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Reliability and concurrent and construct validity of the Strategies for Weight Management measure for adults

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INTRODUCTION

Overweight and obesity is an epidemic affecting two-thirds of the population in the United States[1]. It is associated with an increased risk for many diseases and conditions, including heart disease, high blood pressure, diabetes, and certain cancers[2]. It is recommended that individuals with a Body Mass Index (BMI) greater than 25 kg/m² who have weight-related comorbidities lose at least 5% to 10% of their body weight[3]. Losing this modest amount of weight can improve cardiometabolic risk factors and may attenuate many negative consequences of obesity and improve health[2].

It is well known that lifestyle behavior modification that includes reducing energy intake and increasing energy expenditure produces weight loss and should be considered the first line of intervention[3–6]. Weight loss requires a negative energy balance; that is, energy intake must be lower than energy expenditure[7]. To reduce energy intake, obese individuals should increase intake of low energy dense foods such as fruit, vegetables, and whole grains and decrease intake of fat and added sugar[8] and increase their awareness of energy content of foods and portion size[9]. To increase energy expenditure, individuals are advised to engage in 30 minutes or more of moderate-intensity physical activity (PA) on most days of the week[10] and to increase “lifestyle activities”, the PA that can be part of everyday life such as biking or walking instead of driving[11,12].

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The Strategies for Weight Management (SWM) measure is a self-report questionnaire assessing use of these types of energy intake and energy expenditure lifestyle modification strategies. It includes 20 strategies commonly recommend in interventions to promote weight management. Items are categorized within the following subscales: 1) energy intake, 2) energy expenditure, 3) self-monitoring, and 4) self-regulation. The SWM was inspired by the 26-item *Eating Behavior Inventory* (EBI), a widely used self-report questionnaire published in 1979 that assesses use of recommended behavioral strategies to promote reduced energy intake and weight management in adults[13]. In addition, development of the SWM was informed by social cognitive theory (SCT)[14]. A key component of SCT is that human behavior is explained in terms of a reciprocal model in which behavioral capacities, personal factors, and environmental influences interact. The SWM is different from the EBI because the SWM contains updated eating behavior strategies and energy expenditure strategies. Development of the SWM, including results of exploratory (EFA) and confirmatory factor analyses (CFA) and correlate models, has been described previously[15]. The 4 subscales found with EFA and CFA are consistent with the underlying theoretical framework of SCT as self-monitoring and self-regulation are key components of this theory.

Researchers can use the SWM to assess use of behavioral strategies to evaluate effectiveness of weight management interventions and to better understand the mechanisms of weight loss. It also can be used to tailor intervention content. For instance, researchers can conduct a baseline assessment of weight management strategies using the SWM to identify unique diet and PA behavior challenges for each participant. To date there is no validated questionnaire similar to the SWM. Other questionnaires that assess diet and energy expenditure behaviors measure food intake patterns or time spent in PA as opposed to behavioral strategies to improve weight management[16,17].

The aim of the current study is to assess reliability and concurrent and construct associations of the SWM with weight, diet, and PA variables. These analyses involve an ethnically diverse sample of overweight or obese adults enrolled in a 6-month weight loss intervention.

METHODS

Design

The Social and Mobile Approach to Reduce Weight (SMART) study is a randomized controlled trial testing the efficacy of an intervention that aims to promote weight loss in overweight or obese young adults. The primary goal of the intervention is 5% to 10% weight loss. Participants were randomized to either the treatment ($n=202$) or comparison group ($n=202$). The proposed analyses will use data from the baseline and 6-month assessments from both the intervention and control group. The control group was included in these analyses to add variance to the dataset. In addition, participants in the control group can use change strategies on their own that may relate to behavior change. The SMART study has been described in detail previously [18].

Participants

A total of 404 overweight or obese university students were enrolled (See Table I). Participants were recruited from 3 institutions: 1) BLINDED; 2) BLINDED; and 3) BLINDED. They were recruited from May 2011 to May 2012 through the following channels: 1) print advertisements in college newspapers, 2) flyers and posters posted on the campuses, 3) campus electronic bulletins, 4) online advertisements, 5) the SMART study website, and 6) e-mails sent by student health services via electronic distribution lists.

Potential participants were screened for inclusion and exclusion criteria over the telephone. Individuals eligible for inclusion were: 1) age 18–35 years; 2) enrolled full-time at one of the designated campuses: BLINDED; 3) willing to attend required research measurement visits in BLINDED over the 2-year study; 4) overweight or obese (25.0–34.9 BMI kg/m²); and 5) a Facebook user or willing to enroll in Facebook. In addition, they needed to own: 6) a personal computer and 7) a mobile phone capable of sending and receiving text messages. Individuals were excluded from participation if they: 1) could not provide informed consent; 2) had comorbidities and required immediate sub-specialist referral; 3) met the American Diabetes Association criteria for diabetes; 4) had psychiatric or medical conditions that prohibited compliance with study protocol, prescribed dietary changes, or moderate PA; 5) were using weight-altering medications; 6) were pregnant or intending to get pregnant over the next 2 years; 7) were enrolled in or planned to enroll in another weight loss program; or 8) had a household member on the study staff. Eligible participants were invited to attend the baseline measurement visit at a university where they were re-screened for inclusion and exclusion criteria by measurement staff and underwent written informed consent.

Data collection occurred at BLINDED and Student Health Services at BLINDED and BLINDED by trained measurement staff blind to intervention randomization. The BLINDED Institutional Review Boards approved study protocols. Data used in the present analyses were collected at baseline and 6 months from surveys completed by participants on computers. The measurement visits lasted approximately 2.5 hours. Participants received a \$40 incentive at baseline and \$50 at 6 months.

Intervention and Comparison Group

The SMART intervention was mainly informed by SCT[19]. Five core health behavior strategies (ie, self-monitoring, intention formation, goal setting, goal review, and feedback on performance) were embedded in intervention activities to maximize the effect of the intervention. Facebook was the primary modality for delivering the tailored behavioral weight loss curriculum based on decreasing energy intake and increasing energy expenditure. For instance, participants were encouraged to self-monitor their weight weekly and post their diet and PA health behaviors on Facebook. Participants assigned to the comparison group had access to a website without social networking components containing general health information relevant to young adults. This website included some weight loss recommendations comparable to what individuals would receive from their primary health care providers, but it did not include health behavior recommendations that the intervention group was receiving.

Measures

Body Mass Index was calculated from height and weight (kg/m^2). Body weight was measured to the nearest 0.1 kilograms using a calibrated digital scale. Subjects were asked to wear lightweight clothes (eg, exercise clothes). Height (without shoes) was measured to the nearest 0.1 cm using a stadiometer with the subject standing erect against the stadiometer rod with heels close together. The Seca703, a combined digital scale and stadiometer, was used for body weight and height measurements. Measurement staff took height and weight measurements twice and took the average of the 2 readings. Percent weight change from baseline to 6 months was calculated ($[\text{weight at 6 months} - \text{weight at baseline}] / \text{weight at 6 months} \times 100$). Negative percentages indicate weight loss.

The SWM is a 20-item questionnaire comprised of 4 subscales. Previous research investigated the factor structure of the SWM with EFA and CFA [15]. The EFA suggested a 4-factor model: strategies categorized as targeting 1) energy intake, 2) energy expenditure, 3) self-monitoring, and 4) self-regulation. The CFA indicated good model fit ($\chi^2/\text{df}=2.0$; comparative fit index=0.90; standardized root mean square residual=0.06; and root mean square error of approximation=0.07, confidence interval=0.06 to 0.08; $R^2=0.11$ to 0.74). Correlate models revealed weak associations between SWM scores and age, gender, Hispanic ethnicity, and relationship status in both samples, with the models explaining only 1% to 8% of the variance (betas= $-.04$ to $.29$, $P<.05$). As expected, these weak associations suggest that demographic variables should have little influence on SWM scores.

The SWM asks respondents to select a response to each item based on their behavior from the “last 30 days” (Appendix I). Each SWM item is rated on a 5-point Likert scale (ie, 1= “hardly or never” to 5= “always or almost always”). Items within each subscale are summed and divided by total items answered. Subscale scores range from 1–5. The SWM takes approximately 5 minutes to complete.

The Diet History Questionnaire II (DHQ II) was used to obtain dietary data. The DHQ is a widely used food frequency questionnaire (FFQ) developed by staff at the Risk Factor Monitoring and Methods Branch at the National Cancer Institute. Food frequency questionnaires are less of a burden on participants than other forms of dietary measurement, and they generally have good psychometric properties[20]. The DHQ I was updated to the DHQ II with minimal modifications to the food list and the nutrient database. The DHQ II consists of 124 food items and includes portion size. Correlations for energy intake between truth (estimated by using a measurement error model based on repeat 24-hour recalls collected over the course of 1 year) and the DHQ I were $r=0.49$ in men and $r=0.48$ in women[21]. There have not been validation studies with the DHQ II because validation findings are unlikely to be greatly modified by the minimal modifications made. The nutrient and food group database, created for analyzing the DHQ II, is based on that used for national 24-hour dietary recall data from the National Health and Nutrition Examination Surveys[22]. The time reference for the DHQ II is “in the last month”. The DHQ II was used to estimate the following diet variables: 1) percent of energy intake from dietary fat; 2) percent of whole grains from total grains; vegetables, excluding legumes (c); 3) fruit (c); 4) discretionary oil and solid fat (g) (ie, fat that is added to food such as butter); and 5) added sugar (t). It takes respondents approximately 1 hour to complete this FFQ. Participants with

unreliable total energy intake were removed from the analyses (ie, <800 kcal/d or >5000 kcal/d for men and <600 kcal/d or >4000 kcal/d for women).

The Paffenbarger Physical Activity Questionnaire (PPAQ) is a self-report measure that assesses weekly leisure time energy expenditure in adults[23,24]. Two items on this questionnaire were used that asked respondents to estimate the number of blocks walked and to list sports or exercise in which they had participated during the past week as well as the frequency and duration. For each sport or exercise listed, energy expenditure (kcal) was calculated from the respective metabolic equivalent (MET) intensity level[25]. Total leisure time energy expenditure per week in kcals and minutes per week were calculated. The PPAQ has been validated with cardiorespiratory fitness measures, accelerometers, daily PA logs, and various health outcomes and is believed to be a good measure of moderate and vigorous intensity PA[26–28]. One-month test-retest reliability was acceptable ($r=0.72$)[26]. It took respondents 5–10 minutes to complete this questionnaire.

Statistical Analysis

Reliability of the subscales was examined in terms of internal consistency using Cronbach alpha. A value above 0.7 was considered acceptable; however, a value between 0.8–0.9 was preferable. The corrected item-total correlation, which indicates the degree to which each item correlates with the total score, was used to assess whether items should be removed. A low value (<0.3) indicates the item is measuring something different from the scale as a whole[29].

Linear regression models were used to examine concurrent and construct validity. Dependent variables were transformed to improve their fit to Gaussian distributions assumed by standard statistical tests. If variables were non-normal (skewness or kurtosis $> \pm 3.0$) after transformation, they were made into dichotomous variables (ie, split between negative/zero [0] and positive values [1]) and logistic regressions were conducted. Variables were entered into the models simultaneously. Variables were significant at $P<.05$. Unstandardized parameter estimates and R^2 were reported. Analyses were conducted with SPSS Statistics (SPSS version 22, SPSS Inc., Chicago, IL, 2014).

Concurrent and construct validity was assessed between SWM scores and the following outcome variables: 1) weight, 2) diet variables, and 3) energy expenditure variables. To assess concurrent validity, the associations between baseline SWM subscale scores and baseline scores for each outcome variable were examined. To assess construct I validity (ie, sensitivity to the study treatment condition), the associations between SWM subscale change scores on group (treatment vs. control) were examined. Change scores were calculated as the 6-month score minus the baseline score. To assess construct II validity (ie, relationship to the outcomes), the associations between change scores for each outcome variable on change in SWM subscale scores were examined. It is important to note that the construct associations tested the hypothesized “casual chain” (ie, it is hypothesized that intervention condition will affect weight behaviors and weight behaviors will affect outcomes).

To establish validity, the following results are needed. For concurrent and construct II validity, there should be significant negative associations with SWM subscale scores and

weight, percent energy from fat, discretionary fat, and added sugar. On the other hand, there should be significant positive associations with the SWM subscale scores and percent of whole grains, fruits, vegetables, and both PA variables. For construct II validity, treatment group should be positively associated with the SWM subscale scores. The energy intake and self-regulation subscales only inquire about diet-related behaviors; therefore, associations with the PA variables are not relevant to this analysis and are noted as “not applicable” in the tables. Similarly, the diet variables are not relevant to the energy expenditure subscale. The self-monitoring subscale includes both diet and PA-related items; and therefore, associations with both types of variables were assessed.

Covariates included baseline measures of gender, age, education level, relationship status, income level, and race/ethnicity. Age was a continuous variable. Education level was an ordinal variable with 4 levels (ie, high school graduate/G.E.D., education after high school, college graduate/Baccalaureate degree, Master's/Doctoral degree). Income was a nominal variable with 6 levels (ie, \$15,999, \$16,000–\$24,999, \$25,000–\$34,999, \$35,000–\$49,999, >\$50,000, and “I don't know/I prefer not to answer”). Gender (ie, male, female), relationship status (ie, single, in a committed relationship), and race/ethnicity (ie, yes/no Hispanic, yes/no white non-Hispanic, yes/no African American, yes/no Asian, yes/no other) were dichotomous variables. More than 1 race category could apply. Dummy codes were 1 and 0 for each level of the categorical variables.

Bivariate analyses between SWM scores and possible covariates were conducted to determine appropriate variables to include in multivariate models. Spearman (rho) correlations were used for continuous (age was non-normally distributed), dichotomous, and ordinal variables. One-way ANOVAs were used to determine the relationship between SWM scores and the nominal variable. Variables significantly related to the SWM scores at $P < .10$ were included in multivariate models. Co-linearity of the variables was assessed using correlations. Variables correlated >0.50 were excluded from multivariate models.

RESULTS

Table I shows the demographic characteristics. The majority of SMART participants were female (70%), had some education after high school (29%), and had an income level of \$15,999 (74%). Most SMART participants were white non-Hispanic (48%), followed by equal percentages of Hispanic and Asian race/ethnicities. Twenty-four participants were removed from the diet-related analyses for unreliable energy intake values at baseline and forty-one at 6 months. Six participants did not complete PA questionnaires at 6 months. A total of 24 participants were lost to follow-up at 6 months. Table II displays the baseline and 6-month descriptive statistics for the SWM scores and the diet and PA variables for the combined intervention and control group data.

Reliability

Cronbach alpha coefficient was $\alpha=0.85$ for the energy intake subscale (corrected item-total correlations 0.48–0.72), $\alpha=0.83$ for the energy expenditure subscale (corrected item-total correlations 0.60–0.77), $\alpha=0.76$ for the self-monitoring subscale (corrected item-total

correlations 0.45–0.72), and $\alpha=0.74$ for the self-regulation subscale (corrected item-total correlations 0.40–0.66).

Validity

Bivariate Analyses—Bivariate analyses indicated covariates to include in multivariate models. There were no significant associations between the energy intake subscale and covariates ($\rho=-0.01-0.07$). Significant associations were found between the energy expenditure subscale and age ($\rho=-0.15$, $P<.01$), education ($\rho=-0.11$, $P=.02$), female gender ($\rho=-0.12$, $P=.01$), and married relationship status ($\rho=-0.11$, $P=.03$). However, there also was a significant association between age and education level ($\rho=0.53$, $P<.001$). Because age had a stronger correlation with the energy expenditure subscale than education, age was used instead of education in these multivariate models. Significant associations were found between the self-monitoring subscale and age ($\rho=0.09$, $P=.09$) and Hispanic ethnicity ($\rho=-0.14$, $P=.01$). There were significant associations between the self-regulation subscale and age ($\rho=0.09$, $P=.09$), female gender ($\rho=0.16$, $P=.01$), and married relationship status ($\rho=0.10$, $P=.04$). One-way ANOVAs showed non-significant associations between income and SWM scores ($P>.10$).

Concurrent Validity—Table III shows the linear regression results for concurrent validity. Non-significant associations were found between all the SWM subscale scores at baseline and baseline weight. The energy intake subscale score at baseline was significantly related to most of the diet variables at baseline, with the exception of baseline vegetable intake. The self-regulation subscale score at baseline was significantly associated with certain diet variables at baseline; namely, energy from fat, whole grain intake, and discretionary fat. However, the self-monitoring subscale score at baseline was not significantly related to the diet variables at baseline. There were significant positive associations between the energy expenditure and self-monitoring subscale scores at baseline and both PA variables at baseline. All significant associations were in the expected directions.

Construct I Validity—There were significant positive associations between treatment group and change in the energy intake and self-monitoring subscale scores (Table IV). However, significant relationships were not found between treatment group and change in the energy expenditure and self-regulation subscale scores. All significant results were in the expected directions.

Construct II Validity—Table V displays the linear regression results for construct II validity. There were significant associations between change in the SWM subscale scores and percent weight change, with the exception of change in the energy expenditure subscale scores. There were significant associations between change in the energy intake subscale scores and change in vegetable, whole grain, and added sugar intake, but there were no significant associations with change in the other diet variables. There were no significant associations between change in the self-monitoring subscale scores and change in the diet variables. Change in the self-regulation subscale scores were not significantly related to change in the diet variables except for change in discretionary fat and added sugar. Change

in the energy expenditure and self-monitoring subscale scores had significant associations with change in both PA variables. All significant associations were in the expected directions except for change in the energy intake subscale scores and change in whole grain intake.

DISCUSSION

This study assessed reliability and validity of the SWM. Reliability results showed the SWM has good internal consistency. In addition, corrected item-total correlations were >0.30 , indicating none of the items should be removed from the scale(s). Concurrent, construct I, and construct II validity results showed significant associations between the subscales and select weight-management outcomes.

Concurrent Validity

There was evidence of concurrent validity between baseline SWM subscale scores and many of the baseline diet and PA outcomes, with a few exceptions. Lack of significant associations with some of the diet variables may be because there is random and systematic errors associated with self-reported dietary intake measuring instruments[30]. This is especially true when measuring vegetable intake with the DHQ as vegetable intake correlations between the DHQ and 4 24-hour dietary recalls were among the lowest versus other food groups[31]. Results indicated that the self-monitoring subscale at baseline showed concurrent validity with baseline PA but not baseline dietary intake. These results may have been because participants engaged in more PA monitoring rather than diet monitoring because the latter typically includes recording in more detail, which is a time-consuming, tedious process that is difficult to maintain[32].

Moreover, there was no evidence of concurrent validity with baseline SWM subscales scores and baseline weight. While cross-sectional and longitudinal studies have demonstrated that individuals with lower weight are more likely to use weight management strategies[33–36], individuals are more likely to report weight management strategies if they complete an intervention that encouraged recommended behavioral strategies for weight management. Another explanation is that this association may not have been found because both samples included only overweight or obese participants and did not include normal-weight individuals. A more heterogeneous sample in regard to weight probably would result in more variation in item responses, which should show an association between baseline measures of the SWM subscales and weight.

Construct I Validity

Results showed strong evidence of construct I validity with the energy intake and self-monitoring subscale change scores. These associations were expected because the intervention encouraged participants to engage in weight management strategies, and there was weight loss in the treatment group from baseline to 6 months. It was expected that all SWM subscales would be significantly associated with treatment group, but there was no evidence of sensitivity to the treatment condition from the energy expenditure or self-regulation subscale change scores. Non-significant results could be the result of less than

optimal implementation of the intervention related to energy expenditure and self-regulation strategies.

Construct II Validity

There was strong evidence of construct II validity with change in SWM subscale scores and percent weight change and change in PA outcomes but weaker evidence for change in the diet outcomes. In addition to the unexpected non-significant associations with change in many of the diet variables, one significant diet association was in the opposite expected direction. Results indicated that participants with higher energy intake change scores (ie, improved energy intake behaviors) were significantly less likely to have a positive increase in change in whole grain intake. However, the upper limit of the confidence interval for this logistic regression was close to 1 (0.99), suggesting that there is no true association between the two variables. Similar to the explanation provided in the concurrent validity section, these weak associations with change in the diet variables may be due to random and systematic errors associated with self-reported dietary intake measuring instruments[30].

Strengths and Limitations

Study limitations and strengths should be noted. These analyses tested the SWM in a diverse sample of adults comprised of 68% ethnic minorities. However, as the sample was mainly young adults, future research should investigate validity and reliability of the SWM in other samples such as different age groups. We assessed various forms of validity but tested only one type of reliability. Test-retest reliability was not conducted because the time interval between assessments was 6 months rather than 2 weeks, which is the typical time interval for examining this type of reliability. Last, future research should replicate this analysis with objective measures of diet and PA such as blood-based biomarkers and accelerometers. In particular, self-reported dietary intake measuring instruments are notorious for random and systematic errors[30]. This may explain why the majority of non-significant associations were found between the SWM and dietary variables. However, these non-significant relationships also may be because the SWM is not a valid indicator of specific food or macronutrient intake. As such, caution should be used when assessing dietary intake with the SWM.

CONCLUSION

To examine effective approaches for the prevention and treatment of overweight and obesity, researchers require a way to assess behavioral weight management strategies. The EBI is a widely used measure to assess energy intake behavior strategies; however, it does not assess physical activity or sedentary behaviors and has not been updated for more than 30 years[13]. In addition, it is important to have a measure that assesses behavioral strategies associated with both energy intake and energy expenditure as both are equally important components to weight management[37,38].

The SWM is an up-to-date self-report measure that assesses energy intake and energy expenditure behavioral weight management strategies in adults. The current study aimed to build on the existing validation research for this measure. Previous research showed the

SWM had 4 subscales and good psychometric properties (author name BLINDED, in press 2014). The current study also showed the SWM has good psychometric qualities for reliability and certain concurrent, construct I, and construct II validity outcomes. These results indicate that the SWM follows the intervention causal chain; that is, intervention group was associated with a positive change in SWM scores, and change in SWM scores was associated with weight loss. This study indicates that the SWM has good reliable and validity to assess weight management in an ethnically diverse adult population. As validity is an accumulation of evidence over multiple studies, this study provides initial reliability and validity evidence in one population segment.

The SWM is an efficient, practical, and inexpensive tool to measure behavioral strategies related to weight management. Researchers can use the SWM to assess use of behavioral strategies to evaluate effectiveness of weight management interventions. By effectively assessing interventions, researchers will better understand what works for weight management and thereby improve the quality of future interventions. It can also be used to tailor interventions. Tailoring interventions is a commonly used health communication technique to individualize behavior change programs that has been shown to be more effective than untailored “one-size-fits-all” approaches[39]. By knowing which problematic behaviors contribute to weight gain, researchers can individualize intervention content to each participant. Using the SWM for the prevention and treatment of overweight and obesity may help create effective approaches to healthy weight management for weight loss among adults.

Appendix I. Strategies for Weight Management

Over the *last 30 days*, how often have you used the following strategies to manage your weight?

Response options: Never or hardly ever (1), Some of the time (2), About half of the time (3), Much of the time (4), Always or almost always (5)

Subscale 1: Energy intake

1. Cut out/reduced sweets or junk food
2. Cut out/reduced late night snacking
3. Cut out/reduced between meal snacks
4. Decreased frequency or portion sizes of desserts
5. Reduced my calorie intake
6. Removed high calorie foods from my home, office, or room
7. Ate less fat
8. Increased fruits and vegetables

Subscale 2: Energy expenditure

9. Exercised for period of 30 minutes or more

10. Exercised at a gym or participated in an exercise class

11. Altered my daily routine to get more lifestyle physical activity

Subscale 3: Self-monitoring

12. Recorded or graphed my weight

13. Recorded or graphed my physical activity

14. Recorded or wrote down the type and quantity of food eaten

15. Weighed myself regularly or daily

Subscale 4: Self-regulation

16. If I was served too much, I left food on my plate

17. Changed food preparation techniques

18. Reduced portion sizes

19. Decided ahead of time what I would eat for meals and snacks

20. Kept healthy ready-to-eat or portion controlled snacks for myself

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Table I

Demographic Characteristics of Adults Enrolled in the SMART Weight Loss Intervention (N=404)

Demographic Variables			
Continuous		Mean	SD
Age at study entry in years		22.2	3.8
BMI (kg/m ²) ^a		29.0	2.8
Categorical		N	%
Female		284	70.3
Education			
High school graduate/G.E.D.		116	28.7
Education after high school		206	51.0
College graduate/Baccalaureate degree		62	15.4
Master's/Doctoral degree		20	5.0
Married ^a		31	7.7
Race/ethnicity ^b			
Hispanic ^a		125	30.9
White non-Hispanic		195	48.3
African American		20	5.0
Asian		110	27.2
Other		21	5.2
Income ^c			
\$15,999		275	74.1
\$16,000–\$24,999		36	9.7
\$25,000–\$34,999		34	9.2
\$35,000–\$49,999		18	4.9
\$50,000–\$74,999		1	0.3
\$75,000		7	1.9
“Don't know/Prefer not to answer”		23	5.7

^aMissing data from 1 participant^bMore than 1 race category could apply^cMissing data from 10 participants

Table II

Descriptive Statistics for Baseline and 6-month Strategies for Weight Management (SWM) Subscales Scores, Weight, and Diet and Physical Activity (PA) Variables

Variables	Baseline					6 Months				
	N	Mean	Median	SD	Range	N	Mean	Median	SD	Range
SWM scores										
Energy intake	404	2.6	2.5	0.8	1.0–4.9	378	3.0	2.9	0.9	1.0–5.0
Energy expenditure	404	2.7	2.3	1.1	1.0–5.0	376	2.8	2.7	1.1	1.0–5.0
Self-monitoring	404	1.7	1.3	0.9	1.0–5.0	377	2.1	2.0	1.0	1.0–5.0
Self-regulation	404	2.3	2.2	0.8	1.0–5.0	377	2.6	2.6	0.9	1.0–5.0
Weight (kg)	404	81.1	80.2	12.9	54.8–119.0	381	80.5	79.0	13.1	53.1–124.2
Diet variables										
% Energy from fat	380	35.0	34.9	26.0	7.3–51.5	332	34.4	34.5	7.5	10.9–60.8
% Whole grains	380	15.1	11.9	11.1	0.0–78.3	332	14.9	12.6	10.7	0.0–73.8
Fruits (c)	380	1.2	0.9	1.2	0.0–9.4	332	1.2	1.0	1.0	0.0–7.0
Vegetables (c)	380	1.6	1.3	1.1	0.2–6.9	332	1.5	1.2	1.2	0.2–8.6
Discretionary fat (g)	380	51.6	44.8	26.0	4.0–150.0	332	43.4	39.8	21.2	3.7–153.2
Added sugar (t)	380	11.1	8.6	10.3	1.5–113.9	332	9.6	6.8	9.1	0.7–65.1
PA variables										
Leisure time (kcal/wk)	403	1,418.1	960.0	1,594.5	0.0–14,271.0	376	1,666.6	1,143.0	1,901.6	0.0–14,623.0
Leisure time (min/wk)	403	232.1	160.0	252.6	0.0–2,780.9	376	256.5	200.0	280.6	0.0–2,520.0

Table III
 Linear Regression Results for the Evaluation of Concurrent Validity: Relationships between Baseline Weight and Diet and Physical Activity (PA) variables on baseline Strategies for Weight Management (SWM) Subscale Scores

Dependent Variables	N	SWM											
		Energy Intake			Energy Expenditure			Self-monitoring			Self-regulation		
		beta	SE	R ²	P	beta	SE	R ²	P	beta	SE	R ²	P
Weight (kg)	404	0.50	2.12	-0.00	0.52	0.27	0.49	0.29	.58	-0.06	0.75	0.02	.93
Diet variables	380												
% Energy from fat		-1.28	0.40	0.20	<.01	N/A	N/A	N/A	N/A	-0.77	0.39	0.01	.05
% Whole grains ^a		0.25	0.08	0.02	.01	N/A	N/A	N/A	N/A	0.15	0.09	0.01	.06
Fruits (c) ^b		0.09	0.02	0.03	.001	N/A	N/A	N/A	N/A	0.03	0.02	0.01	.21
Vegetables (c) ^b		0.02	0.02	0.01	.24	N/A	N/A	N/A	N/A	0.00	0.02	0.04	.99
Discretionary fat (g)		-4.91	1.62	0.02	.01	N/A	N/A	N/A	N/A	-2.31	1.58	0.00	.14
Added sugar (t) ^b		-0.06	0.02	0.02	.01	N/A	N/A	N/A	N/A	-0.02	0.02	0.02	.42
PA variables	403												
Leisure time (kcal/wk) ^a		N/A	N/A	N/A	N/A	7.62	0.72	0.27	.001	3.85	1.05	0.05	<.001
Leisure time (min/wk) ^a		N/A	N/A	N/A	N/A	2.73	0.28	0.24	.001	1.30	0.41	0.04	<.01

beta= unstandardized regression coefficient, SE= standard error, R²= adjusted coefficient of determination, N/A= not applicable

*P<.05

**P<.01

***P<.001

^aSquare root transformed

^bLog transformed

Table 4 Linear Regression Results for the Evaluation of Construct I Validity: Relationships between Treatment Group on 6-month Strategies for Weight Management (SWM) Subscale Change Scores

Independent variable	SWM																	
	Energy Intake N=378					Energy Expenditure N=376					Self-monitoring N=377					Self-regulation N=377		
	Mean	SD	beta	SE	R ²	P	Mean	SD	beta	SE	R ²	P	Mean	SD	beta	SE	R ²	P
Treatment	0.40	0.93	0.21	0.09	0.03	.01*	0.18	1.29	0.06	0.13	-0.01	.64	0.74	1.00	0.50	0.10	0.06	.001**
Control (reference)	0.19	0.91					0.12	1.24					0.23	.92			0.23	0.78

= Change from baseline to 6-months, SD= standard deviation, beta= unstandardized regression coefficient, SE= standard error, R²= adjusted coefficient of determination

***P<.001

* P<.05

** P<.01

Linear and Logistic Regression Results for the Evaluation of Construct II Validity: Relationships between 6-month Weight and Diet and Physical Activity (PA) Change Scores on 6-month Strategies for Weight Management (SWM) Subscale Change Scores

Table 5

Dependent variables	N	SWM											
		Energy Intake				Energy Expenditure				Self-monitoring			
Linear regressions		beta	SE	R ²	P	beta	SE	R ²	P	beta	SE	R ²	P
% Weight	376	-0.95	0.26	0.03	*** <.001	-0.27	0.20	0.02	.17	-1.21	0.24	0.07	*** <.001
Diet variables	316												
% Energy from fat		-0.56	0.48	0.00	.25	N/A	N/A	N/A	N/A	-0.20	0.46	0.00	.67
Vegetables (c)		0.23	0.07	0.03	*** <.01	N/A	N/A	N/A	N/A	0.03	0.07	-0.01	.63
Discretionary fat (g)		-2.73	1.49	0.01	.07	N/A	N/A	N/A	N/A	0.41	1.41	0.00	.98
Logistic regressions ^a		OR	CI	P		OR	CI	P		OR	CI	P	
Diet variables	316												
% Whole grains		0.77	0.60–0.99	.04*		N/A	N/A	N/A		1.10	0.87–1.39	.42	0.81
Fruits (c)		1.22	0.95–1.56	.12		N/A	N/A	N/A		1.13	0.90–1.43	.29	0.87
Added sugar (t)		0.58	0.44–0.76	<.001***		N/A	N/A	N/A		0.87	0.68–1.10	.25	0.54
PA variables	373												
Leisure time (kcal/wk)		N/A	N/A	N/A		1.74	1.43–2.11	<.001***		1.57	1.26–1.97	<.001***	N/A
Leisure time (min/wk)		N/A	N/A	N/A		1.74	1.43–2.11	<.001***		1.65	1.31–2.07	<.001***	N/A

beta= unstandardized regression coefficient, SE= standard error, R²= adjusted coefficient of determination, = Change from baseline to 6 months, OR= odds ratio, CI= confidence interval, N/A= not applicable

* P<.05

** P<.01

*** P<.001

^a Odds ratios represent the likelihood of obtaining positive values of the dependent variable.