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# TABLE OF CONTENTS

<table>
<thead>
<tr>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACKNOWLEDGMENTS</td>
</tr>
<tr>
<td>LIST OF TABLES</td>
</tr>
<tr>
<td>LIST OF FIGURES</td>
</tr>
<tr>
<td>LIST OF ABBREVIATIONS</td>
</tr>
<tr>
<td>ABSTRACT</td>
</tr>
</tbody>
</table>

## CHAPTER

1 INTRODUCTION | 12 |
| Overview | 12 |
| Physical Activity and Health | 13 |
| Physical Activity Interventions for Black Women | 18 |
| Conceptual Framework | 23 |
| Socio-Ecological Model | 24 |
| Theory of Planned Behavior | 31 |
| Culture as a Determinant of Physical Activity | 35 |
| The PEN-3 Model | 41 |
| Purpose | 45 |
| Specific Aims and Hypotheses | 47 |

2 METHODS | 53 |
| Study Design | 53 |
| Participants | 53 |
| Procedure | 53 |
| Measures | 56 |
| Statistical Analyses | 61 |
### LIST OF TABLES

<table>
<thead>
<tr>
<th>Table</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>3-1</td>
<td>Demographic and background characteristics of participants.</td>
<td>91</td>
</tr>
<tr>
<td>3-2</td>
<td>TPB bivariate correlations.</td>
<td>92</td>
</tr>
<tr>
<td>3-3</td>
<td>TPB bivariate correlations.</td>
<td>92</td>
</tr>
<tr>
<td>3-4</td>
<td>Regression paths for model predicting intentions.</td>
<td>96</td>
</tr>
<tr>
<td>3-5</td>
<td>Covariances for TPB variables.</td>
<td>96</td>
</tr>
<tr>
<td>3-6</td>
<td>Regression paths for model predicting intentions.</td>
<td>98</td>
</tr>
<tr>
<td>3-7</td>
<td>Covariances for revised TPB variables.</td>
<td>99</td>
</tr>
<tr>
<td>3-8</td>
<td>Regressions paths for model predicting intentions.</td>
<td>105</td>
</tr>
<tr>
<td>3-9</td>
<td>Covariances for PEN-3 variables.</td>
<td>105</td>
</tr>
<tr>
<td>3-10</td>
<td>Regression paths for model predicting intentions.</td>
<td>106</td>
</tr>
<tr>
<td>3-11</td>
<td>Demographic and background characteristics of participants.</td>
<td>108</td>
</tr>
<tr>
<td>3-12</td>
<td>Multivariate logistic regression of TPB factors associated with MVPA.</td>
<td>109</td>
</tr>
</tbody>
</table>
# LIST OF FIGURES

<table>
<thead>
<tr>
<th>Figure</th>
<th>Description</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-1</td>
<td>Socio-ecological model</td>
<td>50</td>
</tr>
<tr>
<td>1-2</td>
<td>Theory of planned behavior</td>
<td>50</td>
</tr>
<tr>
<td>1-3</td>
<td>The PEN-3 model</td>
<td>51</td>
</tr>
<tr>
<td>1-4</td>
<td>Theory of planned behavior conceptual model</td>
<td>51</td>
</tr>
<tr>
<td>1-5</td>
<td>PEN-3 model conceptual model</td>
<td>52</td>
</tr>
<tr>
<td>1-6</td>
<td>Theory of planned behavior plus PEN-3 model conceptual model</td>
<td>52</td>
</tr>
<tr>
<td>3-1</td>
<td>Flow chart of recruitment</td>
<td>90</td>
</tr>
<tr>
<td>3-2</td>
<td>Unidimensional confirmatory factor analysis of attitudes</td>
<td>93</td>
</tr>
<tr>
<td>3-3</td>
<td>Two factor confirmatory factor analysis of attitudes</td>
<td>93</td>
</tr>
<tr>
<td>3-4</td>
<td>Unidimensional confirmatory factor analysis of subjective norms</td>
<td>94</td>
</tr>
<tr>
<td>3-5</td>
<td>Two factor confirmatory factor analysis of subjective norms</td>
<td>94</td>
</tr>
<tr>
<td>3-6</td>
<td>Unidimensional confirmatory factor analysis of PBC</td>
<td>95</td>
</tr>
<tr>
<td>3-7</td>
<td>Two factor confirmatory factor analysis of PBC</td>
<td>95</td>
</tr>
<tr>
<td>3-8</td>
<td>Structural equation model of TPB factors associated with MVPA</td>
<td>97</td>
</tr>
<tr>
<td>3-9</td>
<td>Revised structural equation model of factors associated with MVPA</td>
<td>100</td>
</tr>
<tr>
<td>3-10</td>
<td>Unidimensional confirmatory factor analysis for cultural barriers</td>
<td>101</td>
</tr>
<tr>
<td>3-11</td>
<td>Unidimensional confirmatory factor analysis for family support</td>
<td>101</td>
</tr>
<tr>
<td>3-12</td>
<td>Unidimensional confirmatory factor analysis for friend support</td>
<td>102</td>
</tr>
<tr>
<td>3-13</td>
<td>Two factor confirmatory factor analysis for friends social support</td>
<td>102</td>
</tr>
<tr>
<td>3-14</td>
<td>Unidimensional confirmatory factor analysis for perceived environment</td>
<td>103</td>
</tr>
<tr>
<td>3-15</td>
<td>Structural equation modeling for PEN-3 factors associated with MVPA</td>
<td>104</td>
</tr>
<tr>
<td>3-16</td>
<td>Structural equation modeling for TPB and PEN-3 factors associated with MVPA</td>
<td>107</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>--------------</td>
<td>------------------------------</td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>Body Mass Index</td>
<td></td>
</tr>
<tr>
<td>MVPA</td>
<td>Moderate-Vigorous Physical Activity</td>
<td></td>
</tr>
<tr>
<td>PA</td>
<td>Physical Activity</td>
<td></td>
</tr>
<tr>
<td>PBC</td>
<td>Perceived Behavioral Control</td>
<td></td>
</tr>
<tr>
<td>SEM</td>
<td>Structural Equation Modeling</td>
<td></td>
</tr>
<tr>
<td>TPB</td>
<td>Theory of Planned Behavior</td>
<td></td>
</tr>
</tbody>
</table>
Lack of physical activity is an independent risk factor for various health conditions and a multitude of negative psychological outcomes including depression, anxiety and decreased quality of life. Despite the noted benefits of physical activity, engagement among minorities and women; particularly Black women remains low. Therefore, the current study examined the influence of culture on physical activity attitudes and behaviors among Black female college students using the Theory of Planned Behavior (TBP) and PEN-3 model grounded in an ecological approach. The first aim of the study was to examine the relationship between TPB constructs and physical activity engagement among Black female college students. The second aim examined the influence of PEN-3 factors on physical activity engagement among Black female college students. The third aim evaluated the relative contributions of TPB and PEN-3 constructs on physical activity. The final aim examined the influence of the TPB and PEN-3 model longitudinally (Time 2). The study included 254 participants from 9 universities across the state of Florida. Using structural equation modeling (SEM), three models were developed. Findings support previous work suggesting that the TPB is
useful in predicting intentions to perform physical activity but not behavior. Furthermore, our findings suggest that components of the PEN-3 model negatively predict intentions to engage in physical activity. However, similarly to the TPB intentions within the PEN-3 model did not predict physical activity. Additionally, TPB and PEN-3 model constructs did not predict physical activity at Time 2 (4-weeks after baseline). Based on the results, particular attention should be paid to the perception of control over behavior and cultural barriers when targeting intentions. Additional models are needed that delineate the explanatory role of culture in intentions to perform PA among Black wome
Lack of physical activity is an independent risk factor for various health conditions including cardiovascular disease, type II diabetes, obesity, and select cancers (ACSM, 2007; USDHHS, 2008). Lack of physical activity has also been implicated in a multitude of negative psychological outcomes including depression, anxiety and decreased quality of life (Banks-Wallace, 2002; Kushner, Racette, Neil & Schoeller, 1995). Despite the noted benefits of physical activity, engagement among minorities and women; particularly Black women remains low. Although rates of inactivity for Black women are problematic across the lifespan, rates of inactivity become pronounced during young adulthood. In response to the lower rates of physical activity among Black women, there has been an increase in intervention studies promoting physical activity (Conn, Phillips, Ruppar & Chase, 2012; Conn, Valentine & Cooper, 2002; Whitt-Glover & Kumanyika, 2009). However, intervention studies for both inactive and underactive Black women have produced modest success in short-term engagement and almost no success in long-term maintenance (Harley et al., 2014).

Inadequate attention to the potential influence of culture on engagement in physical activity (e.g. overreliance on an individual-oriented approach to health behaviors) among Black women is an important factor that has not been adequately examined (Airhihenbuwa & Liburd, 2006). Furthermore, given the heterogeneity among Black women it is argued that the most appropriate approach to the study of this group is to examine culture, varying degrees of immersion in it, reactions to demands to adapt to mainstream culture, and the role these play in their behavior and beliefs (Landrine &
Klonoff, 1996; Organista, Organisa, & Kurasaki, 2003; Smith, 2006). Approaches are needed that offer direction on how to address the interaction between culture and health within the context of established theories such as TPB and PEN-3 model. Hence, this study examined the influence of culture on beliefs and attitudes related to physical activity among Black female college students using an ecological approach. The objectives of the study were to: (a) examine the relationship between TPB constructs and physical activity engagement among Black female college students, (b) examine the influence of PEN-3 factors on physical activity engagement among Black female college students, (c) evaluate the relative contributions of TPB and PEN-3 constructs on physical activity engagement among Black female college students, and (d) examine the relationship between TPB and PEN-3 constructs on physical activity engagement longitudinally.

**Physical Activity and Health**

**Significance of Physical Activity**

The World Health Organization (WHO) estimates that lack of physical activity is the fourth-leading risk factor for global mortality (WHO, 2011). Furthermore, estimates suggest that physical inactivity accounts for 6% of global deaths including 2.6 million in low and middle-income countries. The evidence is compelling that physical activity improves both physical and psychological health. Physical activity has been linked to decreases in overweight and obesity (Jakicic & Otto, 2005), cardiovascular disease (Manson, et al., 2002), type 2 diabetes (Knowler, et al., 2002), coronary artery disease (Carlson, Fulton, Schoenborn, & Loustalot, 2010) and cancer (CDC, 2010). Specifically, physical activity has been shown to lead to a 20-40% risk reduction of breast cancer, a
30% lower risk of colon cancer, and a 25-30% reduction in stroke among active individuals (BHF National Centre, 2013).

In addition to the noted benefits of physical activity on improving overall health and ameliorating risk factors for chronic illnesses, physical activity has also been shown to improve psychological health (Banks-Wallace, 2002). Mental illness is a significant cause of disability worldwide, with depression being the second leading cause of disability worldwide (WHO, 2011). A growing body of evidence supports the influence of physical activity on improved mood, decreased symptoms of stress, reduced anger, lessening depression, relieving anxiety, and slowing of cognitive decline. Interestingly, research has suggested that engagement in physical activity may have effects on treating depression that are comparable to pharmacological and behavioral treatment. Taken together, this research suggests that physical activity has important benefits for both physical and mental health.

**National Recommendations for Physical Activity**

Physical activity is often defined as any bodily movement produced by skeletal muscles that result in energy expenditure (Caspersen, Powell, & Christenson, 1985; Harley, 2005). The 2008 Physical Activity Guidelines for Americans (USDHHS, 2008) provides a detailed framework for the intensity, frequency, and duration of physical activity needed to produce important health benefits (Joseph et al., 2013). It is recommended that adults perform strength training activities at least two days per week in addition to achieving one of the following guidelines for aerobic physical activity each week:

1. 150 minutes of moderate-intensity physical activity; or
2. 75 minutes of vigorous-intensity activity; or
3. A combination of both moderate-and vigorous-intensity physical activity

Additionally, the guidelines suggest that physical activity should be performed on most days of the week in at least 10 minutes increments. Moderate-intensity activity is defined as working at a rate between 55% and 69% of a person’s maximal heart rate (ACSM, 2007). Vigorous-intensity activity is performed at a heart rate of 70% or greater than a person’s maximal heart rate. Examples of moderate-intensity activities include ballroom dancing, walking at a rate of approximately three miles per hour, cycling at a rate of approximately 10 miles per hour, gardening, and playing tennis (USDHHS, 2008). Examples of vigorous-intensity include biking greater than 10 miles per hour, running, hiking up-hill, aerobic dancing, and jumping rope.

Strength training recommendations suggest that adults participate in strength building exercises that are performed at a moderate-intensity and target all major muscle groups (i.e. chest, abdominals, shoulders, legs, and back) (USDHHS, 2008). The guidelines do not specify the amount of time needed for muscle strengthening activities. However, the guidelines suggest that exercises for each major muscle group be performed until it would be difficult to do another repetition without assistance. Examples of muscle strengthening activities include weight training and body weight calisthenics (i.e. push-ups, sit-ups).

Patterns of Physical Activity

Due to the increasing concern about the lack of physical activity in the United States, various annual national health surveys such as the Behavioral Risk Factor
Surveillance System (BRFSS) collect pertinent information on levels of physical activity (Metzger et al., 2008). Prevalence and trends of participation in leisure-time physical activity have also been estimated using the 1998–2008 National Health Interview Survey (Carlson, Fulton, Schoenborn, & Loustalot, 2010). Based on the survey, in 2008, 43.5% of adults in the U.S. were engaged in aerobic physical activity, 28.4% were highly active, 21.9% met recommended muscle-strengthening guidelines, and 18.2% met both the muscle-strengthening guideline and physical activity guidelines. The probability of reaching recommended guidelines was associated with being male, being younger, being White, having higher levels of education, and having a lower BMI. More specifically, findings from the survey revealed that aerobic activity was higher among men than women and higher among non-Hispanic whites than among Blacks and Hispanics. Furthermore, activity was higher among adults living in the western part of the U.S. than those living in the South and Northeast and higher among those in the Midwest than those in the South. In addition, the percentage of adults who were aerobically active was higher among both underweight and normal weight individuals than among obese adults and higher among overweight individuals than among obese adults. Conclusions from this national survey suggest that little progress has been made in increasing physical activity among U.S. adults (Carlson, Fulton, Schoenborn, & Loustalot, 2010).

More discouraging than national patterns of physical activity are statistics for engagement among Black adults. Among Black adults, those reporting regular physical activity ranges from 24% to 36% (27%-43% among men and 21%-32% among women) (Whitt-Glover, Taylor, Heath & Macera, 2007). Similar to trends among other racial/ethnic groups, physical activity is highest among men, younger age groups and
higher education and income groups. Moreover, physical activity is higher for those who are employed, married and overweight but not obese men and normal-weight women. Notably, during young adulthood similar trends exist among racial/ethnic groups (Ledford, 2013). According to recent reports, 46.5% of college students meet physical activity recommendations (Ledford, 2013; ACHA-NCHA, 2013). These numbers are lower for female college students where 43.8% report participating in the recommended amount of physical activity per week compared to 51.9% of male college students (Miller, Staten, Rayens, & Noland, 2005; Irwin, 2007).

Furthermore, consistent with statistics among middle-aged and older Black women, Black female college students report the lowest levels of physical activity compared to their counterparts (Dishman, Jackson, & Bray, 2010; McArthur & Raedeke, 2009; Miller, Staten, Rayens, & Noland, 2005; Suminski, Petosa, Uttler, & Zhang, 2002). These statistics make it clear that the lack of physical activity among college aged Black women is an increasing area of concern. Specifically, this lack of engagement is likely to contribute substantially to health disparities seen at later ages. Consistent with literature documenting the positive effects of physical activity and the alarming rates of inactivity, researchers have begun to address what factors are involved in determining engagement in physical activity especially among populations at greatest risk for inactivity. Therefore, the need to increase physical activity among minority populations including Black women has led to widespread research testing interventions designed to promote physical activity.
Physical Activity Interventions for Black Women

Previous reviews of the literature have synthesized findings from physical activity interventions in an effort to identify and understand the most effective strategies for increasing physical activity in Black Americans. To build upon previous systematic reviews, we conducted a review (1984-2016) of physical activity interventions for Black women. Studies were included in the current review (Table B-1) if they focused on primarily African American women aged 18 years and older (i.e. >75% of the study population include African American women) or if the study findings were stratified by race/ethnicity such that the influence of the intervention on African American women could be readily deduced. All study designs were included (i.e. randomized controlled trials, single group, quasi-experimental, or non-randomized). Outcomes were required to focus on increasing physical activity or physical fitness (studies on other outcomes were included if they provided outcome data centered on physical activity).

A total of 46 studies met the inclusion criteria for review. Study sample sizes ranged from 10-1,056 participants with 21 randomized controlled trials reviewed. Majority of studies included primarily middle-aged Black women (ages ranged from 24-90 years). However, many samples were not well described with only a few studies addressing confounding factors such as SES. The most common settings were neighborhood recreation centers, churches, and healthcare settings. Interventions were often delivered by African American professionals, African American lay persons and university research teams. Primary outcomes measured were minutes per week of physical activity, steps per day, energy expenditure, and walking duration. The 7-Day Physical Activity Recall was the most commonly used subjective measure of physical activity (N=6), followed by the CHAMPS survey (N=5). While, pedometers were the
most commonly used objective measures of physical activity (N=7), followed by accelerometers (N=4). Intervention length ranged from 8 weeks to one year. Longitudinal studies reported attrition rates from 3% to 83% with majority reporting moderate rates (7-20%) of loss to follow-up, which could introduce attrition bias.

Overall, studies varied greatly in intervention components and subsequently intervention effectiveness. Twenty-one studies reported significant increases in physical activity from baseline to post-intervention (within group) while 10 studies reported significant increases in physical activity among intervention participants compared to controls (between group). Consistent with conclusions drawn from published systematic reviews, components of effective interventions included the use of African American professionals and community members for recruitment and acceptance of interventions, structuring the environment in ways that facilitated building of community (i.e. selecting meeting times congruent with regularly scheduled communal events, supplementing interventions with group social outings, and inviting family and friends to participate in the intervention), the use of randomized controlled study designs, objective measures of physical activity, provision of specific physical activity goals for participants and inclusion of structured physical activity or exercise programs (Whitt-Glover & Kumanyika, 2009; Banks-Wallace, 2002). Replication studies are needed as well as a further exploration of the most effective intervention approaches for Black women. Weaknesses in the studies included lack of consistent rigorous study design, lack of validated instruments for identifying change in physical activity, and significant attrition of participants.

Many of the studies (61%) reviewed offered ways in which the researchers attempted to adapt their intervention to be salient for Black women (e.g. Sullivan &
Carter, 1985; Resnicow et al., 2005; Kennedy et al., 2005; Walcott-McQuigg et al., 2001). Recently, researchers have called for increased efforts to advance the cultural relevance of interventions to targeted populations to enhance the interventions’ impact and sustainability (Conn, Chan, Banks, Ruppar & Scharff, 2013; Kreuter & McClure, 2004; Lau, 2006; Mitrani, 2009; Resnicow et al., 1999). The extent to which a study is culturally relevant for a certain underrepresented population exists on a continuum, with simple modifications such as delivering the interventions in a culturally appropriate location to more extensive cultural relevance achieved by involving participants in every aspect of the design and implementation of the study. However, generally cultural relevance is viewed as having components of surface structure and/or deep structure (Resnicow et al., 1999). Surface-structure is characterized by matching study content to observable characteristics of the targeted population through the use of personnel, locations, and language that are familiar to the population. While deep-structure matching incorporates cultural beliefs, values, norms, and world view of the population into the intervention. Deep-structure matching may include addressing such factors as the importance of religion and family, beliefs about physical activity, and views regarding ideal body size.

Notably all interventions are influenced by culture (Bernal, Bonilla & Bellido, 1995; Bernal & Domenech Rodriguez, 2012). Traditional physical activity interventions are derived from shared values and worldviews of majority populations in North America and Western Europe (Conn, Chan, Banks, Ruppar & Scharff, 2014). For instance, values of individualism are manifested in interventions that are based on the assumption that the individual is the basic unit of change and that individuals will be motivated to improve their personal health (Paniagua & Taylor, 2008; Kreuter, Lukwago,
The literature in this area validates the need for research to identify effective interventions to modify health behaviors including physical activity behavior in this population (Conn, Chan, Banks, Ruppar & Scharff, 2014). Since receptivity to health messages is strongly impacted by beliefs, values, life experiences, cultural history, and group identity, a pertinent goal is to identify those cultural relevant characteristics that yield the most substantial increases in physical activity behavior for a targeted population.

These findings are consistent with a content analysis done by Conn et al. (2013) of over 60 studies that were designed to change physical activity behavior among underrepresented adults. Conn et al. (2013) found that surface matching predominated the strategies for increasing the cultural relevance of physical activity interventions. Common strategies included employing underrepresented project staff, conducting the study in participants’ native language, and conducting studies in locations frequented by members of the targeted group. Majority of the studies in the current review provided surface-structure adaptations such as the use of Black personnel and holding intervention sessions in Black churches and community centers. The studies reviewed were less likely to use deep structure matching to values and belief systems. The studies that addressed cultural values identified family and social interaction, spirituality, and testimonial narrative information about physical activity. Conn et al. (2013) concluded that although little overt evidence existed for deep structure matching within their review, this type of matching may have occurred related to the possibility that interventionists who were members of the same underrepresented group could share some of the same beliefs and values as participants and thus either consciously or unconsciously embedded pertinent references into their communications. However, this
assumption has not been always been shown to be supported. Overall, Conn et al., (2012) concluded that physical activity interventions had an overall modest, non-clinically significant effect on increasing physical activity behavior in underrepresented populations (standardized mean difference effect size of 0.172 for treatment vs. control comparisons at outcome and 0.312 for treatment pre- post-intervention comparisons).

Therefore, further exploration is needed to identify additional characteristics that may enhance the effectiveness of interventions designed to increase physical activity levels in Black women (Whitt-Glover & Kumanyika, 2009). Majority of the interventions designed for Black women have assumed that all Black women share the same cultural and world beliefs, and thus have presumed that culturally sensitive treatments are appropriate for all African Americans (Newton & Perri, 2004). Since Black culture is heterogeneous, some aspects of culturally sensitive interventions may be appropriate for some Black women but irrelevant for others. Few interventions (only one from the current review) address the issue of varying degrees of immersion in culture when tailoring the intervention to Black participants or in discussing its relationship to physical activity outcomes.

Furthermore, many of the studies reviewed did not adequately address the major factors that may influence the adoption and maintenance of regular physical activity from a theoretical framework such as attitudes and expectations about physical activity, neighborhood conditions and role expectations. Twenty-eight studies reported no theoretical framework. Studies that identified a theoretical framework most commonly used social cognitive theory (N=10) and the transtheoretical model (N=6). Consistently, Whitt-Glover (2014) concluded that future interventions should incorporate behavioral science theories to inform intervention strategies, while addressing broader theoretical
perspectives that include historical and social contextual influences, and interaction with the built environment. Lastly, the studies reviewed were conducted in predominately middle-aged Black women; however, significant declines in physical activity levels have been reported in Black women after commencing college (Leslie et al., 1999; Bray & Born, 2004; Aghenta, 2014). Nonetheless, none of the studies reviewed directly targeted college-aged Black women despite their great risk for inactivity and subsequent health complications.

**Conceptual Framework**

In order to address the complexity of how culture influences physical activity, it is imperative that both external and internal factors are examined. Although many models have been used in relation to physical activity among Black women, ecological models and the TPB have been commonly studied (Eyler et al., 2002). Ecological approaches diverge from other theoretical models as they emphasize factors outside the individual that determine behavior. Thus, these models are not solely individually oriented which allows for a broader understanding of the correlates of physical activity in Black women such as motivation and institutional factors. Whereas, the TPB is one of the numerous intrapersonal-level value expectancy theories that have been used to examine an individual’s intentions to perform physical activity (Beville, 2010). Both models have been used separately and combined to predict physical activity behaviors, although infrequently among Black women. While the TPB and ecological model can provide an understanding of physical activity among Black women, neither model is situated to address the intricacy of culture on engagement in physical activity. Therefore, novel theoretical models are needed that account for the role of culture on participation in physical activity. The PEN-3 model can be used to understand culture in relation to
physical activity behaviors. The PEN-3 model allows for culture to be centralized in delineating the mechanisms influencing health behavior by offering culturally congruent explanations for engagement in behaviors. Given the limitations of current theoretical models to account fully for engagement in physical activity among Black women, the addition of culture to existing models is promising.

**Socio-Ecological Model**

Ecological models identify individual, societal, organizational, and other constraints placed on minority women that may limit their participation in physical activity. For instance, the model proposed by McLeroy et al. (1998) assumes that health behavior is determined by five levels of influence (1) intrapersonal factors (individual), (2) interpersonal processes, (3) community factors, (4) institutional factors and (5) public policy. An ecological model such as this has the advantage of addressing the multiplicity of correlates that influence physical activity behavior including community norms (Eyler et al., 2002) (Figure 1-1).

**Intrapersonal Resources**

**Functional ability.** Interpersonal resources or individual characteristics such as functional ability, socioeconomic status, educational level, employments status and motivational factors are documented correlates of physical activity (Fleury & Lee, 2006). Functional ability (i.e. physical and mental well-being) has been found to be an important predictor of physical activity level (Bouchard, Sheppard & Stevens, 1993). Specifically, poor functional ability or perceptions of poor health have been associated with decreased participation in physical activity among Black women in both community and clinical settings. Among Black women, the probability of meeting recommendations
for physical activity have been shown to be 55% greater for women whose self-reported health status was perceived as excellent or very good (Ainsworth, Wilcox, Thompson, Ritcher & Henderson, 2003; Sanderson et al., 2003). Furthermore, Eyler et al. (1998) found that health concerns, primarily related to chronic illnesses, were pertinent barriers to regular physical activity among minority women.

**Socioeconomic status.** Socioeconomic status (i.e. income, education, and occupation) has been shown to undeniably influence the initiation and maintenance of health promoting behaviors including engagement in consistent physical activity (Fleury & Lee, 2006; Armstrong, 2013). With regards to Black women, educational level and income have been associated with participation in physical activity, with Black women of higher educational and income levels participating in more physical activity than their counterparts (Armstrong, 2013; Sanderson et al., 2003). Clark (1995) suggested that a lower income can potentially limit access to structured exercise facilities and may be related to unsafe environments that discourage activity among Black women. Ainsworth et al. (2003) found that among 917 Black women the likelihood of meeting recommendations for physical activity increased in a dose-response level with increasing education. Similarly, Harrell and Gore (1998) concluded that women who were most likely to be inactive were those who had less than a high school education and an annual family income under $20,000.

**Motivation.** Motivational variables including knowledge, attitudes and beliefs about the benefits of physical activity have been associated with beginning and maintaining recommended levels of physical activity (Fleury & Lee, 2006). Motivational variables may relate to readiness to initiate physical activity plus the use of self-regularity skills (i.e. goal setting and self-monitoring) (Fleury, 1991). For instance,
Ainsworth et al. (2003) found that lack of motivation was a widespread barrier to increasing activity among Black women. Many women indicated that they were aware of the positive benefits of physical activity and how to become more active; however, they expressed not being willing to find the time to engage in activity due in part to “laziness”. Additionally, focus group feedback on barriers to physical activity among Black women often includes negative outcome expectations. For instance, many Black women report avoiding exercise because it will make them feel tired and cause them to perspire contributing to the inability to preserve their hairstyles (Pekmizi et al., 2013).

Although intrapersonal or individual resources have been widely examined, the extent to which physical activity research focuses on these characteristics while ignoring broader social and environmental contexts undoubtedly impacts an understanding of physical activity behavior (Fluery & Lee, 2006). Additionally, an overreliance on intrapersonal characteristics is also likely to influence the effectiveness of programs targeting vulnerable populations including Black women. Thus, newer research has begun to incorporate broader contexts that determine physical activity behavior such as interconnections between family, friends, and the larger community.

**Interpersonal Resources**

**Social support.** Interpersonal resources include social support and social norms that facilitate health behavior change (Fleury & Lee, 2006). The importance of social networks is well-documented (Marquez & McAuley, 2006; Eyler et al., 1999). Research has demonstrated that Black women’s participation in physical activity is positively influenced by support from their friends and family, noting that the majority of Black women who participate consistently in physical activity found empowerment through
social networks (Armstrong, 2013; Eyler et al., 1998; and Fleury & Lee, 2006; Henderson & Ainsworth, 2003). Furthermore, having family members with whom to be physically active with and having family members who acknowledge the value of physical activity are significant factors related to Black women’s engagement in physical activity (Armstrong, 2013; Richter, Wilcox, Greaney, Henderson, & Ainsworth, 2002). Eyler et al. (1999) found that among Black women those with high levels of social support were more likely to accumulate at least 150 minutes of leisure-time physical activity per week than those with lower levels despite controlling for marital status, age, income and education (Fleury & Lee, 2006). Additionally, social support has been noted as a prominent predictor of physical activity among college students. For instance, Trost et al. (2005) and Rovniak et al. (2002) found that increased levels of social support predicted increased levels of physical activity among a large sample of White college students.

**Social norms.** In addition, social norms for physical activity may facilitate communication about physical activity resources as well as create information channels related to activity among groups of people (Fleury & Lee, 2006). Additionally, role models for physical activity behaviors have the potential to promote the development of pertinent behavioral strategies. In particular among Black women, frequently seeing others engage in exercise in the neighborhood has been shown to be positively related to their own engagement in physical activity (King et al., 2000; Fleury & Lee, 2006). Relatedly lack of social support for physical activity both in terms of broader social norms and in experiences with family and friends influences Black women’s engagement in physical activity (Pekmizi et al., 2013). Lastly, formal networks including churches may heighten awareness about health behaviors and provide relevant
opportunities for Black women to participate in physical activity. Weaver & Gary (1996) and Fleury & Lee (2006) found that Black women who frequently attended church and who were active in social groups had higher levels of physical activity compared to women who did not have such supports.

However, variabilities regarding the influence of social networks and social norms on participation in physical activity among Black women exist. Notably, King et al. (2000) concluded that Black women prefer to exercise on their own as opposed to group settings; while, Armstrong (2001) revealed that social networks (i.e. family, friends, mates/spouses) were only minimally influential to Black women's engagement in physical activity. The dichotomy within this literature is largely understood as providing evidence for both positive and negative effects of others on Black women's participation in physical activity. Due in part to the inconsistencies in the literature it is evident that additional factors also contribute to the decision to initiate and maintain appropriate levels of physical activity.

**Community Factors**

Community factors that influence participation in physical activity include: neighborhood environment, community capacity and organizational resources (Eyler et al., 2002). Community resources have a significant impact on creating a supportive physical and personal environment to promote physical activity (McElroy, 2002; Fleury & Lee, 2006). Furthermore, the integration of community resources for physical activity, physical activity features of the environment, and/or the presence of programs that support physical activity all determine access to needed material resources (Fleury & Lee, 2006; Humpel, Owen, & Leslie, 2002).
Neighborhood environment. Specifically, among Black women, environmental assets may facilitate engagement in physical activity and the creation of both goals and strategies related to activity through access to safe exercise facilities (Henderson & Ainsworth, 2003). Relatedly the design of neighborhoods and the perception of a neighborhood as unsafe may influence reductions in physical activity and decreased fitness over time (Heesch, Brown, & Blauton, 2000). Lacking a safe place to exercise has been noted as a primary barrier to participation in physical activity among Black women (Eyler et al., 1998; King et al., 2000; Fleury & Lee, 2006). Qualitative interviews with Black women identified community level barriers to physical activity such as fear of walking the neighborhood, lack of environmental resources for physical activity, lack of convenient facilities for activity, not enough sidewalks, unattended dogs, and lack of culturally specific physical activity alternatives (Jones & Nies, 1996; Nies, Vollman & Cook, 1999; Eyler, 1998). Among college students, evidence exists that reductions in physical activity and increases in weight may be related to the physical environment (Wallace, Buckworth, Kerby, & Sherman, 2000; Johnson, 2006). However, multiple researchers have noted that the evaluation of neighborhood environmental influences on physical activity in college populations has been limited in scope, primarily centering on access to physical activity facilities and home equipment (Leslie, et al., 1999; Reed & Phillips, 2005).

Community capacity. Additionally, community capacity has been described as an integral aspect of a community’s resources (Fleury & Lee, 2006). Community capacity reflects the cultivation as well as the use of transferable knowledge, skills, and systems that influence community and individual-level change. The association between community capacity and physical activity is supported by evidence that social
involvement and participation are factors that are related to perceived control, coping capacity, health behaviors and health status. Black women may learn how to identify appropriate resources, work with other individuals towards a common goal, or begin to gain a better understanding of factors essential to individual coping strategies and decision-making by participating in community organizations (Anderson et al., 2003). Furthermore, community interventions that involve community coalitions and incorporate the development of leadership abilities and resources have been commonly associated with increased levels of physical activity among minority populations (Minkler & Wallerstein, 1997). Moreover, across programs that have targeted Black communities, most significant improvements have been found among those that incorporated community members in the both the planning and implementation of programs (Levine et al., 1992; Brownson et al., 1996; Lewis et al., 1993).

Organizational resources. The role of organizational characteristics and resources has been recognized as important factors in promotion the health of the public (Fleury & Lee, 2006). Organizational resources facilitate program related efforts to integrate health promotion and increase availability of services within the structure of the community. Organizational resources also serve to connect community members with services and opportunities that contribute to risk reduction (Minkler & Wallerstein, 1997). Relatedly, Black women have identified strong community organizations and partnerships between those community organizations as crucial to promoting physical activity (Walcott-McQuigg & Prohaska, 2001; Walcott-McQuigg, Zerwic, Dan & Kelley, 2001; Brownson, Baker, Housemann, Brennan & Bacak, 2001).
Institutional Factors and Public Policy

The association between public policy, institutional factors and physical activity has received little attention (Eyler et al., 2002). However, one study of attitudes toward policy measures that support physical activity revealed that majority of women favored zoning regulations for walking trails and back paths. Furthermore, these women agreed that local government funds should be spent to maintain places where individuals can exercise. Additionally, Carter-Nolan (1996) found that Black women believed that work incentives were needed to promote physical activity within their population. They cited worksite exercise programs, bonuses and lower insurance rates for active women as potential incentives. Consistently, Black, Hispanic, Asian, and American Indian women involved in a focus group conducted by Eyler et al. (1998) concluded that a worksite facility or increased places to walk at work would enable them to be more active. Overall, given the ecological framework’s attention to multiple levels of influence, it is positioned to guide deeper examinations of specific levels such as the intrapersonal level.

Theory of Planned Behavior

The theory of planned behavior (TPB) is one of the most widely used intrapersonal level theories. It is an extension of the theory of reasoned action (Ajzen & Fishbein, 1980; Fishbein & Ajzen, 1975). According to the TPB, intention drives behavior and intentions are influenced by perceived behavioral control (PBC), subjective norms, and attitudes (Figure 1-2). Intentions are defined as an assessment of an individual’s motivation to perform a behavior (Ajzen, 1991). The stronger the intention the more likely it is for an individual to carry out the behavior. Intentions are presumed to capture the motivational factors that influence a behavior as they are
indications of how much effort an individual is planning to exert in an effort to perform the behavior. However, behavioral intention can only be expressed if the behavior is under volitional control or perceived behavioral control (PBC).

PBC assumes that performance of most behaviors depends at least in some degree on non-motivational factors such as availability of opportunities and resources (e.g. time, money, skills) (Ajzen, 1985). PBC is largely based on Bandura’s self-efficacy, which refers to beliefs in one’s ability to execute courses of action necessary to produce given attainments (Bandura, 1997). PBC is determined by control beliefs and by perceived power (Glanz, Rimer & Viswanath, 2008; Aghenta, 2014). Control beliefs are the individual’s perception of their ability to perform a behavior; while perceived power is the perception of the individual’s opportunities to perform the target behavior. The assumption is often made that motivation and ability interact in their effects on behavioral achievement (Ajzen, 2001). Therefore, intentions are expected to influence performance to the extent that the individual has behavioral control, and engagement should increase with behavioral control to the extent that the individual is motivated to try.

Subjective norms or an individual’s perceptions of societal pressures to execute behavior (Ajzen, 1991) also contribute to intentions and behavior. Subjective norms are determined by normative beliefs which are the individual’s perceptions of the attitudes of pertinent others towards a behavior and by the degree to which the individual feels compelled to conform to expectations of their significant others (Aghenta, 2014). The stronger the subjective norms, the more likely individuals are to have higher intentions to perform the behavior (Glanz, Rimer & Viswanath, 2008). Attitude is defined as an individual’s affective perception of a behavior (Ajzen, 2001). Attitudes are an
assessment of the positive or negative outcome of performing a behavior. Attitude like subjective norms are a strong determining factor of intention. Attitude is controlled by behavioral beliefs and evaluation of the outcome. Behavioral beliefs are the individual’s beliefs of the result of a behavior and evaluation of outcome is the value that each individual places on the outcome (Aghenta, 2014). Thus, the higher the value an individual places on the outcome of performing a behavior paired with stronger positive attitudes, the more likely an individual is to carry out the behavior (Glanz, Rimer & Viswanath, 2008).

The TPB has been used in a multitude of studies to predict behaviors including condom use (Albarracin, Johnson, Fishbein, & Muellerleile; 2001; Bosompra, 2001), fruit and vegetable consumption, alcohol use, and dietary habits (Conner & Armitage, 1998), HIV risk behaviors (Bandawe and Foster, 1996), smoking, utilization of health services, mammography utilization and substance abuse (Glanz, Rimer & Viswanath, 2008). The TPB has also been highly utilized and validated in predicting physical activity behavior (Courneya, Nigg & Estabrooks, 1998). To date, the TBP has performed relatively well in explaining physical activity intentions (average $R^2 = 0.43$) and behavior (average $R^2 = 0.33$) in various populations (Blanchard et al., 2008). In particular, a meta-analysis concluded that intention has a large correlation with physical activity behavior and that attitude and PBC are medium to large independent correlates of intention (Hagger, Chatzisarantis, & Biddle, 2002). These findings were consistent with a cross-sectional study by Hagger, Chatzisarantis and Biddle (2001) which found attitudes and PBC to be significant predictors of physical activity intentions while subjective norms were a weaker predictor.
Given these results, a few researchers most notably Blanchard et al., (2008) have begun to determine whether the TPB is culturally sensitive to explaining physical activity intentions and behaviors within Black and White Americans. For instance, Blanchard et al., (2003) found that the relationship between physical activity intentions and attitudes in a college sample and overall attitudes in an adult sample were significantly stronger for Black Americans. Furthermore, Trost et al., (2002) suggested that the relationship between self-efficacy (as conceptualized using a TPB framework) and physical activity was stronger in White compared to Black adolescent girls. Furthermore, Blanchard et al., (2008) conducted a study aiming to examine whether existing theoretical models (i.e. TPB) predict physical activity in different ethnic groups. Findings derived from 238 African American and 197 White college students support the notion that attitudes are a significant predictor of intention for both ethnic groups and that the affective attitude-intention relationship exists similarly for both groups. Results from the study support a stronger instrumental attitude-intention relationship among White students consistent with previous literature. The authors concluded that the non-significant relationship between instrumental attitudes and intention for African American students may be related to the influence of spiritual beliefs on the Black community’s views on health behaviors and outcomes. Lastly, the researchers found that PBC had a similar association with intention for both groups of students and subjective norms were not associated with intentions for either group. Blanchard et al., (2008) concluded that intention is a significant predictor of physical activity for White students but not for Black students. Interestingly, the predictive value of physical activity intentions on physical activity behaviors was overridden by the significant effect of PBC on physical activity behaviors among Black students. Therefore, the results suggest that
intention is the key correlate of physical activity among White students, whereas PBC is more important for Black students. The authors note the preliminary nature of the study, thus concluding that further research identify common and ethnicity-specific beliefs that are statistically associated with global theoretical constructs. Therefore, the current study will add to the literature by testing the TPB among a larger sample of Black female college students.

In summary, while the TPB has provided a good framework to examine physical activity among Black women it has noted limitations. Few studies have attempted to determine how theory predicts physical activity specifically among certain ethnic groups. The few studies that have examined this have uncovered variations in their predictions of physical activity among Black adults (Blanchard et al., 2008). Furthermore, the TPB framework is not equipped to delve deeper into an understanding of how culture influences decisions to engage in physical activity. Examining culture specifically may elucidate key factors that are important for increasing engagement in physical activity among Black women.

**Culture as a Determinant of Physical Activity**

Culture will be conceptualized as “the unique shared values, beliefs, and practices of a group” (Boyington et al., 2008; Pasick, 1997; Pasick, D’Onofrio & Otero-Sabogal, 1996). It is a complex and dynamic construct that exists along a continuum that embraces elements such as language, ethnicity, nationality, religion and values (MacLachlan, 2006). Culture has been attributed to the understanding of individual differences and can influence individual behaviors by affecting thoughts, feelings, acceptance, and thus adoption of health messages (Boyington et al., 2008; Thind, Goldsby, Dulin-Keita & Baskin, 2015). Cultural influences are not static variables,
instead they occur interpedently with the environmental contexts in which they are embedded and interact (Kumanyika & Yancey, 2009).

Cultural factors are posited to influence physical activity levels in Black women. However, determining the cultural influences on physical activity is a difficult endeavor largely due to the close relationship between societal norms (i.e. acceptance of a larger body size) and institutional barriers (i.e. limited access to exercise facilities) that affect personal behavior (Richter, Wilcox, Greaney, Henderson, & Ainsworth, 2002). Moreover, culture is often not consciously considered when individuals discuss their behaviors. For instance, Black women in a focus group conducted by Richter et al. (2002) did not attribute differences in physical activity level to cultural background; however, they described numerous examples of differences between cultural groups in specific types of leisure and work-related activity levels. For example, women stated that Latinos prefer to engage in salsa dancing while Caucasian women prefer to go to the gym.

Despite the challenges, researchers have found that culturally based perceptions associated with types of physical activity, body image, values, religion, and social support impacts physical activity behavior among Black women (Robinson, 2009; Davis, Clark, Carrese, Gary, & Cooper, 2005; Henderson & Ainsworth, 2000; K. S. Johnson et al., 2005; Jones, 1992; Kim et al., 2006; Yenek et al., 2001; Young, He, Harris, & Mabry, 2002). These cultural differences may contribute to Black women’s increased risk for obesity and other chronic health conditions and a decreased likelihood to participate in health promotion behaviors including physical activity.

**Body image.** Attitudes and behaviors related to body size and shape have been understood as culturally defined (Kumanyika & Yancey, 2009). Black women tend to
embrace and tolerate larger body sizes compared with many other ethnic groups. Research has documented a general consensus that the Black community in general embraces a more positive body image and an overall acceptance of heavier body sizes or larger BMIs when compared to other populations (Cash, Melnyk, & Hrabosky, 2004; Davis, Clark, Carrese, Gary, & Cooper, 2005; Hawkins, Tuff & Dudley, 2006; Miller et al., 2000; Young et al., 2004; Robinson, 2009). Various explanations for this perception within the Black culture have been offered to better understand how culture informs individual body image perception. For instance, historically, Black Americans have associated excess body weight with better health, wealth and fertility (Robinson, 2009; Johnson & Broadnax, 2003). Furthermore, biological explanations have been centered on cultural weight disparities as influenced by an innately larger musculoskeletal system (Rubin, Fitts & Becker, 2003; Robinson, 2009). This cultural appraisal of excessive weight has been used to explain the positive association between higher BMI and less body image disturbances; however, this positive outlook often leads to the devaluation of physical activity within the Black community (Breitkopf & Littleton, 2007; Jacobson, Morton, Jacobson, Sharma, & Garcia, 2002; Thomas, Mosley, Stalling, Nichols-English & Wagner, 2008).

Consistently, young Black girls are taught to understand that self-satisfaction with their bodies is based on how their clothes fit rather than their actual size. Furthermore, it’s communicated to girls that being thin and dieting is not as preferable as having a more voluptuous body and weight gain is natural and expected (Boyington et al., 2008; Davis, Clark, Carrese, Gary, & Cooper, 2005; Wilcox, Richter, Henderson, Greaney & Ainsworth, 2002). Relatedly, Black girls and women have noted feelings of bitterness about participating in physical activity only to comply with expectations of the majority
culture (D’Alonzo & Fischetti, 2008). For instance, a focus group of 26 Black and Hispanic college-aged females revealed that many of the participants felt that they were expected to exercise in order to adhere to White societal norms. These findings suggest that weight and body size are socially comparative attributes and illustrate how culture affects values and self-estimations which in turn affects health behaviors including physical activity.

Values. Berger (1996) asserted that understanding personal meanings and values associated with physical activity are crucial to understanding both initiation and maintenance of activity (Bulley, Donaghy, Payne & Mutrie, 2009). Previous studies have shown that cultural differences can influence the personal and situational factors of motivation for physical activity (Fontayne, Sarrazin, & Famose, 2001; Gill & Williams, 2008; Kim & Gill, 1997). In a study of 12 overweight Black adolescences, Boyington et al. (2008) found that Black girls cite perceived “beauty cost”, perceived lack of time, and lack of access to preferred activities as contributors to the lack of engagement in physical activity. When discussing the “beauty cost” the girls in the focus group stated that their attitudes regarding low levels of physical activity was not perceived to be a problem. For instance, one focus group member stated that:

[Girls are] not interested in working like real hard doing all that exercise stuff. Some of them like — like girls they don’t like to sweat and get their hair messed up. . . . They think like they do the wrong thing, they break their nails, it’s a crisis. (p.5)

Furthermore, the girls in the groups thought exercise was not a culturally valued practice; ranking low on their lists of optional behaviors that were demanding to their
time and resources. Consistently, the importance placed on physical activity over rest for instance has emerged as a barrier among Black women (Eyler et al., 2002; Airhihenbuwa, Kumanyika, Agurs, & Lowe, 1995).

The theme that physical activity is a self-indulgent behavior has been identified as a pertinent barrier to participation among Black women (Im et al., 2012). Black women expressed concern that taking care of themselves by engaging in physical activity is selfish and only supports their own needs (Harley, Odoms-Young, Beard, Katz & Heaney, 2009). In a focus group of 20 Black women between the ages of 40 and 60, Im et al. (2012) elucidated a belief that physical activity is a frivolous activity similar to getting a manicure. Furthermore, participants relayed thoughts of guilt if they did participate in physical activity. Many of these women stated that they were too stressed by daily life to “entertain indulgences” such as physical activity. In a related study Young, He, Harris & Mabry (2002) found that Black women valued their role as caregivers in the family and thus devoted majority of their time to spending time with and caring for their husband and/or children.

We, as African Americans, we were taught to put ourselves last. You care for the house, you care for the children, you care for others . . . We try to fit everything in, and you are the last, you suffer. (p.37)

**Religion.** Historically Black culture has been fostered using religion and religious coping, a practice that emerged during experiences with slavery (Robinson, 2009; Black, 1999; Holt, Lewellyn & Rathweg, 2005). During slavery, Black women would rely on prayer to survive mental anguish and abuse (Black, 1999; Jones, 1992). Notably,
this behavior provided a way to reframe harsh circumstances while facilitating a sense of self-worth (Robinson, 2009). Currently members of the Black population continue to experience effects of poverty, marginalization, racism, and health disparities, thus prayer and religion have become a tradition (Holt, Lewellyn & Rathweg, 2005). Black Americans compared to other racial/ethnic groups report greater engagement in organizational and non-organizational religious activities (Chatters, Levin, & Taylor, 1992; Johnson, Elbert-Avila & Tulsky, 2005; Milevsky & Levitt, 2004). Among Black individuals going to church is an accepted and revered coping mechanism (Holt, Lewellyn & Rathweg, 2005). Mixed results exist as to the effects of religiosity on health behaviors (Johnson, et al., 2005; Milevsky & Levitt, 2004). On one hand, religiosity can have a beneficial impact on physical health (DeMano, 2012; Dyer, 2007; Rosmarin, Wachholtz, & Ai, 2011). For example, Merrill & Thygerson (2001) found that attending religious services positively influenced functional health and church attendance was associated with a lower risk of a sedentary lifestyle.

In summary, aspects of culture such as body image, values, and religiosity appear to have variable impacts on engagement in health behaviors including physical activity. Given the noted value of culture, numerous conceptual models have been developed to understand the influence of culture on the lives of Black Americans. One such model is the PEN-3 model which is grounded in acknowledging the historical, spiritual, and cultural experiences of individuals of African descent (Armstrong, 2013). The PEN-3 model consists of three primary domains: relationships and expectations; cultural empowerment; and cultural identity. Each domain includes three factors that form the acronym PEN: person, extended family, neighborhood (cultural identity domain); positive, existential, negative (cultural empowerment domain); and
perceptions, enablers, nurturers (relationships and expectations domain) (Airhihenbuwa, 1995). This paradigm serves as a foundational framework of delineating the role of culture in determining health behaviors. Arguably, adding a focus on culture to existing models of physical activity would increase their relevance for understanding and then developing effective physical activity interventions.

**The PEN-3 Model**

The PEN-3 model was initially developed and applied in African countries and then later adapted for African American culture (Kannan et al., 2008; Airhihenbuwa, 1995; Airhihenbuwa, 1999). The model accentuates culture as a key component related to health behavior (Figure 1-3). The PEN-3 model has been developed to assist in planning, implementing, and evaluating culturally based health interventions. For instance, the model has been applied to elucidating the cultural bases for cancer prevention efforts targeting African American women (Erwin, Spatz, Stotts, Hollenberg, & Deloney, 1996; Paskett et al., 1999) and a hypertension program focused on older African Americans (Walker, 2000).

The PEN-3 model encompasses three interrelated domains and nine constructs used to explain the influence of culture on health behavior (Kannan et al., 2008; Airhihenbuwa, 1995, 1999). The three domains include cultural identity, relationships and expectations, and cultural empowerment. Cultural identity defines the target population and involves person (individuals’ need to be empowered to make informed health decisions situated within their role in their family and community), extended family (“extended” kin and the influence they might play in health decisions of individuals), and neighborhood (promotion of health and prevention of disease in the
neighborhoods and communities). The second domain, relationships and expectations, is composed of perceptions, enablers, and nurtures. Perceptions include attitudes, beliefs, and values that encourage or obstruct positive health behaviors. Enablers are community, societal, and structural factors that influence health behavior changes. Lastly, nurturers are social support networks including family, friends, and community members. The third domain, cultural empowerment, identifies behaviors from a cultural perspective and includes positive (beneficial health behaviors and empowerment, extended family, and community), existential (neutral indigenous cultural beliefs, practices, and behaviors), and negative factors (potential deleterious health beliefs and/or practices).

The PEN-3 model creates a structural framework for understanding cultural health behaviors without perpetuating the tendency to associate culture in health with only negative assumptions (Airhihenbuwa, 1995, Airhihenbuwa & Webster, 2004). The model offers “a space within which cultural codes and meanings can be centralized in the development, implementation, and evaluation of health promotion programs”. The PEN-3 model provides an organizing framework to centralize culture when defining health behaviors and framing their solutions. Airhihenbuwa & Webster (2004) note that these solutions are framed to encourage and reward positive values and aspects of culture, which are better sustained, instead of focusing only on negative values. Thus, identifying the positive aspects of culture and behavior, while reframing those cultural aspects historically viewed as negative allows researchers to develop culturally congruent explanations and culturally sensitive interventions for health outcomes. Airhihenbuwa (1995) stresses that a negative representation of culture typically leads to a “deficit mode” that regulates behaviors associated with culture as unhealthy behaviors
that must be overcome. Unfortunately, across health behavior research there is an absence of focusing on positive aspects of cultural health behaviors that reveal cultural strengths.

Majority of the research conducted on physical activity using the PEN-3 model has been qualitative. For instance, as a precursor to the current study an examination of 12 Black women’s experiences with physical activity was conducted using the PEN-3 model. The study identified several important cultural constructs that influence engagement in physical activity. Analysis of interviews suggested an interplay among the three PEN-3 domains and nine constructs influencing physical activity behavior, with implications for revising theory and designing culturally sensitive interventions. Notably, social support, cultural barriers and perceived environment were deemed to be important factors predicting physical activity within this population.

Within the cultural identity and relationships and expectations domain, participants in the study supported findings that Black women’s participation in physical activity is positively influenced by their social support network (Fleury & Lee, 2006). Women in the study noted that they are more motivated to engage in physical activity when they have someone else to accompany them or hold them accountable. Therefore, consistent with previous research an emphasis on social support and social networks appears to be a positive aspect of Black culture that should be included in theories predicting physical activity.

Furthermore, a number of cultural barriers were elucidated. For instance, themes identified as part of the relationships and expectations domain included beliefs that physical activity is a self-indulgent behavior and discouraging behaviors from others. Women in the study discussed ways in which they are unable to prioritize physical
activity such as working multiple jobs to provide for family as a single mother and caring for family members. Historically, women from all racial/ethnic backgrounds have an established ethic of care that heightens the needs of others (i.e., the needs of family and friends) while diminishing their own needs (Joseph, Ainsworth, Keller & Dodgson, 2015; Henderson and Allen 1991). However, these barriers may be accentuated among Black women; given the collective societal perspective stressed in Black culture (as opposed to an individualistic viewpoint of predominately White cultures) (Coon and Kemmelmeir 2001; Oyserman, Coon, and Kemmelmeier 2002; Joseph, Ainsworth, Keller & Dodgson, 2015). Discouraging behaviors uncovered during the interviews included not discussing physical activity within multiple contexts and promoting other unhealthy or distracting behaviors. Women commented on the lack of discussion within their social networks. Additionally, consistent with previous qualitative research focused on Black women, participants in this study thought that Black women were not aware of the benefits of physical activity independent of weight loss and thus were less motivated to engage in physical activity (Austin, 2014; Wilcox, Bopp, Oberrecht, Kammermann & McElmurray, 2005). This was often discussed in relation to race and culture-based preferences for a larger and curvaceous ideal body shape. Women noted that maintaining and accepting a more voluptuous figure paired with lack of knowledge contributes to decreased engagement in physical activity.

With regards to the cultural empowerment domain, barriers identified included lack of exposure to physical activity. Consistent with national data, participants in the study expressed concern about their lack of exposure to physical activity (Harley, Odoms-Young, Beard, Katz & Heaney, 2009). Black women have traditionally not been encouraged to participate in physical activity consequently leading to sedentary
childhoods, lack of community and familial role models, lack of exposure to different types of physical activity and lack of physical activity related social support. Consistently, women interviewed commented on the lack of engagement in physical activity by their mothers and grandmothers and the experience of being the only Black women in a gym. Lastly, perceived environment was discussed in relation to the cultural identity domain. Women discussed the pertinent role of churches and universities to address health promotion including increased physical activity to prevent chronic illnesses. They further discussed their perception of their environment’s conduciveness to physical activity, noting that their environments were only minimally conducive to physical activity. These findings based on the PEN-3 model align with previous literature and support the need for interventions and behavioral theories to include culture in measurement and development.

**Purpose**

Lack of physical activity is a significant public health problem that has reached epidemic proportions especially among Black women. Consistently, research has begun to focus on efforts to increase physical activity within this population. However, inadequate attention to the potential influence of culture (e.g. overreliance on an individual-oriented approach to health behaviors) and narrow testing of existing theory on engagement in physical activity among Black women may contribute to the mixed success of current interventions, highlighting an important gap in the literature (Airhihenbuwa & Liburd, 2006).

Given the heterogeneity among Black women it is argued that the most appropriate method to the study of this group is to examine culture, varying degrees of immersion in it, reactions to demands to adapt to mainstream culture, and the role these
play in their behavior and beliefs (Landrine & Klonoff, 1996; Organista, Organisa, & Kurasaki, 2003; Smith, 2006). Therefore, approaches are needed that offer direction on how to address the interaction between culture and health within the context of established theories. Arguably understanding cultural contexts is instrumental to developing effective and sustainable solutions to increase levels of physical activity. The ecological model and TPB have been well established in the physical activity literature; however, their influence on predicting physical activity specifically among Black women has produced mixed results. Additionally, neither theoretical framework is equipped fully to address the complexity of culture in relation to physical activity. Therefore, a comprehensive understanding of the mechanisms influencing physical activity behavior is limited. Theoretical models such as the PEN-3 model may be better able to capture the influence of culture thus contributing significantly to our understanding of physical activity within this population. The PEN-3 model however has yet to be examined with regards to physical activity (Iwelunmor, Newsome & Airhihenbuwa, 2014).

Lastly, there are few studies that target Black female college students in physical activity intervention research. Given that lifestyle behaviors are established during these formative years and that students who leave college campuses as sedentary are unlikely to adopt a physically active lifestyle upon entering the workforce, college students are an ideal group to understand in order to better intervene on physical activity behaviors among Black women (Wallace et al., 2000; Johnson, 2006). Therefore, the current study addressed these gaps in the literature by applying the TPB and PEN-3 model constructs to investigate leisure time physical activity behaviors of Black female college students. These findings may assist in identifying specific factors
associated with students’ participation in physical activity and provide pertinent insight regarding how to increase Black female students’ engagement in regular physical activity.

Specific Aims and Hypotheses

Specific Aim 1: Test the proposed conceptual model of TPB constructs (attitudes, subjective norms, perceived behavioral control, intentions) on engagement in moderate to vigorous leisure-time physical activity among Black female college students (Figure 1-4).

Hypothesis 1a: The direct relationship between physical activity attitudes and intentions (Arrow A). It was hypothesized that more positive physical activity attitudes will be associated with higher levels of physical activity intentions.

Hypothesis 1b: The direct relationship between subjective norms and intentions (Arrow B). It was hypothesized that more positive subjective norms will be associated with higher levels of physical activity intentions.

Hypothesis 1c: The direct relationship between perceived behavioral control and intentions (Arrow C). It was hypothesized that greater perceived behavioral control will be associated with higher levels of physical activity intentions.

Hypothesis 1d: The direct relationship between intentions and moderate to vigorous leisure-time physical activity (Arrow D). It was hypothesized that greater intentions will be associated with higher levels of physical activity.
Hypothesis 1e: The indirect relationship between perceived behavioral control and moderate to vigorous physical activity through intentions (Arrow E). It was hypothesized that intentions will mediate the relationship between perceived behavioral control and moderate to vigorous leisure-time physical activity.

Specific Aim 2: Test the proposed conceptual model of the PEN-3 model constructs (cultural barriers, social support, perceived physical environment, intentions) and engagement in physical activity among Black female college students (Figure 1-5).

Hypothesis 2a: The direct relationship between cultural barriers and intentions (Arrow F). It was hypothesized that less cultural barriers will be associated with higher levels of physical activity intentions.

Hypothesis 2b: The direct relationship between social support and intentions (Arrow G). It was hypothesized that higher social support will be associated with higher levels of physical activity intentions.

Hypothesis 2c: The direct relationship between perceived physical environment and intentions (Arrow H). It was hypothesized that greater perception of the physical environment as conducive to physical activity will be associated with higher levels of physical activity intentions.
Hypothesis 2d: The direct relationship between intentions and moderate to vigorous leisure-time physical activity (Arrow I). It was hypothesized that greater intentions will be associated with higher levels of physical activity.

Hypothesis 2e: The indirect relationship between cultural barriers and moderate to vigorous physical activity through intentions (Arrow J). It was hypothesized that intentions will mediate the relationship between cultural barriers and moderate to vigorous leisure-time physical activity.

**Specific Aim 3: Test the proposed conceptual model of the TPB and PEN-3 model on moderate to vigorous leisure-time physical activity among Black female college students (Figure 1-6).**

Hypothesis 3a: It was hypothesized that the combined model will account for significantly more variance in moderate to vigorous leisure-time physical activity than either model. Specifically, it was hypothesized that PEN-3 model constructs will be a stronger predictor of intentions.

**Specific Aim 4: Test the proposed conceptual model of the TPB and PEN-3 model on moderate to vigorous leisure-time physical activity longitudinally among Black female college students).**

Hypothesis 4a: It was hypothesized that the models will account for significant variance in moderate to vigorous leisure-time physical activity overtime.

Figure 1-3. The PEN-3 model. [Adapted from Airhihenbuwa, C. O., & Webster, J. D. (2004). Culture and African contexts of HIV/AIDS prevention, care, and support. Journal of Social Aspects of HIV/AIDS Research Alliance, 1, 4-13.]

Figure 1-4. Theory of planned behavior conceptual model.
Figure 1-5. PEN-3 model conceptual model.

Figure 1-6. Theory of planned behavior plus PEN-3 model conceptual model.
CHAPTER 2
METHODS

Study Design

The current study employed a repeated measures design to test the TPB and PEN-3 model among a sample of Black female college students across multiple universities within the state of Florida. Data was collected using an internet-based survey disseminated via email to students from universities at baseline and again after 4 weeks. This timeframe was chosen to evaluate if the baseline factors impact PA behavior overtime.

Participants

Participants were 254 Black female college students attending universities in the state of Florida between spring of 2017 and spring of 2018. Representativeness of the sample was determined by assessing participants’ age, household family income, and student employment. Inclusion criteria for the study included: a) college students who attended a Florida university or college between spring of 2017 and spring of 2018, b) self-identified as a Black female, and c) between the ages of 18 and 30 years old. Exclusion criteria include: a) students who did not attend a Florida university or college between the spring of 2017 and spring of 2018 and b) have any medical conditions that limit their ability to be physically active (e.g. diabetes, multiple sclerosis, or cancer).

Procedure

A web-based survey was used to collect data from students at universities across the state of Florida. A representative sample of Black female college students were
recruited through student listservs disseminated via the McKnight Doctoral Fellowship alumni directory, student organizations and undergraduate academic advisors. The McKnight Doctoral Fellowship program is designed to address the under-representation of African American and Hispanic faculty at colleges and universities in the state of Florida by increasing the number of doctoral degrees awarded to minorities. Nine universities (Florida Agricultural and Mechanical University, Florida Atlantic University, Florida Institute of Technology, Florida International University, Florida State University, University of Central Florida, University of Florida, University of Miami and University of South Florida) participate in the fellowship program. A list of Black and Hispanic faculty at the above institutions was compiled using the McKnight alumni directory. There are currently 87 Black or Hispanic faculty members at Florida universities and colleges including 22 from Florida Agricultural and Mechanical University; 16 from University of Florida; 12 from University of South Florida; 9 from Florida State University; and 8 from University of Miami. The McKnight Doctoral Fellowship served as the primary recruitment vehicle and emails were sent to the faculty members enlisting their assistance in disseminating the study link to undergraduate students at their respective institutions. Furthermore, a list of campus organizations and academic advisors was compiled from these universities. Student organization listservs included SISTUHS, Incorporated, Black Student Union, Caribbean Students Association, African Student Union and African American sororities. A brief description of the researcher and an overview of the study was incorporated in the email.

The emails contained a link to the online survey. Data was collected using Qualtrics. An online survey was developed that consisted of 10 different scales
including the noted measurement tools and a demographic questionnaire. The survey took approximately 20-30 minutes for participants to complete. Recruited participants were able to access the survey via any internet connection. Once participants clicked on the link they were redirected to the Qualtrics survey. They were asked to read a consent form, click to indicate consent and then continue to take the survey. At the completion of the survey participants were given the opportunity to provide their email address to receive compensation for participation, be contacted for the 4-week follow up and to receive the results of the survey. Participants who provided their email addresses were contacted by email separately and sent a $10 gift card electronically. Email addresses and survey responses were kept separately. The online survey remained open until 300 participants were recruited. To increase the response rate, the Dillman method was used. Recruitment emails were sent to the aforementioned individuals and organizations one week after the initial emails were sent out and then again in three weeks. Four weeks after completion of the online survey, each participant was contacted via email directly to participate in the follow-up data collection. Participants again read a consent form, clicked to indicate consent and then continued to take the survey. The survey consisted of a demographic questionnaire and an assessment of their current PA behaviors. Participants were asked to provide their email address to receive compensation for participation. Participants were contacted by email separately and sent a $10 gift card electronically.
Measures

Specific Aim 1: Theory of Planned Behavior

**Physical activity attitudes.** Attitude is defined as “the degree to which a person has a favorable or unfavorable evaluation or appraisal of the behavior in question” (Azjen, 1991, p.188). For the purpose of this study, attitude was measured with 6 questions using a 5-point bipolar adjectival. The scales were harmful--beneficial, bad-good, useless-useful, unpleasant-pleasant, boring-fun, and unenjoyable-enjoyable. The following preceded each item “For me to do 30 minutes of medium-strength physical activity at least 5 days over the next week would be...”. The scores from each item were combined to create a scale with higher scores indicating a more positive attitude toward physical activity. These items were taken from the studies by Blanchard et al. (2008) and Aghenta (2014). Internal consistency for the attitude scale used in Blanchard et al. (2008) scale was $\alpha = .70$ for African American and $\alpha = .81$ for Caucasian students. In the Aghenta (2014) study internal consistency was reported $\alpha = .89$ for 328 college students comprised of 58 Black or African American students. In the current study the internal consistency was $\alpha = .842$.

**Subjective norms.** Subjective norms are the individual’s perceptions of societal pressures to execute behavior (Azjen, 1991; Aghenta 2014). Subjective norms are often determined by normative beliefs which are the individual’s perceptions of significant other’s attitudes towards a behavior and the degree to which the individual is motivated to conform to what their significant others expect. Subjective norms was measured using 6 items. Three items assessed the two determinants of subjective norms: normative beliefs and motivation to comply. The three items measuring normative
beliefs were derived from Blanchard et al. (2008). Example statements included “Most people who matter to me think I should do 30 minutes of medium strength physical activity at least 5 days during the next week” and “Most people who matter to me, support me in doing 30 minutes of medium strength physical activity at least 5 days during the next week”. The additional 3 questions measuring motivation to comply were based on Ajzen’s (2011) guidelines and taken from Aghenta (2014). These items included “When it comes to doing 30 minutes of medium-strength physical activity at least 5 days during the next week, I want to do what most people who matter to me think I should do,” “I want to be like my friends who do 30 minutes of medium-strength physical activity at least 5 days a week,” and “In terms of doing 30 minutes of medium-strength physical activity at least 5 days during the next week, I want to have the consent of most people who matter to me.” Responses for each of the items ranged from (1) strongly disagree to (5) strongly agree. All items were combined to create a scale with higher scores representing higher subjective norms towards physical activity. In the Aghenta (2014) study internal consistency was reported \( \alpha = .52 \) for 328 college students comprised of 58 Black or African American students.

**Perceived behavioral control.** Perceived behavioral control is “the perceived ease or difficulty of performing the behavior” (Ajzen, 1991). Six items were used to assess perceived behavioral control taken from Aghenta (2014) and Blanchard et al. (2008). Example items included “During the next week, how sure are you that you can do 30 minutes of medium-strength physical activity on at least 5 days?” with responses ranging from (1) not at all confident to (5) very confident and “During the next week, how much control do you believe you have to do 30 minutes of medium-strength physical
activity?’ with responses ranging from (1) extreme lack of control to 5 (extreme control).
The scores from each item were combined to create an overall scale with higher scores indicating a greater perception of ability to participate in physical activity. In the Aghenta (2014) study internal consistency was reported $\alpha = .76$ for 328 college students comprised of 58 Black or African American students.

**Intentions.** Intention refers to an individual’s motivation to perform a behavior and is explained by attitudes, subjective norms, and perceived behavioral control. Intentions were measured using the following statement “During the next week, I intended to do 30 minutes of medium-strength physical activity on at least 5 days.” Responses will range from (1) strongly disagree to (5) strongly agree. Higher scores on this item indicate higher intentions to perform physical activity. In the Aghenta (2014) study internal consistency was reported $\alpha = .57$ for 328 college students.

**Specific Aim 2: PEN-3 model**

**Cultural barriers.** The African American Cultural Barriers to Physical Activity scale was developed by Ledford (2013) and consists of 14 items designed to address seven distinct constraints to physical activity based on qualitative studies with African American females. The seven culture-specific barriers addressed included sedentary childhoods, lack of community/family role models, lack of exposure to different types of physical activities, ethnic isolation (i.e. discomfort of being the only African American woman in an exercise group), cultural ideals of larger body shape and grooming/hair maintenance concerns. Internal consistency for the scale was $\alpha = .77$ for African American female college students. The 14 items used in the scale further aligned with
constructs derived from the PEN-3 model and corroborated with qualitative interviews conducted by the researchers for the purpose of this study. Additionally, 3 items were added to the scale to provide a comprehensive assessment of cultural barriers to physical activity for Black women. These items included lack of encouragement to physical activity and limited knowledge of benefits of physical activity independent of weight loss, and view of physical activity as a self-indulgent behavior. Responses ranged from (1) Strongly Agree to (4) Strongly Disagree. Higher scores signified more cultural barriers to physical activity.

**Social support.** Social support for physical activity was assessed using the Social Support for Exercise Survey (Sallis, Grossman, Pinski, Patterson, & Nader, 1987). This measure uses two separate types of social support- family support and support from friends. The scale has demonstrated adequate test-rest reliability and has good internal consistency when used in Black populations (Bopp et al., 2009). In the Bopp et al. (2009) study internal consistency was reported to range from $\alpha = .88$ to .91 for 119 African American women.

**Physical environment.** Perceptions of the physical environments was assessed using the Neighborhood Environment Walkability Scale (NEWS; Saelens, Sallis, Black, et al., 2003; Johnson, 2006). Students living on-campus were instructed to use the university campus as their neighborhood environment. The NEWS consists of eight subscales developed to assess (a) residential density (frequency of different types of residences), (b) land use mix-diversity (proximity of residence to businesses and public and private facilities), (c) land use mix-access (perceived access to destinations), (d) connectivity (structural characteristics of streets) (e) walking/cycling (availability and
condition of sidewalks, paths, and trails), (f) aesthetics (pleasantness), (g) traffic safety (pedestrian specific), and (h) crime safety.

Specific Aim 3: TPB + PEN-3 Model

Physical activity. Minutes spent engaging in moderate to vigorous physical activity was measured using the International Physical Activity Questionnaire (IPAQ; Booth, 2000). IPAQ assesses physical activity undertaken across a comprehensive set of domains including leisure time physical activity, domestic and gardening (yard) activities, work-related physical activity, and transport-related physical activity. The IPAQ long form asks details about the specific types of activities within each of the four domains. The items are structured to provide separate domain specific scores for walking, moderate-intensity and vigorous-intensity activity with each of the domains. Computation of the total scores requires summation of the duration (in minutes) and frequency (in days) for all of the types of activities in all domains. Thus, the long form allows for domain specific scores or activity specific subscores may be calculated. Domain specific scores require summation of the scores for walking, moderate-intensity and vigorous-intensity activities within the specific domain, whereas activity-specific scores require summation of the scores for the specific type of activity across domains. For this study, physical activity was evaluated in terms of days per week and minutes and/or hours per day in leisure time physical activity. IPAQ correlations were 0.8 for reliability and 0.3 for validity in previous studies of physical activity in adults 18 to 65 years (Craig et al., 2003).
Cultural identity. Cultural identity was measured using the African American Acculturation Scale-Revised (Klonoff & Landrine, 2000). The measure is a 47-item scale comprised of eight theorized dimensions of African American culture. These dimensions include traditional African American religious beliefs and practices, preference for African American things, preference for cultural foods, interracial attitudes, traditional African American family beliefs and practices, traditional African American socialization, cultural superstitions, and traditional African American health beliefs and practices. Subscales have shown high internal consistency and the full scale has high split-half reliability. Subscale coefficient alphas have ranged from .71 (family practices) to .90 (preferences) in previous studies (Landrine & Klonoff, 1996; Newton & Perri, 2004).

Demographics. Age, ethnicity, height and weight were collected via a self-report measure. Participants were asked to note their marital status, number of children, year in school, full-time/part-time enrollment status, family income, year in school and on/off campus living arrangement, and employment status from a list of provided options. Annual family household income ranged from less than $10,000 to $75,000 or more.

Statistical Analyses

Structural Equation Modeling (SEM) is a commonly used statistical methodology that takes a confirmatory (i.e. hypothesis testing) approach to the analysis of a structural theory based on some phenomenon (Byrne, 2001; Canfield, 2012). Although SEM is one of the most widely used data analytic techniques within social and behavioral sciences, applications of SEM to assess factors that influence physical activity are relatively limited (Mâsse et. al, 2002). SEM is advantageous because it provides
information about the processes through which theoretical constructs influence outcomes as it permits for calculation of a variable’s direct, indirect, and total effects on the outcome variable (Kline, 2005). These processes are expected to represent “causal” influences that create observations on multiple variables (Bentler, 1998). Byrne (2001) notes that two aspects of the procedure are often highlighted: “(a) that the causal processes under study are represented by a series of structural (i.e. regression) equations, and (b) that these structural relations can be modeled pictorially to enable a clearer conceptualization of the theory under study” (Byrne, 2001, p. 3).

SEM offers several advantages over other statistical methods (Schumacker & Lomax, 2010). Advantages include concurrent analysis of multiple dependent variables, reducing estimation error and facilitating confirmation of complex relationships, inclusion of latent variables, simultaneous analysis of variables measured using different scales and testing, validation of complex theoretical models and suggestion of alternate models to improve model fit. Given these advantages, SEM was the best choice for this research study. Specifically, SEM was chosen because of its ability to simultaneously test the association of variables using a multivariate technique.

SEM is based on the notion that researchers should approach statistical analysis with a pre-conceived model supported by the literature; however, it allows for modifications as indicated by the data (Hair et al., 2010). Modifications are made related to the data structure, the viability of the change as indicated in the literature and the judgment of the researcher (Schumacker & Lomax, 2010). SEM is often divided into two parts, the measurement model and the structural model (Byrne, 2001). The measurement model is the association between the observed (manifest) and the
unobserved (latent) variables. Specifically, the measurement model indicates the link between the actual scores on a measuring instrument and the underlying construct that they are developed to measure. In SEM, a factor analysis can be used to assess the questionnaires selected to measure the latent variable and a path analysis can be used to construct structural equations representing the theoretical relationships between it and other variables (Schumacker & Lomax, 2010). Whereas, the structural model specifies the association among the unobserved variables and latent variables predict changes in the values of other latent variables in the model (Byrne, 2001, p.12). The overall structural model may then be analyzed in terms of goodness of fit statistics. When a measurement model (factor analysis of at least one latent variable) and a structural model are used in the same analysis, this is called a “full” model and optimally uses the aforementioned advantages of SEM. In this way the relationships between all variables are simultaneously evaluated and the fit of the full model is assessed using a number of selected fit indices.

Prior to conducting an SEM analysis, two steps occurred: Model Specification and Model Identification (Schumacker & Lomax, 2010). In model specification, variable relationships were specified through a visual diagram of variable interactions, based upon theoretical relationships supported in the literature. Model identification involved calculating the number of parameters to be estimated and comparing it to the number of observations in order to guarantee that a solution to the model fit can be estimated. Finally, once data was collected, three steps occurred in the SEM data analysis: Model Estimation, Model Testing and Model Modification (Schumacker & Lomax, 2010). Model estimation defines how the SEM will estimate parameters in the model. This study used
the most commonly used estimation method, Maximum Likelihood Estimation. Assumptions were evaluated such as normality, linearity, homogeneity, etc. Model testing is the running of the data to evaluate how well the model fits the data. Output provided factor loadings for factor analysis, correlation and covariance matrices, structural equation coefficients and fit indices. Model modification consisted of modifying the initially specified model to meet criteria for goodness-of-fit.

The models were tested with maximum likelihood estimates using AMOS 18.0 software (Arbuckle, 2009). The SEM analysis was conducted according to the two-step modeling approach (Anderson & Gerbing, 1988; Pentz & Chou, 1994; Thall, 2014). In the first step, the variables within the latent factors were analyzed for their confirmatory factor loadings. After the appropriateness of the measurement model was established, hypothesized relationships among the latent factors were tested for goodness-of-fit. Indices such as goodness-of-fit (GFI), adjusted goodness of fit (AGFI), comparative fit index (CFI), and the root mean square error of approximation (RMSEA) were analyzed to determine model fit. The GFI, AGFI, and CFI range from zero to 1.00 with values above .90 being demonstrative of good model fit (Byrne, 2001). RMSEA values of less than .05 indicate good model fit and values up to .08 representative of adequate fit. Additionally, Hu and Bentler (1999) suggested that a value of .06 be used as a cutoff for good model fit with values of .08-.10 being indicative of a mediocre fit and values above .10 representing a poorly fitting model. A 90% confidence interval and a p value were also examined in addition to the actual RMSEA value. More narrow confidence intervals indicate better precision with the value suggesting better fit model (MacCallum, Browne,
& Sugawara, 1996). The p value should be greater than .05 since this value tests the null hypothesis that the RMSEA value is not greater than .05 (Kenny, 2003).

**Variables in Structural Equation Analysis**

Three models were developed: 1) direct and indirect effects model for physical activity based on the TPB; 2) direct and indirect effects model for physical activity based on the PEN-3 model, and 3) direct and indirect effects model for physical activity based on the TPB and PEN-3 model. The effects model for the TPB included subjective norms, perceived behavioral control, attitudes and intentions on leisure-time physical activity. The effects model for the PEN-3 model included cultural barriers, perceived physical environment, social support, and intentions on leisure-time physical activity. The combined model examining variance in physical activity explained by the TPB and PEN-3 model included the aforementioned variables. Pearson-r correlations were conducted to determine whether the relationships between the variables were consistent with the theoretical predictions. Analyses for specific aims are as follows:

**Specific Aim 1: Test the proposed conceptual model of TPB constructs (attitudes, subjective norms, perceived behavioral control, intentions) on moderate to vigorous leisure-time physical activity among Black female college students.**

**Test of Specific Aim 1:** To test Specific Aim 1 the structural model for the effects of attitudes, subjective norms, and perceived behavioral control and physical activity intentions on leisure-time physical activity was evaluated. The direct pathways from attitudes and intentions were examined followed by an assessment of the
pathways from subjective norms and intentions and perceived behavioral control and intentions. Variance in physical activity intentions explained by the model was assessed. The direct effects of physical activity intentions on minutes spent in leisure-time moderate to vigorous activity was evaluated. Lastly, the pathway between perceived behavior control and moderate to vigorous leisure-time physical activity mediated by physical activity intentions was assessed. Mediation was suggested if there was a lower or non-significant path coefficient between perceived behavioral control and physical activity once intentions was added into the model. The complete structural model with standardized regression coefficients and critical ratios is presented. Overall model fit was assessed using goodness of fit indices as described above.

Specific Aim 2: Test the proposed conceptual model of the PEN-3 model constructs (cultural barriers, social support, perceived physical environment, intentions) and physical activity among Black female college students.

Test of Specific Aim 2: To test Specific Aim 2 the structural model for the effects of cultural barriers, perceived environment, and social support and physical activity intentions on physical activity was evaluated. The direct pathways from cultural barriers and intentions was examined followed by an assessment of the pathways from social support and intentions and perceived environment and intentions. Variance in physical activity intentions explained by the model was assessed. The direct effects of physical activity intentions on minutes spent in leisure-time moderate to vigorous activity was evaluated. Lastly, the pathway between cultural barriers and moderate to vigorous leisure-time physical activity mediated by physical activity intentions was assessed.
Mediation was suggested if there is a lower or non-significant path coefficient between cultural barriers and physical activity. The complete structural model with standardized regression coefficients and critical ratios is presented. Overall model fit was assessed using goodness of fit indices.

Specific Aim 3: Test the proposed conceptual model of the TPB and PEN-3 model on moderate to vigorous leisure-time physical activity among Black female college students.

Test of Specific Aim 3: To test Specific Aim 3 the structural model for the effects of cultural barriers, perceived environment, social support, attitudes, subjective norms, perceived behavioral control and physical activity intentions on physical activity was evaluated. The direct pathways from cultural barriers and intentions will be examined followed by an assessment of the pathways from social support and intentions, perceived environment and intentions, attitudes and intentions, subjective norms and intentions and perceived behavioral control and intentions. Variance in physical activity intentions explained by the model was assessed. The direct effects of physical activity intentions on minutes spent in leisure-time moderate to vigorous activity was evaluated. The pathway between cultural barriers and moderate to vigorous leisure-time physical activity mediated by physical activity intentions and the pathway between perceived behavioral control and physical activity mediated by intentions was assessed. Again, mediation was suggested if there is a lower or non-significant path coefficient between cultural barriers/perceived behavioral control and physical activity. The complete structural model with standardized regression coefficients and critical
ratios is presented. Overall model fit was assessed using goodness of fit indices. Goodness of fit indices was compared to the previous models.

**Test of Specific Aim 4: Test the proposed conceptual model of the TPB and PEN-3 model on moderate to vigorous leisure-time physical activity longitudinally among Black female college students**

To test Specific Aim 4 logistic regression was used to examine the relationship between TPB and PEN-3 model constructs and engagement in physical activity. To create the categorical variable for physical activity, minutes spent engaging in physical activity was dichotomized into participation in any minutes of physical activity and no participation in physical activity.

**Power**

Calculations were undertaken to determine the required number of responses needed to test the proposed theoretical model using SEM. The proposed structural model consists of 15 correlations among exogenous variables, 9 regression coefficients, and 2 disturbances equaling 26 parameters. The guidelines of Bentler and Chou (1987) indicate that in order to achieve adequate power, are ratio of 5:1 or 10:1 responses to estimated parameters should be used. The optimal sample size using these ratios was 130 to 260. Therefore, 260 was selected initially as the sample for this study. Furthermore, previous meta-analyses assessing the TPB have demonstrated a large effect size (d=.05) for the relationship between physical activity intentions and behaviors (Hagger, Chatzisarantis & Biddle, 2002). Other assumptions are that SEM requires
more than 200 observations or at least 50 more than 8 times the number of variables in the model (e.g. 122). As a result, a final sample size of 300 is more than adequate.

**Missing Data**

The design of the internet survey ideally minimized missing data by giving participants a visual indicator of their progress in the survey and visually presenting only one question at a time (Cobb, 2007). Additionally, conditions were set by the researcher to restrict unnecessary items from appearing to the participant through the use of skip patterns. Despite the design of the survey to limit missing data since there are no forced responses was expected that there will be missing data. When all participants had completed the survey, data was reviewed for completeness, accuracy, and viability. Outliers and missing data were reviewed, assessed and appropriately handled. Depending on the reason for missingness different approaches were used to assess and then intervene. SPSS was used to assess the number of missing responses for individual items included in the survey. For variables that are expressed as a total subscale score, the quantity of missing data was assessed for each item individually as well as the aggregate responses for all items included in all subscale calculations. If less than 10% of the responses are missing for an item comprising a subscale and the pattern of missing data is determined to be missing at random, missing data will be replaced by the mean of that item. However, if greater than 10% of the data are missing the item was excluded from the calculations used to determine the subscale score. There were no items excluded from the analyses.
CHAPTER 3
RESULTS

Out of the 292 participants, 38 participants were excluded from final analysis (Figure 3-1). Six participants were under the age of 18 and thus excluded from the analysis. Additionally, two participants did not identify as a Black female and were also excluded from the final analysis. Furthermore, 30 participants had a preponderance of missing data (greater than 75% item nonresponse) and were omitted from the analysis. Therefore, 254 participants were included in the final data analysis. The item nonresponse data was determined to be missing at random given the low probability that a value for a variable was missing was related to the value of other observed variables. Overall, missing responses for items comprising subscales was below the threshold. Further, given the use of Maximum Likelihood estimation techniques in Structural Equation Modeling, imputation of missing data was not necessary. One hundred and two participants were retained at Time 2 (4 weeks after baseline survey). Attrition rates were influenced by anonymity of survey responses specifically the ability to complete the survey without providing contact information (name and email address). However, three months into data collection (March 2017) an IRB revision ensured that participants were required to provide an email address for compensation and for Time 2 follow-up. Prior to March 2017, 66 participants did not include their contact information and were thus not able to be contacted to complete the Time 2 survey. Therefore, 187 participants were contacted to provide responses at Time 2. Eighty-five of the participants declined to participate in the survey at Time 2. Therefore, 102 participants were included in the Time 2 analysis.
Sample Characteristics

Among the 254 respondents, the distributions of their age, year in school, income, and BMI are described in Table 3-1. Descriptive statistics showed that participants ranged in age from 18 to 27 with the mean age of 19.65 (SD = 1.54). Five percent of participants identified their ethnicity as Hispanic/Latino. Thirty-four percent (86) of participants reported that they were in their 1st year of school. Majority of participants were taking between 12 and 15 credit hours (78 percent). Seventy-four percent of participants reported enrollment at the University of Florida (187). Additionally, 51.4 percent of participants reported an annual household income of less than $15,000. Almost 60 percent of participants indicated that they reside in off-campus housing. Fifty-four percent of individuals reported being currently employed. Based on self-reported height and weight, mean BMI was 25.92 (SD = 5.68). Forty-two participants (16 percent) were classified as obese (BMI of above 30), while 72 (28.5 percent) were classified as overweight (BMI of between 25 and 30). With regards to cultural identity, the mean score on the Africentrism scale was 213.1 (SD = 46.1). Scores ranged from 91-319 (scale ranges from 47-329) indicating moderate identification with Africentrism. The mean minutes for engaging in MVPA per week was 109.1 (SD = 253.9). Of note, 74% of participants reported engaging in no physical activity within the past week., which is representative of national data. A review of the scores recorded on the TPB constructs reveal that participants had positive attitudes, subjective norms, and perceived behavioral control with regards to physical activity. Specifically, on the attitude scale (scale of 1 to 5) the mean responses for each of the 6 items ranged from 3.45 to 4.54. Black women in the current study also reported high
levels of PBC (range 3.14-4.32). Thirty-six percent of participants reported positive intentions to engage in physical activity within the next week while 19% denied an intent to participate in physical activity.

Lastly, responses on the PEN-3 model were assessed. Fifty-nine percent participants agreed that they receive more positive attention from the opposite sex when they are thick and shapely. However, 77% of participants did not agree that a larger body is more attractive/sexy than a thin/toned body. Only 24% of participants reported that their family/social support engage in discouraging behaviors. Only 29% of participants reported that weight loss is the most important outcome of physical activity. Additionally, women reported having friends that were engaged in physical activity routinely (73%) and having access to Black exercise partners (73%).

Lastly, many individuals in the current study (18-43%) endorsed lack of physical activity during childhood as a cultural barrier to physical activity within PEN-3 model construct. Furthermore, approximately 33% of participants reported decreasing physical activity due to hair care and maintenance. In particular, 70% of participants endorsed easily accessible shopping venues and 52% reported having several places to go within walking distance. Additionally, almost 70% of acknowledged positive aspects of the sidewalks near their homes and aesthetics of their neighborhood. Furthermore, in the current study, 40% of participants reported living on-campus. Participants reported that family members often exercised with them (19%), offered to exercise with them (21%), and encouraged them to adhere to physical activity program (33%). Further, only 8% of Black female college students acknowledged that family members engage in discouraging behaviors such as complain about the time they spend engaging in
physical activity. With respect for friend social support, participants reported that friends often exercised with them (27%), offered to exercise with them (35%), and encouraged them to adhere to physical activity program (30%).

**Item Reliability**

Cronbach alpha coefficients were calculated for each of the constructs. Attitudes, based on six items, yielded an internal consistency of $\alpha = .842$. Subjective norms comprised of six items produced a Cronbach's alpha of .732. While the internal consistency for perceived behavioral control was $\alpha = .811$. For the PEN-3 variables the reliability analysis for cultural barriers (18 items) was .647, friend social support (13 items) was .91, and family social support (13 items) was .842. Lastly, perceived environment, based on 18 items, yielded an internal consistency of $\alpha = .651$. An additional measure of cultural identity comprised of 47 items yielded a reliability statistic of .914.

**Correlation Matrix**

Table 3-2 presents the correlation for all the TPB study variables. Attitudes, perceived behavioral control, and subjective norms were found to be positively correlated to behavioral intentions. Whereas none of the TPB variables were correlated with age or minutes spent engaging in MVPA. BMI was found to be significantly negatively correlated with physical activity attitudes. Cultural identity was positively related to subjective norms for physical activity and intentions to engage in MVPA.
Table 3-3 presents the correlation for all the PEN-3 study variables. None of the PEN-3 variables (Social Support, Perceived Environment, Cultural Barriers) were found to be significantly related to behavioral intentions. Additionally, none of the variables were significantly correlated with age or BMI. While cultural identity was found to be significantly positively correlated with cultural barriers, perceived environment, and physical activity intentions.

Specific Aim 1

Theory of Planned Behavior

Prior to running the structural equation model, a confirmatory factors analysis on items comprising the three latent constructs of the TPB (attitudes, subjective norms, PBC) was conducted. For each of these constructs, the variance was constrained for the item with the highest factor loading to be 1.0, leaving the variance for the remaining items comprising the factor free to vary. Factor analyses were conducted in AMOS using Confirmatory Factor Analyses (CFA) methods.

Attitudes. The latent construct of attitude was comprised of 6 items (harmful--beneficial, bad-good, useless-useful, unpleasant-pleasant, boring-fun, and unenjoyable-enjoyable). Exploration of the attitude items is shown in Figure 3-2, which displays a unidimensional confirmatory factor analysis of attitudes using AMOS. Factor loadings ranged from .264 to .951 and suggested that not all six items load strongly onto the single latent construct of attitudes for physical activity. Further, this initial CFA resulted in fair model fit, with a relative chi-square of 263.28 (p=.00), an RMSEA of .349 (90% CI: .313-.386), a TLI of .259, IFI of .687, and a CFI of .682.
Based on the results above, Figure 3-3 shows a second CFA was constructed for a two-factor model of attitudes for physical activity allowing the factors to correlate. This resulted in moderate-to-strong factor loadings. Item loading on the first component (Significance) of the latent construct of attitudes included harmful-beneficial (.817), bad-good (.755), and useless-useful (.880), while component two (Affective) included unpleasant-pleasant (.793), boring-fun (.890) and unenjoyable-enjoyable (.965).

Overall, the CFA shown in Figure 3-3 appears to have a good fit, with a relative chi-square of 18.15 ($p = .020$), an RMSEA of .074 (90% CI: .028–.120), a TLI of .967, an IFI of .988, and a CFI of .987.

**Subjective norms.** The latent construct of subjective norms was comprised of 6 items assessing two determinants: normative beliefs and motivation to comply. Exploration of the subjective norm items as a single latent construct is shown in Figure 3-4. Factor loadings ranged from .103 to .781 and suggested that not all 6 items load strongly onto the single latent construct of subjective norms. Further, this initial CFA resulted in moderate model fit, with a chi-square of 98.65, $p = .00$, an RMSEA of .207 (90% CI: .171-.245) a TLI of .396, IFI of .750, and a CFI of .741.

Based on the results above, Figure 3-5 shows a second CFA that was constructed for a two-factor model of subjective norms allowing the factors to correlate. This resulted in moderate-to-strong factor loadings. Specifically, items loadings on Normative Beliefs ranged from .682 to .803 and included items such as “Most people who matter to me think I should do 30 minutes of medium strength physical activity at least 5 days during the next week” and “Most people who matter to me, support me in doing 30 minutes of medium strength physical activity at least 5 days during the next
week”. While items loading on Motivation to Comply ranged from .465 to .871 and included items such as “When it comes to doing 30 minutes of medium-strength physical activity at least 5 days during the next week, I want to do what most people who matter to me think I should do,” “I want to be like my friends who do 30 minutes of medium-strength physical activity at least 5 days a week,” and “In terms of doing 30 minutes of medium-strength physical activity at least 5 days during the next week, I want to have the consent of most people who matter to me.” Overall, the CFA shown in Figure 10 appears to have a good fit, with a chi-square of 48.58 (p = .000), an RMSEA of .148 (90% CI: .109–.189), a TLI of .692, an IFI of .887, and a CFI of .883.

**Perceived behavioral control.** The latent construct of perceived behavioral control was comprised of 6 items. Examination of the PBC items is shown in Figure 3-6 which displays a unidimensional confirmatory factor analysis of PBC. Factor loadings ranged from .354 to .778 and suggested that not all 6 items load strongly onto the single latent construct of PBC. Further, this initial CFA resulted in moderate model fit, with a chi-square of 128.98, p =.00, an RMSEA of .240 (90% CI: .204–.277), a TLI of .420, IFI of .758, and a CFI of .752.

Based on the results above, Figure 3-7 shows a second CFA that was constructed for a two-factor model of PBC allowing the factors to correlate. This resulted in moderate-to-strong factor loadings. An examination of the four items loading on component one ranged from .666 to .787. Items loading on the first component (Control) included “During the next week, how sure are you that you can do 30 minutes of medium-strength exercise on at least 5 days”, “During the next week, for me to do 30 minutes of medium-strength exercise on at least 5 days will be”, “During the next week,
how much control do you believe you have to do 30 minutes of medium-strength exercise” and “During the next week, I will have the chance to do 30 minutes of medium-strength exercise on at least 5 days”. While the two items loading on component two (Access) ranged from .691 to 1.01 (suggestive of high multicollinearity). These items included “I have access to facilities where I can do 30 minutes of medium strength exercise” and “I believe I have all the things I need to do 30 minutes of medium-strength exercise”. Overall, the CFA shown in Figure 3-7 appears to have an overall good fit, with a chi-square of 8.768 (p = .362), an RMSEA of .020 (90% CI: .000–.081), a TLI of .996, an IFI of .998, and a CFI of .998.

**SEM Analysis**

The structural model for the effects of attitudes, subjective norms, and PBC and physical activity intentions on leisure-time physical activity were evaluated. Specifically, Hypothesis 1a predicted that more positive physical activity attitudes will be associated with higher levels of physical activity intentions. The latent construct of attitudes did not reveal a significant direct association with intentions, β = -.077, p = .268. Conversely, when physical activity attitudes increase by one standard deviation, intention is predicted to decrease by .077 standard deviations, holding other relevant variables constant. Hypothesis 1b predicted that more positive subjective norms would be associated with higher levels of physical activity intention. Subjective norms were not found to be directly related to intentions, β = .081, p = .182. In particular, when subjective norms increase by one standard deviation, intentions is predicted to increase by .081 standard deviations. Additionally, greater perceived behavioral control was
found to significantly predict physical activity intentions (Hypothesis 1c), $\beta = .748$, $p = .000$. When perceived behavioral control increases by one standard deviation, intentions is predicted to increase by $.748$. Table 3-4 provides unstandardized and standardized regression weights and critical ratios for predictive factors of physical activity of intentions in the model. Additionally, the covariances for the TPB variables if found in Table 3-5. The combined model (PBC, attitudes, subjective norms) accounted for 54.4% of the variance in physical activity intentions.

Lastly, greater intention was hypothesized to be associated with higher levels of engagement in MVPA (Hypothesis 1d). Intention was not found to significantly related to minutes spent participating in physical activity, $\beta = -.014$, $p = .898$. Furthermore, it was hypothesized that intentions would mediate the relationship between PBC and MVPA (Hypothesis 1e). The direct pathway from PBC to MVPA was found to not be significant, $\beta = .097$, $p = 0.188$. Once intentions was added into the model, the pathway between PBC and MVPA continued to remain insignificant, $\beta = .110$, $p = 0.342$ thus suggesting that intentions does not mediate the relationship between PBC and engagement in physical activity.

The fit of the model shown in Figure 3-8 was evaluated using maximum likelihood algorithm. Overall, the model appears to have a moderate fit, with a chi-square of showed $\chi^2 = 739.86$, $df = 164$, $p = .000$, an RMSEA of .123 (90% CI: .114–.132) with a p value = .000, a TLI of .619, an IFI of .709, and a CFI of .702. Based on this information, it was concluded that the data moderately supports the model. The model accounted for 10% of the variance in physical activity.
SEM Revised Model

SEM allows for modifications as indicated by the data based upon model diagnostics, examination of modification indices and theoretical coherence, therefore a revised structural model was developed for the effects of attitudes, subjective norms, and PBC and physical activity intentions on leisure-time physical activity. The latent construct of “Significance” did not reveal a significant direct association with intentions, $\beta = -0.021$, $p = 0.770$ or for the “Affective” component of physical activity attitudes, $\beta = -0.112$, $p = 0.093$. Additionally, similar to the previous model “Normative Beliefs” ($\beta = 0.009$, $p = 0.913$) and “Motivation to Comply” ($\beta = 0.143$, $p = 0.066$) were not significant predictors of physical activity intentions. Although there was a trend towards significance for the “Motivation to Comply” latent construct. Furthermore, it was hypothesized that greater perceived behavioral control would be associated with higher levels of physical activity intentions (Hypothesis 1c). Parameter estimates for the path occurred in the expected direction between PBC (Control) and physical activity intentions, $\beta = 0.672$, $p = 0.000$ highlighting the significance of one’s confidence in performing physical activity as a significant predictor of intentions to engage in physical activity. Lastly, the latent construct of PBC (Access) was found to trend towards significance in predicting intentions ($\beta = 0.145$, $p = 0.068$). Table 3-6 provides unstandardized and standardized regression weights and critical ratios for predictive factors of intentions in the model. While Table 3-7 displays the covariances for the latent constructs. The combined model (PBC, attitudes, subjective norms) accounted for 55.4% of the variance in physical activity intentions.
Lastly, greater intention was hypothesized to be associated with higher levels of engagement in MVPA (Hypothesis 1d). Intention was not found to significantly related to minutes spent participating in physical activity, $\beta = -.005, p = .965$. Furthermore, it was hypothesized that intentions would mediate the relationship between PBC and MVPA (Hypothesis 1e). The direct pathway from PBC (Control) to MVPA was found to not be significant, $\beta = .114, p = .121$. While the direct pathway from PBC (Access) to MVPA was not significant, $\beta = -.116, p = .115$. The pathway between PBC (Control) and MVPA was not found to be significant with the addition of physical activity intentions, $\beta = .136, p = .236$. Once intentions was added into the model the pathway between PBC (Access) and MVPA was found to be significant $\beta = -.189, p = .028$. Thus, the mediation hypothesis was not supported for the revised model of the TPB and MVPA.

The fit of the model shown in Figure 3-9 was evaluated using maximum likelihood algorithm. Overall, the model appears to have a good fit, with a chi-square of showed $\chi^2 = 260.69, df = 148, p = .000$, an RMSEA of .057 (90% CI: .046–.069) with a p value for close fit = .145, a TLI of .917, an IFI of .944, and a CFI of .942. Based on this information, it was concluded that the data did support the revised model.

Specific Aim 2

PEN-3 Model

Prior to running the structural equation model, a confirmatory factors analysis on items comprising the three latent constructs of the PEN-3 model (cultural barriers, perceived environment, social support) was conducted. For each of these constructs, the variance was constrained for the item with the highest factor loading to be 1.0,
leaving the variance for the remaining items comprising the factor free to vary. Factor analyses were conducted in AMOS using Confirmatory Factor Analyses (CFA) methods.

**Cultural barriers.** The latent construct of cultural barriers was comprised of 18 items. Examination of the cultural barrier items is shown in Figure 3-10 which displays a unidimensional confirmatory factor analysis of cultural barriers using AMOS. Factor loadings range from .073 to .960 and suggested that not all 18 items load strongly onto the single latent construct of cultural barriers. In fact, many of the items load poorly onto the construct and suggest that the items within the cultural barriers construct are not highly correlated. However, items that loaded strongly onto the latent construct included “I'm less comfortable in the gym/exercise classes because I rarely see other African-Americans there” (.960) and “The gym/exercise classes make me self-conscious because often I’m the only African-American female there” (.800). While items that loaded poorly onto the construct of cultural barriers included “Physical exercise was not encouraged in my family home” (.073) and “Many people in my community exercise regularly” (.096). As expected due to the lack of coherence within the latent construct the initial CFA resulted in poor model fit, with a chi-square of 596.851, p =.00, an RMSEA of .121 (90% CI: .112-.131), a TLI of .246, IFI of .431, and a CFI of .405. Further, due to the limited factor loadings and low correlation among cultural barriers items, a revised model could not be appropriately constructed thus the unidimensional factor was retained (Savalei & Bentler, 2001). Construction of the revised model is not advisable due to the low correlation between the items and limited factor loadings.
**Social support.** The latent construct of social support was comprised of 13 items each for two separate types of social support- family support and support from friends. A unidimensional confirmatory factory analysis for family social support is shown in Figure 3-11. Factor loadings range from .514 to .821 and suggested that all 13 items load moderately well onto the single latent construct of family social support. This initial CFA resulted in good model fit, with a chi-square of 395.65, p =.00, an RMSEA of .148 (90% CI: .134-.162), a TLI of .725, IFI of .807, and a CFI of .804.

Further exploration of the friend social support items is shown in Figure 3-12 which displays a unidimensional confirmatory factor analysis of friend social support using AMOS. Factor loadings ranged from .514 to .821 and suggested that not all 13 items strongly load onto the single latent construct of friend social support. Further, this initial CFA resulted in moderate model fit, with a chi-square of 467.35, p =.00, an RMSEA of .163 (90% CI: .150-.177), a TLI of .517, IFI of .622, and a CFI of .655. Based on the low to moderate factor loadings, Figure 3-13 shows a second CFA that was constructed for a two-factor model of friend social support allowing the factors to correlate. This resulted in moderate-to-strong factor loadings. Specifically, items loading on the positive family social support ranged from .614 to .823, while items loading on negative family support ranged from .785 to .966. Item loading on the first component of the latent structure of friend social support (Positive) included exercised with me (.735), offered to exercise with me (.759), gave me helpful reminders to exercise (.782), gave me encouragement (.823), changed their schedule to exercise with me (.749), discussed exercise with me (.771), planned for exercise on recreational outings (.649), helped plan activities around my exercising (.715), asked me for ideas on how they can
get more exercise (.614) and talked about how much they like exercising (.628). Only three items loaded on the second factor (Negative) including complained about the time I spent exercising (.858), criticized me for exercising (.966) and gave me rewards for exercising (.785). The final item loading on the second component (“Gave me rewards for exercising”) dissented from theoretical coherence. Overall, the CFA shown in Figure 19 appears to have a good fit, with a relative chi-square of 200.73 (p = .000), an RMSEA of .096 (90% CI: .081–.111), a TLI of .834, an IFI of .886, and a CFI of .883.

**Perceived environment.** The latent construct of perceived environment was comprised of 18 items measuring walkability. Figure 3-14 displays a unidimensional confirmatory factor analysis of perceived environment. Factor loadings range from -.005 to .690 and suggested that not all 18 items load well onto a single latent construct of perceived environment. Factor loadings suggest that the items within the latent construct are not highly correlated. Items that loaded poorly onto the latent structure included ease of walking to public transit stations (-.013), too much traffic along street that makes it difficult and unpleasant to walk (-.067), and neighborhood streets are hilly making the neighborhood difficult to walk in (.037). While items that loaded moderately well included items such as interesting things to look at in neighborhood (.691) and many attractive natural sights in neighborhood (.664). Further, this initial CFA resulted in poor model fit, with a chi-square of 709.903, p = .00, an RMSEA of .135 (90% CI: .126-.145), a TLI of .155, IFI of .360, and a CFI of .331. Further, due to the limited correlation between items, a revised model could not be appropriately constructed thus the unidimensional factor was retained.
SEM Analysis

The structural model for the effects of cultural barriers, social support, perceived environment and physical activity intentions on leisure-time physical activity were evaluated. It was hypothesized that less cultural barriers will be associated with higher levels of physical activity intentions (2a). The latent construct of cultural barriers revealed a significant direct association with intentions, $\beta = -.232, p = .019$. Specifically, when cultural barriers increase by one standard deviation, intention is predicted to decrease by .232 standard deviations, holding other relevant variables constant. Hypothesis 2b predicted that greater social support would be associated with higher levels of physical activity intention. Family social support was not found to predict physical activity intentions ($\beta = .137, p = .069$), although family social support was trending towards significance. In particular, when family social support increases by one standard deviation, intention is predicted to increase by .137 standard deviations. Conversely, friend social support was not found to predict physical activity intentions, $\beta = -.057, p = .542$. When social support received by friends increased by one standard deviation, intention is expected to decrease by .057. Lastly, perceived environment was not found to predict physical activity intentions, $\beta = -.064, p = .458$). Instead as perceived environment increases by one standard deviation, intentions is predicted to decrease by .064. Table 3-8 provides unstandardized and standardized regression weights and critical ratios for predictive factors of physical activity intentions in the model. The combined model (cultural barriers, social support, perceived environment) accounted for 7% of the variance in physical activity intentions. Covariances for the PEN-3 model constructs are displayed in Table 3-9.
Finally, greater intentions was hypothesized to be associated with higher levels of engagement in MVPA (Hypothesis 2d). Intention was not found to be significantly related to minutes spent engaging in MVPA in the model ($\beta = .072, p = .311$). Furthermore, it was hypothesized that intentions would mediate the relationship between cultural barriers and MVPA (Hypothesis 2e). The direct pathway from cultural barriers to MVPA was not significant, $\beta = .005, p = .952$. Once intentions was added into the model, the pathway between cultural barriers and MPVA remained insignificant, $\beta = .021, p = .796$ thus suggesting that intentions does not mediate the relationship between cultural barriers and engagement in physical activity.

The fit of the model shown in Figure 3-15 was evaluated using maximum likelihood algorithm. Overall, the model appears to have a poor fit, with a chi-square of showed $\chi^2 = 4683.250$, df = 1942, $p = .000$, an RMSEA of .078 (90% CI: .075–.081) with a p value = .000, a TLI of .458, an IFI of .506, and a CFI of .494. Based on this information, it was concluded that the data did not support the model. The variance explained in MVPA based on the PEN-3 model was 5%. A revised model was not constructed for the PEN-3 model due to the limited correlation among items within the cultural barriers and perceived environment latent constructs.

**Specific Aim 3**

The structural model for the effects of cultural barriers, perceived environment, social support, attitudes, subjective norms, perceived behavioral control and physical activity intentions on physical activity was evaluated. The pathway from cultural barriers and intentions was not found to be significant, $\beta = -.040, p = .583$. Additionally, the
pathway from family social support and intentions ($\beta = .048, p = .396$) and friend social support and intentions ($\beta = .045, p = .520$) were both found to be insignificant. Furthermore, perceived environment did not predict physical activity intentions, $\beta = -.073, p = .279$. Attitudes was found not to be a significant predictor of intentions, $\beta = -.090, p = .202$. The pathway from subjective norms to physical activity intentions was assessed and found to not be significant, $\beta = .080, p = .185$. Lastly, perceived behavioral control was again found to be a significant predictor of physical activity intentions, $\beta = .748, p = .000$. Table 3-10 provides unstandardized and standardized regression weights and critical ratios for predictive factors of physical activity intentions in the model. The combined model (TPB and PEN-3 model variables) accounted for 55% of the variance in physical activity intentions.

Greater intentions were hypothesized to be associated with higher levels of engagement in MVPA. Intention was not found to be significantly related to minutes spent engaging in MVPA in the model ($\beta = -.008, p = .940$). Furthermore, it was hypothesized that intentions would mediate the relationship between cultural barriers and MVPA. The direct pathway from cultural barriers to MVPA was not significant, $\beta = .005, p = .952$. Once intentions was added into the model, the pathway between cultural barriers and MPVA remained insignificant, $\beta = .016, p = .839$ thus suggesting that intentions does not mediate the relationship between cultural barriers and engagement in physical activity. The pathway from PBC to MPVA was not significant, $\beta = .097, p = .188$. When intentions was added into the model, the pathway between PBC and MVPA remained insignificant, $\beta = .097, p = .404$. 
The fit of the model shown in Figure 3-16 was evaluated using maximum likelihood algorithm. Overall, the model appears to have a poor fit, with a chi-square of \( \chi^2 = 7195.244, \text{df} = 1942, p = .000 \), an RMSEA of .073 (90% CI: .071–.075) with a p value = .000, a TLI of .475, an IFI of .514, and a CFI of .503. Based on this information, it was concluded that the data did not support the model. Goodness of fit indices were determined to be lower than for the TPB. However, the combined model explained 12% of the variance in MVPA suggesting that the combination of PEN-3 model and TPB model variables accounted for 2% more variance in MVPA than the TPB alone.

**Specific Aim 4**

The final aim of the study was to test the proposed conceptual model of the TPB and PEN-3 model on moderate to vigorous leisure-time physical activity longitudinally among Black female college students. Demographic variables for Time 2 participants is displayed in Table 3-11. Of note, 66% of participants did not engage in any MVPA the previous week. A multivariate logistic regression analyses was used to assess the role of the TPB and PEN-3 model constructs on engagement in MVPA. The physical activity variable was dichotomized due to the preponderance of participants that were not engaged in physical activity resulting in a positively skewed variable. The results of the multivariate logistic regression analyses for the TPB are shown in Table 3-12. Each one point increase in attitudes was associated with .90 increase in the odds of engagement in physical activity, Odds Ratio (OR) = .97, 95% CI: .797–1.106, \( p = .090 \). Additionally, a one point increase in subjective norms was associated with 1.04 times increase in the odds of MVPA, Odds Ratio (OR) = 1.04, 95% CI: .929 – 1.67, \( p = .495 \). Furthermore, a
one point increase in PBC was associated with .97 times increase in the odds of engagement in physical activity, Odds Ratio (OR) = .971, 95% CI: .839–1.13, p = .699. Lastly, a one point increase in intention to participate in MVPA was associated with 1.38 times increase in the odds of engagement in physical activity, Odds Ratio (OR) = 1.38, 95% CI: .783–2.44, p = .265. The results do not support our hypothesis and suggest that the TPB constructs do not predict engagement in MVPA. The overall model effect size was small, as attitudes, subjective norms, PBC, and intentions accounted for 9% of the variance in engagement in MVPA at Time 2 (R² = .090).

The results of the multivariate logistic regression analyses for the PEN-3 are shown in Table 3-13. Each one point increase in cultural barriers was associated with 1.01 increase in the odds of engagement in physical activity, Odds Ratio (OR) = 1.01, 95% CI: .892-1.15, p = .862. These results dissent from the direction of the relationship hypothesized as cultural barriers were predicted to be associated with lower odds of engaging in physical activity. A one point increase in family support was associated with 1.06 times increase in the odds of MVPA, Odds Ratio (OR) = 1.06, 95% CI: .993 – 1.13, p = .079. Additionally, a one point increase in friend support was associated with 1.02 times increase in the odds of engagement in physical activity, Odds Ratio (OR) = 1.02, 95% CI: .965–1.07, p = .557. A one point increase in perceived environment was associated with .880 times increase in the odds of engagement in physical activity, Odds Ratio (OR) = 0.88, 95% CI: .653–1.19, p = .400. Finally, a one point increase in intentions within the PEN-3 model was associated with a 1.13 times increase in the odds of engaging in MVPA, Odds Ratio (OR) = 1.13, 95% CI: .566 – 2.26, p = .729. The results do not support our hypothesis and again suggest that the PEN-3 model variables
does not predict MVPA. The overall model effect size was small and accounted for 12% of the variance in engagement in MVPA at Time 2 ($R^2 = .123$).
Figure 3-1. Flow chart of participant recruitment.

Enrollment

Recruited and assessed for eligibility (N=292)

Excluded (N=38)
- Not meeting inclusion criteria (n=8)
- 75% or greater item nonresponse (n=30)

Included in analysis at Time 1 (N=254)

Follow-Up

- Lost to follow-up due to survey anonymity (prior to March 2017) (n=66)
- Did not respond to follow-up survey (n=85)

Included in analysis at Time 2 (N=103)
Table 3-1. Demographic and background characteristics of participants.

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<td>FAMU</td>
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<td></td>
<td></td>
</tr>
<tr>
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<td></td>
<td></td>
<td>25.92 (5.68)</td>
<td>16.44-56.47</td>
</tr>
<tr>
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<td></td>
<td></td>
<td>211.4 (42.59)</td>
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</tr>
<tr>
<td>MVPA</td>
<td></td>
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<td>109.1 (253.9)</td>
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Table 3-2. TPB bivariate correlations.

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<th>7</th>
<th>8</th>
</tr>
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<td>.041</td>
<td>.111</td>
<td>.108</td>
<td>.080</td>
<td>.012</td>
<td>.094</td>
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<td>-.243**</td>
<td>-.017</td>
<td>-.144</td>
<td>-.036</td>
<td>.113</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Cultural Identity</td>
<td>.041</td>
<td>.232**</td>
<td>.073</td>
<td>.150*</td>
<td>.062</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Attitudes</td>
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<td></td>
<td>.199**</td>
<td>.460**</td>
<td>.335**</td>
<td>.074</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Subjective Norms</td>
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<td></td>
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<td>.261**</td>
<td>-.071</td>
<td></td>
<td></td>
<td></td>
</tr>
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<td></td>
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<td>.048</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Intentions</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>.069</td>
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<td>8. PA</td>
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Note: p <.05*, p <.01**

Table 3-3. TPB bivariate correlations.

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<th>6</th>
<th>7</th>
<th>8</th>
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<td>.030</td>
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<td>.094</td>
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<td>2. BMI</td>
<td>.140</td>
<td>.137*</td>
<td>.085</td>
<td>.131</td>
<td>-.036</td>
<td>.113</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Cultural Identity</td>
<td></td>
<td></td>
<td>.375**</td>
<td>.173**</td>
<td>.126</td>
<td>.150*</td>
<td>.062</td>
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<tr>
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<td>-.085</td>
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<td>.039</td>
<td></td>
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<td>.014**</td>
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<td>6. Social Support</td>
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<td>.148</td>
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<td>7. Intentions</td>
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<td>8. PA</td>
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Note: p <.05*, p <.01**
Figure 3-2. Unidimensional confirmatory factor analysis of attitudes.

Figure 3-3. Two-factor confirmatory factor analysis of attitudes.
Figure 3-4.  Unidimensional confirmatory factor analysis of subjective norms.

Figure 3-5.  Two-factor confirmatory factor analysis of subjective norms.
Figure 3-6. Unidimensional confirmatory factor analysis of PBC.

Figure 3-7. Two-factor confirmatory factor analysis of PBC.
Table 3-4. Regression paths for model predicting intentions.

<table>
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<tr>
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<th>(\beta)</th>
<th>SE</th>
<th>C.R.</th>
<th>(p)</th>
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<td>Attitudes</td>
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<td>-.077</td>
<td>.346</td>
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<td>.268</td>
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<td>Subjective Norms</td>
<td>.112</td>
<td>.081</td>
<td>.084</td>
<td>1.34</td>
<td>.182</td>
</tr>
<tr>
<td>PBC</td>
<td>.792</td>
<td>.748</td>
<td>.087</td>
<td>9.08</td>
<td>.000**</td>
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Note: \(p < .05^*, p < .01^{**}\)

Table 3-5. Covariances for TPB variables.

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<th>SE</th>
<th>C.R.</th>
<th>(p)</th>
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</thead>
<tbody>
<tr>
<td>Subjective Norms</td>
<td></td>
<td>.034</td>
<td>.017</td>
<td>2.04</td>
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<tr>
<td>Subjective Norms</td>
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<td>3.36</td>
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Note: \(p < .05^*, p < .01^{**}\)
Figure 3-8. Structural equation model of TPB factors associated with MVPA.
Table 3.6. Regression paths for model predicting intentions.

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<tr>
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<th>$\beta$</th>
<th>SE</th>
<th>C.R.</th>
<th>$p$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes-Affective</td>
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<td>-.112</td>
<td>.112</td>
<td>-1.68</td>
<td>.093</td>
</tr>
<tr>
<td>Attitudes-Significance</td>
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<td>-.021</td>
<td>.085</td>
<td>-.292</td>
<td>.770</td>
</tr>
<tr>
<td>Subjective-Motivation to comply</td>
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<td>.143</td>
<td>.095</td>
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<td>.066</td>
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<tr>
<td>Subjective-Beliefs</td>
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<td>.009</td>
<td>.130</td>
<td>.109</td>
<td>.913</td>
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<tr>
<td>PBC-Control</td>
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<td>.672</td>
<td>.092</td>
<td>7.57</td>
<td>.000</td>
</tr>
<tr>
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<td>.210</td>
<td>.145</td>
<td>.115</td>
<td>1.83</td>
<td>.068</td>
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Note: $p < .05^*$, $p < .01^{**}$
Table 3-7. Covariances for revised TPB variables.

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<th>p</th>
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<tr>
<td>Normative&lt;-- Control</td>
<td>.226</td>
<td>.076</td>
<td>2.990</td>
<td>.003</td>
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<tr>
<td>Normative&lt;-- Motivation</td>
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<td>.074</td>
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<td>.000</td>
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<td>.000</td>
</tr>
<tr>
<td>Normative&lt;-- Affective</td>
<td>.166</td>
<td>.070</td>
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<td>Motivation&lt;-- Significance</td>
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<td>.052</td>
<td>1.937</td>
<td>.053</td>
</tr>
<tr>
<td>Motivation&lt;-- Control</td>
<td>.143</td>
<td>.084</td>
<td>1.695</td>
<td>.090</td>
</tr>
<tr>
<td>Motivation&lt;-- Affective</td>
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<td>.079</td>
<td>1.051</td>
<td>.293</td>
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<td>.057</td>
<td>4.559</td>
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<td>.101</td>
<td>6.166</td>
<td>.000</td>
</tr>
<tr>
<td>Access&lt;-- Control</td>
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<td>.076</td>
<td>4.680</td>
<td>.000</td>
</tr>
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<td>4.672</td>
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<td>.059</td>
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Note: p <.05*, p <.01**
Figure 3-9. Revised structural equation model of factors associated with MVPA.
Figure 3-10. Unidimensional confirmatory factor analysis for cultural barriers.

Figure 3-11. Unidimensional confirmatory factor analysis for family support.
Figure 3-12. Unidimensional confirmatory factor analysis for friend support.

Figure 3-13. Two factor confirmatory factor analysis for friends social support.
Figure 3-14. Unidimensional confirmatory factor analysis for perceived environment.
Figure 3-15. Structural equation modeling for PEN-3 factors associated with MVPA.
Table 3-8. Regressions paths for model predicting intentions.

<table>
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<tr>
<th></th>
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<th>SE</th>
<th>C.R.</th>
<th>$p$</th>
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<td>-.232</td>
<td>.205</td>
<td>-2.35</td>
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<tr>
<td>Family Social</td>
<td>.144</td>
<td>.137</td>
<td>.080</td>
<td>1.81</td>
<td>.069</td>
</tr>
<tr>
<td>Friend Social</td>
<td>-.082</td>
<td>-.057</td>
<td>.134</td>
<td>-.610</td>
<td>.542</td>
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<tr>
<td>Environment</td>
<td>-.256</td>
<td>-.064</td>
<td>.345</td>
<td>-.742</td>
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</table>

Note: $p < .05^*$, $p < .01^{**}$

Table 3-9. Covariances for revised TPB variables.

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<th>C.R.</th>
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</thead>
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<td>Environment &lt;---&gt; Family</td>
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<td>.053</td>
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Note: $p < .05^*$, $p < .01^{**}$
Table 3-10. Regression paths for model predicting intentions.

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Note: p <.05*, p <.01**
Figure 3-16. Structural equation modeling for TPB and PEN-3 factors associated with MVPA.
Table 3-11. Demographic and background characteristics of participants.

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<td>18 or more</td>
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<td>$75,000 and above</td>
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<td>72.5</td>
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<tr>
<td>Dating casually</td>
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<td>6.9</td>
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<tr>
<td>Dating seriously</td>
<td>15</td>
<td>14.7</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married or in committed relation</td>
<td>5</td>
<td>4.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>University/College Enrollment</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>University of Florida</td>
<td>70</td>
<td>68.6</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Florida State University</td>
<td>8</td>
<td>7.8</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Santa Fe College</td>
<td>5</td>
<td>4.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>FAMU</td>
<td>1</td>
<td>.9</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMI</td>
<td>25.32</td>
<td></td>
<td>5.45</td>
<td>17.23-41.19</td>
</tr>
<tr>
<td>MVPA</td>
<td>157.3</td>
<td></td>
<td>297.7</td>
<td>0-1125</td>
</tr>
</tbody>
</table>
Table 3-12. Multivariate logistic regression of TPB factors associated with MVPA.

<table>
<thead>
<tr>
<th></th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>p</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Attitudes</td>
<td>0.90</td>
<td>0.80 - 1.01</td>
<td>.090</td>
<td>.090</td>
</tr>
<tr>
<td>Subjective</td>
<td>1.04</td>
<td>0.93 - 1.17</td>
<td>.495</td>
<td>.495</td>
</tr>
<tr>
<td>PBC</td>
<td>0.97</td>
<td>0.84 - 1.13</td>
<td>.699</td>
<td>.699</td>
</tr>
<tr>
<td>Intent</td>
<td>1.38</td>
<td>0.78 - 2.44</td>
<td>.265</td>
<td>.265</td>
</tr>
<tr>
<td><strong>Final Model</strong></td>
<td></td>
<td></td>
<td></td>
<td>.090</td>
</tr>
</tbody>
</table>

Note: p <.05*, p <.01**

Table 3-13. Multivariate logistic regression of PEN-3 factors associated with MVPA.

<table>
<thead>
<tr>
<th></th>
<th>Odds Ratio</th>
<th>95% CI</th>
<th>p</th>
<th>( R^2 )</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultural</td>
<td>1.01</td>
<td>0.89 - 1.15</td>
<td>.862</td>
<td>.862</td>
</tr>
<tr>
<td>Family Support</td>
<td>1.06</td>
<td>0.99 - 1.13</td>
<td>.079</td>
<td>.079</td>
</tr>
<tr>
<td>Friend Support</td>
<td>1.02</td>
<td>0.97 - 1.07</td>
<td>.557</td>
<td>.557</td>
</tr>
<tr>
<td>Environment</td>
<td>0.88</td>
<td>0.65 - 1.19</td>
<td>.400</td>
<td>.400</td>
</tr>
<tr>
<td>Intent</td>
<td>1.13</td>
<td>0.56 - 2.26</td>
<td>.729</td>
<td>.729</td>
</tr>
<tr>
<td><strong>Final Model</strong></td>
<td></td>
<td></td>
<td></td>
<td>.123</td>
</tr>
</tbody>
</table>

Note: p <.05*, p <.01**
CHAPTER 4
DISCUSSION

The purpose of the current study was to investigate the leisure time physical activity behaviors of Black female college students using the theory of planned behavior (TPB) and PEN-3 model. The aims of the study were to examine the relationship between TPB constructs and physical activity engagement among Black female college students, examine the influence of PEN-3 factors on physical activity engagement among Black female college students, and evaluate the relative contributions of TPB and PEN-3 constructs on physical activity engagement among Black female college students. The study included a sample of 254 college students from multiple universities across that the state of Florida. Data of interest was collected via an online assessment battery at baseline (Time 1) and again 4 weeks after baseline (Time 2). At Time 1 60% of participants engaged in no minutes of PA while 73% of participants did not engage in any PA at Time 2. These rates are consistent with previous literature documenting the lack of engagement in PA among this population (Whitt-Glover, Taylor, Heath & Macera, 2007).

Summary of Findings

Using structural equation modeling (SEM), three models were developed. The first model (the direct and indirect effects model for physical activity based on the TPB) revealed that the obtained data moderately fit the model. A revised model with additional paths improved model fit. Of note, this model was derived post hoc and must be treated with interpretational caution. However, the revised model can be theoretically justified based on rationalization and justification processes. Additionally, previous
research demonstrates a higher degree of precise measurement with the two-component model, thus supporting the revised model (Vallance, 2011). Despite good model fit, the results do not support the predictive validity of the theory of planned behavior in determining PA behavior. The second model (the direct and indirect effects model for physical activity based on the PEN-3 model) did not support the data. A revised model for the PEN-3 was not derived due to limitations (i.e., additional pathways would jeopardize theoretical underpinning and reduce parameter value replication due to poor factor loadings). Lastly, it was concluded that the data did not support the third model (direct and indirect effects model for physical activity based on the TPB and PEN-3 model).

The Theory of Planned Behavior

For Specific Aim 1 (test the proposed conceptual model of TPB constructs on engagement in moderate to vigorous leisure-time physical activity), we hypothesized that more positive physical activity attitudes will be associated with higher levels of physical activity intentions (Hypothesis 1a), more positive subjective norms will be associated with higher levels of intentions (Hypothesis 1b), that greater perceived behavioral control will be associated with higher levels of intentions (Hypothesis 1c), that greater intentions will be associated with higher levels of physical activity (Hypothesis 1d), and that intentions will mediate the relationship between perceived behavioral control and moderate to vigorous leisure-time physical activity (Hypothesis 1e). For the TPB, approving attitudes, stronger subjective norms and greater perceived control for leisure time physical activity were positively correlated with intention to
perform physical activity. Majority of studies that use the TPB show that the most significant predictor of intentions is attitude (Hausenblas, Carron and Mack, 1997; Gordon, 2008). In the present study, attitude yielded the second lowest correlation of the three predictors. With regards to participation in leisure time physical activity, none of the TPB variables were correlated with engagement in physical activity. Additionally, none of the variables were correlated with the age of the participants. Physical activity attitudes were found to be negatively correlated with BMI. The association between BMI and physical activity attitudes has been found in other studies including Deforche, De Bourdeaudhuij, and Tanghe (2006) investigation that suggested that obese adolescents had a less positive attitude compared with their normal-weight and overweight peers. Lastly, cultural identity was positively correlated with subjective norms and intentions to perform physical activity. Greater identification with African American culture was related to greater perceptions of societal pressures to engage in physical activity and intentions to engage in physical activity. These findings uncover the potential influence of cultural strengths supporting physical activity behavior.

**Attitudes.** Contrary to many previous studies using the TPB (McEachan, Conner, Taylor, & Lawton, 2011; Rhodes & Courneya, 2005; Gordon, 2008), our hypothesis that more positive physical activity attitudes are associated with higher levels of physical activity intentions was not supported. Specifically, although participants expressed positive attitudes toward engaging in PA, their attitudes did not translate to intentions to participate in the behavior. A review of the scores recorded on the attitude scale revealed that participants acknowledged the benefit of engaging in PA over the next week. Favorable attitudes towards physical activity are consistent with previous
research showing that college students in general acknowledge the importance of being physically fit and believe that physical activity is important and worth their effort (Dunlavy et al., 2008; Kahn et al., 2002). Additionally, previous studies have concluded that on average females exhibit more positive attitudes towards physical activity than males (Kahn et al., 2002). However, the lack of significance for the attitudes to intentions pathway draws attention to dissonance between an attitude towards a behavior and intention to perform that behavior. Mounting empirical evidence in other domains suggests that attitudes may not consistently influence behaviors as expected (Bhattacherjee & Sanford, 2006). For instance, Venkatesh et al. (2003) reported a correlation of 0.38-0.44 between performance expectancy (a belief measure of attitude) and intention and only 0.20-0.25 between attitude and intention, signifying even poorer correlations with actual behaviors. Given this discrepancy researchers have turned their attention to distinguishing between attitudes (beliefs and affect) and attitude strength.

Attitudes are considered relatively enduring evaluations of attitude objects or behaviors (e.g., physical activity (Eagly and Chaiken, 1993) and are generally conceptualized and measured along a bipolar continuum ranging from “negative/unfavorable” to “positive/favorable” (or “strongly disagree” to “strongly agree”. Whereas the concept of attitude strength holds that two individuals holding similar attitudes (e.g., both with +3) may have equivalent attitude valence (positive) and extremity (+3); however, these individuals may differ in their attitude strengths (Bhattacherjee & Sanford, 2006). Specifically, the individual with a strong +3 attitude may behave more enthusiastically and proactively than the person with a weak +3 attitude. Thus, the relationship between attitudes and intentions may be muted in this sample due to varying attitude strength by
which the measurement of attitudes does not fully capture intentions to perform the behavior.

Another explanation is that although students were knowledgeable of the benefits and agree that physical activity is relatively pleasant, the consequences of not engaging in physical activity at this time are not perceived as prominent for younger women (Gothe, 2016). In particular, previous research including the qualitative study conducted as a precursor to the current investigation, suggests that older Black women comment on pressing need to engage in physical activity to attenuate their risk for obesity and associated chronic diseases. Whereas, it is plausible that younger Black women have a greater understanding of the benefits of physical activity which translate to positive attitudes; however, because the consequences of not being active are not as proximal. In support of this explanation, Pooblan et al. (2012) found that among college students were unworried about putting on weight and/or didn’t think that far into the future. Our results suggest that for these women, positive attitudes about physical activity were not enough to develop an intent to participate in the behavior.

**Subjective norm.** Furthermore, subjective norms were not found to predict physical activity intentions. Overall, the construct of subjective norm has not performed well in explaining physical activity intention across studies when controlling for attitude and perceived behavioral control (Rhodes, Jones, & Courneya, 2002). Our findings are consistent with several previous studies including a cross-sectional study by Hagger, Chatzisarantis and Biddle (2001) which found attitudes and PBC to be significant predictors of physical activity intentions while subjective norms were a weaker predictor (Okun, Karoly, & Lutz, 2002). These researchers concluded that improving subjective
norms might not be effective in changing students’ intention to participate in leisure time physical activity unless students’ attitudes and PBC are changed first. Additionally, Courneya, Plotnikoff, Hotz, and Birkett (2000) found that while social support was a significant predictor of intentions to participate in physical activity and engagement in physical activity, subjective norms was not a significant predictor of either variable.

One possible account for our results and the results of aforementioned studies is the premise that the relationship between subjective norm and intent is moderated by other variables (Okun, Karoly, & Lutz, 2002). For instance, Chatzisarantis and Biddle (2005) investigated the relationship between subjective norm and intent separately for participants who were intrinsically and extrinsically motivated to engage in physical activity. The researchers found that the relationship between subjective norm and intention varied based on motivation. In particular, for intrinsically motivated participants intentions increased as subjective norms increased whereas for extrinsically motivated individual’s intentions decreased as subjective norms decreased. Another explanation is that the relationship between subjective norm, intentions, and behavior is dependent on what type of subjective norms are assessed (Montano & Kasprzyk, 2015). Specifically, there has become an increasing distinction between injunctive and descriptive subjective norms; where injunctive norms assess what individuals should do and descriptive norms assess what individuals actually do. Recent studies have provided support for the notion that descriptive norms more strongly influence intentions and behaviors than injunctive norms (Kallegren, Reno, Ciadilin, 2000; Priebe & Spink, 2011). Suggesting that what other people are doing versus what they believe may exert a greater influence on physical activity behavior. Relatedly, in the current study, the
measurement of subjective norms is comprised of items such as “other important people think I should” engage in physical activity. Thus, the predominate measures of subjective norms within the TPB assesses for injunctive norms as opposed to descriptive norms which may have lessened the predictive value of subjective norms. Furthermore, the high rates of physical inactivity within the Black community may have influenced the results such that important individuals where not engaging in physical activity themselves contributing to the lack of predictability. Interestingly, research specific to the Black community suggests that subjective norms may represent an important cultural value of interconnectedness which may influence the subjective norm to intention relationship (Ashing-Giwa, 1999; Blanchard et al., 2008). However, other measures of interconnectedness pay greater attention to descriptive norms which again suggests that our results may be explained by the measurement of subjective norms. Although the measurement of descriptive norms in addition to injunctive norms shows promise for explaining our results, descriptive norms have not performed well in all studies including a study by Ho (2011) investigating psychosocial mechanisms in Korean Americans’ physical activity behavior.

**Perceived behavioral control.** Additionally, greater PBC was found to significantly predict physical activity intentions. PBC is often viewed as the combined effect of two components: ease or difficulty of adopting a behavior and the extent to which engagement is up to the person (Ajzen, 2002). Black women in the current study reported high levels of PBC. Participants who believed themselves to be more confident in their ability to perform PA had stronger intentions to engage in MVPA. Our results
provide additional support for the relationship between PBC and intentions (Blanchard et al., 2008; Aghenta, 2014).

Additionally, we hypothesized that intentions would mediate the relationship between PBC and MVPA (Bozionelos & Bennett, 1999; Latimer & Martin Ginis, 2005). The finding that PBC was not directly associated with behavior and thus not mediated by intentions was surprising. Our results differ from those of Blanchard et al. (2008) that found that there is a significant effect of PBC on physical activity behaviors among Black college students. Our varying results are potentially related to the understanding that the strength of PBC in determining behavior depends on the accuracy with which PBC reflects actual control (Wang & Wang, 2015). Relatedly, according to Ajzen and Madden (1986) two conditions determine the extent to which PBC directly impacts behaviors. First, the behavior being predicted must not be under complete volitional control. The premise behind this condition is that PBC becomes irrelevant for behaviors that are completely under volitional control and performs well for predicting behaviors that are in part uncontrollable. Secondly, as mentioned previously perceptions of behavioral control must reflect actual control in the situation (Sheeran, Trafimow, & Armitage, 2003). Although the women in the sample perceived greater control over their ability to engage in physical activity, this may not have been the case.

**Intentions.** In contrast to many previous studies, intentions in the current study did not predict engagement in MVPA (Blanchard et al., 2008; Aghenta, 2014). Our results align with the work of Blanchard et al., (2008) that concluded that intention is not a significant predictor of physical activity for Black students and several other researchers that have uncovered the gap between intentions and behavior (Rhodes &
The insignificant relationship between intentions and behaviors highlights an increasingly identified problem of “inclined abstainers”. Inclined abstainers are those who form an intention to engage in a behavior and subsequently fail to act (Orbell & Sheeran, 1998). Research into the intention-physical activity discordance clearly shows that intention is a necessary construct for behavioral enactment as few individuals report performing PA with low intention (Rhodes & Yao, 2015). However, it is plausible that unlike attitudes, subjective norms, and PBC which are generally treated as relatively stable individual factors, intentions are likely to shift and reflect the fluctuating nature of motivation as individuals navigate various constraints, goals, and interests in their day to day lives (Conroy, Elavsky, Hyde, & Doerksen., 2011). Therefore, one explanation for our findings is that these changing constraints reduced the predictive validity of intentions that were assessed before these intervening factors occurred (Ajzen, 2011).

**TPB Model Testing and Modification**

The combined model (PBC, attitudes, subjective norms) accounted for 54.4% of the variance in physical activity intentions and 10% of the variance in physical activity. Our results align with previous studies using the TPB suggesting that the theory accounts for approximately 55% of the variance in intention and 13% of the variance in activity (Norman & Conner, 2005). One of the strengths of using SEM is that it allows for modifications as indicated by the data. Therefore, a revised structural model was developed based upon model diagnostics and the examination of modification indices and theoretical coherence.
The latent construct of attitudes was separated into attitudes related to significance (instrumental) of physical activity and affect concerning the behavior. The separation of the attitude construct has been supported in the literature based on knowledge that certain aspects of the cognitive system that impact decisions are not well captured by a general feeling of favorableness or unfavorableness, as reflected in the global attitude measure (Gordon, 2008). Prior studies have incorporated the two-dimensional model of attitudes with results suggesting that both components are uniquely associated with physical activity intentions (Beville, 2010; French et al., 2005; Lowe, Eves, & Carroll, 2002). However, despite separating the components, neither component of attitudes revealed a significant association with intentions in the current study. Our results do support findings from the Beville (2010) study that showed that instrumental attitudes and intention was non-significant among Black students compared to White students.

Additionally, separating the subjective norms construct into normative beliefs and motivation to comply were not significant predictors of intentions. Although there was a trend towards significance for the “Motivation to Comply” latent construct. Previous research has documented that normative beliefs are the extent to which other individuals who are important to them think they should or should not perform particular behaviors. Injunctive norms and motivations to comply assess how much individuals desire to behave consistently with the prescriptions of important others (Sheeran, Trafimow, & Armitage, 2003). Our results suggest that motivation to comply is a stronger predictor of intentions than beliefs about what other people expect them to do. As with the initial TPB model, PBC was associated with higher levels of physical
activity intentions. However, only the control component reached significance. One explanation for these results is that majority of the participants had similar access to recreational facilities and other environments favorable for participating in physical activity as they all attend universities with free or low-cost facilities. Therefore, for this population their own perception of their control over engaging in physical activity is more prominent than their access to appropriate facilities. Additionally, in the revised model intention was not found to be significantly related to minutes spent participating in physical activity. Again, these results draw attention to the “inclined abstainers” and the intention-behavior gap documented in the physical activity literature. Lastly, our hypothesis that intentions mediates the relationship between PBC and MVPA was not supported. The direct pathways from PBC (Control) to MVPA and from PBC (Access) to MPVA were not significant presumably related to inaccurate perceptions of behavioral control. The combined revised model accounted for 55.4% of the variance in intentions and 10% of variance in MVPA.

**PEN-3 Model**

The PEN-3 model was used to understand culture in relation to physical activity behaviors. For Specific Aim 2 (test the proposed conceptual model of PEN-3 constructs on engagement in moderate to vigorous leisure-time physical activity), we hypothesized that less cultural barriers will be associated with higher levels of physical activity intentions (Hypothesis 2a), higher social support will be associated with higher levels of intentions (Hypothesis 2b), greater perception of the physical environment as conducive to physical activity will be associated with higher levels of physical activity intentions (Hypothesis 2c), that greater intentions will be associated with higher levels of physical
activity (Hypothesis 2d), and that intentions will mediate the relationship between cultural barriers and moderate to vigorous leisure-time physical activity (Hypothesis 2e). For the PEN-3 model, social support, perceived environment, and cultural barriers were not significantly correlated with intention to perform leisure-time physical activity. Additionally, none of the PEN-3 model variables were correlated with engagement in physical activity. With regards to the demographic variables, as expected cultural identity was positively correlated with cultural barriers.

**Cultural barriers.** Our hypothesis that increases in cultural barriers would predict decreases in physical activity intentions was supported. No previous studies have examined the relationship between cultural barriers and intention to engage in physical activity. However, our findings are consistent with previous studies that have identified cultural-specific barriers to participating in physical activity (Im et al., 2012; Joseph et al., 2015; Armstrong et al., 2010). In the current study, many of the participants endorsed barriers within the PEN-3 model domains. For instance, within the relationships and expectations domain participants agreed that physical activity was a self-indulging behavior. These results concur with the current literature reporting that Black women conceptualize physical activity as a self-indulgent behavior that is frivolous and unproductive (Im et al., 2012; Heesch, Brown & Blauton, 2000; Juarbe, Turok, & Perez-Stable, 2002). Interestingly, many of the studies that suggest that Black women consider physical activity as self-indulging or “luxurious” behavior have been conducted with middle to older aged Black women (Im et al., 2012). Presumably these younger women have less caregiving responsibilities which has been documented as their primary rationale for believing physical activity is self-indulgent (Coon and
As college students, these women are beginning to reconcile competing value systems (e.g., values of their family and values related to developing their identity within the college culture) and thus are susceptible to similar barriers. Also, within the relationships and expectations domain, we found that Black women in the study endorsed race and cultural-based preferences for a larger and curvaceous ideal body shape (Im et al., 2012). Over half of participants agreed that they receive more positive attention from the opposite sex when they are thick and shapely. However, majority of participants did not agree that a larger body is more attractive/sexy than a thin/toned body. Findings suggest that Black female college students adhere to components of cultural preferences for a larger body size; however, they are much more accepting of body size diversity than previously assumed. Additionally, women in the study did not endorse problematic behaviors from their social support network. Specifically, a small percentage of participants reported that their family/social support engage in discouraging behaviors suggesting that although participants’ social support network did not necessarily encourage them to be physically active but did not engage in discouraging behaviors (Joseph, Ainsworth, Keller & Dodgson, 2015).

With respect to cultural barriers within the cultural identity domain, Black women did not conceptualize physical activity as a means for weight control (Austin, 2014; Wilcox, Bopp, Oberrecht, Kammermann & McElmurray, 2005). Only a quarter of participants reported that weight loss is the most important outcome of physical activity. Results provide further evidence suggesting that Black female college students are knowledgeable about the advantages of physical activity yet do not intend to participate.
Additionally, women reported having friends that were engaged in physical activity routinely and having access to Black exercise partners. Previous studies have noted that lack of a partner with whom to engage in physical activity and having positive physical activity role models serve as barriers to engagement in physical activity for Black women (Bopp et al. 2006; Im et al. 2012; Pekmezi et al. 2013; Walcott-McQuigg et al. 2001; Wilcox et al. 2005; Nies, Vollman, & Cook 1999; Harley et al. 2009; Henderson & Ainsworth 2000; Richter et al. 2002). Our results don’t support the findings from these studies (all of which have been examined qualitatively) and suggest that Black female college students have access to positive physical activity role models.

Lastly, many individuals in the current study endorsed lack of physical activity during childhood as a cultural barrier to physical activity within the cultural empowerment domain. Our findings in this area are consistent with previous research has documented the limited exposure among Black women during childhood (Joseph et al., 2015). Limited exposure to PA as a child appears to create a lasting barrier to engaging in PA as an adult. Furthermore, less than half of participants reported decreasing physical activity due to hair care and maintenance. Although, slightly lower than previous studies our results are consistent with previous research documenting that Black women cite not wanting to “sweat out” hairstyles or deterred by the cost and time associated with their hairstyles (Harley et al. 2009; Im et al. 2012; Pekmezi et al. 2013; Price, Greer, and Tucker 2013; Henderson & Ainsworth 2000). Our lower percentages of Black women reporting that hair care maintenance is a barrier to physical activity aligns with the increasing trend of natural hairstyles.
**Perceived environment.** Our hypothesis that increases in perceived environment would predict increased physical activity intentions was not supported. Perceived environment and intentions to engage in physical activity have yet to be examined within the physical activity literature. However, previous research has documented the effect of the built environment on physical activity behaviors although not consistently (Durand et al., 2011). Specifically, only 20-50% of studies in a systematic review by Durand et al. (2011) were in the expected direction regarding walkability of the environment, engagement in physical activity, and BMI. However, other studies have suggested that environmental perceptions are an important mediator between the built environment and physical activity and may moderate the relationship between social support and physical activity (Mama et al., 2015, Van Dyck et al., 2013). Among college students, leisure time PA has been associated with reduced traffic, aesthetics, and seeing others being active, whereas other studies have observed an association between moderate intensity PA and the presence of sidewalks.

Results from our study suggest that women in the study had favorable perceptions of their physical environment. In particular, majority of participants endorsed easily accessible shopping venues and having several places to go within walking distance. Additionally, most participants of acknowledged positive aspects of the sidewalks near their homes and aesthetics of their neighborhood. Results from our study are consistent with previous studies indicating that the presence of sidewalks, traffic, and aesthetics of their environment were not associated with physical activity level (Mama et al., 2015). One explanation for these results is that there was a preponderance of participants who attended the same university which may have
limited the variability in environmental perceptions. However, notably all the universities assessed in the current study have free or low-cost access to recreational facilities including gyms, pools, and outdoor activities. Despite, favorable perceptions of the environment and adequate access to recreational resources less than a quarter of participants took advantage of the resources provided to them. This supports previous literature among Black women who report moderate to high incomes and easy access to recreational facilities yet don’t engage in physical activity (Joseph, 2015).

Furthermore, in the current study, less than half of participants reported living on-campus. There was no relationship between campus living and activity level. The question about walkability (e.g., aesthetics) elicited a high positive response which suggests that the questions may not have had sufficient specificity. Castle, Alman, Kostelnik, & Smith (2015) suggested that users of on-campus recreational facilities are more to be male, White, non-smokers, live-on campus or off-campus within a mile of the college or university, age 21 and under, not involved in any type of extracurricular activity, and have no health concerns. Additional research in this area, suggests that the on-campus environment promotes physical activity more than the off-campus environment (with the exception of residential density).

**Social support.** Our hypothesis that social support would be significantly related to physical activity intentions was not supported. Social support is commonly considered a precursor to self-efficacy in that self-efficacy tends to increase through social support (Farren, Zhang, Martin & Thomas, 2017). Therefore, modifying college students’ social support network to include physical activity could possibly increase physical activity frequency, which then could increase their self-efficacy. Our results don’t support
previous studies documenting the importance of social support. Specifically, within the cultural identity and relationships and expectations domain of the PEN-3 model, the precursor to the current study found that Black women’s participation in physical activity is positively influenced by their social support network. Therefore, it was concluded that consistent with previous research an emphasis on social support and social networks appears to be a positive aspect of Black culture that should be included in theories predicting physical activity (Fleury & Lee, 2006).

Although our results did not support a relationship between social support and physical activity intentions, there were several promising findings. For instance, when social support was separated into support from family and support from friends, family social support and intentions trended toward significance. A few participants reported that family members often exercised with them, offered to exercise with them, and encouraged them to adhere to physical activity program. Further, only a small percentage of Black female college students acknowledged that family members engage in discouraging behaviors such as complain about the time they spend engaging in physical activity. With respect for friend social support, participants reported that some friends often exercised with them, offered to exercise with them, and encouraged them to adhere to physical activity program. These findings are similar to two studies of older rural Black women, which both showed that frequently reported support for participation in physical activity from both family and friends included offers to participate in physical activity and encouragement to adhere to the exercise regimen (Walker et al., 2006; Johnson et al., 2014).
Interestingly, college provides a unique opportunity to assess the influence of both family and friend social support. As students are transitioning to college the dynamics and individualization of social support become increasingly evident (Mattanah, Hancock, & Brand, 2004). For instance, prior work has described a decrease in functional social support provided by family during students’ first year of college along with the number of people providing tangible support. These researchers also suggested that family members may be the primary source of tangible support for physical activity (i.e. providing transportation) prior to transitioning to college (Friedlander, Reid, Shupak, & Cribbie, 2007). However, our results suggest that despite participants transition to college they still were influenced by social support from their family.

PEN-3 Model Testing and Modification

The combined model (cultural barriers, perceived environment, and social support) accounted for 7% of the variance in physical activity intentions and 5% of the variance in physical activity. A revised model for the PEN-3 was not derived due to limitations. To our knowledge this is the first study that uses the PEN-3 model to uncover antecedents of intention to perform physical activity and physical activity behavior. Our results suggest that the PEN-3 model doesn’t contribute a large amount of variance in physical activity intentions compared to the TPB. This finding although not aligned with our hypotheses, is not surprising given the formulation of the TPB to include intentions (Ajzen, 2001). Lastly, the PEN-3 model also contributed less variance in moderate to vigorous leisure-time physical activity than the TPB.
TPB and PEN-3 Model

For Specific Aim 3 (test the proposed conceptual model of the TPB and PEN-3 model on moderate to vigorous leisure-time physical activity) we hypothesized that the combined model would account for significantly more variance in physical activity than either model alone. Our hypothesis was supported and the combined model explained 55% of variance in intentions and 12% of variance in MVPA. Although not representing a large effect, the PEN-3 model added to the understanding of factors related to physical activity intentions and MVPA.

TPB and PEN-3 Model Longitudinally

For Specific Aim 4 (test the proposed conceptual model of the TPB and PEN-3 model on moderate to vigorous leisure-time physical activity longitudinally) we hypothesized that each model would account for a significant amount of variance in physical activity behavior at Time 2 (4 weeks after Time 1). There were no significant differences in demographics variables of participants who completed the survey at Time 1 versus those that completed Time 2. Results of the multivariate logistic regression analysis do not support our hypothesis as none of the TPB variables measured at Time 1 significantly predicted participation in PA at Time 2. Further, intentions was also not a significant predictor of engagement in PA. The overall model effect size was small, as attitudes, subjective norms, PBC, and intentions accounted for only 9% of the variance in engagement in MVPA at Time 2. Plotnikoff et al. (2013) found that the TPB performed modestly well in predicting physical activity behavior 15 years later. These researchers found that TPB constructs measured in 1988 explained 13% of variance in 2003
physical activity behavior. Further, similar to our results 1988 intentions in the study did not significantly predict 2003 physical activity behavior. However, other researchers have acknowledged mixed evidence for the prevalence of this “intention instability” which may have contributed in part to our findings (Conner & Godin, 2007; Conner, Sheeran, Norman, & Armitage, 2000). Similar results were found when analyzing the PEN-3 model. Specifically, cultural barriers, perceived environment, and social support were not significant predictors of MVPA. The results do not support our hypothesis and again suggest that the PEN-3 model variables don’t predict MVPA. The overall model effect size was small and accounted for 12% of the variance in engagement in MVPA at Time 2.

**Limitations and Strengths**

**Limitations**

Our study has a few noteworthy limitations. First, the study relied on participants to accurately self-report time spent engaging in leisure time physical activity. Although self-reporting problems are not unique to physical activity research (Blanchard et al., 2008; Blanchard et al., 2003), there was potential for students to inflate or underreport their leisure time physical activity participation. Self-report methods also have the potential susceptibility for issues of recall and response bias including social desirability and inaccurate memory (Prince et al., 2008). In addition, the IPAQ has shown only moderate validity compared to other measures of physical activity including accelerometers (Wanner et al., 2016). Specifically, higher correlations have been found for vigorous physical activity and sitting time as opposed to moderate intensity physical activity. It is plausible that the use of the IPAQ to capture MVPA limited the ability to find
the expected relationship. However, our results are similar to previous rates of physical activity among Black women. Our results also align with previous studies on college students that suggests that students often discontinue physical activity for long periods of time and report phases of not engaging in physical activity (Pooblan et al., 2012). Therefore, the discrepancies in self-report of physical activity at Time 1 and Time 2 can be attributed to fluctuations in activity throughout an academic semester (e.g., finals weeks, holidays). Another limitation was the lack of generalizability and the selection bias that occurred. This research attempted to minimize selection bias by recruiting a representative sample of Black female college students from 9 universities in Florida. However, due to recruitment demands majority of the participants were from the University of Florida. Thus, these results may not be generalizable to other samples of college students and other aged populations. Furthermore, the study did not include demographic variables such as participation in athletics or sororities. Nonetheless, these results are relatively generalizable to other Black female college students at the university and similar universities in which the research was conducted. Another limitation of the current study is the high rate of attrition between Time 1 and Time 2. Procedures were taken to decrease the attrition of participants between time points; however, even with the additional methods there were 85 participants that completed the Time 1 survey but chose not to complete the second survey. Attrition was likely influenced by the ebbs and flow of the academic year paired with the use of email as the method for contacting students at Time 2. Lastly, the study used the PEN-3 model to guide the inclusion of measures that adequately assess for culture in relation to physical activity. However, other measures may have better estimated the relevance of
culture on physical activity behaviors. Although to date, no quantitative measures have been developed to test the PEN-3 model. This limitation highlights the need for further measurement development and testing.

**Strengths**

Our study is also greatly enhanced by many notable strengths. First, our study is the first to examine the relative influences of a universal behavioral change theory (TPB) and a novel cultural model (PEN-3 model) on engagement in physical activity. Few studies have examined the universality of the TPB and its predictability in diverse racial/ethnic populations (Blanchard et al., 2008). This study adds to the literature by testing the TPB among a sample of Black female college students. Our results suggest that components of the model don’t account fully for physical activity intentions or physical activity behavior among this sample. The PEN-3 model has not been used previously to predict physical activity behavior thus highlighting another strength of the current study. Although, our results don’t provide evidence for the utility of the PEN-3 model in predicting physical activity behavior. It should be noted that this is the first study of this kind and thus further exploration into the role of culture and appropriate cultural models that account for physical activity are needed. Another strong aspect of the current study is that it sheds light on the predictive value of the TPB and PEN-3 model over time in the context of physical activity behavior. Few studies have examined the predictive power of the TBP model at multiple time points (Plotnikoff et al., 2013). Lastly, there are a limited range of studies that target Black female college students in physical activity intervention research. However, given that lifestyle behaviors are
established during these formative years college students are an ideal group to understand in order to better intervene on physical activity behaviors among Black women (Wallace et al., 2000; Johnson, 2006). Our study focusing on younger Black women has contributed to the understanding of physical activity behavior at a pivotal age.

**Future Research**

Research indicates that almost half of all college students report a decrease in physical activity following graduation (Kilpatrick, Hebert, & Bartholomew, 2010). Therefore, there is a pressing need to study physical activity antecedents and behavior in order to develop better programs and interventions to improve the physical activity patterns of college students, especially for populations at greater risk for chronic health conditions such as Black women. Given the prominent intention-behavior gap, future studies should focus on how to translate intentions into behaviors. Several theoretical elaborations have been proposed to bridge the gap and increase the predictive validity of the TPB including past behavior (Norman & Smith, 1995), habit strength (Ouellette & Wood, 1998), implementation intentions (Sheeran & Orbell, 1999), and intention stability (Conner et al., 2000; Conroy, Elavsky, Hyde, & Doerksen, 2011). Thus, a greater understanding of the translation of intention into behavior is necessary to improve upon theoretical frameworks of PA (Rhodes & Yao, 2015). It follows that if these gaps are identified, effective cognitive strategies, which target the gaps, could be utilized to facilitate goal implementation.

Additionally, an investigation of additional behavioral theories is warranted. Increasingly, research has shown that motivation for physical activity is likely to be more
robust if it involves greater choice and self-determination rather than external control (Rhodes et al., 2005). Therefore, staged-based theories such as the Transtheoretical Model (TTM) of behavior change have grown in popularity (Marshall and Biddle, 2001). The TTM incorporates cognitive, behavioral, and temporal aspects of behavior change. When applied to physical activity the TTM consists of the stages of change, the processes of change, decisional balance (weighing up the pros and cons of change) and self-efficacy.

Furthermore, the conceptualization and operationalization of culture should continue to be refined in future studies. There are few conceptual models that consider the influence of culture and apply this model to investigating physical activity behavior. In addition, there are no comprehensive instruments that are derived with an understanding of contextual factors and incorporate the dynamic nature of culture in relation to physical activity. Other models should expand upon the constructs of the PEN-3 model to more accurately capture the role of culture. Additionally, a more thorough understanding of varying degrees of immersion in culture is warranted. Lastly, future studies are needed to validate the present finding, and further additional predictors of physical activity.

**Implications**

This research added to the literature in that it measured constructs from the TPB and PEN-3 model to examine leisure time physical activity behavior among college students. No known research published to date has used the PEN-3 model in a quantitative study assessing leisure time physical activity. The findings from this research support the need for further investigation of using cultural theoretical
frameworks to explain, predict, and potentially increase MVPA. This research has several implications for researchers and health professionals, with an interest in promoting leisure time physical activity. The implications of this study suggest Black female college students may have sufficient positive attitudes and motivation to perform physical activity, yet they may find it challenging to place physical activity as a top priority amongst competing demands. Thus, interventions embedded within college health and wellness programs should focus on promoting behavioral control and reducing cultural barriers in order to increase physical activity intentions. Specifically, it is likely that increasing community capacity (i.e. social involvement and participation) and providing physical activities that can be done in short intervals will both translate to increases in perceived behavioral control. Additionally, incorporating deep-structure modifications such as cultural beliefs, values, and norms appears to be a useful strategy in targeting cultural barriers to engaging in physical activity. This research provides a better understanding of the leisure time physical activity behaviors of college students which can aid in the development of interventions aimed to increase physical activity over short periods of time but also longitudinally.

**Conclusion**

Taken together, results support previous work suggesting that the TPB is useful in predicting intentions to perform physical activity but not the behavior. Furthermore, our findings suggest that components of the PEN-3 model negatively predict intentions to engage in physical activity. However, similarly to the TPB intentions within the PEN-3 model did not predict physical activity. Based on the results, particular attention should be paid to the perception of control over behavior and cultural barriers when targeting
intentions. Additional models are needed that delineate the explanatory role of culture in intentions to perform PA among Black women.
Understanding Physical Activity Behavior among Black Female College Students

Please read this document carefully before you decide to participate in this study.

Purpose of this research study: The purpose of this study is to gain an understanding of experiences of physical activity among Black female college students.

What you will be asked to do in the study: You will be asked to participate in 2 online surveys about your engagement in physical activity and factors related to participation.

Time required: 20 minutes for the Time 1 survey (baseline) and 10 minutes for the Time 2 survey (in 4 weeks).

Risks and benefits: There are no anticipated risks or benefits to participating in this study. You will be compensated $10 for your participation at Time 1 and $10 for your participation at Time 2.

Confidentiality: Your identity will be kept confidential to the extent provided by law. Your information will be assigned a pseudonym to protect your identity. The information gathered from the survey will be kept in a password-protected document by the principal researcher. When the study is completed and the data has been analyzed, the document will be destroyed. Your name will not be used in any way in any future documents. Your email address and survey responses will be kept separate.

Voluntary participation: Your participation in this study is completely voluntary. There is no penalty for not participating.

Right to withdraw from the study: You have the right to withdraw from the study at any time without consequence.

Whom to contact if you have questions about the study:
Allyson Diggins, M.A  Department of Clinical and Health Psychology  PO Box 100165, University of Florida, Gainesville, FL, 32610,  Phone: 352-273-6013.  Email: adiggins@phhp.ufl.edu  Nicole Ennis Whitehead, Ph.D.  Department of Clinical and Health Psychology  P O Box 1001652, University of Florida, Gainesville, FL, 32610,  Phone: 352-273-6145 Email: nwhitehead@phhp.ufl.edu  Whom to contact about your rights as a research participant in the study: IRB02 Office, Box 112250, University of
Florida, Gainesville, FL 32611, Phone: 352-392-0433

**Agreement:** Completion of this survey indicates you have read the procedure described above and voluntarily agree to participate in the study. A copy of this form is available to you upon request. Your participation in this study is greatly appreciated. Thank you for your time!
Q1 We would like to take the opportunity to thank you for your participation! The purpose of this study is to gain an understanding of experiences of physical activity among Black female college students. Thus, it is very important that you answer the following questions as carefully and as honestly as possible. In the survey, you will see instructions that explain how to use the numeric scale to answer questions for different sections of the survey. Please pay close attention to these instructions that are printed in bold font.

Q2 1. DEMOGRAPHICS

Q3 How old are you?

Q4 Which of the following best describes your race/ethnicity?

- Black/African American  (1)
- Native-American/American Indian  (3)
- Asian-American/Pacific Islander  (4)
- Caucasian/European American/White  (5)
- Multiracial  (6)
Q136 Are you Hispanic-American/Latino/Chicano?

- Yes (1)
- No (4)

Q5 What college or university do you currently attend?

________________________________________________________________________________

Q6 What is your academic classification?

- 1st Year (1)
- 2nd Year (2)
- 3rd Year (3)
- 4th Year (4)
- 5th Year or above (5)

Q7 Are you an international student?

- Yes (1)
- No (2)
Q8 How many credit hours are you currently taking?

- 6 hours or less (1)
- 9 (2)
- 12 (3)
- 15 (4)
- 18 or more (5)

Q9 Do you live on or off campus?

- On campus (1)
- Off campus (2)

Q10 What is your current relationship status?

- Single, no partner (1)
- Dating casually (2)
- Dating seriously (3)
- In a married or committed relationship (4)
- Divorced (5)
Q11 How many children do you have?

- 0 (1)
- 1 (2)
- 2 (3)
- 3 (4)
- 4 or more (5)

Q12 Typically, how many hours per week do you work?

- 0 (1)
- 1-10 (2)
- 11-20 (3)
- 21-30 (4)
- 31-39 (5)
- 40 or more (6)

Q13 What is your approximate income level?
If self-supporting, please report own income. If supported by parent(s) or guardian(s) please report that income:

- Less than $15,000 (1)
- $15,000-$25,000 (2)
- $25,000-$50,000 (3)
- $50,000-$75,000 (4)
- $75,000-$100,000 (5)
- $100,000 and above (6)

Q14 What is your religious affiliation?

________________________________________________________________

Q15 What is your height in inches?

________________________________________________________________

Q16 What is your weight in pounds?

________________________________________________________________
Q17 2. BODY IMAGE

Q19 Which figure above best fits where you are now?

Q138
Q21 Which figure above would be ideal for you now?


Q23 Below are some beliefs and attitudes about religion, families, racism, Black people, White people, and health. Please tell us how much you personally agree or disagree with these beliefs and attitudes by circling a number. There are no right or wrong answers, we simply want to know your views and your beliefs.
<table>
<thead>
<tr>
<th>Statement</th>
<th>I Totally Disagree or Not True At All (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>Sort of Agree or Sort of True (4) (5)</th>
<th>(6) (6)</th>
<th>I Strongly Agree or Absolutely True (7) (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I believe in the Holy Ghost.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I like gospel music</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I believe in heaven and hell.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>The church is the heart of the Black community.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I have seen people &quot;get the spirit&quot; or speak in tongues.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I am currently a member of a Black church.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>When I was young, I was a member of a Black church.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>Prayer can cure disease</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>What goes around, comes around.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>I used to sing in the church choir.</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>
Most of the music I listen to is by Black artists. (11)

I like Black music more than White music. (12)

I listen to Black radio stations. (13)

I try to watch all of the Black shows on TV. (14)

The person I admire most is Black. (15)

I feel more comfortable around Blacks than around Whites. (16)

When I pass a Black person (a stranger) on the street, I always say hello or nod at them. (17)

Most of my friends are Black. (18)

I read (or used to read) Essence or Ebony magazine. (19)

I don't trust White people. (20)
<table>
<thead>
<tr>
<th>Statement</th>
<th>I Totally Disagree or Not True At All (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>Sort of Agree or Sort of True (4)</th>
<th>(5)</th>
<th>(6)</th>
<th>I Strongly Agree or Absolutely True (7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>IQ tests were set up purposefully to discriminate against Black people. (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most Whites are afraid of Blacks. (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deep in the hearts, most White people are racists. (3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Whites don’t understand Blacks. (4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Most tests (like the SATs and tests to get a job) are set up to make sure that Blacks don’t get high scores on them. (5)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Some members of my family hate or distrust White people. (6)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
When I was young, I shared a bed at night with my sister, brother, or some other relative. (7)

When I was young, my parent(s) sent me to stay with a relative (aunt, uncle, grandmother) for a few days or weeks, and then I went back home again. (8)

When I was young, my cousin, aunt, grandmother, or other relative lived with me and my family for awhile. (9)

When I was young, I took a bath with my sister, brother, or some other relative. (10)

Some people in my family use Epsom salts. (11)
Illnesses can be classified as natural types and unnatural types. (12)

Some old Black women/ladies know how to cure diseases. (13)

Some older Black women know a lot about pregnancy and childbirth. (14)

I was taught that you shouldn't take a bath and then go outside. (15)

I avoid splitting a pole. (16)

When the palm of your hand itches, you'll receive some money. (17)

There's some truth to many old superstitions. (18)
I eat black-eyed peas on New Year's Eve. (19)

I grew up in a mostly Black neighborhood. (20)

I went to (or go to) a mostly Black high school. (21)

I went to a mostly Black elementary school. (22)

I currently live in a mostly Black neighborhood. (23)

It's better to move your family ahead in this world than it is to be out for only yourself. (24)

Old people are wise. (25)

I often lend money or give other types of support to members of my family. (26)
A child should not be allowed to call a grown woman by her first name, “Alice.” The child should be taught to call her “Miss Alice.” (27)
Q26 Please tell us your thoughts towards performing 30 minutes of medium strength exercise at least 5 days during the next week. Medium strength exercise refers to activities that take moderate physical effort and make you breathe somewhat harder than normal. Medium strength activities include bicycling at a regular pace, swimming at a regular pace, and doubles tennis. There are no right or wrong responses; we are merely interested in your personal opinions. In response to the questions below, please list the thoughts that come immediately to mind.

<table>
<thead>
<tr>
<th>Harmful (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>Beneficial (5)</th>
</tr>
</thead>
</table>

For me, to do 30 minutes of medium-strength exercise at least 5 days over the next week would be (1)
**Q27** Please tell us about your attitude towards performing 30 minutes of medium strength exercise at least 5 days during the next week.

<table>
<thead>
<tr>
<th>Bad (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>Good (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For me, to do 30 minutes of medium-strength exercise at least 5 days over the next week would be (1)

**Q28** Please tell us about your attitude towards performing 30 minutes of medium strength exercise at least 5 days during the next week.

<table>
<thead>
<tr>
<th>Useless (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>Useful (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

For me, to do 30 minutes of medium-strength exercise at least 5 days over the next week would be (1)
**Q29 Please tell us about your attitude towards performing 30 minutes of medium strength exercise at least 5 days during the next week.**

<table>
<thead>
<tr>
<th>Unpleasant (1)</th>
<th>(2) (2)</th>
<th>(3) (3)</th>
<th>(4) (4)</th>
<th>Pleasant (5) (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For me, to do 30 minutes of medium-strength exercise at least 5 days over the next week would be (1)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

**Q30 Please tell us about your attitude towards performing 30 minutes of medium strength exercise at least 5 days during the next week.**

<table>
<thead>
<tr>
<th>Boring (1) (1)</th>
<th>(2) (2)</th>
<th>(3) (3)</th>
<th>(4) (4)</th>
<th>Fun (5) (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For me, to do 30 minutes of medium-strength exercise at least 5 days over the next week would be (1)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>
Q31 Please tell us about your attitude towards performing 30 minutes of medium strength exercise at least 5 days during the next week.

<table>
<thead>
<tr>
<th>Unenjoyable (1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>Enjoyable (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>For me, to do 30 minutes of medium-strength exercise at least 5 days over the next week would be (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q32 When it comes to your exercising for at least 30 minutes, 5 times per week for the next weeks, there might be individuals or groups who think you should or should not perform this behavior. Please answer the following questions related to these individuals.

Q33 Most people who matter to me think I should do 30 minutes of medium strength exercise at least 5 days during the next week

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly Agree (5)

Q34 Most people who matter to me support me in doing 30 minutes of medium strength exercise at least 5 days during the next week

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly Agree (5)
Q35 Most people who matter to me approve of me doing 30 minutes of medium strength exercise at least 5 days during the next week

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly Agree (5)

Q36 When it comes to doing 30 minutes of medium-strength exercise at least 5 days during the next week, I want to do what most people who matter to me think I should do

- Strongly disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)
Q37 I want to be like my friends who do 30 minutes of medium-strength exercise at least 5 days a week

- Strongly disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly agree (5)

Q38 In terms of doing 30 minutes of medium-strength exercise at least 5 days during the next week, I want to have the consent of most people who matter to me

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly Agree (5)
**Q39** Please tell us what you think about the possibility of performing 30 minutes of medium strength exercise at least 5 days during the next week.

<table>
<thead>
<tr>
<th>Not At All Confident (1)</th>
<th>(2)</th>
<th>Somewhat Confident (3)</th>
<th>(4)</th>
<th>Very Confident (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>During the next week, how sure are you that you can do 30 minutes of medium-strength exercise on at least 5 days (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Q40** Please tell us what you think about the possibility of performing 30 minutes of medium strength exercise at least 5 days during the next week.

<table>
<thead>
<tr>
<th>Very Difficult (1)</th>
<th>(2)</th>
<th>Somewhat Difficult (3)</th>
<th>(4)</th>
<th>Very Easy (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>During the next week, for me to do 30 minutes of medium-strength exercise on at least 5 days will be (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
Q41 Please tell us what you think about the possibility of performing 30 minutes of medium strength exercise at least 5 days during the next week.

<table>
<thead>
<tr>
<th>Extreme Lack of Control (1) (1)</th>
<th>(2) (2)</th>
<th>Some Control (3) (3)</th>
<th>(4) (4)</th>
<th>Extreme Control (5) (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>During the next week, how much control do you believe you have to do 30 minutes of medium-strength exercise (1)</td>
<td>○</td>
<td>○</td>
<td>○</td>
<td>○</td>
</tr>
</tbody>
</table>

Q42 During the next week, I will have the chance to do 30 minutes of medium-strength exercise on at least 5 days

- ○ Strongly Disagree (1)
- ○ Disagree (2)
- ○ Neither agree nor disagree (3)
- ○ Agree (4)
- ○ Strongly Agree (5)
Q43 I have access to facilities where I can do 30 minutes of medium strength exercise

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly Agree (5)

Q44 I believe I have all the things I need to do 30 minutes of medium-strength exercise

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly Agree (5)

Q45 During the next week, I intend to do 30 minutes of medium-strength exercise on at least 5 days

- Strongly Disagree (1)
- Disagree (2)
- Neither agree nor disagree (3)
- Agree (4)
- Strongly Agree (5)
Cultural Barriers to Physical Activity Scale (Ledford, 2013)

Q46 Below are statements that relate to ideas about physical activity. Indicate the response that corresponds to the degree to which you agree or disagree with each statement.

Q47 Physical exercise was not a big part of my childhood

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q48 Physical exercise was not encouraged in my family home

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)
Q49 Women in my family do not exercise

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q50 Many people in my community exercise regularly

- Strongly Agree (1)
- Agree (2)
- Disagree (3)
- Strongly Disagree (4)

Q51 I have friends who exercise regularly

- Strongly Agree (1)
- Agree (2)
- Disagree (3)
- Strongly Disagree (4)
Q52 I am used to being in a gym or physical exercise setting

- Strongly Agree (1)
- Agree (2)
- Disagree (3)
- Strongly Disagree (4)

Q53 I find myself intimidated by gyms because I am not familiar with equipment and/or the gym atmosphere

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q54 I'm less comfortable in the gym/exercise classes because I rarely see other African-Americans there

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)
Q55 The gym/exercise classes make me self-conscious because often I’m the only African-American female there

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q56 I have African-American friend(s) who do/would like to exercise with me

- Strongly Agree (1)
- Agree (2)
- Disagree (3)
- Strongly Disagree (4)

Q57 I’d exercise more if only I could find an African-American exercise partner

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly agree (4)
Q58 A thin/toned female body is less sexy/attractive than a larger body shape

○ Strongly Disagree (1)
○ Disagree (2)
○ Agree (3)
○ Strongly Agree (4)

Q59 I receive more positive feedback from the opposite sex if I am thick and shapely

○ Strongly Disagree (1)
○ Disagree (2)
○ Agree (3)
○ Strongly Agree (4)

Q60 I don’t mind if my hair will get messed up because of sweating during physical exercise

○ Strongly Agree (1)
○ Agree (2)
○ Disagree (3)
○ Strongly Disagree (4)
Q61 I find myself regularly avoiding or decreasing exercise to preserve my hairstyle

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)

Q62 My family members do not encourage me to exercise

- Strongly Agree (1)
- Agree (2)
- Disagree (3)
- Strongly disagree (4)

Q63 Physical activity is a self-indulgent behavior

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly Agree (4)
Q64 Weight loss is the most important outcome of physical activity

- Strongly Disagree (1)
- Disagree (2)
- Agree (3)
- Strongly agree (4)

Q140 What is your Body Mass Index (BMI)? Please do not use online calculations.

Social Support for Exercise Survey (Sallis, Grossman, Pinski, Patterson, & Nader, 1987)

Q65 Below is a list of things people might do or say to someone who is trying to exercise regularly. If you are not trying to exercise, then some of the questions may not apply to you, but please read and give an answer to every question. Please rate each question twice. Under family, rate how often anyone living in your household has said or done what is described during the last three months. Under friends, rate how often your friends, acquaintances, or coworkers have said or done what is described during the last three months.

*Please make sure to answer questions for BOTH FAMILY AND FRIENDS*

<table>
<thead>
<tr>
<th></th>
<th>Family</th>
<th>Friends</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>None (1)</td>
<td>None (1)</td>
</tr>
<tr>
<td></td>
<td>Rarely (2)</td>
<td>Rarely (2)</td>
</tr>
<tr>
<td></td>
<td>A few times (3)</td>
<td>A few times (3)</td>
</tr>
<tr>
<td></td>
<td>Often (4)</td>
<td>Often (4)</td>
</tr>
<tr>
<td></td>
<td>Very Often (5)</td>
<td>Very Often (5)</td>
</tr>
<tr>
<td></td>
<td>N/ A (6)</td>
<td>N/ A (6)</td>
</tr>
<tr>
<td></td>
<td>None (1)</td>
<td>None (1)</td>
</tr>
<tr>
<td></td>
<td>Rarely (2)</td>
<td>Rarely (2)</td>
</tr>
<tr>
<td></td>
<td>A few times (3)</td>
<td>A few times (3)</td>
</tr>
<tr>
<td></td>
<td>Often (4)</td>
<td>Often (4)</td>
</tr>
<tr>
<td></td>
<td>Very Often (5)</td>
<td>Very Often (5)</td>
</tr>
</tbody>
</table>
Exercised with me. (1)

Offered to exercise with me. (2)

Gave me helpful reminders to exercise ("Are you going to exercise tonight?"). (3)

Gave me encouragement to stick with my exercise program. (4)

Changed their schedule so we could exercise together. (5)

Discussed exercise with me. (6)
Complained about the time I spend exercising. (7)
Criticized me or made fun of me for exercising. (8)
Gave me rewards for exercising (bought me something or gave me something I like). (9)
Planned for exercise on recreational outings. (10)
Helped plan activities around my exercise. (11)
Asked me for ideas on how they can get more exercise. (12)
Talked about how much they like to exercise. (13)
Q66 5. ENVIRONMENTAL FACTORS RELATED TO PHYSICAL ACTIVITY:

Neighborhood Environment Walkability Scale (NEWS; Saelens, Sallis, Black, et al., 2003; Johnson, 2006)

Q67 NEIGHBORHOOD: If you live "on-campus", the university campus is considered your neighborhood. If you live "off campus", your neighborhood is defined as a half-mile radius or a 10-minute walk from your apartment, house, etc. 
RESIDENCE: Your campus housing or your apartment, house, etc. depending on where you currently live.

Q68 How common are the following types of residences in your neighborhood?

<table>
<thead>
<tr>
<th></th>
<th>None (1)</th>
<th>A Few (2)</th>
<th>Some (3)</th>
<th>Most (4)</th>
<th>All (5)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Detached single-family homes (1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Townhouses or row houses (2)</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Apartments or condos (3)</td>
<td></td>
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</tr>
</tbody>
</table>

Q69 Using the following scale, select the answer that best describes the way you perceive your current neighborhood relative to the definition above. Local and/or within walking distance mean within a 10-15 minute walk from your residence.
<table>
<thead>
<tr>
<th>Statement</th>
<th>Strongly Disagree (1)</th>
<th>Somewhat Disagree (2)</th>
<th>Somewhat Agree (3)</th>
<th>Strongly Agree (4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>I can do most of my shopping at local stores. (1)</td>
<td></td>
<td></td>
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<tr>
<td>Stores are within easy walking distance of my home. (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Parking is difficult in local shopping areas. (3)</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>There are many places to go within easy walking distance of my home. (4)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>It is easy to walk to a transit stop (bus, train) from my home. (5)</td>
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</tr>
<tr>
<td>The streets in my neighborhood are hilly, making my neighborhood difficult to walk in. (6)</td>
<td></td>
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</tr>
<tr>
<td>There are many canyons/hillsides in my neighborhood that limit the number of route for getting from place to place. (7)</td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
The streets in my neighborhood do not have many, or any, cul-de-sacs (dead-end streets). (8)

There are walkways in my neighborhood that connect cul-de-sacs to streets, trails, or other cul-de-sacs. (9)

The distance between intersections in my neighborhood is usually short (100 yards or less; the length of a football field or less). (10)

There are many four-way intersections in my neighborhood. (11)

There are many alternative routes for getting from place to place in my neighborhood. (I don't have to go the same way every time.) (12)
There are sidewalks on most of the streets in my neighborhood. (13)

The sidewalks in my neighborhood are well maintained (paved, even, and not a lot of cracks). (14)

There are bicycle or pedestrian trails in or near my neighborhood that are easy to get to. (15)

Sidewalks are separated from the road/traffic in my neighborhood by parked cars. (16)

There is a grass/dirt strip that separates the streets from the sidewalks in my neighborhood. (17)

There are trees along the streets in my neighborhood. (18)
Trees give shade for the sidewalks in my neighborhood. (19)

There are many interesting things to look at while walking in my neighborhood. (20)

My neighborhood is generally free from litter. (21)

There are many attractive natural sights in my neighborhood (such as landscaping, views). (22)

There are attractive buildings/homes in my neighborhood. (23)

There is so much traffic along the street I live on that it makes it difficult or unpleasant to walk in my neighborhood. (24)
There is so much traffic along nearby streets that it makes it difficult or unpleasant to walk in my neighborhood. (25)

The speed of traffic on the street I live on is usually slow (30 mph or less). (26)

The speed of traffic on most nearby streets is usually slow (30 mph or less). (27)
6. PARTICIPATION IN PHYSICAL ACTIVITY:

International Physical Activity Questionnaire (IPAQ; Booth, 2000)

Q71
We are interested in finding out about the kinds of physical activities that people do as part of their everyday lives. The questions will ask you about the time you spent being physically active in the last 7 days. Please answer each question even if you do not consider yourself to be an active person. Please think about the activities you do at work, as part of your house and yard work, to get from place to place, and in your spare time for recreation, exercise or sport. Think about all the vigorous and moderate activities that you did in the last 7 days. Vigorous physical activities refer to activities that take hard physical effort and make you breathe much harder than normal. Moderate activities refer to activities that take moderate physical effort and make you breathe somewhat harder than normal.

Q72 PART 1: JOB-RELATED PHYSICAL ACTIVITY
The first section is about your work. This includes paid jobs, farming, volunteer work, course work, and any other unpaid work that you did outside your home. Do not include unpaid work you might do around your home, like housework, yard work, general maintenance, and caring for your family. These are asked in Part 3.

Q73 1. Do you currently have a job or do any unpaid work outside your home?
- Yes  (1)
- No  (2)

Skip To: Q83 if 1. Do you currently have a job or do any unpaid work outside your home? = No

Q74 The next questions are about all the physical activity you did in the last 7 days as part of your paid or unpaid work. This does not include traveling to and
During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, digging, heavy construction, or climbing up stairs as part of your work? Think about only those physical activities that you did for at least 10 minutes at a time.

________________________________________________________________

Q75 How much time did you usually spend on one of those days doing vigorous physical activities as part of your work? (hours per day)

________________________________________________________________

Q76 How much time did you usually spend on one of those days doing vigorous physical activities as part of your work? (minutes per day)

________________________________________________________________

Q77 Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like carrying light loads as part of your work? Please do not include walking.

________________________________________________________________

Q78 How much time did you usually spend on one of those days doing moderate physical activities as part of your work? (hours per day)

________________________________________________________________
Q79 How much time did you usually spend on one of those days doing moderate physical activities as part of your work? (minutes per day)
________________________________________________________________

Q80 During the last 7 days, on how many days did you walk for at least 10 minutes at a time as part of your work? (days per week)
Please do not count any walking you did to travel to or from work.
________________________________________________________________

Q81 How much time did you usually spend on one of those days walking as part of your work? (hours per day)
________________________________________________________________

Q82 How much time did you usually spend on one of those days walking as part of your work? (minutes per day)
________________________________________________________________
Q83
PART 2: TRANSPORTATION PHYSICAL ACTIVITY

These questions are about how you traveled from place to place, including to places like work, stores, movies, and so on.

Q84

* During the last 7 days, on how many days did you travel in a motor vehicle like a train, bus, car, or tram? (days per week)

__________________________________________________________

Q85

* How much time did you usually spend on one of those days traveling in a train, bus, car, tram, or other kind of motor vehicle? (hours per day)

__________________________________________________________

Q86

* How much time did you usually spend on one of those days traveling in a train, bus, car, tram, or other kind of motor vehicle? (minutes per day)

__________________________________________________________
Q87 Now think only about the bicycling and walking you might have done to travel to and from work, to do errands, or to go from place to place.

During the last 7 days, on how many days did you bicycle for at least 10 minutes at a time to go from place to place? (days per week)

________________________________________________________________

Q88 How much time did you usually spend on one of those days to bicycle from place to place? (hours per day)

________________________________________________________________

Q89 How much time did you usually spend on one of those days to bicycle from place to place? (minutes per day)

________________________________________________________________

Q90 During the last 7 days, on how many days did you walk for at least 10 minutes at a time to go from place to place? (days per week)

________________________________________________________________

Q91 How much time did you usually spend on one of those days walking from place to place? (hours per day)

________________________________________________________________
Q92 How much time did you usually spend on one of those days walking from place to place? (minutes per day)

___________________________________________________________

Q93

PART 3: HOUSEWORK, HOUSE MAINTENANCE, AND CARING FOR FAMILY
This section is about some of the physical activities you might have done in the last 7 days in and around your home, like housework, gardening, yard work, general maintenance work, and caring for your family.

Q94 Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do vigorous physical activities like heavy lifting, chopping wood, shoveling snow, or digging in the garden or yard?

________________________________________________________________

Q95 How much time did you usually spend on one of those days doing vigorous physical activities in the garden or yard? (hours per day)

________________________________________________________________

Q96 How much time did you usually spend on one of those days doing vigorous physical activities in the garden or yard? (minutes per day)

________________________________________________________________
Q97 Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate activities like carrying light loads, sweeping, washing windows, and raking in the garden or yard? (days per week)

________________________________________________________________________

Q98 How much time did you usually spend on one of those days doing moderate physical activities in the garden or yard? (hours per day)

________________________________________________________________________

Q99 How much time did you usually spend on one of those days doing moderate physical activities in the garden or yard? (minutes per day)

________________________________________________________________________

Q100 Once again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate activities like carrying light loads, washing windows, scrubbing floors and sweeping inside your home? (days per week)

________________________________________________________________________

Q101 How much time did you usually spend on one of those days doing moderate physical activities inside your home? (hours per day)

________________________________________________________________________
Q102 How much time did you usually spend on one of those days doing moderate physical activities inside your home? (minutes per day)

__________________________________________________________________________

Page Break
Q103

PART 4: RECREATION, SPORT, AND LEISURE-TIME PHYSICAL ACTIVITY  This section is about all the physical activities that you did in the last 7 days solely for recreation, sport, exercise or leisure. Please do not include any activities you have already mentioned.

Q104 Not counting any walking you have already mentioned, during the last 7 days, on how many days did you walk for at least 10 minutes at a time in your leisure time? (days per week)

________________________________________________________________

Q105 How much time did you usually spend on one of those days walking in your leisure time? (hours per day)

________________________________________________________________

Q106 How much time did you usually spend on one of those days walking in your leisure time? (minutes per day)

________________________________________________________________

Q107 Think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do vigorous
physical activities like aerobics, running, fast bicycling, or fast swimming in your leisure time? (days per week)

Q108 How much time did you usually spend on one of those days doing vigorous physical activities in your leisure time? (hours per day)

Q109 How much time did you usually spend on one of those days doing vigorous physical activities in your leisure time? (minutes per day)

Q110 Again, think about only those physical activities that you did for at least 10 minutes at a time. During the last 7 days, on how many days did you do moderate physical activities like bicycling at a regular pace, swimming at a regular pace, and doubles tennis in your leisure time? (days per week)

Q111 How much time did you usually spend on one of those days doing moderate physical activities in your leisure time? (hours per day)
Q112 How much time did you usually spend on one of those days doing moderate physical activities in your leisure time? (minutes per day)

________________________________________

Q113

PART 5: TIME SPENT SITTING

The last questions are about the time you spend sitting while at work, at home, while doing course work and during leisure time. This may include time spent sitting at a desk, visiting friends, reading or sitting or lying down to watch television. Do not include any time spent sitting in a motor vehicle that you have already told me about.

Q114

During the last 7 days, how much time did you usually spend sitting on a weekday? (hours per day)

________________________________________

Q115

During the last 7 days, how much time did you usually spend sitting on a weekday? (minutes per day)

________________________________________

Q116

During the last 7 days, how much time did you usually spend sitting on a weekend day? (hours per day)

________________________________________
Q117 During the last 7 days, how much time did you usually spend sitting on a weekend day? (minutes per day)

Q118 Your participation is greatly appreciated!
To receive your $10 Amazon gift card, please enter your first and last name and email address below. Your responses to the questionnaire and name/email address will be kept separately.
## APPENDIX B

### PHYSICAL ACTIVITY INTERVENTIONS IN BLACK WOMEN

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample and attrition</th>
<th>Design and follow-up</th>
<th>Target behavior</th>
<th>Intervention description</th>
<th>Physical activity measure</th>
<th>Physical activity outcomes</th>
<th>Other significant outcomes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Argus-Collins et al., 1997</td>
<td>N=64. Ages 55-79 years. 77% African American women. Overweight participants with diabetes. Attrition=14%</td>
<td>Randomized trial with usual care control group. No delay between intervention and outcome measurement.</td>
<td>Physical activity, diet, nutrition outcomes</td>
<td>6-month weekly biweekly hospital-based group meetings with information motivation content and supervised exercise and individual motivational session. Social action theory based.</td>
<td>Physical Activity for the Elderly Questionnaire</td>
<td>Increased physical activity score at 3 months. By 6 months scores not significantly different from baseline values.</td>
<td>Decreases in weight and HbA1c at 3and 6 months. Decrease in diastolic blood pressure at 6 months.</td>
</tr>
<tr>
<td>Baranowski et al., 1990</td>
<td>N=114. Mean age= 32 years. 83% African American women. Families not currently exercising with 5th-7th grade children. Attrition=14%</td>
<td>Random assignment to experimental and control group. No delay between intervention and outcome measurement.</td>
<td>Physical activity, diet</td>
<td>14-weekly small group program community-center based sessions with education motivation and supervised exercise session. Percent participation was low affecting treatment integrity. No specific theoretical framework. Noted adaptation for cultural relevance (family support, Black staff, visual and verbal representation of Black heritage, testimonials).</td>
<td>Stanford 7-day recall and frequency of aerobic activity form. Pulse rate, blood pressure, BMI</td>
<td>No differences in measures of activity or fitness measures between control and treatment groups.</td>
<td>None reported</td>
</tr>
<tr>
<td>McNabb et al., 1997</td>
<td>N=39. Mean age=57 years. 100% African American obese women. Attrition= 15%</td>
<td>Randomized two-group experiment with waiting list control group. Delay of 1 week between intervention completion and outcome measurement.</td>
<td>Physical activity, diet</td>
<td>14-week church-based, Weekly small-group education. Theoretical framework unclear. Intervention designed for African American women (church setting, lay facilitators were church members).</td>
<td>Self-report of exercise during the previous week.</td>
<td>No significant difference in exercise between groups.</td>
<td>Significant weight loss, changes in BMI, and waist circumference in the treatment group.</td>
</tr>
<tr>
<td>Author(s)</td>
<td>Year</td>
<td>N/A</td>
<td>Study Design</td>
<td>Intervention</td>
<td>Activity Measure</td>
<td>Follow-Up</td>
<td>Within Group</td>
</tr>
<tr>
<td>---------------------------------</td>
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</tr>
<tr>
<td>Keyserling et al., 2002</td>
<td></td>
<td>200. 100% African</td>
<td>Randomized control</td>
<td>Physical Counseling to increase Caltrac accelerometer</td>
<td>Within group: not Presented. Between group: significant overall increase in physical activity, significant differences in mean physical activity for A vs. C at 12 mo and for B vs. C at 6 mo.</td>
<td>Acceptable to participants. 88% were very satisfied with clinic-based counseling to enhance physical activity.</td>
<td></td>
</tr>
<tr>
<td>Newton &amp; Perri, 2004</td>
<td></td>
<td>60. 81% African American</td>
<td>Randomized control</td>
<td>Physical activity</td>
<td>Standard behavioral exercise counseling group received 10 group intervention sessions. Participants attended groups with predominantly white group members and group leaders. Materials were not tailored to address issues of particular concern to African Americans. Culturally sensitive exercise counseling group received identical sessions except all group members were African American, sessions were led by African American counselors, and were conducted at a site located in the African American community using materials designed to address sociocultural concerns of African Americans regarding exercise.</td>
<td>Fitness change (VO2 max), 7-day physical activity recall</td>
<td>Participants in all 3 groups reported significant increases in walking, but significant improvements in fitness were observed only in the 2 intervention groups. Participants in the culturally sensitive intervention reported significantly higher levels of exercise social support compared to members of the other 2 groups.</td>
</tr>
<tr>
<td>Young &amp; Stewart, 2006</td>
<td></td>
<td>196. 100% African American</td>
<td>Randomized control</td>
<td>Physical activity</td>
<td>Intervention included 1 h/wk of group exercise, but participants were encouraged to work up to 30 min five times per week, which would need to include exercise outside of class times. Information and strategies on social cognitive theory– related topics during brief discussion period (5 brief discussion period (5 min)</td>
<td>Stanford 7-Day Physical Activity Recall (PAR) and the Yale Physical Activity Survey (YPAS).</td>
<td>Prevalence of physical inactivity declined to 32% in aerobic exercise group and to 31% in stretching group. Physical activity levels did not differ between groups at end of intervention period.</td>
</tr>
<tr>
<td>Fitzgibbon et al., 2005</td>
<td>N=64. 100% African American women. Ages 45-65 years. All women had BMIs over 25. Attrition=12%</td>
<td>Randomized controlled design. Group sessions. Two supervised 45-minute exercise sessions per week. 20-week intervention with follow-up at week 20.</td>
<td>Physical activity, diet</td>
<td>Sessions delivered in small-group format. Participants met twice weekly. First 90 min included 45 min of didactic talking about breast health and weight loss strategies and 45 min of exercise. Second weekly meeting was 45-min exercise session. Noted adaptations for cultural relevance (All African American participants, used gospel music, held sessions in churches, used aerobics instructors from the African American community, incorporated prayer).</td>
<td>Stanford Seven-Day Physical Activity Questionnaire.</td>
<td>No statistically significant differences between intervention and controls in Regular physical activity, or physical activity frequency, duration, or intensity. For cohort two, changes in regular physical activity and physical activity frequency, duration, and intensity significantly greater in intervention compared to the control group.</td>
<td>No differences in television viewing.</td>
</tr>
<tr>
<td>Resnicow et al., 2005</td>
<td>N=1,056. 76% African American women. Mean age=46.3 years. Attrition=14%</td>
<td>Randomized controlled design. 1 year intervention and 1 year follow up. 16 churches were randomly assigned to 3 intervention conditions. Group 1 (5 churches) received standard nutrition and physical activity intervention materials, Group 2 (7 churches) Physical activity, diet Culturally targeted self-help nutrition and physical activity intervention materials or culturally targeted self-help nutrition and physical activity intervention materials plus motivational interviewing delivered via telephone. Noted adaptations for cultural relevance (All African American participants, used biblical and spiritual themes, provided cookbook with recipes from members of participating churches,</td>
<td>Modified CHAMPS instrument</td>
<td>Within groups 2 and 3, those who reported using the activity guide had greater changes in minutes per week for all activities, activities greater than three METs, and exercise items. Minutes per week for all activities, activities more than three METs, and exercise items increased more in groups 2 and 3 compared with group 1. Those who reported At 1-year follow-up, Groups 2 and 3 showed significant changes in both fruit &amp; vegetable intake.</td>
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</table>
(6 churches) received culturally targeted self-help nutrition and physical activity intervention materials, and Group 3 (5 churches) received the same intervention as Group 2 and four telephone counseling calls based on motivational interviewing.

20-min promotional exercise video featuring well-known African American celebrities from area and including footage of local pastors giving sermons about the importance of exercise and maintaining a healthy body, use of gospel music to promote physical activity.

Using pedometer had greater changes in minutes per week for activities more than three METs and minutes per week in exercise items than those who did not use pedometer.

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Size</th>
<th>African American Participants</th>
<th>Study Design</th>
<th>Intervention Details</th>
<th>Physical Activity</th>
<th>Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kennedy et al., 2005</td>
<td>N=40, 93%</td>
<td>African American women. Mean age=44. Attrition=10%</td>
<td>Randomized control trial without control group. 40 participants were randomized into two treatment groups: the group intervention (n=20) and the individual intervention (n=20). 6-month intervention, 6-month follow-up</td>
<td>The group intervention consisted of nutrition education delivered in six monthly group meetings and included group discussion. The individual intervention consisted of similar nutrition education delivered in 15 individual meetings, record keeping (a seven-day food diary each month), and basic dietary assessment using a commercial nutrition computer software program. An increase in physical activity was emphasized in both intervention groups. Noted adaptations for cultural relevance (All African American participants, held in African American churches, conducted by trained church members).</td>
<td>Physical activity questionnaire</td>
<td>Significant improvement in physical function on quality-of-life scale in overall group and individual groups. Significant improvements in group reporting no leisure-time physical activity for overall and both groups. No between-group differences.</td>
</tr>
<tr>
<td>Ard et al., 2000</td>
<td>N=62, 87%</td>
<td>African American women. Mean age=40.4 years. Attrition=30%</td>
<td>Randomized modified cross-over study in which volunteers received either early or delayed weight loss</td>
<td>Educated during group sessions on usefulness of exercise in weight loss and weight maintenance, advised to increased activity above baseline levels.</td>
<td>Health-Related Quality of Life Scores</td>
<td>Significant improvements in physical functioning and physical role limitation, and mental health. No between group.</td>
</tr>
<tr>
<td>Yanek et al., 2001</td>
<td>N=529; 100% Black women. N=267 in spiritual group. N=188 in standard. N=74 in control group. Ages 40 years and older.</td>
<td>Randomized control trial. 1-year intervention with follow up at 1-year.</td>
<td>Physical activity, diet</td>
<td>Standard intervention churches held weekly sessions on nutrition and physical activity in their own facilities. Female African American health educators from the study staff taught the curriculum, standardized for the first 20 weeks of sessions, with the assistance of church lay leaders. The sessions, based on social learning theory, were designed to enhance individual self-efficacy. Churches offering the spiritual intervention received the same sessions as the standard intervention churches, with the addition of spiritual components and church contextual components. All weekly sessions incorporated group prayers and health messages enriched with scripture. Telephone calls from lay leaders and word of mouth from other participants motivated attendance. The self-help intervention was included as a control or reference contingency. It included materials from the American Heart Association on healthy eating and physical activity.</td>
<td>Yale Physical Activity Survey</td>
<td>Almost significant change in energy expenditure for I (p &lt; 0.07)</td>
</tr>
<tr>
<td>Study</td>
<td>Participants</td>
<td>Setting</td>
<td>Adaptations for Cultural Relevance</td>
<td>Theoretical Framework Mentioned</td>
<td>Physical Activity Log</td>
<td>Physical Activity</td>
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<tr>
<td>Van Roojen et al., 2004</td>
<td>N=157. 100% African American women. 80 in intervention group and 77 in control. Age range=40-65 years. Women diagnosed with type 2 diabetes mellitus. Attrition=9%</td>
<td>Single blind, double intervention randomized trial. 12-wk intervention, 12-wk follow-up. Physical activity</td>
<td>Exercise intervention consisted of an incremental daily home exercise program, the use of daily physical activity records, and 6 supervised aerobic exercise classes. Noted adaptations for cultural relevance (all African American participants). No theoretical framework mentioned.</td>
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<tr>
<td>Duru et al., 2010</td>
<td>N=62. N=34 in treatment group. N=28 in control group. Mean age=73.3 and 72.2. No adverse health conditions. Attrition=13%</td>
<td>Randomized controlled trial. 8 weeks of weekly meetings and 6 months of monthly meetings. Physical activity</td>
<td>Treatment group participated in 8-week program, twice per week, 45 min per session; faith-based curriculum; goal setting and reinforcement; pedometer competition; weekly exercise class. Control group participated in 8-week program, twice per week, 45 min per session; lectures on topics unrelated to physical activity; weekly exercise class. Cultural adaptation noted (sessions included scripture reading and prayer, set in churches). No theoretical</td>
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<td>Study</td>
<td>N/Location</td>
<td>Intervention</td>
<td>Physical Activity</td>
<td>Framework</td>
<td>Other Measures</td>
<td>Notes</td>
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<td>Hornbuckle et al., 2012</td>
<td>N=44. N=25 in intervention group (walking group), N=19 in control group (walking plus resistance training group). 100% African American. Mean age=49 years. Women not engaged in resistance training and/or averaging &gt;10,000 steps per day. Attrition=27%</td>
<td>Randomized trial. 12 week intervention with follow-up at study completion.</td>
<td>Physical activity</td>
<td>Walking group asked to increase daily pedometer-measured walking to &gt;10,000 steps per day. Walking plus resistance training group was given the same walking prescription plus supervised resistance training 2 d per week. No cultural adaptations or theoretical framework noted.</td>
<td>Muscle strength, pedometer</td>
<td>Walking with resistance group was more effective in improving several body composition measures and glucose control.</td>
</tr>
<tr>
<td>Parra-Medina et al., 2011</td>
<td>N=266 African American women (treatment group, n = 136; control group, n = 130) Attrition=43%</td>
<td>Randomized controlled trial</td>
<td>Physical activity</td>
<td>Standard care intervention (provider counselling, nurse goal setting, and educational materials) vs. comprehensive intervention (standard care intervention plus. 12 months of telephone counselling and tailored print materials). Cultural adaptations noted (used photos, common foods, and testimonials of African Americans to emphasize cultural values and norms). Social cognitive theory and transtheoretical model used.</td>
<td>CHAMPS PA Survey</td>
<td>Comprehensive intervention group more likely to improve in leisure-time physical activity at 6 months (OR = 3.82; CI = 1.41, 10.3). Comprehensive participants more likely than standard care participants to decrease total physical activity at 6 months.</td>
</tr>
<tr>
<td>Pekemizi et al., 2010</td>
<td>N=38 African Americans. 96% African American women. Mean age=42.58. Three groups: tailored print (n = 15), tailored Internet (n = 11) standard Internet (n = 12). Attrition=N/A</td>
<td>Randomized controlled trial. 12 month intervention with follow-up immediately post-intervention</td>
<td>Physical activity</td>
<td>Transtheoretical model, social cognitive theory used. Three groups compared: a tailored print condition, a tailored Internet condition, and a standard Internet condition. No cultural adaptations noted.</td>
<td>7-d PA record</td>
<td>Self-reported increase in physical activity from 17.24 min (SD = 20.72) at baseline to 139.44 min (SD = 99.20) at 6 months in all Participants. No significant change in physical activity from 6 months to 12 months.</td>
</tr>
<tr>
<td>Stolley et al., 2009</td>
<td>N=198 African American women. N=100 (treatment group) and N=98 control group. Age range 30-65 years.</td>
<td>Randomized controlled trial6-month weight loss intervention with a 1-year maintenance</td>
<td>Physical activity, diet</td>
<td>Social cognitive theory used. Small groups met two times per week for 6 months and monthly motivational interviewing sessions. Meetings were 60–90 min</td>
<td>International Physical Activity Questionnaire</td>
<td>Intervention group reported more walking compared with control group. Intervention group showed significant improvements in moderate Women in the intervention group lost significantly more weight than women in the control group (P &lt; 0.001). However, weight change</td>
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<td>BMI range</td>
<td>Intervention</td>
<td>Attrition rate</td>
<td>Attrition rate</td>
<td>Physical activity</td>
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<td>BMIs between 30 and 50</td>
<td>and included didactic sessions that focused on diet and physical activity behaviors. Cultural adaptations noted focused on food, family, music, social roles and relationships, and spirituality/religion.</td>
<td>7%</td>
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<td>((P = 0.05)), vigorous ((P &lt; 0.001)), and moderate-to-vigorous ((P = 0.01)) physical activity compared with control group.</td>
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<td>was variable within the intervention group, with a maximum weight loss of 19.4% of initial body weight and a maximum weight gain of 6.4% of initial body weight. Women in the intervention group also showed significant improvements in fruit intake ((P &lt; 0.01)), Healthy Eating Index score ((P &lt; 0.001)).</td>
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<td>Dutton (2007) N=139. 92% African American women. Mean age=41.73 years. All overweight/obese and low income. Attrition=12-26%.</td>
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<td>Randomized controlled trial. Participants were recruited from the waiting rooms of 2 family medicine clinics in provide care for predominantly low-income, African American population.</td>
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<td>Tailored intervention participants received 6 monthly, 16-minute physician visits. Each visit included a review of current dietary and physical activity habits and plans for future behavior change building on the progress since the last visit. Each of the monthly sessions included advice on incorporating lifestyle activity into daily routines. Patients also received recommendations to begin a physical activity program with the goal of achieving 150 minutes/week of at least moderate-intensity physical activity. Standard care physicians were instructed to provide their usual obesity management conducted during a typical office visit. Standard care physicians provided no structured information on diet or physical activity. Interventions included components from the social cognitive theory and the transtheoretical model, including self-efficacy, motivational readiness, decisional balance, and social support. No</td>
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<td>Physical activity 7-day physical activity recall, YMCA 3-minute step test heart rate recovery following exercise</td>
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<td>Although the intervention group demonstrated an increase in physical activity, this did not differ significantly from standard care. A significantly greater proportion of intervention participants (90%) achieved current physical activity recommendations compared with standard care (77%), (P&lt;.03).</td>
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<td>None reported.</td>
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<td>Study</td>
<td>Participants</td>
<td>Design</td>
<td>Outcomes</td>
<td>Cultural Adaptations</td>
<td>Description</td>
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<td>Scarinci et al., 2014</td>
<td>N=565. 100% African American women. All participants from 6 counties were enrolled in the study. N=276 in comparison arm. N=298 in intervention arm. Mean age=53.9 years. Attrition=37-55%</td>
<td>Group randomized controlled trial with counties as the unit of randomization. 12-month and 24-month follow ups.</td>
<td>Physical activity, diet</td>
<td>The intervention arm consisted of a 5-week healthy lifestyle intervention (four group sessions and one individual session) that was adapted from the “New Leaf… Choices for Healthy Living with Diabetes”. The “New Leaf… Choices for Healthy Living” program is a structured nutrition and physical activity assessment and a counseling program that emphasizes practical strategies for change. The comparison arm consisted of educational and behavioral strategies to promote breast and cervical cancer screening. In this arm we addressed the importance of knowing their family health history (perceived susceptibility), barriers and facilitators to screening, problem solving and communication skills. Community-based participatory research (CBPR) represents the philosophical framework. No cultural adaptations noted; however, researchers identify the intervention as culturally relevant.</td>
<td>Participants in the “healthy lifestyle” arm showed significant positive changes compared to the “screening” arm at 12-month follow-up with regard to physical activity. At 24-month follow-up, these positive changes were not maintained with engagement in physical activity.</td>
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<td>Swearingin (2008)</td>
<td>N=45. 100% African American women. Mean age= 39.3 years. Participants had not participated in regular physical activity for at least the past 3 months (&lt; 2 days/week; &gt;20 minutes/day). The minimum BMI cutoff for participation in the study was 23. Attrition=7%.</td>
<td>Randomized controlled trial. Participants were randomly assigned to one of three 12-week groups, each consisting of 15 participants.</td>
<td>Physical activity</td>
<td>The Lifestyle Activity Modification (Lifestyle): participated in a lifestyle activity curriculum during weekly one-hour meetings for the first six weeks and alternating weekly meetings during the second six weeks of the study, in which they were educated about the incorporation of exercise into activities of daily living. Traditional group exercise (Traditional) provided traditionally</td>
<td>Participants in the “healthy lifestyle” arm showed significant positive changes compared to the “screening” arm at 12-month follow-up with regard to decrease in fried food consumption and an increase in both fruit/vegetable intake. At 24-month follow-up, these positive changes were maintained with healthy eating behaviors, but not engagement in physical activity.</td>
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<tr>
<td>Study</td>
<td>N</td>
<td>Intervention Group</td>
<td>Control Group</td>
<td>Study Details</td>
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<td>Wilbur et al., 2016</td>
<td>N=288</td>
<td>100% African American women</td>
<td>Age range=40-65 years. Participants did not have any signs/symptoms of pulmonary/ cardiovascular disease. Attrition=10%.</td>
<td>48-week randomized clinical trial with three conditions randomly assigned across six sites. Physical activity Six group meetings delivered over 48 weeks with either 11 personal motivational calls, 11 automated motivational messages, or no calls between meetings. Six cohorts had no contact except reminder calls for upcoming meetings and automated reminder calls to report steps in the automated telephone computer-linked system. Social cognitive theory was used. Cultural adaptations noted.</td>
<td>Questionnaires, accelerometer, aerobic fitness. Adherence to PA increased significantly ($p &lt; .001$) for questionnaire, Accelerometer, and aerobic fitness at 24 weeks and was maintained at 48 weeks ($p &lt; .001$), with no differences across conditions. Adherence to PA increased significantly ($p &lt; .001$) for questionnaire, Accelerometer, and aerobic fitness at 24 weeks and was maintained at 48 weeks ($p &lt; .001$), with no differences across conditions. No changes in weight or glucose tolerance were observed in the control group. The intervention group had significant ($p &lt; .005$) improvements in body weight and glucose tolerance in response to the 1-week diet, which persisted for 4 months ($p &lt; .001$ vs. control for...</td>
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<tr>
<td>Non-randomized controlled trials</td>
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<td></td>
<td>48-week randomized clinical trial with three conditions randomly assigned across six sites. Physical activity Six group meetings delivered over 48 weeks with either 11 personal motivational calls, 11 automated motivational messages, or no calls between meetings. Six cohorts had no contact except reminder calls for upcoming meetings and automated reminder calls to report steps in the automated telephone computer-linked system. Social cognitive theory was used. Cultural adaptations noted.</td>
<td>Questionnaires, accelerometer, aerobic fitness. Adherence to PA increased significantly ($p &lt; .001$) for questionnaire, Accelerometer, and aerobic fitness at 24 weeks and was maintained at 48 weeks ($p &lt; .001$), with no differences across conditions. No changes in weight or glucose tolerance were observed in the control group. The intervention group had significant ($p &lt; .005$) improvements in body weight and glucose tolerance in response to the 1-week diet, which persisted for 4 months ($p &lt; .001$ vs. control for...</td>
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<tr>
<td>Racette et al., 2001</td>
<td>N=69</td>
<td>N=45 in intervention group. N=24 in control group. 85% African American women. Ages range from 30-70 years. BMI greater than 27.0 and impaired glucose tolerance or type 2 diabetes mellitus. Attrition=18-83%</td>
<td>Physical activity A total of 45 subjects comprised the intervention group; 24 subjects matched for age, body weight, body composition, and degree of glucose intolerance comprised the control group. 1 year</td>
<td>All subjects received educational materials, measuring utensils, and individual recommendations from the study dietitian regarding ways to meet this goal. Subjects in the intervention group had frequent contact with the research team through monthly telephone</td>
<td>Seven-day physical activity recall No changes in physical activity for either group. No changes in weight or glucose tolerance were observed in the control group. The intervention group had significant ($p &lt; .005$) improvements in body weight and glucose tolerance in response to the 1-week diet, which persisted for 4 months ($p &lt; .001$ vs. control for...</td>
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**Prescribed Exercise Using Common Modes of Exercise through Group Exercise Sessions.** A control group met the first, third, sixth, ninth and twelfth weeks of the study to verify continued participation in the study, to verify records and answer questions about record keeping during the course of the study. This group was asked to make no changes in pre-study levels of physical activity during the twelve-week period. No cultural adaptations or theoretical framework noted.
### Sharpe et al., 1997

| **N=110. 86% Black women. Age range 60-91 years. Attrition=14%-15%.** | **Participants at two sites in County A were the intervention subjects (n = 75) and participants at three sites in County B were the comparison subjects (n = 64). One year intervention with follow-up at 1 year.** | **Physical activity** | **During the one-year program period, a low intensity exercise class was conducted twice a week at the two intervention sites. The intervention employed in this research was modeled after the SMILE program (So Much Improvement with a Little Exercise), a low-intensity exercise demonstration project designed for a chronically impaired population of older adults who were at risk of institutionalization. The low-intensity program consisted of movements that are performed sitting and standing, and all standing movements may be adapted for participants who cannot or prefer not to stand. No theoretical framework or cultural adaptations were noted.** | **Perceived change in Physical functioning and Performance Oriented Mobility Assessment** | **Significant change in fast walk for intervention.** | **Intervention more likely than control to improve grip strength, balance, and fast walk when comparing greater than or equal to median change and more likely to improve normal change.** |

### Williams et al., 2004

<p>| <strong>N=294. N=160 women from 5 rural companies with mean age 33 years. N=134 women from 17 urban worksites with mean age 24 years. 100% low income African American women. Attrition=</strong> | <strong>Two interventions groups. No control group. Pretest vs. posttest measures.</strong> | <strong>Physical activity and diet</strong> | <strong>Participants were given health risk appraisal and on-site measurement of health risk behaviors. Participants were referred for medical tests and follow-up if abnormal measures were identified. Lifestyle support and management of barriers for diet and PA behavior</strong> | <strong>Healthier People Health Risk Appraisal</strong> | <strong>No significant changes in physical activity.</strong> | <strong>Posttest changes in cholesterol and fat intake risks were more significant in rural women than in urban women.</strong> |</p>
<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Design</th>
<th>Activity</th>
<th>Facilitators</th>
<th>Outcome</th>
<th>Cultural Adaptations</th>
<th>Theoretical Frameworks</th>
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<tbody>
<tr>
<td>Bopp et al., 2009</td>
<td>N=146, N=72 in intervention group, N=74 in control group, 81% African American women. Attrition= 56% (treatment group) vs. 58% (control group)</td>
<td>Quasi-experimental design (subset of participants from a larger trial). 3 and 6 months post-intervention assessments.</td>
<td>Physical activity, diet</td>
<td>Led by trained volunteer facilitator at each church; facilitator recruited participants, and delivered program 20–30 min week−1 of PA, Biblical weekly topic, discussion questions, handouts, and homework assignments. Noted cultural adaptations (held in church, incorporated Biblical scriptures into session content). Theoretical frameworks used included Transtheoretical model of behavior change and Social Cognitive Theory.</td>
<td>CHAMPS, pedometer</td>
<td>No changes in physical activity over time</td>
<td>Increase in social support for physical activity at 3 months in treatment group vs. control group</td>
</tr>
<tr>
<td>Farid et al., 2010</td>
<td>N=246, N=121 in intervention group, N=125 in control group, 84.8% African American women in treatment group. 77.8% African American women in control group. Age range 18-79 years. All women at risk for diabetes. Attrition rate: 38%</td>
<td>Non-randomized controlled intervention vs. delayed-intervention control group. 1 year intervention with follow-up at study completion.</td>
<td>Physical activity</td>
<td>Church-based intervention in two urban African American communities. Community health advisors paid for training. Community health advisors tailored intervention methods and frequency of contact and teaching methods to participants (some did group education plus Bible study classes, others individual counselling); community health advisors also organized community outreach events to increase diabetes awareness. Noted cultural adaptations included (held in churches, education sessions plus Bible study (but did not include scriptures).</td>
<td>7 d PA record</td>
<td>Improved energy expenditure in both groups. No change in % of participants increasing, decreasing, or not changing physical activity. Improved energy expenditure in intervention compared with control group.</td>
<td>None reported.</td>
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<tr>
<td>Study</td>
<td>Setting</td>
<td>Sample characteristics</td>
<td>Study design</td>
<td>Intervention</td>
<td>Outcome measures</td>
<td>Results</td>
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<td>Oh et al., 2010</td>
<td>N=148 African American women</td>
<td>(minimal treatment, n = 55; enhanced treatment, p = 93)</td>
<td>Quasi-experimental; 24 week intervention followed by assessment</td>
<td>Physical activity</td>
<td>Enhanced treatment or minimal treatment behavioral intervention; 24-week intervention delivery adoption phase. Social cognitive theory and transtheoretical model used. No cultural adaptations noted.</td>
<td>PA diary, heart rate Monitor</td>
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<td>Wilder et al., 2011</td>
<td>N=25 African American women</td>
<td>Mean age=59 years. Two groups: cohort 1 (N = 14); cohort 2 N = 11. Attrition rate: 17%</td>
<td>Quasi-experimental; pretest/post-test Design 6 months</td>
<td>Physical activity</td>
<td>No theoretical framework noted. 6-month individualized exercise program in a gym within a housing authority. Cardiorespiratory fitness assessed using dynamic, rhythmic movements (i.e. walking, stationary and recumbent cycling, elliptical walking, stair stepping, rowing). Participants encouraged to do multiple exercises with a goal of at least 30 min moderate-intensity exercise once per day either in one session or in 10-min bouts. Exercise duration or intensity, or both, increased gradually based on participant’s fitness goals and comfort and published guidelines. No cultural adaptations noted.</td>
<td>Maximal graded treadmill exercise test</td>
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<td>Zoeller et al., 2010</td>
<td>N=83. 98% African American women</td>
<td>Mean age=44 years.</td>
<td>Quasi-experimental design. 6 month intervention.</td>
<td>Social support and transtheoretical model Frameworks were used. Participants wore a pedometer, maintained a pedometer diary for the study duration, and attended monthly nutrition and physical activity education sessions.</td>
<td>Pedometer, Pedometer diary</td>
<td>Average step per day increased, with 6,665 during month 1 and increased to 9,232 steps per day during month 6.</td>
<td>None reported.</td>
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<td>Study</td>
<td>Sample Size</td>
<td>Race</td>
<td>Intervention</td>
<td>Group Discussion and Physical Activity</td>
<td>Significant Differences</td>
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<td>Befort et al., 2008</td>
<td>N=44, N=21 in the behavioral weight loss program plus motivational interviewing. N=23 in the behavioral weight loss program plus health education. Mean age=44.3 years. Attrition=23%</td>
<td></td>
<td>Participants were randomized to receive four individual sessions of MI or health education (HE; attention control) as an adjunct to a 16-week culturally-targeted behavioral weight loss program.</td>
<td>Participants randomized to MI received four 30-min individual MI sessions with an advanced doctoral clinical psychology student. MI sessions followed a semi-structured format. HE is a standard counseling technique which, contrary to MI, focuses on providing didactic information and advice. HE sessions were conducted by the same counselors who provided the MI sessions. MI and HE sessions were structured using handouts and flip-charts, occurred at the same study time points, were of the same duration, and followed the same in-person and phone delivery schedule. MI and HE participants were in the same groups to ensure comparable programs across conditions; group sessions did not address the content of the adjunct MI or HE sessions. Cultural adaptations noted (social support emphasized by sharing time and by addressing ways to build support among existing social networks, barriers related to transportation, neighborhood safety, literacy and other stressors; provided childcare during meeting; guidance about food and physical activity were made relevant to cultural practices; health benefit of physical activity was emphasized; African American community leaders who had succeed in weight loss were invited as peer mentors; developed group names). No theoretical framework was noted.</td>
<td>No significant differences across MI and HE conditions. Results showed that participants in both MI and HE conditions lost a significant amount of weight, reduced their energy intake and percent calories from fat, and increased their fruit and vegetable consumption.</td>
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<td>Notwehr et al.,</td>
<td>N=23. 100% African</td>
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<td>Participants were physical</td>
<td>CHAMPS</td>
<td>Changes in physical activity did not differ across MI and HE conditions.</td>
<td>The only group difference</td>
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<tr>
<td>Year</td>
<td>Study</td>
<td>Sample Description</td>
<td>Intervention Details</td>
<td>Activity, Diet, and Exercise</td>
<td>Outcome Measures</td>
<td>Findings</td>
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<td></td>
</tr>
<tr>
<td>2001</td>
<td>American women with diabetes mellitus and BMIs over 27. Mean age=49.4 years. Attrition=18%</td>
<td>randomly assigned to either 10 weekly sessions about healthy eating followed by 6 weekly sessions about exercise or to the reverse sequence. 16-wk intervention, follow-ups at 16 wk and 1 year.</td>
<td>activity, diet, problem solving, group exercise and walking, introduction and orientation to exercise equipment at YMCA. Noted adaptations for cultural relevance (all African American participants, sessions held in YMCA located in predominately African American neighborhood). Sessions consisted of small group discussions and physical activity or food tasting. No theoretical framework mentioned.</td>
<td>walking in the past week and the number of minutes engaged in other moderate-level activities.</td>
<td>In minutes per week in physical activity at either time, significant increase in mean physical activity combined group at 4 month and 1 year assessments.</td>
<td>found at the 12-month follow-up was in diastolic blood pressure.</td>
<td></td>
</tr>
</tbody>
</table>

**Single-group pre-post design**

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample Description</th>
<th>Intervention Details</th>
<th>Activity, Diet, and Exercise</th>
<th>Outcome Measures</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>2001</td>
<td>Doshi et al., 1994</td>
<td>N=31. Mean age=72 years. 87% African American women. Elderly adults. Attrition=3%</td>
<td>Single-group pre-post design. No delay between intervention and outcome measurement.</td>
<td>Physical activity, diet, 10-week biweekly church-based nutrition education and 30–40 minutes of supervised exercise. No theoretical framework reported or implied. BMI, percentage of ideal body weight, skin fold assessment of body density</td>
<td>No significant differences seen in fitness following the intervention. Decrease in waist circumference, total cholesterol, low-density lipoproteins, and total cholesterol/high-density lipoprotein ratio. No change in body-mass index, percentage of ideal body weight, or skin fold assessment.</td>
</tr>
<tr>
<td>1994</td>
<td>Kanders et al.</td>
<td>N=61. Mean Age=49 years. 100% overweight African American women. Attrition=9%</td>
<td>Single-group pre-post design. No delay between intervention and outcome measurement.</td>
<td>Physical activity, diet, 10 weekly group sessions with information and motivational content. Theoretical framework not reported.</td>
<td>Self-report activity records</td>
</tr>
<tr>
<td>1993</td>
<td>Lewis et al.</td>
<td>N=647. Mean age=41 years. 78% African American women. Low-income</td>
<td>Single treatment group; baseline data and outcome data from different</td>
<td>Physical Activity History</td>
<td>Physical activity history scores did not improve for women in intervention communities, but were</td>
</tr>
<tr>
<td>Study</td>
<td>N</td>
<td>Demographics</td>
<td>Intervention Details</td>
<td>Outcomes</td>
<td>Notes</td>
</tr>
<tr>
<td>-------------------------------</td>
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<td>--------------------------------------------------------------------------------------</td>
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</tr>
<tr>
<td>Banks-Wallace &amp; Conn, 2005</td>
<td>N=21</td>
<td>100% sedentary African American women. Ages 25-68 years. Women currently being treated for hypertension or previously diagnosed as having hypertension. Attrition= 9%</td>
<td>Walk the Talk used a pre/post single group design, with a 6-month follow-up, to develop and pilot an intervention 12-month intervention; follow-ups at 3, 6, 9, 12, and 18 months.</td>
<td>Physical activity A 3 hour monthly group meeting with sharing, storytelling, interactive learning period, and group PA plus home-based walking component Group walking sessions were structured walks through neighborhood, adding one to two blocks at a time, with gradual increase from 5–40 min of walking. Home-based program was Stanford Walking Kit designed to encourage gradual increase in walking during 6-wk period. Group and individual. Noted adaptations for cultural relevance (All African American participants).</td>
<td>Accusplit Eagle pedometers, the Cross-Cultural Activity Participation Study Physical Activity Questionnaire (CAPSPAQ), and walking diaries were used to collect data. Total group had slight increase in steps per day (5%). Analysis of subset of women who participated in all data collection visits showed decrease in steps per day (213%). At end of 6-mo follow-up assessment, mean steps per day had increased by 1425 steps from baseline (37%) for total group and by 2379 steps (51%) for subgroup. None reported.</td>
</tr>
<tr>
<td>Wilson et al., 2005</td>
<td>N=24</td>
<td>100% African American breast cancer survivors. Mean age=55 years. Attrition=8%</td>
<td>8-week intervention. 3 time points for assessments (baseline, after intervention and 3-month follow-up).</td>
<td>Physical Activity An 8-wk community-based walking program with 75-min weekly sessions that included a curriculum focused on exercise benefits and barriers, relationship to health and cancer risk, and personal assessment and problem-solving session for motivation. The Health Belief Model was used as the theoretical framework for the intervention. Noted adaptations for cultural relevance (All African American participants).</td>
<td>Steps per day were measured using a steps-only pedometer Statistically significant difference in steps per day (4791 at baseline; improved +3506 at 8 wk; p , 0.001). No difference from after 8-wk program to 3-mo follow-up. None reported.</td>
</tr>
<tr>
<td>Study</td>
<td>N</td>
<td>Ethnicity</td>
<td>Age (years)</td>
<td>Attrition (%)</td>
<td></td>
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<tr>
<td>-------------------------------</td>
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<td>---------------</td>
<td></td>
</tr>
<tr>
<td>Karanja et al., 2002</td>
<td>66</td>
<td>100% African American women</td>
<td>44</td>
<td>33</td>
<td></td>
</tr>
<tr>
<td>Women participated in a 6-month weight loss program that included weekly group meetings and supervised exercise sessions. 10-wk intervention, 10-wk follow-up.</td>
<td></td>
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<tr>
<td>Physical activity</td>
<td>Proficiently led exercise classes offered on Saturdays. Noted adaptations for cultural relevance (All African American participants, all education materials reviewed by minority advisers to ensure cultural appropriateness).</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Questionnaire</td>
<td>Mean (SD) reported exercise time increased from 64 (112) to 132 (111) min/wk</td>
<td></td>
<td></td>
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<tr>
<td>Weight loss at 26 weeks was 3.7 kg, categorizing those who were lost to follow-up as having zero weight loss. Participants who attended at least 75% of the group meetings lost a mean of 8.2 kg at six months. Those who attended fewer meetings lost a mean of 5.9 kg.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Walcott-McQuigg et al., 2002</td>
<td>23</td>
<td>100% African American women</td>
<td>38</td>
<td>31</td>
<td></td>
</tr>
<tr>
<td>One group pre-test/post-test design. 26-wk intervention, follow-up weekly through 26 wk.</td>
<td></td>
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</tr>
<tr>
<td>Physical activity</td>
<td>Agreed to participate in PA three times per week for 20 min, viewed exercise videos to discuss appropriateness for overweight and African American women, maintained weekly monitoring forms that included types of exercise behavior. Theoretical underpinnings guiding the research study were based on social cognitive theory (SCT). Noted adaptations for cultural relevance (all African American participants, information provided in demonstration, the women met as a group with an African American nurse certified as a lifestyle counselor in weight management and stress for 32 one-hour sessions).</td>
<td></td>
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<tr>
<td>Exercise/Activity Scale</td>
<td>Significant increase in mean hours per week of activity, significant increase in percentage of people meeting goal of 1.5 h/wk of structured PA.</td>
<td></td>
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</tr>
<tr>
<td>Weight loss was significantly correlated with attendance and dietary readiness to decrease emotional eating. Women who continued on to complete the weight loss maintenance classes maintained a significant loss in body mass index, and increased their high-density lipoproteins and dietary readiness to monitor hunger and eating cues.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Peterson et al., 2011</td>
<td>18</td>
<td>100% African American women</td>
<td>49.61</td>
<td>10</td>
<td></td>
</tr>
<tr>
<td>Quasi-experimental design. Intervention lasted 6 months and assessment followed completion.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical activity</td>
<td>African American nurse practitioner with special interests and training in holistic health and wellness, physical activity, and yoga. Based on focus group analysis of the Heart and Soul Physical Activity Program, by African American church women; had one, 2-h session per week for 6 weeks (30-min group exercise). Participants used a booklet for goal</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Seven-day physical activity recall and RT3 accelerometer</td>
<td>Total weekly physical activity increased from 412 min per week at baseline to 652 min per week (S). Positive increases in intensity from 3.33 METS at baseline to 4.33 METS in 6 weeks (NS).</td>
<td></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Participants reported increases in social support for physical activity in the 6-week study.</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Study (Year)</td>
<td>Sample Characteristics</td>
<td>Design</td>
<td>Physical Activity</td>
<td>Intervention</td>
<td>Analysis</td>
</tr>
<tr>
<td>-------------</td>
<td>------------------------</td>
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<td>-------------------</td>
<td>--------------</td>
<td>----------</td>
</tr>
<tr>
<td>Rimmer et al., 2010</td>
<td>N=33. 100% severely obese African American women with mobility disabilities. Mean age=60.1 years. Not meeting physical activity recommendations for last 6 months. Attrition=38%</td>
<td>Quasi-experimental design. 6 month intervention with follow-up immediately at the completion of the intervention.</td>
<td>Telephone-based, physical activity coaching intervention: weekly calls for 6 months (15–30 min)</td>
<td>MI techniques used to assist participants in removing barriers to physical activity involved building a relationship with the participant; identifying important ways to increase physical activity in the home, outdoors and indoor facilities. Resources from the National Center on Physical Activity guided ideas for suggestions on eliminating key barriers to physical activity. No specific theoretical framework reported (social cognitive theory and theory of planned behavior mentioned). No cultural adaptations noted.</td>
<td>Increase in total min d−1 of structured exercise (S), general indoor household physical activity (S), and total physical activity (S). No significant changes reported in leisure physical activity or outdoor household activity. (S) decrease in personal barriers to physical activity. No significant change in environmental/facility or total barriers to physical activity.</td>
</tr>
<tr>
<td>Gaston et al., 2007</td>
<td>N=134. N=106 in intervention group. N= 28 in control group. 100% African American women. Mean age=54.4 years. Attrition=18–27%</td>
<td>Pretest-posttest. Assessments at 10 weeks, and six and 12 months.</td>
<td>The PTSC uses a cognitive behavioral modality to reduce the health risk factors of negative stress, inactivity and poor nutrition—all of which contribute to negative health outcomes. There were 106 participants in the 10 PTSC structured intervention groups, with 8–13 women per group. The groups met for 90 minutes for 10 weeks. Each group was led by a facilitator who had prior experience in group facilitation. Over the</td>
<td>Reported Behavior Change questionnaire</td>
<td>A significant increase in the women's involvement in physical activity at 10 weeks, and six and 12 months.</td>
</tr>
</tbody>
</table>
course of the 10-week intervention, the women received information related to spirituality, self-esteem, prioritizing themselves first, stress, nutrition and exercise, cardiovascular disease and diabetes from the facilitators and consultants. There were 28 women in the comparison group. They received the copy of the Gaston and Porter text but did not receive a curriculum, facilitator, expert consultants or stipend.

(62.7%) and 12 months (65.9%) reported utilizing stress management strategies. There was also a 60% increase in yearly mammograms and a 54% increase in blood pressures checks. Finally, 83.7% of the women at 12 months felt that the positive changes could be maintained over their lifetime.
APPENDIX C
EXAMINATION OF PHYSICAL ACTIVITY BEHAVIOR

Table C-1. Overview of Physical Activity at Time 1.

<table>
<thead>
<tr>
<th>Minutes</th>
<th>N</th>
<th>%Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>187</td>
<td>74.0</td>
</tr>
<tr>
<td>1-30</td>
<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td>31-60</td>
<td>4</td>
<td>1.6</td>
</tr>
<tr>
<td>61-90</td>
<td>3</td>
<td>1.2</td>
</tr>
<tr>
<td>91-120</td>
<td>8</td>
<td>3.1</td>
</tr>
<tr>
<td>121-150</td>
<td>2</td>
<td>0.8</td>
</tr>
<tr>
<td>151-180</td>
<td>6</td>
<td>2.4</td>
</tr>
<tr>
<td>181-360</td>
<td>19</td>
<td>7.5</td>
</tr>
<tr>
<td>361-720</td>
<td>8</td>
<td>3.1</td>
</tr>
<tr>
<td>721-1290</td>
<td>13</td>
<td>5.1</td>
</tr>
</tbody>
</table>

Table C-2. Overview of Physical Activity at Time 2.

<table>
<thead>
<tr>
<th>Minutes</th>
<th>N</th>
<th>%Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>68</td>
<td>66.0</td>
</tr>
<tr>
<td>1-30</td>
<td>3</td>
<td>2.9</td>
</tr>
<tr>
<td>31-60</td>
<td>1</td>
<td>0.9</td>
</tr>
<tr>
<td>61-90</td>
<td>1</td>
<td>0.9</td>
</tr>
<tr>
<td>91-120</td>
<td>3</td>
<td>2.9</td>
</tr>
<tr>
<td>121-150</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>151-180</td>
<td>3</td>
<td>2.9</td>
</tr>
<tr>
<td>181-360</td>
<td>7</td>
<td>6.8</td>
</tr>
<tr>
<td>361-720</td>
<td>10</td>
<td>9.7</td>
</tr>
<tr>
<td>721-1125</td>
<td>7</td>
<td>6.8</td>
</tr>
</tbody>
</table>
Table C-3. Percent Change Physical Activity Time 1-Time 2.

<table>
<thead>
<tr>
<th>% ▲</th>
<th>N</th>
<th>%Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>-100.0</td>
<td>17</td>
<td>45.9</td>
</tr>
<tr>
<td>-83.3</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>-63.1</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>-50.0</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>-37.5</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>-32.8</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>-26.9</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>0</td>
<td>2</td>
<td>5.4</td>
</tr>
<tr>
<td>25.0</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>43.3</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>50.0</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>73.3</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>75.9</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>100.0</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>168.7</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>260.0</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>274.1</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>368.6</td>
<td>1</td>
<td>2.7</td>
</tr>
<tr>
<td>500.00</td>
<td>2</td>
<td>5.4</td>
</tr>
</tbody>
</table>

Note: N=66 participants reported 0 minutes of PA at Time 1 and Time 2.
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BIOGRAPHICAL SKETCH

Allyson Diggins is a psychology predoctoral intern at the University of Florida Health Science Center and a doctoral candidate in the Clinical and Health Psychology program at the University of Florida. Prior to pursuing her doctoral degree in clinical psychology from the University of Florida, Allyson received her master’s degree in psychology from North Carolina Central University in 2013 (graduating summa cum laude) and her bachelor’s degree in psychology in 2011 from the University of North Carolina at Chapel Hill. Broadly speaking her research interest are in improving health outcomes among underserved populations (i.e., socioeconomically disadvantaged, rural, racial/ethnic minorities, sexual minorities). Specifically, her work aims to first understand the complex and unique factors that influence obesity and obesity-related illnesses among Black women and then apply this knowledge to disseminating and implementing interventions that address these disparities.