Reliability and Validity of the SE-HEPA: Examining Physical Activity and Healthy Eating-Specific Self-Efficacy among a Sample of African-American Pre-Adolescents

by

William S. Frye

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Approved by

Michael M. Steele, Chair, Assistant Professor of Psychology
Steven K. Shapiro, Co-Chair, Associate Professor of Psychology
Chris Correia, Professor of Psychology

Abstract

Current estimates indicate that nearly one-third of all U.S. children can be classified as either overweight or obese and is even more prominent in African American children, affecting approximately 39%. In attempts to identify variables relevant to weight loss through behavior change, researchers have recently begun to examine self-efficacy. Self-efficacy has been found to predict health outcomes and weight loss related behaviors in children and adolescents. The purpose of this study is to examine the psychometric properties of a modified measure of the Self-Efficacy for Healthy Eating and Physical Activity (SE-HEPA) created by Young, Steele, and Burns (2012) in a sample of African American pre-adolescents. A confirmatory factor analysis was used to determine if a two-factor measurement model of the SE-HEPA (Physical Activity and Healthy Eating factors) provided a better fit for the data than a one factor model of self-efficacy. Latent structural regression analysis was used to determine if the Healthy Eating and Physical Activity factors were associated with the pre-adolescents' body mass index (BMI) and weight status in our sample. Consistent with previous research, results indicated that the two-factor model demonstrated good global fit and provided significantly better fit than the one-factor model. Additionally, correlations revealed a significant positive relationship between the Healthy Eating factor and weight status and no direct relationships between the two factors and BMI. Limitations and future directions for research and use of the measure were discussed.

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List of Abbreviations

CDC	Centers for Disease Control and Prevention
HRQoL	Health Related Quality of Life
BMI	Body Mass Index
USDA	United States Department of Agriculture
TLD	Traffic Light Diet
TTM	Transtheoretical Model
SE-HEPA	Self-Efficacy for Healthy Eating and Physical Activity
CFA	Confirmatory Factor Analysis
CFI	Comparative Fit Index
SRMR	Standardized Root Mean Square Residual
RMSEA	Root Mean Square Error Approximation
SEM	Structural Equation Modeling

Introduction

Obesity has become one of the primary health concerns in the United States (Vivier & Tompkins, 2008), and currently more than one-third of all American adults are classified as obese (Ogden et al., 2006). Even more shocking is that almost 45% of African American adults can be classified as obese (Flegal, Carrol, Ogden, & Curtin, 2010). Unfortunately, this problem extends to children and adolescents as well as adults, and the rate at which youths are becoming obese is particularly alarming. For example, the prevalence of childhood obesity has steadily risen over the past two decades (Freedman, Khan, Serdula, Ogden, & Dietz, 2006); with almost 32% of youths being currently defined as overweight or obese (Ogden, Carroll, Kit, & Flegal, 2012). In addition to the general child population, certain racial and ethnic groups have been found to be at greater risk for developing obesity. Recent epidemiological studies have shown that almost 39% of African American children between the ages of 6 and 19 years can be classified as overweight or obese (Ogden, Carroll, Curtin, Lamb, & Flegal, 2010).

These statistics become particularly worrisome when one considers that the physical consequences of childhood and adolescent obesity are numerous, such as cardiovascular disease, hypertension, increased metabolic syndrome, asthma, hyperlipidemia, elevated blood pressure, and Type-2 diabetes (Annesi, 2006; Dietz, 1998; Banis & Varni, 1988; Weiss et al., 2004; Whitlock, Williams, Gold, Smith, & Shipman, 2005; Wright, Parker, Lamont, & Craft, 2001). Unfortunately, research also indicates that African American children have disproportionately higher rates of obesity-related health problems, such as diabetes and cancer (American Cancer Society, 2011; Centers for Disease Control and Prevention (CDC), 2011). Because African

American youth are at greater risk for the negative physical consequences of obesity (Strauss & Polluck, 2001) and African American children are becoming obese at a much faster rate than their Caucasian counterparts, this particular population has been targeted by researchers who are interested in ameliorating the negative impact obesity can have on the physical health of children (Freedman et al., 2006).

Along with physical consequences, youth with obesity are more likely than their recommended weight peers to struggle with psychosocial problems, such as lower health- related quality of life (HRQoL; Shoup, Gattshall, Dandamudi, & Estabrooks, 2008; Tsiros et al., 2009; Vivier & Tompkins, 2008; Zeller & Modi, 2006). For example, previous research has established that levels of HRQoL for youth with obesity are similar to those diagnosed with cancer (Schwimmer, Burwinkle, & Varni, 2003). Additionally, research suggests that obese children have poorer self-perception, are less socially competent, and have more negative family interactions than non-obese children (Banis & Varni, 1988). Further, these psychological consequences may be even more prevalent in African American children and adolescents. For example, previous research has found that adolescent Body Mass Index (BMI) was positively associated with depressive symptoms in a sample of African American females, ages 14-19 years (Kowaleski-Jones & Christie-Mizell, 2010). The same study indicated that BMI was more strongly related to depressive symptomatology in African American females than their Caucasian counterparts (Kowaleski-Jones & Christie-Mizell, 2010). Furthermore, similar research indicates that African American children report greater weight-related stress and body dissatisfaction than same weight Caucasian children (Young-Hyman, et al., 2006).

Given the tremendous physical and psychological consequences associated with obesity in childhood and adolescence, it is no surprise that researchers have focused on gaining a better understanding of the obesity epidemic. In terms of etiology, potential causes of childhood obesity include low physical activity levels, increased sedentary behavior, and unhealthy eating behaviors (Epstein, Wing, Koeske, & Valoski, 1988). For example, numerous studies have established that a child's physical activity level is an important predictor of weight status (Biddle, Gorely, & Stensel, 2004; Bouchard, 2001; Hill & Peters, 1998; Wilson & Meyers, 2009), leading the CDC to recommend that youth engage in at least 60 minutes of moderate-intensity exercise each day (CDC, 2011). Furthermore, studies have shown that increased levels of physical activity can both reduce BMI and raise quality of life in youth with obesity (Dalton, Schetzina, Pfortmiller, Slawson, & Frye, 2011; Foreyt & Poston, 1999; Wiltink et al., 2007).

Research comparing physical activity levels of African American and Caucasian youth has shown mixed results. Studies using self-report data have shown that African American children engage in less physical activity and more sedentary behavior than Caucasian children (Anderson, Crespo, Bartlett, Cheskin, & Pratt, 1998; CDC, 2002; Gordon-Larsen, Adair, & Popkin, 2002), while recent studies using more objective measures of physical activity have shown support for the opposite trend (Belcher et al., 2010; Newton et al., 2011; Pate, Pfeiffer, Tost, Ziegler, & Dowda, 2004; Troiano et al., 2008). Because, physical activity is such an important factor for maintaining a healthy weight/weight loss, and physical activity patterns among African American children appear unclear, future research in this area is warranted.

In addition to physical activity, healthy eating behaviors such as fruit and vegetable consumption have also been associated with healthier weight status (Alinia, Hels, & Tetens, 2009; Buijsse et al., 2009). Specifically, increased consumption of fruits and vegetables have been found to be a beneficial component of weight management programs, associated with both weight loss and maintenance of weight loss (Rolls, Ello-Martin, & Tohill, 2004; Tohill, Seymour, Serdula, Kettel-Khan, & Rolls, 2004). Higher vegetable intake has also been associated with a decrease in BMI and waist circumference even at 10 year follow-up among both men and women (Kahn, Tatham, Rodriguez, Calle, Thun, & Heath, 1997). The impact of fruit and vegetable consumption on weight status has also been established in children and adolescents. For example, the National Health and Nutrition Examination Survey (NHANES) found that fruit and vegetable intake was associated with lower levels of body fat in youth (Bradlee, Singer, Qureshi, & Moore, 2009). Another study utilizing an African American sample of children showed that participants who reported very low preferences for fruit and vegetables were 5.5 times more likely to be categorized as at risk for overweight or overweight than those who reported high preferences (Lakkakula, Zanovec, Silverman, Murphy, & Tuuri, 2008). In addition to these findings, previous research has shown concerning results regarding the consumption of fruits and vegetables in African American youth. One study examining health attitudes and behaviors of African American adolescents showed that not only did African American adolescents have poor fruit and vegetable intake, but only 29% felt it was a very good idea to have a balanced diet, and only 25% reported being moderately or very likely to eat a balanced diet in the next three months (Lewis-Moss, Paschal, Redmond, Green, & Carmack, 2008). Another study inspecting nutritional knowledge showed that African American adolescents consumed significantly less fruits and vegetables and scored significantly lower on a nutrition quiz about fruit and vegetable consumption than their Caucasian counterparts (Beech, Rice, Myers, Johnson, & Nicklas, 1999). Based on these studies, it is no surprise that the USDA currently recommends regular servings of fruits and vegetables each day (Dietary Guidelines for Americans, 2005)

Because research, such as the aforementioned studies, have found that physical activity and healthy eating behaviors are important to weight status and weight loss, current approaches to weight management with children include a multifaceted approach. Empirically derived pediatric obesity treatments tend to include physical activity and nutrition recommendations (Christian, 2011). In fact, the most effective treatment methods to date for treating pediatric obesity involve a combination of nutrition education, physical activity education, and a behavioral component within the context of a family-based treatment program. One such treatment is the Traffic Light Diet (TLD; Epstein, 1988), which is a family-based weight loss program that has evidenced some of the most impressive outcomes for pediatric weight loss (Epstein, Paluch, Beecher, & Roemmich, 2008). Follow-up studies of Epstein’s TLD have shown that five and ten years after program completion, parents and children show significantly greater decreases in percentage overweight than control groups (Epstein, Valoski, Wing, & McCurley, 1990). Furthermore, after a 10 year follow-up, almost 30% of participants were no longer obese (Epstein, Valoski, Wing, & McCurley, 1994). Unfortunately, although there is a rich body of literature that examines the efficacy of weight loss programs among Caucasian samples, few studies exist that have evaluated the effectiveness of this type of treatment with African American children (Kumanyika et al., 2005). This line of research can be seen as a crucial next step in the battle against pediatric obesity.

Effective weight loss only occurs when the individual actually engages in the behaviors found to effectively reduce weight (e.g., physical activity, healthy eating). In terms of family-based interventions, previous research indicates that more adherent families have children who experience greater weight loss (Steele, Steele, & Hunter, 2009). Thus, researchers have begun focusing on improving adherence rates in this population, within the context of family-based intervention, in an effort to improve child outcomes. In an effort to improve existing weight loss treatment and adherence, an Expert Committee comprised of 15 professional organizations was appointed in 2005 to review the literature and recommend approaches for prevention, assessment, and treatment of childhood obesity (Barlow & Expert Committee, 2007). The Expert Committee recommended that to improve adherence, standard protocols should evaluate parent and child "readiness to change" within the context of family-based behavioral pediatric obesity treatment programs (Spear et al., 2007). This would allow clinicians to identify participants who are less ready to change, and treatment strategies could be utilized to enhance the individual's readiness to change important weight loss behaviors. This could ultimately increase adherence levels among participants, which would then subsequently improve health outcomes for this population. In an effort to reach this goal a great deal of research is needed, and much can be gained from a careful examination of parallel lines of research among other illness populations.

Although several theories exist that conceptualize readiness to change, perhaps the best documented is the Transtheoretical Model of behavior change (TTM; Prochasksa & DiClemente, 1983). The TTM describes the process of change and how an individual progresses through different stages of readiness towards adopting a new healthier behavior. The TTM integrates several constructs such as the stages of change, decisional balance, and self-efficacy to describe and explain how and when individuals change their behavior. According to the TTM, change is a process involving a series of *stages of change*. These stages include a spectrum of readiness, from people who have no intention to change their behavior to those who have made modifications in their behavior and are working to prevent relapse. *Decisional balance* refers to a person's perception of the specific advantages and disadvantages of making a change, and varies depending on an individual's stage of change. Finally, *self-efficacy* was adapted from Bandura's social learning theory (Velicer, Prochaska, Fava, Norman, & Redding, 1998), and can be described simply as the confidence an individual has in his or her ability to change a specific behavior. These different components are frequently used as a way to describe an individual's readiness to change, and a great deal of research exists that examines how these constructs relate to important health behaviors.

Several studies exist that utilize the aforementioned constructs to better understand behavior change among a variety of populations. For example, a recent review by Byrne (2002) found that self-efficacy is a helpful predictor of weight loss behaviors. Linde and colleagues (2006) showed that self-efficacy for physical activity and healthy eating was significantly related to actual weight loss behaviors and weight loss among a sample of overweight adults. Similarly, studies utilizing adult samples found that exercise-related self-efficacy was associated with the adoption and maintenance of actual exercise behavior during an intervention directed at reducing sedentary behavior (McAuley, Courney, Rudolph, & Lox, 1994; McAuley et al., 2011). Additional studies among overweight and obese adults indicate that higher levels of self-efficacy predict greater weight loss for individuals participating in weight loss interventions (Dallow & Anderson, 2003; Wiltink et al., 2007). Further research among a sample of African American adults indicated that self-efficacy for healthy eating was associated with actual fruit and vegetable consumption (Watters, Satia, & Galanko, 2007). Perhaps more germane to the current investigation, a similar study showed that self-efficacy for physical activity was associated with actual physical activity levels in African American children (Kitzman-Ulrich, Wilson, Van Horn, & Lawman, 2010). To improve weight loss treatment and the implementation of healthy behaviors such as fruit and vegetable consumption and exercise, the association of self-efficacy with healthy eating and physical activity must be further elucidated.

Consistent with the aforementioned literature, researchers have begun studying the effects of modifying self-efficacy levels among different health populations, within the context of treatment, as a means for improving adherence to specific behavioral recommendations. For example, in a recent study among adults with type-2 diabetes, participants who were provided with self-efficacy enhancing counseling sessions, reported lower usage of health services and hospital visits as well as higher levels of self-care behaviors than a control group who received no intervention (Wu et al., 2011). Researchers have also begun to modify levels of self-efficacy to improve adherence and treatment outcomes in the area of weight loss. One such study involved evaluating the effectiveness of an intervention designed to reduce sedentary behaviors in a sample of middle aged adults (McAuley et al., 1994). Results indicated that the treatment group demonstrated better adherence to the program's treatment recommendations, spent more time engaging in exercise, and walked greater distances than the control group. While researchers have begun to examine the effect of modifying self-efficacy on weight loss behaviors among Caucasian samples, virtually no research exists that examines these questions among African American children. Again, further research in African American children is warranted.

Although a careful examination of the literature supports the need for more research related to self-efficacy among African American children, important limitations exist that may prevent research from progressing in this area. Because there is a lack of child-specific self-efficacy weight loss measures, this line of research has been significantly hampered. Due to the lack of such valid instruments, it has been difficult to assess this construct effectively among children. Addressing this need, Young and colleagues (2012) recently developed and validated a self-report measure of self-efficacy for healthy eating and physical activity behaviors. The Self Efficacy for Healthy Eating and Physical Activity scale (SE-HEPA: see Appendix A) was modified from an existing measure of exercise-specific self-efficacy for pre-adolescents (Motl et al., 2000). Because the original measure includes items for evaluating exercise-specific self-efficacy only, and healthy eating is crucial for effective weight loss, Young and colleagues (2012) designed a 16-item single measure with parallel subscales to measure both physical activity- and healthy eating-specific self-efficacy.

The initial validation study for the SE-HEPA involved performing analyses to determine if the factor structure of the instrument was consistent with the original design of the SE-HEPA. Using an exploratory analysis in a confirmatory factor analysis framework with a sample of 319 middle school pre-adolescents, Young and colleagues (2012) found that items for physical activity and healthy eating properly loaded onto their respective factors, and a two factor model of self-efficacy provided good global fit (i.e., physical activity and healthy eating factors). However, analyses indicated that two of the items (i.e. "I can ask my parent or other adult to do physical activity things with me" "I can ask my best friend to eat healthy with me on most days.") failed to show discriminant validity. This lack of discriminant validity was thought to be a result of the fact that these particular items ask the respondent about engaging another person in healthy behaviors, rather than the respondent's own behaviors. Consequently, these items were dropped from both scales, modifying the SE-HEPA into a 12-item measure. Analyses indicated that the 12-item SE-HEPA showed good convergent and discriminant validity.

Further analyses of the SE-HEPA showed that high levels of healthy eating- and physical activity-specific self-efficacy were associated with lower BMI scores among pre-adolescents in the sample. This represents an important milestone in this line of research, due to the previous lack of measures of self-efficacy for weight loss behaviors, and may have important implications for treatment in youth with obesity. However, one limitation of this study is that the sample was predominantly (90%) Caucasian. Again, it is imperative that measures such as the SE-HEPA be validated among an African American sample.

Proposed Study

Recent research has highlighted the important relationship among physical activity, healthy eating behaviors, and healthy weight status (Iannotti & Wang, 2013). An alarming increase in pediatric obesity has necessitated a better understanding of factors that may contribute to adopting these healthy lifestyles. This is particularly true for African American youth, given the unique statistics and physical and psychological consequences associated with this demographic group (Strauss & Polluck, 2001). Self-efficacy, from the perspective of "readiness to change" in the Transtheoretical Model, has become a critical construct for understanding behavior change among a variety of health populations (Byrne, 2002; Linde, et al., 2006). Until recently, the field lacked a psychometrically sound instrument designed to assess self-efficacy for healthy eating and physical activity among children and adolescents. By validating the SE-HEPA among racial and ethnic groups, it will become possible to develop a better understanding of how readiness to change impacts weight loss relevant behaviors within a population that is particularly at risk for developing weight related problems. Ultimately, the validating the SE-HEPA among this population may lead to culturally-sensitive pediatric obesity treatment programs that are designed to enhance self-efficacy. Increasing self-efficacy may then in turn increase adherence among participants in such treatment programs, which would then improve health outcomes for this population. This study seeks to add to the body of literature concerning readiness to change by assessing the factor structure, internal consistency, and concurrent validity of the SE-HEPA in a sample of pre-adolescents from ethnic minorities.

Hypotheses

Consistent with findings from Young and colleagues (2012), it was hypothesized that a two-factor model of the 12-item SE-HEPA would show the best global fit, relative to a one-factor solution in a predominantly African-American sample of youth living in the Southeastern United States. These two factors were expected to align conceptually with Healthy Eating and Physical Activity and possess adequate internal consistency. Finally, research has shown that self-efficacy has predictive utility regarding weight loss behaviors. Therefore, it was hypothesized that both factors of the SE-HEPA would be associated with BMI and weight status in this sample. Specifically, it was hypothesized that higher SE-HEPA scores would be associated with healthier BMI scores and weight status.

Method

Participants and Procedures

Participants in the current study were predominantly African American pre-adolescents recruited from a public middle school in Eastern Alabama. All participants completed a research packet and were measured to assess height, weight, and BMI. The participants' packet included the Self Efficacy-Healthy Eating and Physical Activity (SE-HEPA; Young et al., 2012), as well as questionnaires assessing demographics. Students completed all measurements and questionnaires in the school gymnasium during their regularly scheduled physical education classes, and were directed to stations for each section of the data collection. For example, students would begin by completing questionnaires while sitting on the gymnasium bleachers, and then would be called across the gym to have their height, weight, and BMI assessed. To maintain privacy and confidentiality, each student's research packet was given a coded number rather than a name, and the height, weight, and BMI stations were located where other students could not see or hear individual results.

Of the approximately 300 students who were invited to take part in the study, 88 obtained parental consent and child assent, and were eligible to participate. Age of participants ranged from 12-15 years (M = 13.07, SD = .74). Specifically, approximately 22% were age 12 years, 52% were age 13 years, and 24% of participants were age 14 years. Thirty-six of the students were in the 7th grade, 52 were in the 8th grade, and 58% were female. The current reported school enrollment states that 99% of students can be described as African-American and of lower socioeconomic status (i.e., 99% are eligible for free or reduced lunch). This report is consistent with student-reported demographics, in which 98% of students endorsed their ethnicity as Black or Bi-racial and 1.1% of students endorsed American Indian. Although 88 students participated in this study, one student did not complete the SE-HEPA portion of their research packet and was dropped from analyses.

Measures

Demographics: Students were asked to provide information pertaining to their age, gender, and ethnicity (please see Appendix A).

Weight Status: The CDC uses Body Mass Index (BMI) as an indicator of body fatness for children and adults. BMI is an objective measure of human body shape based on an individual's height and weight as it relates to the general population. To determine BMI in this study, students first had their heights and weights measured, and informed researchers of their sex and age. This information was plotted on the 2000 CDC age- and sex-specific growth charts for the United States, which indicates the relative position of each student's BMI among children of the same sex and age in the country and gives them a BMI percentile rank. The CDC uses percentile ranks to determine what percentile a certain BMI score falls under for each age and sex combination. These percentile ranks are then used to form five weight class categories: underweight (BMI scores under 5^{th} percentile), recommended weight (BMI scores at the 5^{th} to less than the 85^{th} percentile), overweight (BMI scores at the 85^{th} to less than 95^{th} percentile), obese (BMI scores at the 95^{th} to less than the 97^{th} percentile), and extremely obese (BMI scores at or above the 97^{th} percentile).

Self-efficacy: Students completed the Self Efficacy for Healthy Eating and Physical Activity scale (SE-HEPA; Young et al., 2012) to assess healthy eating- and physical activity-specific self-efficacy. This form evaluated the pre-adolescents' confidence in their ability to engage in physical activity and eat healthy foods. Using recommendations from Young and colleagues (2012), this measure was adapted from a 16-item measure to a 12-item measure consisting of six healthy eating questions and six physical activity questions, based on the original validation study for the instrument. Each question is presented on a five-point Likert scale ranging from "Strongly Disagree" to "Strongly Agree." This measure has shown good internal consistency (Physical activity items: $\alpha = 0.738$, Healthy eating items: $\alpha = 0.835$), good convergent and discriminant validity, as well as good predictive validity for BMI among preadolescents. Please see Appendix B for an example of this measure.

Results

Weight Status

Based on CDC-recommended procedures described above, 0% of students were categorized as underweight, 50% as recommended weight, 19.3% as overweight, 8% as obese, and 22.7% of students as extremely obese. Weight status categorized by gender is shown in Table 1. In the current sample, the mean BMI percentile for preadolescents was 75.94 (SD = 23.32), 75.54 (SD = 24.31) for males, and 76.23 (SD = 22.81) for females. These mean BMI Percentiles correspond to the recommended weight range for the combined gender sample. However, median BMI Percentiles fall in the overweight range for males (85), and almost overweight for the combined sample (84.5) and females (84). Percentiles for BMI by sex and age are provided in Table 2.

Preliminary Item Analyses

Table 3 shows the means, standard deviations, skewness and kurtosis values for the 12 items from the SE-HEPA. Skewness and kurtosis were both at an acceptable level although item values were skewed towards higher scores on the SE-HEPA. Bivariate correlations of the SE-HEPA items are provided in Table 4, and exhibit significant correlations between almost all items. Overall means of self-efficacy for both the Healthy Eating and Physical Activity factors were slightly above 3.5 on the 5-point scale, which represents most scores falling between "neither agree nor disagree" and "somewhat agree." Cronbach's alphas were calculated for the Healthy Eating and Physical Activity factors of the SE-HEPA. The Healthy Eating factor demonstrated good internal consistency ($\alpha = .77$), while the Physical Activity factor exhibited acceptable internal consistency (α = .72). These scores were commensurate with the past finding of good reliability in Young and colleagues (2012) study (i.e. Healthy eating: α = .84; Physical Activity: α = .74).

Factor Analysis

Two confirmatory factor analyses were conducted to evaluate potentially competing models of the SE-HEPA, reflecting the previous two-factor model used in Young and colleagues (2012), versus a one-factor model of self-efficacy. Models were evaluated using Maximum Likelihood Estimation. AMOS 20 was used to perform a CFA to test the fit between the two factor model of the SE-HEPA and the data (Figure 1). Multiple criteria were used to assess goodness of fit between the proposed model and the obtained data. These criteria included: Comparative Fit Index (CFI; Bentler, 1990), Standardized Root Mean Square Residual (SRMR; Byrne, 1998), and the Root Mean Square Error Approximation (RMSEA; Steiger, 1990). Acceptable model fit for the CFI index is typically set at a score of 0.95 or higher, while well-fitting models obtain SRMR values of less than .05 (Hu & Bentler, 1999). RMSEA values of 0.06 or less are indicative of acceptable model fit (Brown, 2012).

The proposed two-factor model of the SE-HEPA did not provide an acceptable global fit ($\chi^2(53) = 85.4$; $p = .003$, CFI = .87, SRMR = .07, RMSEA = .08, 90% CI = .05-.12). Standardized and unstandardized factor loadings for the two-factor model of the SE-HEPA are available in Table 5. All loadings met the recommended guideline of 0.4 with the exception of Item 2 on the Physical Activity subscale, which had a loading of 0.37 (Brown, 2012).

A CFA of a single model of self-efficacy was conducted to determine if this model may potentially be more parsimonious. Consistent with study hypotheses, the one factor model demonstrated poor global fit ($\chi^2(54) = 98.0$; $p < .001$, CFI = .82, SRMR = .08, RMSEA = .10, 90% CI = .07-.13). Additionally, a chi-square difference test was conducted to determine if the two-factor model provided significantly greater fit than the single-factor model. This test was achievable considering the two-factor model is nested in the one-factor model. The chi-square difference test was significant ($\chi^2(1) = 12.6$) at $p = .05$, suggesting that model fit was significantly worsened by constraining the two-factors of self-efficacy into one factor.

Relation of BMI and Weight Status to Healthy Eating and Physical Activity Factors

Our study aimed to determine if the latent factors of the SE-HEPA were associated with BMI and weight status. Hypotheses were evaluated using a structural equation modeling (SEM) approach, conducted in Mplus, version 7 (Muthén & Muthén, 2007). BMI and the latent factors of the SE-HEPA were evaluated in the measurement model and the maximum likelihood estimator was used in our analysis. Corresponding measurement and structural models were specified and suggested acceptable fit ($\chi^2(63) = 93.3$, $p = .008$, CFI = .86, SRMR = .07, RMSEA = .07, 90% CI = .039-.105). The correlations between BMI with the Healthy Eating and Physical Activity factors were not significant (Healthy Eating: r = .054, $p = .458$; Physical Activity: r = .036, $p = .606$). To test the concurrent validity of the two factors, a latent structural regression analysis was conducted in this model to determine if Healthy Eating and Physical Activity were associated with BMI (Figure 2). Results of this structural analysis revealed that neither factor had a significant direct relationship with BMI (Healthy Eating: β = .052, *p* = .637; Physical Activity: β = .003, *p* = .977).

SEM was again used to evaluate weight status with the latent factors of the SE-HEPA (Figure 3). Since weight status is classified as categorical, the weighted least squares estimator was used. Corresponding measurement and structural models were specified and suggested acceptable fit to the data ($\chi^2(63)$ = 101.5, p = .002, CFI = .83, RMSEA = .048, 90% CI = .030-.065). Results from this model demonstrated that neither factor had a significant correlation with weight status (Healthy Eating: r = .047, *p* = .538); Physical Activity: r = .038, *p* = .643). To examine the concurrent validity of the SE-HEPA, a structural model was fit to the data and a structural regression analysis was conducted (Figure 3). Results of this analysis indicated that neither latent factor of the SE-HEPA is significantly associated with weight status. (Healthy Eating: β = .039, *p* = .719; Physical Activity: β = .012, *p* = .915).

Discussion

This study was designed to further validate a measure of self-efficacy for healthy eating and physical activity in a sample of African American pre-adolescents. The concept of self-efficacy having positive outcomes for weight loss treatments is based on the Transtheoretical Model of change (Prochaska & DiClemente, 1983). This model has been used in interventions for a variety of health issues to assist in long-term behavior change. Because self-efficacy is amenable to change, it may serve an important role in weight loss treatment if well validated. Although the SE-HEPA has been validated in a primarily Caucasian sample, it has not been examined in other ethnicities. The primary goal of this study was to further validate the SE-HEPA by examining the reliability of the instrument as well as its construct and concurrent validity in a sample of African American pre-adolescents.

The first hypothesis, which examined the fit of the two-factor SE-HEPA model, was not supported in the current investigation. The SE-HEPA was modified based on recommendations by Young and colleagues (2012) to remove two items from the Healthy Eating and two items from the Physical Activity sections of the measure, which transformed the SE-HEPA into a 12-item measure. Confirmatory factor analysis indicated that the two-factor model of SE-HEPA did not provide good global fit for the total sample, which is inconsistent with previous findings by Young and colleagues (2012). A second confirmatory factor analysis demonstrated that the single-factor model of the SE-HEPA had poor global fit; however, a Chi-square analysis revealed that the two-factor model had significantly greater fit than the single-factor model. This inconsistency between the findings of Young and colleagues (2012) and the current study indicates that the SE-HEPA scale may not be a valid measurement for assessing self-efficacy in both Caucasian and African American samples. Another potential and more likely reason for inconsistent findings is the small sample size of the current study, creating a lack of statistical power. Using tables from MacCallum, Browne, and Sugawara (1996), power was estimated to assess how likely the fit indices in this study could detect good fit. Power for tests of not close fit in this study were close to .261, demonstrating a low probability of finding that fit was excellent. Therefore, it is difficult to determine whether this model lacked appropriate fit or if fit may have been appropriate, but there was not enough power for it to be detected.

The hypothesis that the SE-HEPA would demonstrate adequate internal consistency in a sample of African American pre-adolescents was supported. Reliability coefficients of .77 for the Healthy Eating-specific scale and .72 for the Physical Activity-specific scale were obtained. These results were commensurate with previous reported alphas of .84 for Health Eating- and .74 for Physical Activity-specific scales by Young et al. (2012), indicating good and acceptable levels of internal consistency, respectively.

Finally, the hypothesis that the SE-HEPA would be associated with BMI and weight status in African American pre-adolescents was not supported. Structural equation modeling (SEM) was used to evaluate the relationship between the Healthy Eating and Physical Activity subscales and BMI. Correlations and direct relationships between the latent factors of the SE-HEPA and BMI were not significant. Similarly, no correlation or direct relationships were found between weight status and the latent factors of the SE-HEPA. This finding is inconsistent with that of Young and colleagues (2012), who found that higher Healthy Eating and Physical Activity scores on the SE-HEPA was associated with lower BMI scores in a primarily Caucasian sample. Similar to the current study, Young and colleagues (2012) did not find either of the SE-HEPA factors to significantly predict BMI scores in a latent structural regression analysis.

One potential reason that BMI and weight status were not associated with the SE-HEPA scale in the current study may be the disproportionate amount of students who were overweight or obese. Although there is a strikingly high amount of students in this sample who were overweight or obese, this finding is consistent with studies showing that African American children are at greater risk of being overweight or obese than other ethnic and racial groups

(Ogden, et al., 2010). However, because higher weight status has been associated with lower levels of physical activity, students in this sample may assume these lower levels to be normative, given the disparate amount of overweight and obese students in their school, and inaccurately assume they are regularly physically active. Research in adults has shown that those with higher levels of BMI significantly overestimate their physical activity levels when compared to their recommended weight counterparts (Irwin, Ainsworth, & Conway, 2001; Norman, Bellocco, Bergstrom, & Wolk, 2001). This trend may also occur in African American pre-adolescents, and in turn may cause overweight and obese students to endorse higher levels of self-efficacy due to a misperception of their health behaviors.

Another explanation for the lack of concurrent validity found in the current study, and the SE-HEPA not predicting BMI in Young and colleagues' (2012) findings, is that other constructs in the Transtheoretical model may be better suited to predict BMI or weight status in African American pre-adolescents. For example, items on the Decisional Balance scale ask about one's perception of advantages and disadvantages to healthy eating and physical activity, rather than their belief that they have the ability to engage in a specific behavior. It may be that students in this sample who are of higher weight status may know that they "can be physically active," as worded on the SE-HEPA, but perhaps there is a culturally-based reason they choose not to such as different values on weight status and body image. Therefore, tapping into the motivation behind engaging in health behaviors, which is captured by the perceptions of advantages and disadvantages in the Decisional Balance scale, may demonstrate more utility than the SE-HEPA in African American pre-adolescents. This ability to examine the impetus behind health behaviors has been demonstrated in a study of adult African American women, where items from a decisional balance scale were associated with cognitive and motivational attitudes about weight loss (Hawkins, Hornsbury, & Schorling, 2001). Even more beneficial may be the stages of change construct of the Transtheoretical model. Stages of change items ask how regularly one eats healthy and is physically active, which may be indicative of actual health behaviors, and better predict BMI and weight status in African American pre-adolescents. Studies in adult African American women indicate that those with higher stages of change reported significantly greater intake of fruits and vegetables were more likely to be physically active than those in lower stages (Henry, Reimer, Smith, & Reicks, 2006). This same finding may prove true when tested in African American pre-adolescents.

Limitations and Future Research

Certain limitations should be noted when interpreting the findings of the current study. First, because of the small sample size of 88 participants in this study, a lack of power may have led to Type II errors in the interpretation of model fit indices. According to MacCallum, Browne, and Sugawara (1996), because the SE-HEPA model had 53 degrees of freedom, to achieve a power of 0.8 for a test of close fit, the study needed 200-214 participants. Further, to examine tests of not close fit, the study would need between 253-268 participants. Future studies should address this issue by having the necessary sample size for appropriate power in their analyses.

Second, due to sample size, model fit and concurrent validity were not assessed specifically for males and females. Future research may mitigate this problem by extending the grade levels examined and using multiple sites for data collection. This will allow for gender-specific analyses to be conducted and may assist researchers in determining if excessive rates of overweight and obesity are unique to this site or a regional trend. Further, this sample may not be representative of other samples with similar demographics. The markedly high percentage of students who were overweight or obese, the majority of who were extremely obese, is atypical when compared to state and national averages for African American children and adolescents (Ogden et al., 2010). This may cause limited generalizability to similar samples and require some findings to be interpreted with caution.

Due to the cross-sectional nature of this research design, we are unable to determine how weight change may affect self-efficacy over time in this sample and the predictive validity of the SE-HEPA. Longitudinal methodology may provide more insight into the associations between these two variables as well as shed light on the test-retest stability of the measure. Future studies may also begin to assess the SE-HEPA in other ethnicities such as Hispanic or Latino children and adolescents. This research is necessary due to the influence that self-efficacy may have upon nutrition and physical activity among racial and ethnic minority children and adolescents (Sallis, Prochaska, & Taylor, 2000). Further, these assessments of the SE-HEPA may allow for between group comparisons of different ethnic groups and allow researchers to determine potential characteristics or distinctions which may be beneficial in the treatment of obesity. Greater awareness of the determinants of obesity, barriers to treatment, beliefs about weight status and healthy behaviors among ethnic populations may assist clinicians in the treatment of obesity by developing ethnically and culturally appropriate strategies (Pena, Dixon, & Taveras, 2012). For example, knowing culturally based beliefs such as a family's belief that a child's size is fixed or that their child can "grow out of it" can inform treatment and prevent excess weight gain (Jain, et al., 2001).

The results of this study may guide future research in understanding the relationship between healthy eating- and physical activity-specific self-efficacy and health outcomes among children and adolescents. It may also assist cross-cultural pediatric weight loss intervention strategies by targeting self-efficacy to increase physical activity and healthy eating. For example, examining the role of self-efficacy in family-based weight loss interventions for children and adolescents would be an important next step in this line or research. Further validation of this scale may also broaden the current literature on the treatment of obesity and improve family-based behavioral interventions for a wider range of overweight and obese children and adolescents, specifically in racial and ethnic groups.

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Table 1

Percentage in Weight Status Category by Gender

	Underweight	Recommended Weight	Overweight	Obese	Extremely Obese
Males	0	48.6	18.9	8.1	24.4
Females	0	51	19.6	7.8	21.6

Table 2

Percentiles for BMI by sex and age

	Mean BMI Percentile Rank	Weight Status	N
Males age 12 years	73^{rd}	Recommended Weight	9
Females age 12 years	69^{th}	Recommended Weight	10
Males age 13 years	73^{rd}	Recommended Weight	17
Females age 13 years	79^{th}	Recommended Weight	29
Males age 14 years	86^{th}	Overweight	10
Females age 14 years	78^{th}	Recommended Weight	11
Males age 15 years	27^{th}	Recommended Weight	1
Females age 15 years	44^{th}	Recommended Weight	1

Table 3
Normality of SE-HEPA Items

Item	Mean	S.D.	Skewness	Kurtosis
Physical Activity 1	4.02	1.32	-1.32	0.51
Physical Activity 2	3.45	1.41	-0.46	-1.09
Physical Activity 3	3.29	1.42	-0.38	-1.18
Physical Activity 4	3.40	1.48	-0.53	-1.13
Physical Activity 5	3.47	1.46	-0.55	-1.49
Physical Activity 6	2.91	1.48	0.10	-1.41
Healthy Eating 1	3.07	1.16	-1.37	1.24
Healthy Eating 2	3.63	1.28	-0.71	-0.42
Healthy Eating 3	3.34	1.32	-0.42	-0.86
Healthy Eating 4	3.48	1.33	-0.53	-0.85
Healthy Eating 5	3.80	1.45	-0.88	-0.62
Healthy Eating 6	3.54	1.53	-0.56	-1.14

Table 4

Bivariate Correlations between SE-HEPA Variables

Variable	SEHE 1	SEHE 2	SEHE 3	SEHE 4	SEHE 5	SEHE 6	SEPA 1	SEPA 2	SEPA 3	SEPA 4	SEPA 5	SEPA 6
SEHE 1	1.00											
SEHE2	.54**	1.00										
SEHE3	.30**	.27*	1.00									
SEHE4	.36**	.36**	.28**	1.00								
SEHE5	.33**	.12	.33**	.42**	1.00							
SEHE6	.33**	.46**	.34**	.48**	.45**	1.00						
SEPA1	.46**	.29**	.27**	.27**	.33**	.35**	1.00					
SEPA2	.14	.10	.07	.25*	.16	.22*	.38*	1.00				
SEPA3	.20	.19	.27*	.27*	.12	.44**	.36**	.27**	1.00			
SEPA4	.17	.16	.20	.33**	.37**	.40**	.30**	.22*	.42**	1.00		
SEPA5	.33**	.21*	.20	.42**	.23*	.19	.25*	.21	.42**	.38**	1.00	
SEPA6	.23*	.21	.28**	.23*	.19	.44**	.28**	.03	.49**	.28**	.24*	1.00

**p* < .05, ** *p* <.001

Table 5

Factor Loadings for the Two Factor Solution of the SE-HEPA

Predictor	B (SE B)	β
SEHE1	1.00	.52*
SEHE2	1.06 (.24)	.50*
SEHE3	1.06 (.31)	.49*
SEHE4	1.44 (.36)	.66*
SEHE5	1.37 (.37)	.57*
SEHE6	1.92 (.45)	.76*
SEPA1	1.000	.57*
SEPA2	.70 (.25)	.37
SEPA3	1.31(.28)	.70*
SEPA4	1.19 (.29)	.60*
SEPA5	1.05 (.28)	.54*
SEPA6	1.08 (.28)	.55*
SEHE with SEPA	.35 (.12)	.78*

Note. $R^2 = .78$. *$p < .05$

Figure 1. Two Factor CFA model

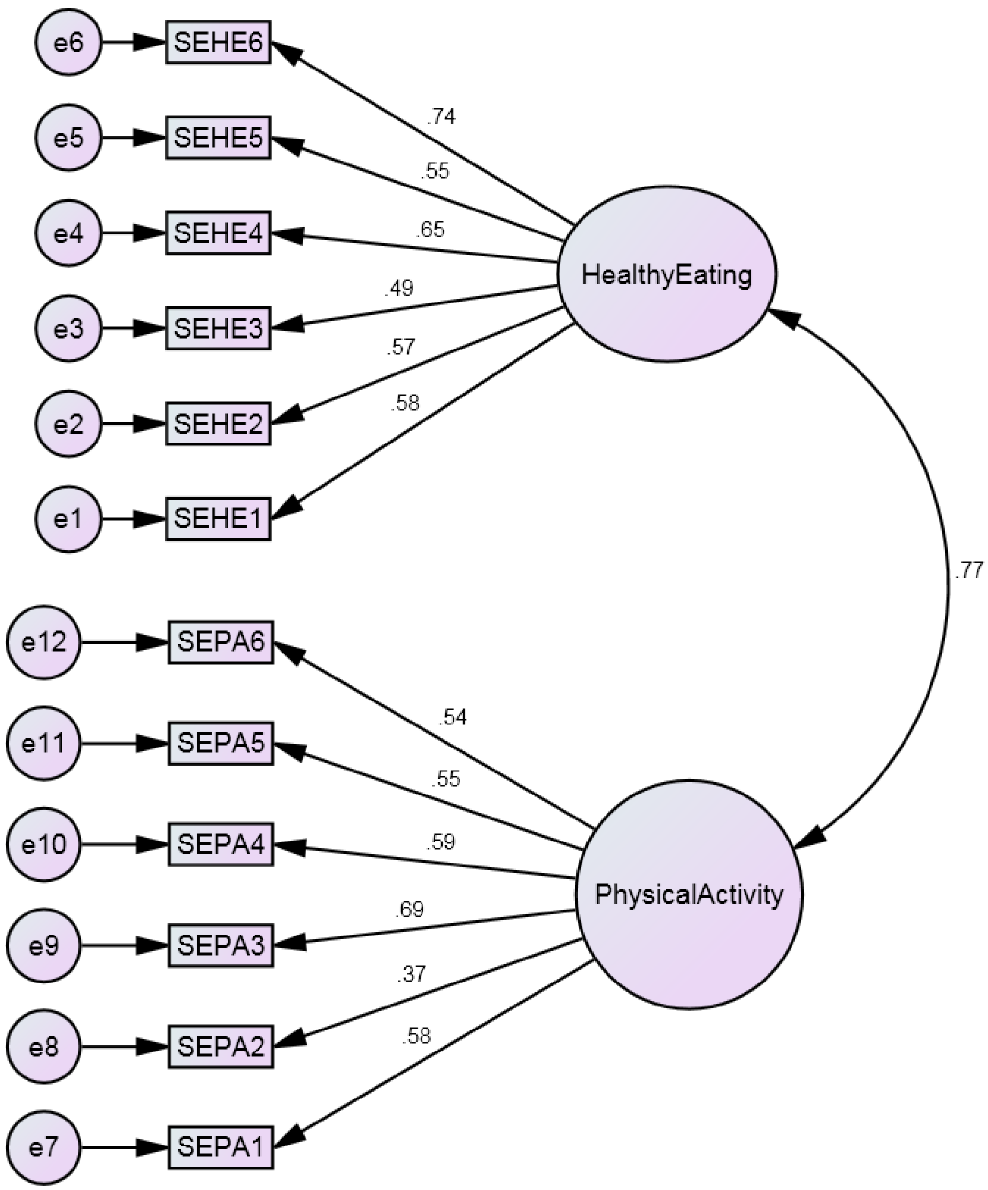


Figure 2. Regression analysis of Healthy Eating and Physical Activity with BMI

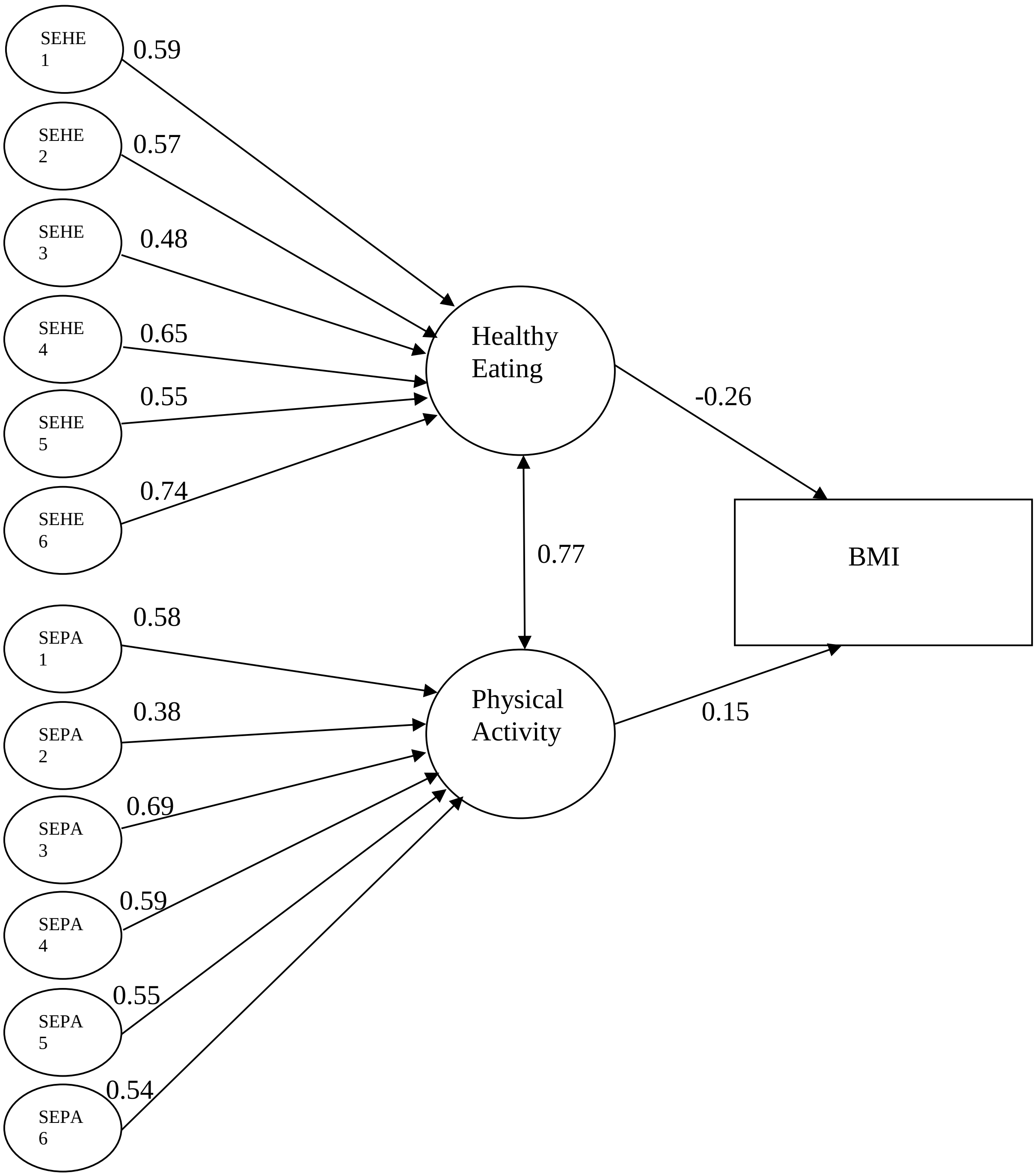
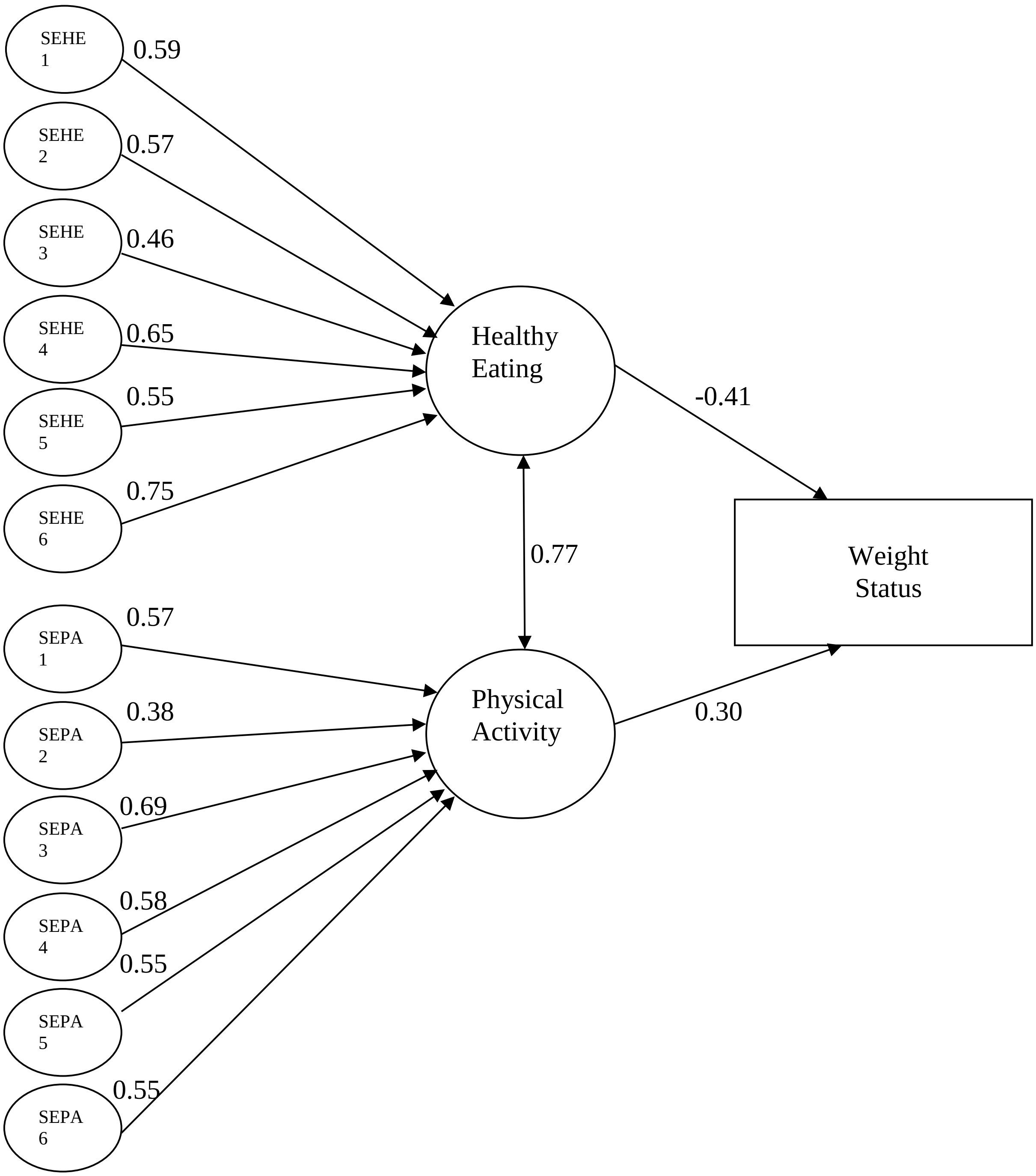


Figure 3. Regression analysis of Healthy Eating and Physical Activity with Weight Status



APPENDIX A: Demographics

APPENDIX A: Items for Demographics

Demographics

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Answer the following questions by writing in the blank space or by checking the box:

Q1: About how tall are you without shoes? _____Ft _____Inches

Q2: About how much do you weight without shoes? __________Pounds

Q3: What is your age? ________Years

Q4: What grade are you in? ________Grade

Q5: Are you?

- ☐ Male
- ☐ Female

Q6: Are you?

- ☐ Black, Non-Latino
- ☐ Mexican/Latino
- ☐ Asian or Pacific Islander
- ☐ American Indian/Alaskan Native
- ☐ White, Non-Latino
- ☐ Other _____________

Q7: What is your mother's job?

Q8: What is your father's job?

Q9: Parents level of education (check one box for each)

	Mother	Father
Graduate School		
Standard college of university graduate		
Part of college		
High school graduate		
Part of high school		
Junior high school (7th-9th grade)		
Less than 7 years of school		

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APPENDIX B: Measures

APPENDIX B: Items for physical activity subscale of SE-HEPA

Self-Efficacy – Physical Activity

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Please indicate how much you agree with the following questions about physical activity

1	2	3	4	5
Strongly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Strongly Agree

Q1. I can be physically active during my free time on most days.

Q2. I can be physically active during my free time on most days even if I could watch TV or play video games instead.

Q3. I can be physically active during my free time on most days even if it is very hot or cold outside.

Q4. I can be physically active during my free time on most days even if I have to stay at home.

Q5. I have the coordination I need to be physically active during my free time on most days.

Q6. I can be physically active during my free time on most days no matter how busy my day is.

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APPENDIX B: Items for healthy eating subscale of SE-HEPA

Self-Efficacy - Healthy Eating

Please indicate how much you agree with the following questions about healthy eating

1	2	3	4	5
Strongly Disagree	Somewhat Disagree	Neither Agree Nor Disagree	Somewhat Agree	Strongly Agree

Q1. I can eat healthy on most days.

Q2. I can eat healthy foods even when unhealthy foods are available.

Q3. I can eat healthy on most days even if I don’t like what is available at home or school.

Q4. I can eat healthy on most days even if I have to stay at home.

Q5. I know how to find and prepare healthy foods.

Q6. I can eat healthy on most days no matter how busy my day is.
