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Self-efficacy Scale for Weight Loss among Multi-ethnic Women of Lower Income: A Psychometric Evaluation

Lara Latimer, MA,

University of Texas at Austin

Lorraine O. Walker, EdD, RN, FAAN,

University of Texas at Austin

Sunghun Kim, MA,

University of Texas at Austin

Keryn E. Pasch, PhD, and

University of Texas at Austin

Bobbie Sue Sterling, PhD, RN

University of Texas at Austin

Introduction

High weight gain in pregnancy with resultant postpartum weight retention affects maternal health and is a key women's health issue (1,2). Significantly higher postpartum weight retention found among lower socioeconomic groups (versus higher SES groups), despite nonsignificant differences in gestational weight gain, may be indicative of the emergence of SES differences in postpartum weight retention (3). Ethnic differences in pregnancy-related weight gain have also been found (4). Although the Institute of Medicine recommends that pregnant women of normal body mass index (BMI) gain 25–35 lb (11.5–16 kg), nearly half of women with lower income may exceed these guidelines (1) and are likely to be at least 13.2 lb (6 kg) heavier at 6 weeks postpartum than before pregnancy (5).

Programs for reducing postpartum weight retention are of interest to avoid a trajectory that perpetuates future weight gain and retention (6). A key component of weight loss programs is assessing psychosocial factors that may affect motivation and success. The United States Department of Health and Human Services identifies self-efficacy as a predictor of weight-loss success (7). According to Bandura (8), a person's self-efficacy, i.e., perceived capabilities related to a particular situation, combined with their outcome expectations, partly determine whether they choose to engage in certain behaviors. In practical terms, increasing self-efficacy to eat more healthily and engage in more activity may lead to weight loss. However, Bandura notes that self-efficacy beliefs based on persuasion and vicarious experience are subject to change and tend to be less accurate than those based on actual behavioral efforts (9). Thus, unrealistically high self-efficacy beliefs based on, for example, celebrity testimonials, may change when behavioral changes are attempted.

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Corresponding Author: Lorraine O. Walker, EdD, RN, FAAN, School of Nursing, University of Texas at Austin, 1700 Red River St. Austin, TX 78701-1499, TEL: 512-232-4751, FAX: 512-475-9179, lwalker@mail.nur.utexas.edu.

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The purpose of this study is to present initial test-retest and internal consistency reliability, and construct, factorial, and predictive validity of the Physical Activity and Nutrition Self-Efficacy (PANSE) scale developed for use with postpartum women of lower income. The PANSE scale was developed to fill a void in weight-related self-efficacy instruments available for this population. Previous instruments have focused on one aspect of weight-related situational eating or physical activity self-efficacy. The PANSE was designed to address both nutrition and physical activity, so that researchers might use a single brief instrument to assess self-efficacy for weight loss behaviors.

Methods

Study Design

Psychometric testing of the PANSE scale occurred during randomized (treatment [N=34] versus control [N=37] group) pilot tests of a 13-week weight loss intervention for mothers with lower income in their first year postpartum. Participants completed the PANSE scale by paper- and-pencil at Time 1 (baseline), Time 2 (7 weeks after baseline), and Time 3 (13 weeks after baseline). Institutional Review Board approval was obtained.

Participants and Recruitment

Participants were recruited using a variety of strategies (e.g., flyers at clinics, direct mailings, and radio advertising). Selection inclusion criteria were: English language literate; at least 18 years old; between 6 weeks to 12 months postpartum; overweight (BMI ≥ 25) and at least 5 kg over self-reported pre-pregnant weight; insured during pregnancy through Medicaid ($<185\%$ of poverty); healthy pregnancy resulting in a single birth; no more than 3 total births; and having access to a phone or pager. Women with chronic health conditions (heart disease, diabetes, HIV/AIDS, renal disease, mental illness treated by drugs) were excluded.

Of the 112 women meeting eligibility criteria, 71 self-identifying as Hispanic ($n = 23$), African American ($n = 25$), or Anglo/White ($n = 23$) were enrolled in the study. The mean age of the sample was 24.5 years ($SD = 4.8$, range 18-36). Sixty percent had a high school education or less; 83% had family incomes $< \$30,000$. Treatment and control groups did not differ by age, health behaviors, perceived stress, or decisional balance related to weight loss (scales described below), but did differ on BMI (treatment group = 31.4 vs. control group = 35.4, $p < .01$), and baseline self-efficacy (treatment group = 66.7 vs. control group = 74.1, $p < .05$).

Measures

The PANSE is an 11-item self-report scale of self-efficacy for weight loss. The definition of self-efficacy used in developing the PANSE scale was the degree of confidence women have regarding their capabilities to enact nutrition and physical activity behaviors related to weight loss. The initial items were developed from the authors' judgment, research experience, and knowledge of dietary (8 items) and activity behaviors (3 items) that influence weight loss. Example items include: "How confident are you that you can reduce your portion sizes at meals and snacks each day" and "How confident are you that you can increase time spent in physical activity while at home, given your current family responsibilities?" Respondents rate how confident they feel about doing the identified behavior on a scale of 1 (not at all) to 9 (completely). Scores can range from 11 to 99. Responses are summed to obtain a total score.

Three measures were used in construct validity analyses of the PANSE scale. An abbreviated 15-item version of the *Self Care Inventory* (SCI) (10) was used to measure

health behaviors at the three data collection points. The instrument contains items on positive and negative health practices pertaining to dietary, activity, alcohol, and smoking practices that may affect physical well-being. Higher scores on this measure indicate higher frequencies of unhealthy behavior. The SCI scores were expected to correlate negatively with PANSE scores, indicating less efficacy regarding activity and diet would be associated with more unhealthy behaviors. The *Perceived Stress Scale* (PSS) (11) was used to measure postpartum perceived stress at each of the three collection times. The PSS measures stress defined as feeling overwhelmed, overloaded, and out of control about general life events. Higher scores on the PSS indicate higher levels of stress, thus, a high PSS score was expected to correlate with a low PANSE score. The *Decisional Balance Inventory* (DBI) (12) is a measure of the individual's beliefs of the perceived pros and cons of losing weight. The final score is equal to pros minus cons; therefore, a higher total score represents more perceived pros of losing weight. Individuals who identified more pros than cons for weight loss were expected to have higher PANSE total scores. The DBI was completed at Time 1.

Weight change from Time 1 to Time 3 was used to establish the predictive validity of the PANSE. Women were weighed on an electronic scale (Fairbanks Portable Digital Scale, Kansas City, MO) following research protocol at each time period.

Data Analysis

Test-retest Reliability & Internal Consistency—Statistical analyses were performed using SPSS 16.0 (SPSS Inc., Chicago, IL, 2007). Combined treatment and control group data at Time 1 were used in internal consistency, construct validity, and factor analyses. Control group data at Time 1 and Time 2 were used for short-term test-retest analysis using Pearson correlation. Treatment group data at Times 1 and 3 were used in predictive validity analysis for weight loss. A Cronbach alpha coefficient of $r = \geq .70$ (13) was used to evaluate PANSE internal consistency. Item-total statistics were calculated using PANSE data at Time 1 to evaluate the contribution of each item to the total score. The criterion of $r = \geq .30$ was used for item-total correlations (13).

Validity: Construct, Factorial, Predictive—Construct validity assessment was based on the correlation of PANSE scores with SCI, PSS, and DBI at Time 1. The dimensionality of the PANSE scale (factorial validity) was explored using factor analysis. The scree plot and magnitude of eigenvalues were examined to determine the number of factors to extract. Varimax and oblique factor solutions were explored to find which method resulted in items having high loadings on no more than one factor. For predictive validity, PANSE scores for the treatment group at Time 1 were hypothesized to predict weight loss at Time 3. Pearson correlation coefficient (two-tailed test) was calculated between the treatment-group PANSE data at Time 1 and their weight change at Time 3 [(weight change) = (weight at Time 3) – (weight at Time 1)]. This method resulted in negative values if weight was lost between the start and end of the study. Additionally, PANSE change scores were computed similarly and correlated with weight loss.

Results

Test-retest Reliability & Internal Consistency

PANSE scale means for the treatment ($n = 34$) and control ($n = 37$) groups at Time 1 were 66.7 (SD = 16.5) and 74.1 (SD = 12.7), respectively. At Time 2, treatment ($n = 21$) and control ($n = 31$) group means were 72.3 (SD = 14.7) and 66.0 (SD = 17.2), respectively. The test-retest reliability of PANSE scores between Time 1 and Time 2 in the control group yielded a correlation of $r = .55$ ($P < 0.01$).

The PANSE Cronbach alpha coefficient of $r = .89$ exceeded the predetermined alpha criterion of $r \geq .70$ (13). The potential lowering of alpha coefficients associated with deletion of any individual item (SPSS “alpha if deleted”) ranged from $r = .87$ to $r = .89$. The item-total correlations ranging from $r = .48$ to $r = .73$ satisfied the criterion of $r \geq .30$. Each of the 11 items contributed to increasing the overall PANSE scale internal consistency and thus was retained.

Validity: Construct, Factorial, Predictive

In tests of construct validity at Time 1 in combined treatment and control groups, PANSE scores were significantly correlated with SCI ($r = -.33$, $P = .005$), PSS ($r = -.24$, $P = .04$), and DBI ($r = .25$, $P = .03$). Each measure was correlated with PANSE total scores in the expected directions.

For factor analysis, the initial Kaiser-Meyer-Olkin Measure of Sampling Adequacy resulted in a value of 0.86 ($P < .01$), indicating an adequate ratio of sample size to number of items on the PANSE scale for valid analysis. The first 2 eigenvalues exceeded 1.0; however, the scree plot showed only one sharp bend in the array to eigenvalues. Because the scree plot is a more accurate method for determining how many factors to extract, whereas eigenvalues of greater than 1.0 may overestimate factors (14), a one-factor solution was applied. This factor had an explained variance of 48.21% and loadings ranged from .80 to .57 (see Table 1). Although we also examined 2-factor solutions using Varimax orthogonal and oblique rotations, several items cross-loaded on both factors and thus further supported the 1-factor solution as more parsimonious.

In tests of predictive validity within the treatment group, the Pearson correlation between PANSE total scores at Time 1 and weight change at Time 3 was $r = .08$ ($P > .05$). (Note, mean weight change was -1.2 lb [SD = 9.9]). However, the correlation between weight change and PANSE change from Time 1 to Time 3 for total scores was $r = -.54$ ($P < .01$). The direction of this correlation indicates that as self-efficacy increased, weight decreased.

Discussion

Test-retest results of the PANSE scale for only the control group moderately support the instrument's capability of producing similar results over a 7-week interval when no intervention has been employed. The Cronbach alpha and item-total statistics showed strong internal consistency of the PANSE scale. This suggests that each of the 11 PANSE items share substantial variance related to self-efficacy for weight loss behaviors.

Correlations between the PANSE and construct validity measures in this study are congruent with past research. A meta-analysis of positive health practices and self-efficacy (15) supports the negative correlation between the SCI and PANSE scale in the present analysis. Regarding the relationship between the PSS and PANSE scale, Foreyt and colleagues (16) found weight “fluctuators” report higher stress and lower eating self-efficacy than “non-fluctuators” do. Robinson and colleagues (17) report an increase in pros and self-efficacy for physical activity and a decrease in cons occurred with stage of change progression for weight loss in overweight or obese women. These findings mirror those between the DBI and PANSE scale.

Factor analysis results rendered a one-factor model related to dietary behavior and physical activity with all 11 items loading .57 or higher on that factor. Although both dietary and activity items are included in the PANSE, its unidimensionality indicates these items share a common domain with regard to self-efficacy for weight loss. In this regard, it is noteworthy that Jeffery and French (18) reported that women who watched more television (sedentary

behavior) had higher caloric intake (dietary behavior). Because our analysis was based on a relatively small sample, its replication in a larger sample is warranted to confirm the factor structure of the PANSE.

Higher baseline self-efficacy generally has been associated with greater weight loss (19). This was not the case in the current study. Indeed, Bandura postulated the strong influence of mastery experience by stating that individuals' prediction of their own performance in a given task will be less accurate if they have little experience with it and individuals may also have faulty self-appraisals of confidence in their abilities due to faulty memory of previous experiences (20). Mastery experience may be necessary for individuals to judge their capacity for a given behavior correctly (21, 22). These situations may partially explain the discrepancy between baseline self-efficacy and lack of weight loss in the current sample.

By contrast, in the current study, change in PANSE scores did predict weight change in the treatment group from Time 1 to Time 3. Similar results regarding self-efficacy and weight change have been previously reported (22). Participants' increased experience with weight loss methods during the intervention phase, specifically within the context of motherhood, may have provided a mastery experience for them, thus increasing likelihood of weight loss.

A limitation of the current study is the small sample size, which did not allow for some analyses, or permit subgroup psychometric analyses within ethnicity that may be important to understanding self-efficacy for weight loss within these populations. Sample size also did not allow for subgroup analyses within the treatment and control groups to assess the impact of differences in baseline BMI and self-efficacy on the psychometric findings. Further validation tests, such as confirmatory factor analyses, may illuminate additional information about the underlying structure of the PANSE scale. A measure of diet history, which may reflect building self-efficacy through mastery experience, may provide further construct validation of the PANSE scale.

Implications for Research and Practice

Preliminary psychometric assessment of the PANSE scale indicates it is a promising measure for activity and eating self-efficacy for weight loss among postpartum women of lower income. The scale is brief, and findings support its test-retest reliability, internal consistency, and factorial, construct, and predictive validity in this small sample. Further testing of the PANSE scale with larger samples over long periods using more complex analyses are needed to support its predictive validity for weight loss. At present, it is premature to recommend widespread use of the PANSE scale in practice. It may be useful for psychosocial assessment if predictive validity is supported in future studies. Still, the PANSE offers the potential to deepen understanding of psychosocial aspects of the weight loss process among lower income women.

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Table 1
Items and Factor Loadings of the Physical Activity and Nutrition Self-Efficacy (PANSE) Scale

PANSE items	Factor loadings
6. How confident are you that you can reduce or omit fats (butter, fatty meats or oils) in cooking vegetables, beans, or frijoles?	.80
3. How confident are you that you can reduce the amount of butter and other fats or oils that you eat each day?	.80
4. How confident are you that you can eat only a very small amount of fried foods like fried chicken, French fries, potato chips, or other fried foods each week?	.72
11. How confident are you that you can select lower calorie foods at a fast food restaurant?	.72
5. How confident are you that you can reduce or omit drinking sugary drinks like Kool-Aid, colas, sugared teas and coffee, or other sugared soft drinks?	.71
8. How confident are you that you can reduce the amount of time you sit and watch TV?	.71
2. How confident are you that you can increase the number of fruits and vegetables you eat daily?	.69
9. How confident are you that you can increase time spent in physical activity while at home, given your current family responsibilities?	.68
7. How confident are you that you can substitute lower calorie foods – like fruits, vegetables, or yogurt – for high calorie snacks – like cakes, pies, or ice cream?	.61
1. How confident are you that you can reduce your portion sizes at meals and at snacks each day?	.59
10. How confident are you that you can increase time spent in physical activity by walking or other activities outside the home?	.57