the inclusion of the depression subscale scores in the prediction of African American's self-reported exercise adherence scores did not result in a significant $R^2$ increase over the regression incorporating only the self-regulation theory-based predictors ($R^2_1$=.406, $R^2_2$=.423, $\Delta R^2$=.017, $F(4,81)$=0.609, $p$=.657). As such, after accounting for the contribution of the expanded self-regulation theory based variables, depression subscale scores did not significantly improve the prediction of general medication adherence scores.

However, the first levels of the hierarchical regressions applied to the African American data with depression subscale scores as the predictor variables, shown in Table B.2 and B.4 (Appendix B), were not significant when the criterion variables were general medication adherence scores ($R^2$ = 0.014, $F(4,92)$=0.338, MSe=18.200, $p$=.852) or dietary adherence scores ($R^2$ = 0.062, $F(4,92)$=1.526, MSe=30.521, $p$=.201). Moreover, the inclusion of the depression subscales did not result in significant changes in $R^2$ over those regressions incorporating only the self-regulation theory-based predictors when predicting general medication adherence scores ($R^2_1$=.252, $R^2_2$=.271, $\Delta R^2$=.020,

$F(4,81)=0.546$, $p=.703$) or dietary adherence scores ($R^2_1=.313$, $R^2_2=.363$, $\Delta R^2=.050$, $F(4,81)=1.602$, $p=.182$).

The first level of the hierarchical regression applied to the Caucasian American data with exercise adherence scores as the criterion variable and depression subscale scores as the predictor variables, shown in Table B.7 (Appendix B), was significant ($R^2 = 0.204$, $F(4,64)=4.221$, MSe=41.000, $p=.004$). In addition, the inclusion of the depression subscale scores in the prediction of Caucasian American patients' exercise adherence scores resulted in a significant increase in $R^2$ over the regression incorporating only the self-regulation theory-based predictors ($R^2_1=.578$, $R^2_2=.698$, $\Delta R^2=.119$, $F(4,55)=5.434$, $p=.001$). In addition, the first level of the hierarchical regression applied to the Caucasian American data with dietary adherence scores as the criterion variable and depression subscale scores as the predictor variables, shown in Table B.8 (Appendix B), was also significant ($R^2 = 0.167$, $F(4,64)=3.319$, MSe=36.737, $p=.015$). Moreover, the inclusion of the depression subscale scores in the prediction of Caucasian American patients' dietary adherence scores also resulted in a significant increase in $R^2$ over the regression incorporating only the self-regulation theory-based predictors ($R^2_1=.437$, $R^2_2=.585$, $\Delta R^2=.148$, $F(4,55)=4.893$, $p=.002$). As such, after accounting for the contribution of the expanded self-regulation theory based variables, Caucasian Americans self-reported depression subscale scores significantly improved the prediction of both exercise adherence scores and dietary adherence scores.

The first level of the hierarchical regression applied to the Caucasian American data with Morisky medication adherence scores as the criterion variable and depression subscale scores as the predictor variables, shown in Table B.6 (Appendix B), was

significant ($R^2$ = 0.208, $F(4,64)=4.329$, MSe=16.981, $p=.004$). However, the first level of the hierarchical regression applied to Caucasian American data with general medication adherence scores as the criterion variable, shown in Table B.5 (Appendix B), was not significant ($R^2$ = 0.082, $F(4,64)=1.465$, MSe=0.545, $p=.223$). Moreover, the inclusion of the depression subscales did not result in significant changes in $R^2$ over those regressions incorporating only the self-regulation theory-based predictors when predicting Caucasian Americans' self-reported Morisky medication adherence scores ($R^2_1=.491$, $R^2_2=.537$, $\Delta R^2=.045$, $F(4,55)=1.338$, $p=.267$) or general medication adherence scores ($R^2_1=.578$, $R^2_2=.597$, $\Delta R^2=.019$, $F(4,55)=0.642$, $p=.635$). As such, after accounting for the contribution of the expanded self-regulation theory based variables, depression subscale scores did not significantly improve the prediction of Morisky medication adherence scores or general medication adherence scores.

# CHAPTER 5
# DISCUSSION

Previous chapters have established that hypertension is one of the leading causes of death in American society and endangers the health of over fifty million American adults (AHA, 2004; JNC-7, 2003). As illustrated in earlier chapters, the most ubiquitous and effective treatment for hypertension involves anti-hypertensive medication, a modified diet, and increased exercise. However, with the often asymptomatic nature of hypertension, the overwhelming majority of those with hypertension either do not know they have high blood pressure or are not effectively controlling the disease. As such, the present research intended to extend previous research and examine whether specific patient characteristics are associated with nonadherence to the anti-hypertensive medical regimen – a medical regimen repeatedly shown to be effective in reducing the likelihood for secondary illness and death.

Patient variables selected for the present research were based in part on Kanfer's Self-Regulation Model (Kanfer & Gaelick-Buys, 1991). As applied to health promotion, the self-regulation model suggests that regulation of health behaviors (e.g., medication, diet, and exercise) is determined by three self variables: (1) motivation or self-determinism to be healthy and perform the requisite behaviors; (2) perceived control or self-efficacy about performing the behaviors; and (3) perceived social support for the behaviors from family, friends, and significant others (Kanfer, 1970; Kanfer, 1986; Kanfer & Gaelick-Buys, 1991). Due to the inadequacy existing conceptualizations of

social support to describe the communication of support between the support provider and the support recipient (Melamed & Brenner, 1990), the self-regulation model was expanded in the present research to include an exploration of social support satisfaction as indicated by the discrepancy between social support perceived and that actually desired by participants. Indeed, no research has examined the relative influence on adherence to the three components of the typical anti-hypertensive medical regimen of (a) perceived social support received from family, friends, and significant others and (b) social support satisfaction as indicated by the discrepancy between desired and perceived social support received from family, friends, and significant others. In addition, increasing evidence for the association between depression and adherence to various medical recommendations (e.g., Kim, et al., 2003) led to the inclusion of depressive symptomology as an additional variable for exploration in the present research.

## Synopsis of Findings

The first four hypotheses proposed that each of the three measures of self-reported adherence (i.e., medication, diet, and exercise adherence) would be correlated with the expanded self-regulation theory-based variables: (1) health-based self-efficacy; (2) motivation to engage in health promoting behaviors; (3) perceived social support from family, friends, and significant others; and (4) satisfaction with social support received from family, friends, and significant others. These hypotheses were partially supported by the findings for both African American and Caucasian American patients.

African American (AA) patients who self-reported better adherence to anti-hypertensive medication felt more efficacious in performing general healthy behaviors, perceived higher levels of social support from family and significant others, and were

more satisfied with the social support received from friends, family, and significant others. In addition, AA patients who self-reported better adherence to exercise recommendations felt more efficacious in performing general healthy behaviors, perceived higher levels of social support from friends, and were more satisfied with the social support received from friends, family, and significant others. Further, AA patients who self-reported better adherence to dietary recommendations felt more motivated and self-determined to engage in health-promoting behaviors, perceived higher levels of social support from family, and were more satisfied with the social support received from family.

Caucasian American (CA) patients who self-reported better adherence to anti-hypertensive medication felt more efficacious in performing general healthy behaviors, perceived social support from friends, family, and significant others, and were more satisfied with the social support received from friends, family, and significant others. In addition, CA patients who self-reported better adherence to exercise recommendations and dietary recommendations felt more efficacious in performing general healthy behaviors and felt more motivated and self-determined to engage in health-promoting behaviors. Perceived social support and social support satisfaction from friends, family, and significant others were not related to CA patients self-reported exercise or dietary adherence.

Hypotheses five through seven essentially proposed that the variables of the expanded self-regulation model would predict each of the three components of the typical anti-hypertensive medical regimen: (1) exercise adherence; (2) dietary adherence; and (3) medication adherence. Each of these hypotheses were supported by the data. Indeed, the

variables associated with the expanded self-regulation model (i.e., motivation to be healthy, self-efficacy, perceived social support, and social support satisfaction) were consistently effective at predicting adherence to all three components of the anti-hypertensive medical regimen (i.e., medication, diet, and exercise) in both African American and Caucasian American patients. The ability of the theoretical components of the self-regulation model to predict medication, diet, and exercise adherence in the present study was supportive of many findings from existing literature, though most previous research exploring these components investigated adherence among patients with chronic illnesses other than hypertension. Indeed, previous research has shown (a) self-efficacy to predict medication adherence (e.g., Lennon et al., 2001), dietary adherence (e.g., Senecal et al.. 2000), and exercise adherence (e.g., Bock et al., 1998); (b) motivation or self-determinism to be healthy to predict medication adherence (e.g., Williams et al., 1998), dietary adherence (e.g., Senecal et al., 2000), and exercise adherence (e.g., Ryan et al., 1997); and (c) social support to predict medication adherence (Morisky et al., 1985), dietary adherence (e.g., Wilson & Ampey-Tornhill, 2001), and exercise adherence (e.g., Wallace et al., 1995). In addition to supporting the findings of previous research, the present study also extended existing research on adherence to the three components of the anti-hypertensive medical regimen. Specifically, no published research was found that explored all three aspects of the self-regulation model in a single study, as was done in the present research.

A secondary goal of this research was to explore the relative importance of the traditional concept of social support (i.e., perceived social support) and the more interactional concept of social support satisfaction (i.e., social support satisfaction as

indicated by the discrepancy between perceived and desired social support). In keeping with this goal, the final three hypotheses essentially proposed that adherence to each of the three components of the typical anti-hypertensive medical regimen would be better predicted by social support satisfaction than perceived social support in relation to support from (1) family, (2) friends, and (3) significant others. As mentioned above, both perceived social support and social support satisfaction showed relationships with adherence among both African American (AA) and Caucasian American (CA) patients, such that higher perceived social support and higher social support satisfaction were related to higher adherence to the three components of the anti-hypertensive medical regimen (i.e., medication, diet, and exercise).

However, it appears that the relative strengths of the two concepts of social support were not equivalent in their ability to predict adherence to the anti-hypertensive medical regimen. In support of the final three hypotheses, perceived social support from friends and from significant others were not shown to be stronger independent predictors of adherence to any of the three components of the anti-hypertensive regimen. Indeed, when compared to perceived social support from friends and significant others, satisfaction with social support received from both friends and significant others were stronger independent predictors of medication adherence in both AA and CA patients and a stronger independent predictor of exercise adherence in AA patients. Further supporting the final three hypotheses, satisfaction with social support received from family was a stronger independent predictor of medication adherence in AA and CA patients and a stronger independent predictor of exercise adherence in AA patients. The final three hypotheses were not entirely supported, however, in that perceived social

support from family was shown to be a stronger independent predictor of dietary adherence among AA patients.

The traditional concept of social support typically assumes that individuals require a level of support defined by a set of specific items intended to be indicative of positive social support. Many studies have supported the relationship between traditionally-defined levels of perceived social support and compliance with specific medical regimen behaviors (e.g., Wilson & Ampey-Tornhill, 2001). Indeed, the present study also supported the importance of this traditional concept of social support in that perceived social support was important in the prediction of adherence to the three aspects of the anti-hypertensive medical regimen. Most studies finding a relationship between perceived social support and compliance with medical recommendations interpret such findings as suggesting that increasing social support will lead to an increase in adherence. For instance, a group of studies finding family support to be related to adherence suggested that a patient's family should be recruited to assist in supervision of patients (Feldman et al., 1998; Fishman, 1995; Sherbourne et al., 1992). However, the present research suggests that such conclusions may be inaccurate and could, potentially, result in a reduction in adherence.

Indeed, a limited but growing body of research has begun qualifying the conclusions suggested by research using the traditional concept of social support. For instance, research has suggested that other variables (e.g., coping style) may lead to high levels of social support having a negative impact on the performance of health-promoting behaviors (e.g., Walcott-McQuigg & Prohaska, 2001). The present research suggests that the social support satisfaction, indicated by the discrepancy between perceived and desired social support, is typically a stronger predictor of adherence than perceived social support

alone. In this light, the results stress the importance of assessing what a patient desires before intervening to increase social support, which may reduce adherence should a higher level of social support not be desired by the patient. It is important to note that the present findings do not negate the importance of the traditional concept of social support. Instead, the findings stress the importance of the individually-determined *quality* of social supports rather than the more traditional concept of *quantity* of supports. In other words, the present research suggests that statistical significance should not be presumed to imply individual significance.

A third goal of this research was to explore the ability of depressive symptoms to predict adherence to the anti-hypertensive medical regimen and the ability of depressive symptoms to further strengthen the ability of the expanded self-regulation model to predict adherence to the anti-hypertensive medical regimen. Among AA patients, depressive symptoms were effective in independently predicting adherence to medication and exercise and added significantly to the prediction of medication adherence above and beyond the contributions of the expanded self-regulation model. Similarly, among CA patients, depressive symptoms were effective in independently predicting adherence to all three components of the anti-hypertensive medical regimen (i.e., medication, exercise, and diet) and added significantly to the prediction of dietary and exercise adherence beyond the contributions of the expanded self-regulation model. Results suggest, across both ethnicities, level of depressive affect was consistently the strongest independent predictor of adherence to the three components of the anti-hypertensive medical regimen.

The present research fits well with the existing literature, most of which has demonstrated a relationship between depressive symptoms and adherence to medical

recommendations in the treatment of chronic diseases such as kidney disease (e.g., McGee et al., 1998), high cholesterol (Lynch et al., 1992), chemotherapy (Ayres et al., 1994), coronary artery disease (Carney et al., 1995), diabetes (e.g., Ciechanowski et al., 2003), and other chronic conditions. Only one published study was found that examined adherence to the anti-hypertensive medical regimen, demonstrating that (a) more than one-fourth of the sample presented with clinical depression and (b) level of depression was associated with poor medication and dietary adherence (Kim et al., 2003). Although Kim and colleagues (2003) studied only African American men, the present research supported their findings and extended them to a sample of African American and Caucasian American men and women. Indeed, similar to Kim et al. (2003), approximately one-fourth of the Caucasian American sample and one-fifth of the African American sample in the present research presented with clinical depression. Overall, the importance of assessing and targeting depressive symptoms among hypertensive patients cannot be overemphasized, given the pattern of relationships between such symptoms and adherence to all three components of the anti-hypertensive medical regimen.

## Implications

With the rising costs of health care and the emerging view of patients as consumers, this research presents clear implications for health care and the inclusion of psychology in the treatment of chronic disease, particularly among patients diagnosed with hypertension and at-risk for non-adherence. As detailed in previous chapters, a central theme of the self-regulation model (Kanfer & Gaelick-Buys, 1991) is the importance of empowerment in the self-regulation of behaviors. Indeed, the present research found that the self-regulation model predicted adherence to all three aspects of

the anti-hypertensive medical regimen, thus suggesting the importance of empowering patients to feel more efficacious in performing adherent behaviors, more self-motivated to engage in adherent behaviors, and more able to obtain a higher level of desired social support.

Empowerment is not a new concept in the field of psychology, where it has long been understood that empowering a person to change their own lives is more effective and more lasting than changing it for them or simply giving advice. Healthcare professionals, on the other hand, often operate from the medical model wherein diagnosis and symptom identification are of paramount concern to ensure appropriate and safe treatment. This is not to imply the medical model is inappropriate, indeed, it is almost necessary in today's society. However, the medical model often results in minimal emphasis on empowering patients to change their lives, which is not surprising as the average patient would not be expected to know which medications are best for specific symptoms and would not have the ability to prescribe their own medications. That being said, the present research suggests the importance of addressing empowerment issues, particularly in the treatment of chronic illnesses such as hypertension where there is possibility of long-term and severe effects from non-adherence. Overall, patients being treated for hypertension could benefit from short-term individual, group, and/or family therapy where they could be empowered to increase self-efficacy, motivation, and social support.

As discussed before, an additional focus of this research was on social support satisfaction, a component of the expanded self-regulation model indicated by the difference between desired and perceived social support. The finding that social support

satisfaction is typically a stronger predictor of adherence than level of perceived social support alone has several clear implications. Namely, this finding suggests that it is inadequate, if not damaging, to assume that individuals require a level of social support that has been predetermined by mental health or medical professionals. Indeed, the research findings stress the importance of asking patients whether they desire to increase social support and, if so, what areas and which support givers they would like to specifically address. To address this, family therapy techniques could be modified to help families provide added support to patients with hypertension, with therapy and education tailored specifically for each family and based on an assessment of those support characteristics desired by the patient. Individual therapy techniques could also be utilized, focusing on assisting the patient understand and identify the types and levels of social support desired, as well as empowering them to respectively and assertively request the desired support.

In addition to factors specifically outlined by the self-regulation model, the link between depressive symptoms and adherence to the anti-hypertensive medical regimen also presents important implications for medicine and psychology. Namely, the importance of inquiring about depressive symptoms in the treatment of hypertension cannot be overstated, particularly depressive affect and/or a lack of positive affect. This is not to imply that only patients diagnosable with clinical depression are at risk for non-adherence, nor does it imply that anti-depressant medication should be considered for those who are having difficulty in adherence. Rather, those who endorse more negative feelings and fewer positive feelings are at risk for non-adherence and, as such, may benefit from short-term individual or group psychotherapy. As with empowerment,

identifying and working through difficult feelings is a goal not foreign to the fields of counseling and clinical psychology.

In addition to clinical implications, the methodology of the present research also has important implications. Of paramount importance is that the method of recruitment resulted in a much higher response rate than is typical in survey research. It appears that hand-delivering packets and explaining the importance of the research to each patient was effective in maintaining a higher response rate while also abiding by the strict HIPAA regulations. This method also resulted in lower overall costs of the research project; in that hand-delivering reduces the amount of time required by healthcare staff and professionals and alleviates the need for additional postage in the initial mailing of questionnaires packets.

The present research also provided justification for the use of the difference model research approach (Oyemade & Rosser, 1980) as opposed to the more traditional deficit model approach (Jenkins, 1989). Indeed, the present study found important differences between African American and Caucasian American patients that might have been missed had the groups not been explored separately in keeping with the difference model approach. For instance, although the variables of the self-regulation model were generally effective at predicting adherence to the three components of the typical hypertensive medical regimen (i.e., self-reported medication, exercise, and dietary adherence), the variables were more effective predictors of adherence to all three components among Caucasian Americans than among African Americans. Additionally, depressive symptoms were more effective in the prediction of dietary and exercise adherence among Caucasian Americans. Further, while social support satisfaction was a

stronger predictor of medication adherence and exercise adherence among both ethnic groups, perceived social support from family was a stronger predictor of dietary adherence among African American patients though not among Caucasian American patients. Clearly, there were several important differences that might have been missed had the deficit model approach been used, thus justifying the use of the difference model approach in the present study.

## Limitations and Future Research

Although there were important findings and implications of the present study, there also existed limitations which could be addressed by future research. One such limitation was that the research methodology did not allow for definitive assumptions to be drawn about the recruitment method. Another limitation was the use of self-report adherence measures. While self-report measures can be valid and reliable, and while this research had no option but to use self-report measures, it is possible that the measures chosen were not ideal. For instance, both the Morisky and the supplemental medication adherence scales included only four "yes/no" questions, as opposed to a Likert format that could have provided more information. Open-ended questions could also prove beneficial; such as asking patients why they missed their medication and how often they did so, as done in other research (e.g., Shaw et al., 1995). To further clarify the picture of medication adherence, future research could use the method developed by Bartucci et al. (1987), wherein patients were asked to describe their medication and dosage schedule that was then compared to actual recommendations. Such a method would better identify those individuals who believe they are adhering, but may be inaccurate in their medication taking.

In addition to the medication adherence measure, the exercise adherence measure was also limited due to the format of responses. As it was used in the present research, the exercise adherence measure asked patients to answer how often they exercised in a typical week. Unfortunately, this sort of open-ended questioning results in decreased power when analyzing data. Future research might consider developing a new measure of exercise adherence, perhaps using a Likert-type response format or making the questions more specific.

The present study was also limited in several ways by the measure of social support. First, although satisfaction with social support received (as indicated by the discrepancy between perceived and desired social support) from family, friends, and significant others provided some interesting and important findings, the scores were based on the absolute value of the difference between perceived and desired levels of support. An alternative method that might be interesting to investigate in future research would be to explore not only the discrepancy, but also the direction of that discrepancy (i.e., do patients desire more or less social support than they perceive). Second, the scale used to measure perceived social support was expert-created and, thus, may not have tapped all possible sources of social support desired or perceived by participants. Alternative methods which could be used in future research would be to use an interview method to identify additional sources of support and their attitudes towards that support. Another possibility would be to use a focus group methodology to identify a more complete list of desired and perceived social support behaviors from various others in patients' lives.

Another limitation is that the present study only investigated African American and Caucasian American patients. Statistics show that other populations also have high rates of hypertension, including Native Americans and Hispanic Americans. Although participants from both of these populations are difficult to recruit, future researchers could consider alternative methods for engaging such populations. Methods for developing diverse and competent research teams, such as those suggested by Gil and Bob (1999), may assist in the engagement of Hispanic American and Native American patients. An additional recruitment limitation is that the sample was homogeneous in terms of location of recruitment (i.e., outpatient clinic). Homogeneity of the sample serves to qualify some results, and future research could rectify such a limitation by recruiting physicians who would be able to mail or hand-deliver study questionnaires to an ethnically diverse group of patients.

The current study found an expanded self-regulation model and depressive symptoms were effective in predicting adherence to the anti-hypertensive medical regimen. There are several avenues down which future research could proceed, though the most logical next step for this research is in exploring possible interventions targeting the components of the expanded self-regulation model. For instance, a study investigating various methods of eliciting family social support (e.g., therapist-assisted family therapy versus individual-focused assertiveness training) would be an interesting extension of this research. It might also be intriguing to look at the influence of discrepancies between desired and perceived social support on the adherence to medical recommendations in the treatment of other chronic illnesses, such as obesity, kidney failure (i..e, hemodialsyis), or heart disease. Overall, this study has supported the

importance of empowering patients to improve the quality of their own lives and helps bolster the importance of psychology in the treatment of chronic illness.

# APPENDIX A
# MULTIPLE REGRESSION TABLES:
# HYPOTHESES FIVE THROUGH SEVEN

Table A-1

Multiple Regression Predicting Morisky Medication Adherence – African Americans

| Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 2.128 | 1.272 | | 1.672 | .098 |
| Nutrition Self-Efficacy | .016 | .016 | .135 | .962 | .339 |
| Well-Being Self-Efficacy | -.019 | .016 | -.192 | -1.199 | .234 |
| Exercise Self-Efficacy | -.020 | .011 | -.275 | -1.800 | .075 |
| Other Health Practices Self-Efficacy | **.055** | **.023** | **.332** | **2.379** | **.020** |
| Perceived Support - Family | -.002 | .027 | -.014 | -.085 | .932 |
| Perceived Support - Friends | -.012 | .025 | -.060 | -.481 | .632 |
| Perceived Support – Sig. Others | -.008 | .040 | -.033 | -.200 | .842 |
| Support Discrepancy - Family | **-.100** | **.033** | **-.494** | **-3.063** | **.003** |
| Support Discrepancy - Friends | -.014 | .034 | -.054 | -.419 | .677 |
| Support Discrepancy – Sig. Others | -.039 | .040 | -.157 | -.982 | .329 |
| Health Self-Determinism | .010 | .013 | .077 | .814 | .418 |

Note: $R$ = .598, $R^2$ = 0.358, Adjusted $R^2$ = 0.275, Standard Error of the Estimate = 0.885, $n$ = 97

Table A-2

Multiple Regression Predicting General Medication Adherence – African Americans

| Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 20.33 | 5.562 | | 3.656 | .000 |
| Nutrition Self-Efficacy | .126 | .071 | .269 | 1.780 | .079 |
| Well-Being Self-Efficacy | -.098 | .068 | -.249 | -1.443 | .153 |
| Exercise Self-Efficacy | -.058 | .048 | -.199 | -1.207 | .231 |
| Other Health Practices Self-Efficacy | .109 | .101 | .164 | 1.088 | .280 |
| Perceived Support - Family | -.083 | .120 | -.126 | -.688 | .493 |
| Perceived Support - Friends | .084 | .110 | .104 | .768 | .445 |
| Perceived Support – Sig. Others | .060 | .174 | .061 | .345 | .731 |
| Support Discrepancy - Family | **-.519** | **.143** | **-.630** | **-3.619** | **.001** |
| Support Discrepancy - Friends | .208 | .147 | .197 | 1.412 | .162 |
| Support Discrepancy – Sig. Others | .013 | .173 | .013 | .077 | .939 |
| Health Self-Determinism | .002 | .055 | .003 | .034 | .973 |

Note: $R$ = .502, $R^2$ = 0.252, Adjusted $R^2$ = 0.155, Standard Error of the Estimate = 3.868, $n$ = 97

Table A-3

Multiple Regression Predicting Morisky Medication Adherence – Caucasian Americans

| Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 3.817 | 1.081 | | 3.529 | .001 |
| Nutrition Self-Efficacy | -.002 | .015 | -.022 | -.161 | .872 |
| Well-Being Self-Efficacy | .013 | .016 | .139 | .789 | .433 |
| Exercise Self-Efficacy | -.012 | .011 | -.141 | -1.015 | .314 |
| Other Health Practices Self-Efficacy | -.007 | .017 | -.052 | -.376 | .708 |
| Perceived Support - Family | -.035 | .026 | -.271 | -1.361 | .179 |
| Perceived Support - Friends | **.083** | **.028** | **.498** | **3.017** | **.004** |
| Perceived Support – Sig. Others | **-.114** | **.040** | **-.804** | **-2.835** | **.006** |
| Support Discrepancy - Family | .016 | .046 | .079 | .341 | .734 |
| Support Discrepancy - Friends | -.052 | .036 | -.252 | -1.433 | .157 |
| Support Discrepancy – Sig. Others | **-.191** | **.056** | **-1.024** | **-3.431** | **.001** |
| Health Self-Determinism | **.044** | **.015** | **.329** | **2.923** | **.005** |

Note: $R$ = .761, $R^2$ = 0.578, Adjusted $R^2$ = 0.500, Standard Error of the Estimate = 0.729, $n$ = 71

Table A-4

Multiple Regression Predicting General Medication Adherence – Caucasian Americans

| Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 20.50 | 5.179 | | 3.958 | .000 |
| Nutrition Self-Efficacy | .015 | .070 | .032 | .210 | .834 |
| Well-Being Self-Efficacy | .100 | .077 | .252 | 1.303 | .198 |
| Exercise Self-Efficacy | **-.117** | **.054** | **-.329** | **-2.158** | **.035** |
| Other Health Practices Self-Efficacy | .009 | .084 | .017 | .109 | .914 |
| Perceived Support - Family | -.067 | .124 | -.118 | -.538 | .593 |
| Perceived Support - Friends | .120 | .132 | .166 | .913 | .365 |
| Perceived Support – Sig. Others | -.220 | .192 | -.355 | -1.141 | .259 |
| Support Discrepancy - Family | -.030 | .222 | -.035 | -.137 | .891 |
| Support Discrepancy - Friends | -.239 | .174 | -.266 | -1.377 | .174 |
| Support Discrepancy – Sig. Others | -.497 | .267 | -.610 | -1.862 | .068 |
| Health Self-Determinism | **.212** | **.073** | **.359** | **2.905** | **.005** |

Note: $R$ = .701, $R^2$ = 0.491, Adjusted $R^2$ = 0.397, Standard Error of the Estimate = 3.492, $n$ = 71

Table A-5

Multiple Regression Predicting Dietary Adherence – African Americans

| Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 45.708 | 7.074 | | 6.462 | .000 |
| Nutrition Self-Efficacy | **.258** | **.090** | **.416** | **2.873** | **.005** |
| Well-Being Self-Efficacy | -.072 | .087 | -.138 | -.833 | .407 |
| Exercise Self-Efficacy | **-.218** | **.061** | **-.561** | **-3.553** | **.001** |
| Other Health Practices Self-Efficacy | .180 | .128 | .203 | 1.410 | .162 |
| Perceived Support - Family | .253 | .153 | .291 | 1.659 | .101 |
| Perceived Support - Friends | -.085 | .139 | -.080 | -.613 | .542 |
| Perceived Support – Sig. Others | **-.570** | **.221** | **-.434** | **-2.580** | **.012** |
| Support Discrepancy - Family | -.113 | .182 | -.103 | -.618 | .538 |
| Support Discrepancy - Friends | .062 | .188 | .044 | .329 | .743 |
| Support Discrepancy – Sig. Others | **-.601** | **.220** | **-.452** | **-2.731** | **.008** |
| Health Self-Determinism | .087 | .070 | .122 | 1.244 | .217 |

Note: $R$ = .560, $R^2$ = 0.313, Adjusted $R^2$ = 0.224, Standard Error of the Estimate = 4.919, $n$ = 97

Table A-6

Multiple Regression Predicting Dietary Adherence – Caucasian Americans

| Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 31.162 | 7.821 | | 3.985 | .000 |
| Nutrition Self-Efficacy | **.221** | **.106** | **.330** | **2.072** | **.043** |
| Well-Being Self-Efficacy | .085 | .116 | .149 | .735 | .466 |
| Exercise Self-Efficacy | -.006 | .082 | -.012 | -.075 | .941 |
| Other Health Practices Self-Efficacy | .087 | .127 | .111 | .691 | .492 |
| Perceived Support - Family | -.268 | .187 | -.331 | -1.436 | .156 |
| Perceived Support - Friends | -.141 | .199 | -.136 | -.711 | .480 |
| Perceived Support – Sig. Others | .073 | .291 | .083 | .252 | .802 |
| Support Discrepancy - Family | .493 | .335 | .393 | 1.472 | .146 |
| Support Discrepancy - Friends | **-.824** | **.262** | **-.638** | **-3.138** | **.003** |
| Support Discrepancy – Sig. Others | .052 | .403 | .044 | .128 | .899 |
| Health Self-Determinism | .112 | .110 | .132 | 1.017 | .313 |

Note: $R$ = .661, $R^2$ = 0.437, Adjusted $R^2$ = 0.332, Standard Error of the Estimate = 5.273, $n$ = 71

Table A-7

Multiple Regression Predicting Exercise Adherence – African Americans

| Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | -2.272 | 10.012 | | -.227 | .821 |
| Nutrition Self-Efficacy | -.234 | .127 | -.248 | -1.841 | .069 |
| Well-Being Self-Efficacy | .158 | .123 | .198 | 1.286 | .202 |
| Exercise Self-Efficacy | **.287** | **.087** | **.485** | **3.299** | **.001** |
| Other Health Practices Self-Efficacy | .007 | .181 | .005 | .040 | .968 |
| Perceived Support - Family | -.388 | .216 | -.293 | -1.793 | .076 |
| Perceived Support - Friends | .154 | .197 | .094 | .780 | .438 |
| Perceived Support – Sig. Others | -.037 | .313 | -.019 | -.119 | .906 |
| Support Discrepancy - Family | -.268 | .258 | -.161 | -1.037 | .303 |
| Support Discrepancy - Friends | -.332 | .265 | -.155 | -1.250 | .215 |
| Support Discrepancy – Sig. Others | .264 | .312 | .130 | .847 | .400 |
| Health Self-Determinism | **.211** | **.099** | **.194** | **2.127** | **.036** |

Note: $R$ = .637, $R^2$ = 0.406, Adjusted $R^2$ = 0.329, Standard Error of the Estimate = 6.963, $n$ = 97

Table A-8

Multiple Regression Predicting Exercise Adherence – Caucasian Americans

| Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|
| (Constant) | 4.582 | 7.309 | | .627 | .533 |
| Nutrition Self-Efficacy | -.122 | .099 | -.170 | -1.230 | .224 |
| Well-Being Self-Efficacy | -.109 | .109 | -.176 | -1.002 | .320 |
| Exercise Self-Efficacy | **.430** | **.076** | **.781** | **5.628** | **.000** |
| Other Health Practices Self-Efficacy | -.069 | .118 | -.081 | -.582 | .563 |
| Perceived Support - Family | **.355** | **.175** | **.405** | **2.031** | **.047** |
| Perceived Support - Friends | **-.619** | **.186** | **-.549** | **-3.327** | **.002** |
| Perceived Support – Sig. Others | .041 | .272 | .042 | .150 | .882 |
| Support Discrepancy - Family | .213 | .313 | .157 | .680 | .499 |
| Support Discrepancy - Friends | -.345 | .245 | -.247 | -1.406 | .165 |
| Support Discrepancy – Sig. Others | .020 | .377 | .016 | .053 | .958 |
| Health Self-Determinism | .112 | .103 | .122 | 1.087 | .281 |

Note: $R$ = .760, $R^2$ = 0.578, Adjusted $R^2$ = 0.500, Standard Error of the Estimate = 4.928, $n$ = 71

# APPENDIX B
# HIERARCHICAL REGRESSION TABLES: RESEARCH QUESTIONS

Table B-1

Hierarchical Regression Predicting Morisky Medication Adherence – African Americans

| | Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|---|
| Model One | (Constant) | 3.639 | .157 | | 23.174 | .000 |
| | Depressive Affect | **-.091** | **.034** | **-.468** | **-2.695** | **.008** |
| | Somatic Symptoms | -.034 | .036 | -.154 | -.956 | .341 |
| | Interpersonal Difficulties | -.043 | .090 | -.056 | -.474 | .636 |
| | Positive Affect | .073 | .058 | .207 | 1.253 | .213 |
| Model Two | (Constant) | 1.421 | 1.182 | | 1.202 | .233 |
| | Depressive Affect | **-.099** | **.034** | **-.506** | **-2.901** | **.005** |
| | Somatic Symptoms | -.010 | .036 | -.045 | -.276 | .783 |
| | Interpersonal Difficulties | .099 | .092 | .130 | 1.071 | .288 |
| | Positive Affect | .007 | .067 | .020 | .104 | .918 |
| | Nutrition Self-Efficacy | .011 | .016 | .093 | .656 | .514 |
| | Well-Being Self-Efficacy | -.034 | .017 | -.346 | -1.951 | .055 |
| | Exercise Self-Efficacy | -.020 | .010 | -.271 | -1.930 | .057 |
| | Other Health Practices Self-Efficacy | **.076** | **.024** | **.461** | **3.123** | **.002** |
| | Perceived Support - Family | -.002 | .025 | -.014 | -.088 | .930 |
| | Perceived Support - Friends | .008 | .024 | .042 | .351 | .727 |
| | Perceived Support – Sig. Others | .017 | .038 | .070 | .452 | .653 |
| | Support Discrepancy - Family | **-.101** | **.030** | **-.499** | **-3.355** | **.001** |
| | Support Discrepancy - Friends | .052 | .035 | .200 | 1.510 | .135 |
| | Support Discrepancy – Sig. Others | -.032 | .038 | -.130 | -.856 | .394 |
| | Health Self-Determinism | .003 | .012 | .024 | .275 | .784 |

Note: Model 1: $R$ = .478, $R^2$ = 0.229, Adjusted $R^2$ = 0.195, Standard Error of the Estimate = 0.932, $n$ = 97
**$F(4,92)=6.816$, MSe=0.869, $p<.001$**
Model 2: $R$ = .710, $R^2$ = 0.504, Adjusted $R^2$ = 0.412, Standard Error of the Estimate = 0.797, $n$ = 97
**$F(15,81)=5.480$, MSe=0.635, $p<.001$**

Table B-2

Hierarchical Regression Predicting General Medication Adherence – African Americans

| | Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|---|
| Model One | (Constant) | 24.85 | .719 | | 34.588 | .000 |
| | Depressive Affect | -.040 | .155 | -.051 | -.257 | .797 |
| | Somatic Symptoms | -.108 | .163 | -.121 | -.665 | .508 |
| | Interpersonal Difficulties | .098 | .413 | .032 | .236 | .814 |
| | Positive Affect | .060 | .267 | .042 | .224 | .823 |
| Model Two | (Constant) | 18.80 | 5.799 | | 3.243 | .002 |
| | Depressive Affect | .048 | .167 | .061 | .287 | .775 |
| | Somatic Symptoms | -.180 | .177 | -.200 | -1.016 | .313 |
| | Interpersonal Difficulties | .421 | .452 | .137 | .932 | .354 |
| | Positive Affect | -.046 | .329 | -.032 | -.139 | .890 |
| | Nutrition Self-Efficacy | .127 | .080 | .271 | 1.583 | .117 |
| | Well-Being Self-Efficacy | -.124 | .085 | -.315 | -1.467 | .146 |
| | Exercise Self-Efficacy | -.064 | .050 | -.218 | -1.284 | .203 |
| | Other Health Practices Self-Efficacy | .130 | .120 | .195 | 1.089 | .280 |
| | Perceived Support - Family | -.084 | .124 | -.128 | -.681 | .498 |
| | Perceived Support - Friends | .128 | .118 | .158 | 1.086 | .281 |
| | Perceived Support – Sig. Others | .127 | .185 | .129 | .685 | .495 |
| | Support Discrepancy - Family | **-.542** | **.148** | **-.658** | **-3.651** | **.000** |
| | Support Discrepancy - Friends | .240 | .170 | .227 | 1.412 | .162 |
| | Support Discrepancy – Sig. Others | .072 | .185 | .072 | .389 | .698 |
| | Health Self-Determinism | -.009 | .057 | -.016 | -.149 | .882 |

Note: Model 1: $R = .120$, $R^2 = 0.014$, Adjusted $R^2 = 0.028$, Standard Error of the Estimate = 4.266, $n = 97$
**$F(4,92)=0.338$, MSe=18.200, $p=.852$**
Model 2: $R = .521$, $R^2 = 0.271$, Adjusted $R^2 = 0.136$, Standard Error of the Estimate = 3.910, $n = 97$
**$F(15,81)=2.009$, MSe=15.288, $p=.024$**

Table B-3

Hierarchical Regression Predicting Exercise Adherence – African Americans

| | Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|---|
| Model One | (Constant) | 10.42 | 1.391 | | 7.494 | .000 |
| | Depressive Affect | -.198 | .300 | -.124 | -.659 | .512 |
| | Somatic Symptoms | -.484 | .316 | -.267 | -1.532 | .129 |
| | Interpersonal Difficulties | -.063 | .800 | -.010 | -.079 | .937 |
| | Positive Affect | .272 | .517 | .094 | .526 | .600 |
| Model Two | (Constant) | -3.526 | 10.423 | | -.338 | .736 |
| | Depressive Affect | -.205 | .300 | -.128 | -.682 | .497 |
| | Somatic Symptoms | -.090 | .318 | -.050 | -.285 | .777 |
| | Interpersonal Difficulties | -.013 | .812 | -.002 | -.016 | .987 |
| | Positive Affect | .031 | .592 | .011 | .053 | .958 |
| | Nutrition Self-Efficacy | -.230 | .144 | -.243 | -1.599 | .114 |
| | Well-Being Self-Efficacy | .104 | .152 | .130 | .680 | .498 |
| | Exercise Self-Efficacy | **.289** | **.089** | **.488** | **3.228** | **.002** |
| | Other Health Practices Self-Efficacy | .067 | .215 | .050 | .312 | .756 |
| | Perceived Support - Family | -.400 | .222 | -.302 | -1.800 | .076 |
| | Perceived Support - Friends | .222 | .212 | .136 | 1.047 | .298 |
| | Perceived Support – Sig. Others | .015 | .333 | .007 | .045 | .965 |
| | Support Discrepancy - Family | -.284 | .267 | -.171 | -1.064 | .291 |
| | Support Discrepancy - Friends | -.138 | .305 | -.065 | -.453 | .652 |
| | Support Discrepancy – Sig. Others | .309 | .332 | .153 | .932 | .354 |
| | Health Self-Determinism | .185 | .103 | .170 | 1.789 | .077 |

Note: Model 1: $R = .308$, $R^2 = 0.095$, Adjusted $R^2 = 0.056$, Standard Error of the Estimate = 8.258, $n = 97$
**$F(4,92)=2.417$, MSe=68.191, $p=.054$**
Model 2: $R = .650$, $R^2 = 0.423$, Adjusted $R^2 = 0.316$, Standard Error of the Estimate = 7.028, $n = 97$
**$F(15,81)=3.958$, MSe=49.392, $p<.001$**

Table B-4

Hierarchical Regression Predicting Dietary Adherence – African Americans

| | Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|---|
| Model One | (Constant) | 47.02 | .931 | | 50.520 | .000 |
| | Depressive Affect | -.109 | .201 | -.104 | -.544 | .588 |
| | Somatic Symptoms | -.184 | .211 | -.155 | -.872 | .386 |
| | Interpersonal Difficulties | .445 | .535 | .109 | .832 | .408 |
| | Positive Affect | -.120 | .346 | -.063 | -.347 | .729 |
| Model Two | (Constant) | 42.70 | 7.194 | | 5.936 | .000 |
| | Depressive Affect | -.035 | .207 | -.034 | -.171 | .864 |
| | Somatic Symptoms | -.196 | .219 | -.165 | -.893 | .375 |
| | Interpersonal Difficulties | .525 | .561 | .129 | .936 | .352 |
| | Positive Affect | -.365 | .408 | -.192 | -.893 | .375 |
| | Nutrition Self-Efficacy | **.235** | **.099** | **.379** | **2.370** | **.020** |
| | Well-Being Self-Efficacy | -.182 | .105 | -.347 | -1.729 | .088 |
| | Exercise Self-Efficacy | **-.214** | **.062** | **-.550** | **-3.463** | **.001** |
| | Other Health Practices Self-Efficacy | **.306** | **.148** | **.345** | **2.065** | **.042** |
| | Perceived Support - Family | .259 | .153 | .297 | 1.687 | .096 |
| | Perceived Support - Friends | .028 | .146 | .026 | .189 | .851 |
| | Perceived Support – Sig. Others | **-.496** | **.230** | **-.378** | **-2.158** | **.034** |
| | Support Discrepancy - Family | -.168 | .184 | -.154 | -.913 | .364 |
| | Support Discrepancy - Friends | .279 | .211 | .198 | 1.323 | .190 |
| | Support Discrepancy – Sig. Others | **-.508** | **.229** | **-.382** | **-2.219** | **.029** |
| | Health Self-Determinism | .062 | .071 | .087 | .871 | .386 |

Note: Model 1: $R = .249$, $R^2 = 0.062$, Adjusted $R^2 = 0.021$, Standard Error of the Estimate = 5.525, $n = 97$
**$F(4,92)=1.526$, MSe=30.521, $p=.201$**
Model 2: $R = .603$, $R^2 = 0.363$, Adjusted $R^2 = 0.246$, Standard Error of the Estimate = 4.851, $n = 97$
**$F(15,81)=3.083$, MSe=23.532, $p=.001$**

Table B-5

Hierarchical Regression Predicting Morisky Medication Adherence – Caucasian Americans

| | Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|---|
| Model One | (Constant) | 3.581 | .227 | | 15.747 | .000 |
| | Depressive Affect | -.106 | .079 | -.467 | -1.330 | .188 |
| | Somatic Symptoms | -.010 | .044 | -.043 | -.221 | .826 |
| | Interpersonal Difficulties | -.060 | .109 | -.086 | -.551 | .583 |
| | Positive Affect | .111 | .103 | .339 | 1.076 | .286 |
| Model Two | (Constant) | 3.524 | 1.159 | | 3.042 | .004 |
| | Depressive Affect | .050 | .071 | .221 | .702 | .486 |
| | Somatic Symptoms | -.018 | .036 | -.080 | -.506 | .615 |
| | Interpersonal Difficulties | .030 | .093 | .042 | .320 | .750 |
| | Positive Affect | .000 | .089 | .000 | -.001 | .999 |
| | Nutrition Self-Efficacy | -.007 | .016 | -.062 | -.426 | .672 |
| | Well-Being Self-Efficacy | .022 | .018 | .245 | 1.268 | .210 |
| | Exercise Self-Efficacy | -.013 | .012 | -.157 | -1.044 | .301 |
| | Other Health Practices Self-Efficacy | -.015 | .019 | -.115 | -.783 | .437 |
| | Perceived Support - Family | -.025 | .030 | -.190 | -.817 | .417 |
| | Perceived Support - Friends | **.085** | **.029** | **.511** | **2.988** | **.004** |
| | Perceived Support – Sig. Others | **-.134** | **.046** | **-.945** | **-2.895** | **.005** |
| | Support Discrepancy - Family | .018 | .048 | .088 | .365 | .717 |
| | Support Discrepancy - Friends | -.047 | .039 | -.227 | -1.213 | .230 |
| | Support Discrepancy – Sig. Others | **-.217** | **.062** | **-1.162** | **-3.518** | **.001** |
| | Health Self-Determinism | **.056** | **.018** | **.417** | **3.160** | **.003** |

Note: Model 1: R = .286, $R^2$ = 0.082, Adjusted $R^2$ = 0.026, Standard Error of the Estimate = 1.018, n = 71
**F(4,64)=1.465, MSe=1.517, p=.223**
Model 2: R = .773, $R^2$ = 0.597, Adjusted $R^2$ = 0.487, Standard Error of the Estimate = 0.738, n = 71
**F(15,55)=5.437, MSe=0.545, p<.001**

Table B-6

Hierarchical Regression Predicting General Medication Adherence – Caucasian Americans

| | Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|---|
| Model One | (Constant) | 27.20 | .921 | | 29.538 | .000 |
| | Depressive Affect | -.426 | .322 | -.432 | -1.325 | .190 |
| | Somatic Symptoms | -.198 | .177 | -.201 | -1.117 | .268 |
| | Interpersonal Difficulties | -.601 | .442 | -.197 | -1.358 | .179 |
| | Positive Affect | .544 | .417 | .381 | 1.303 | .197 |
| Model Two | (Constant) | 20.98 | 5.419 | | 3.872 | .000 |
| | Depressive Affect | -.028 | .332 | -.028 | -.084 | .933 |
| | Somatic Symptoms | -.292 | .168 | -.297 | -1.739 | .088 |
| | Interpersonal Difficulties | -.172 | .433 | -.057 | -.398 | .692 |
| | Positive Affect | .407 | .418 | .285 | .975 | .334 |
| | Nutrition Self-Efficacy | .038 | .073 | .083 | .527 | .601 |
| | Well-Being Self-Efficacy | .107 | .083 | .268 | 1.294 | .201 |
| | Exercise Self-Efficacy | -.105 | .057 | -.296 | -1.829 | .073 |
| | Other Health Practices Self-Efficacy | -.034 | .087 | -.061 | -.386 | .701 |
| | Perceived Support - Family | -.174 | .141 | -.308 | -1.235 | .222 |
| | Perceived Support - Friends | .183 | .133 | .252 | 1.370 | .176 |
| | Perceived Support – Sig. Others | -.120 | .217 | -.194 | -.555 | .581 |
| | Support Discrepancy - Family | -.052 | .226 | -.059 | -.229 | .820 |
| | Support Discrepancy - Friends | -.223 | .180 | -.248 | -1.236 | .222 |
| | Support Discrepancy – Sig. Others | -.405 | .289 | -.497 | -1.401 | .167 |
| | Health Self-Determinism | **.192** | **.083** | **.326** | **2.303** | **.025** |

Note: Model 1: $R$ = .456, $R^2$ = 0.208, Adjusted $R^2$ = 0.160, Standard Error of the Estimate = 4.121, $n$ = 71
**$F$(4,64)=4.329, MSe=16.981, $p$=.004**
Model 2: $R$ = .732, $R^2$ = 0.537, Adjusted $R^2$ = 0.410, Standard Error of the Estimate = 3.453, $n$ = 71
**$F$(15,55)=4.245, MSe=11.921, $p$<.001**

Table B-7

Hierarchical Regression Predicting Exercise Adherence – Caucasian Americans

| | Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|---|
| Model One | (Constant) | 9.154 | 1.431 | | 6.397 | .000 |
| | Depressive Affect | **-1.623** | **.500** | **-1.062** | **-3.249** | **.002** |
| | Somatic Symptoms | -.376 | .276 | -.246 | -1.362 | .178 |
| | Interpersonal Difficulties | 1.101 | .688 | .233 | 1.602 | .114 |
| | Positive Affect | **2.348** | **.649** | **1.061** | **3.620** | **.001** |
| Model Two | (Constant) | .668 | 6.783 | | .098 | .922 |
| | Depressive Affect | **-1.874** | **.416** | **-1.226** | **-4.504** | **.000** |
| | Somatic Symptoms | .057 | .210 | .037 | .272 | .787 |
| | Interpersonal Difficulties | .076 | .542 | .016 | .141 | .888 |
| | Positive Affect | **2.335** | **.523** | **1.055** | **4.468** | **.000** |
| | Nutrition Self-Efficacy | -.106 | .091 | -.148 | -1.165 | .249 |
| | Well-Being Self-Efficacy | -.205 | .103 | -.332 | -1.982 | .053 |
| | Exercise Self-Efficacy | **.476** | **.072** | **.865** | **6.620** | **.000** |
| | Other Health Practices Self-Efficacy | -.054 | .109 | -.064 | -.500 | .619 |
| | Perceived Support - Family | .233 | .177 | .265 | 1.317 | .193 |
| | Perceived Support - Friends | **-.604** | **.167** | **-.536** | **-3.616** | **.001** |
| | Perceived Support – Sig. Others | **.557** | **.271** | **.581** | **2.054** | **.045** |
| | Support Discrepancy - Family | .441 | .283 | .326 | 1.559 | .125 |
| | Support Discrepancy - Friends | -.390 | .226 | -.280 | -1.728 | .090 |
| | Support Discrepancy – Sig. Others | .443 | .361 | .351 | 1.227 | .225 |
| | Health Self-Determinism | .018 | .104 | .019 | .168 | .867 |

Note: Model 1: $R$ = .451, $R^2$ = 0.204, Adjusted $R^2$ = 0.155, Standard Error of the Estimate = 6.403, $n$ = 71
**$F$(4,64)=4.221, MSe=41.000, $p$=..004**
Model 2: $R$ = .835, $R^2$ = 0.698, Adjusted $R^2$ = 0.615, Standard Error of the Estimate = 4.321, $n$ = 71
**$F$(15,55)=8.466, MSe=18.673, $p$<.001**

Table B-8

Hierarchical Regression Predicting Dietary Adherence – Caucasian Americans

| | Variable | Unstandardized Coefficients B | Unstandardized Coefficients Std. Err. | Standard Coefficient Beta | t | Sig. |
|---|---|---|---|---|---|---|
| Model One | (Constant) | 43.45 | 1.355 | | 32.078 | .000 |
| | Depressive Affect | **-1.305** | **.473** | **-.923** | **-2.760** | **.007** |
| | Somatic Symptoms | .440 | .261 | .311 | 1.684 | .097 |
| | Interpersonal Difficulties | 1.256 | .651 | .288 | 1.930 | .058 |
| | Positive Affect | 1.143 | .614 | .558 | 1.862 | .067 |
| Model Two | (Constant) | 28.21 | 7.362 | | 3.832 | .000 |
| | Depressive Affect | **-1.707** | **.452** | **-1.207** | **-3.782** | **.000** |
| | Somatic Symptoms | .271 | .228 | .192 | 1.190 | .239 |
| | Interpersonal Difficulties | **1.287** | **.588** | **.294** | **2.188** | **.033** |
| | Positive Affect | **1.508** | **.567** | **.736** | **2.658** | **.010** |
| | Nutrition Self-Efficacy | **.203** | **.099** | **.304** | **2.043** | **.046** |
| | Well-Being Self-Efficacy | .017 | .112 | .030 | .151 | .880 |
| | Exercise Self-Efficacy | -.027 | .078 | -.052 | -.342 | .734 |
| | Other Health Practices Self-Efficacy | .176 | .118 | .223 | 1.493 | .141 |
| | Perceived Support - Family | -.207 | .192 | -.255 | -1.081 | .284 |
| | Perceived Support - Friends | -.238 | .181 | -.228 | -1.312 | .195 |
| | Perceived Support – Sig. Others | .395 | .294 | .445 | 1.342 | .185 |
| | Support Discrepancy - Family | **.742** | **.307** | **.592** | **2.418** | **.019** |
| | Support Discrepancy - Friends | **-1.014** | **.245** | **-.785** | **-4.136** | **.000** |
| | Support Discrepancy – Sig. Others | .402 | .392 | .344 | 1.025 | .310 |
| | Health Self-Determinism | .041 | .113 | .048 | .359 | .721 |

Note: Model 1: $R = .409$, $R^2 = 0.167$, Adjusted $R^2 = 0.117$, Standard Error of the Estimate = 6.061, $n = 71$
**$F(4,64)=3.319$, MSe=36.737, $p=.015$**
Model 2: $R = .765$, $R^2 = 0.585$, Adjusted $R^2 = 0.471$, Standard Error of the Estimate = 4.690, $n = 71$
**$F(15,55)=5.160$, MSe=21.998, $p<.001$**

APPENDIX C
PHYSICIAN COVER LETTER TO PATIENTS

Date: _____

Dear Patient:

I would like to inform you about an important research study on high blood pressure being conducted by Mr. Charles Byrd, a graduate student at the University of Florida attempting to complete his final project for his Doctorate. I have given you this packet because I thought you might be interested in helping Mr. Byrd by filling out his surveys.

This research is important for Mr. Byrd and for American society, as more than fifty million Americans have high blood pressure and over 50,000 Americans die from this each year. Mr. Byrd's research is a survey study where he is hoping to find factors that might influence whether or not patients actually do what their doctors suggest for the treatment of high blood pressure. **The study is easy to complete and requires you to simply complete <u>one set</u> of surveys that should take <u>less than one hour</u> to complete**.

Mr. Byrd will never know that you received this packet and he will not tell your doctor whether you completed the surveys. I have reviewed the research method, and I am certain that all the information you provide on the surveys will be kept private and anonymous.

**If you decide to complete the surveys, read the letter from Mr. Byrd to find out what you need to do.** If you do not want to complete the surveys, then either return this packet to the doctor who gave it to you or simply throw it in the trash. Please be aware that all costs for this research are paid for by Mr. Byrd himself. You will not receive any more information about this study from Mr. Byrd or your doctor.

If you know others who would like to complete the surveys as well, please tell the doctor who gave you this packet and she/he will get you additional packets or postcards that you can give to those you think would like to participate.

If you have any questions about this research, please either speak with the doctor who gave you this packet or contact Mr. Charles Byrd. You may call Mr. Byrd in Jacksonville at (904) 233-1923. Thank you for thinking about completing this study.

Sincerely,

*Ghiana Masri, M.D.*
*Practice Information*
*Phone Number*

APPENDIX D
REPLY INVITATION POSTCARD

# YES – I AM INTERESTED

**Please complete and return this postcard to take part in this ONE TIME survey project.**

***You must have High Blood Pressure to take part in this study.***

NAME: _____

ADDRESS: _____

CITY, STATE, ZIP: _____

***Any adult with high blood pressure may complete the surveys.***
**How many packets would you like to receive? _____**

B A C K

Charles E. Byrd
2306 SW 13th Street, #610
Gainesville, Florida 32608

Place Stamp Here

**Charles E. Byrd**
Department of Psychology
University of Florida
P.O. Box 112250
Gainesville, Florida 32611

***Your doctor will NOT be given ANY information you provide in this project.***

F R O N T

APPENDIX E
INVESTIGATOR LETTER TO PATIENT: INFORMED CONSENT

Dear Patient:

I am a student at the University of Florida and I am conducting this research on high blood pressure to fulfill the requirements for a Doctor of Philosophy degree. Many people with high blood pressure are asked to change their diet, exercise more, and take medication. However, many do not follow these instructions as much as their doctors would like, resulting in more than 50,000 deaths each year. The purpose of this research is to find factors that might influence how well these recommendations are followed. Although your answers may not benefit you directly, when combined with the answers of others, they could help lead to the development of methods to help promote healthier living in people with high blood pressure.

If you decide to take part in this study, please **complete the enclosed surveys within seven (7) days** of receiving them (it is okay if it takes longer), which should take about one hour to finish. The information you provide will be kept completely anonymous, so please do not put your name on any sheet that you return. There will be no way for me to know your name and your doctor will **NOT** be given **ANY** information that you provide to me. Also, **no information about you or your medical history will be given to me by your doctor**.

If you do not want to take part in this study or if you should change your mind while filling out the surveys, do not complete the surveys and do not return them (just throw them away). Your decision will have no effect on your current or future health care. If you have any questions about your rights as a research participant, you can phone the University of Florida Institutional Review Board at (352) 846-1494.

I am not able to pay you for taking part in this study, but answering the questions will also not cost you anything. When you are finished completing the surveys, simply fold them, seal them in the pre-stamped, self-addressed envelope, and place them in the mail (If you are filling them out in the Clinic waiting room, then seal them in the envelope and return to the front desk). Please keep this letter for your records and do not include it with your responses.

Thank you for your time in reading this letter and thinking about helping me finish my research. If you have any questions, please call me at (904) 233-1923 or (352) 392-0601 ext. 504. You may also email me at cbyrd@ufl.edu .

Sincerely,
Charles E. Byrd, M.S.
Principal Investigator

APPENDIX F
MULTIDIMENSIONAL SCALE OF DESIRED SOCIAL SUPPORT

Direction: We are interested in how much you **DESIRE** or **WANT** the following statements from your friends, family, and/or partners (the statements are similar to the previous survey). Read each statement carefully. Try not to think about how you answered the previous survey and indicate how you much you want or desire each statement by bubbling in the circle under your choice.

| Very Strongly **DO NOT WANT** | Strongly **DO NOT WANT** | Mildly **DO NOT WANT** | Neutral | Mildly **WANT** | Strongly **WANT** | Very Strongly **WANT** | |
|---|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | **7** | |
| O | O | O | O | O | O | O | 1. I **want** a special person to be around when I am in need. |
| O | O | O | O | O | O | O | 2. I **want** a special person with whom I could share joys and sorrows. |
| O | O | O | O | O | O | O | 3. I **want** my family to really try and help me. |
| O | O | O | O | O | O | O | 4. I **want** to get the emotional help and support I need from my family. |
| O | O | O | O | O | O | O | 5. I **want** a special person who is a real source of comfort to me. |
| O | O | O | O | O | O | O | 6. I **want** my friends to really try and help me. |
| O | O | O | O | O | O | O | 7. I **want** to count on my friends when things go wrong. |
| O | O | O | O | O | O | O | 8. I **want** to talk about my problems with my family. |
| O | O | O | O | O | O | O | 9. I **want** to have friends with whom I can share my joys and sorrows. |
| O | O | O | O | O | O | O | 10. I **want** a special person in my life who will care about my feelings. |
| O | O | O | O | O | O | O | 11. I **want** my family to help me make decisions. |
| O | O | O | O | O | O | O | 12. I **want** to talk about my problems with my friends. |

APPENDIX G
SUPPLEMENTAL MEDICATION ADHERENCE SCALE

Directions: Please bubble in the answer that tells how often was each of the following true for you during the **past four (4) weeks**?

| None of the Time | A little of the time | Some of the time | A good bit of the time | Most of the time | All of the time | During the Past FOUR WEEKS: |
|---|---|---|---|---|---|---|
| **1** | **2** | **3** | **4** | **5** | **6** | |
| O | O | O | O | O | O | I had a hard time taking my medicine as my doctor suggested. |
| O | O | O | O | O | O | I followed by doctor's suggestions about my medication exactly. |
| O | O | O | O | O | O | I was unable to do what was necessary to take my medicine. |
| O | O | O | O | O | O | I found it easy to take my medicine as my doctor suggested. |

APPENDIX H
DEMOGRAPHIC AND RESEARCH QUESTION INVENTORY

Directions: For this set of questions, please fill in the blank or circle the appropriate response from the choices given. Remember, your answers to all questions in this packet are kept strictly confidential and private.

1. **What is your current age (if over 89, please only write "over 89")?**

   _____Years Old

2. **What is your Gender (Circle one)?**

   Male Female

3. **What is your Ethnicity or Race (Circle one or more)?**

   African American Asian American Caucasian American

   Hispanic American Native American Other: _____

4. **How many years has it been since your physician or other health care provider told you that you had high blood pressure (Circle one)?**

| 0-1 years | 2-3 years | 4-5 years | 6-7 years | 8-9 years | 10 plus years |
|---|---|---|---|---|---|

5. **Have you experienced any symptoms related to your high blood pressure (Circle one)?**

   YES NO

6. **If you have experienced symptoms, please list them here:**

   _____

   _____

7. **Which of the following has your physician or other health care provider recommended to treat your high blood pressure (Check all that apply)?**

   ☐ Medication ☐ Diet ☐ Exercise ☐ Weight Loss

   Other: _____

8. **Have any other members of your family been diagnosed with high blood pressure (Circle one)?**
   YES NO

9. **If other members of your family or friends have high blood pressure, how many and what relation are they to you (please use the back of the page if needed)?**

| Number | Relation |
|---|---|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

10. **How much do you agree or disagree that you can get ample amounts of education and consultation about hypertension" (Circle your answer)?**

| 1 | 2 | 3 | 4 | 5 |
|---|---|---|---|---|
| Strongly Agree | Somewhat Agree | Neutral | Somewhat Disagree | Strongly Disagree |

11. **Please list any other illnesses or medical concerns that you currently have (e.g., high cholesterol, diabetes, renal disease, obesity, heart disease, cancer, etc.):**

_____

_____

_____

12. **How many different medicines or medications do you take during a typical day?** _____

13. **What is your annual household income? This information will NOT be given to ANY person, organization, or group. Circle One Response.**

| 0 to 10,000 | 10,001 to 15,000 | 15,001 to 20,000 | 20,001 to 25,000 | 25,001 to 30,000 | 30,001 to 35,000 | 35,001 to 40,000 | 40,000 or more |
|---|---|---|---|---|---|---|---|

**THANK YOU FOR COMPLETING THESE SURVEYS. PLEASE RETURN IN THE PROVIDED ENVELOPE.**

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## BIOGRAPHICAL SKETCH

Charles Edward Byrd was born December 11th, 1975, in Jacksonville, Florida, to Robert Byrd and Vicki Lusson Lee. Charles completed high school in 1994, graduating with honors from Stanton College Preparatory High School in Jacksonville, Florida. After high school graduation, Charles entered the University of North Florida in Jacksonville, Florida. He received his Bachelor of Arts in Psychology in 1997, graduating summa cum laude with honors in psychology. Charles then worked for the Duval County School Board for one year, coordinating the In-School Suspension Program at James Weldon Johnson Middle School in Jacksonville, Florida.

Charles then entered graduate school at the University of South Florida, pursuing a Ph.D. in industrial/organizational psychology. In 1999, Charles transferred to the University of Florida to pursue a Ph.D. in counseling psychology. At UF, Charles was the recipient of the prestigious four-year J. Hillis Miller Presidential Fellowship, and received his Master of Science in Psychology in 2001. He is currently completing his pre-doctoral internship year at River Valley Services, an outpatient clinic of the State of Connecticut Department of Mental Health and Addiction Services, working with low-income individuals with severe and persistent mental illness. He will be officially conferred a Doctor of Philosophy in Counseling Psychology in August of 2004, at which time he will begin his new position as a Visiting Assistant Professor with the College of Health and Human Performance at the University of Florida.