Effects of Treatment Differences on Psychosocial Predictors of Exercise and Improved Eating in Obese, Middle-Age Adults

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Background: Behavioral interventions for weight-loss have been largely unsuccessful. Exercise is the strongest predictor of maintained weight loss and much of its effects may be from associated changes in psychosocial factors.

Methods: Middle-aged, formerly sedentary adults with severe obesity were randomly selected to 6-month treatments of cognitive-behavioral exercise support paired with either standard nutrition education (n = 99) or nutrition change supported by cognitive-behavioral means with an emphasis on self-regulation (n = 101).

Results: Overall improvements in self-efficacy and self-regulation for both exercise and managed eating, and mood, were found, with significantly greater improvements associated with the cognitive-behavioral nutrition condition in self-regulation for eating and mood. Change scores trended toward being stronger predictors of increased exercise and fruit and vegetable intake than scores at treatment end. Multiple regression analyses indicated that significant portions of the variance in both increased volume of exercise ($R^2 = 0.45$) and fruit and vegetable intake ($R^2 = 0.21$) were explained by changes in self-regulatory skill usage, self-efficacy, and mood.

Conclusions: Cognitive-behavioral methods for improved eating paired with behavioral support of exercise may improve weight loss through effects on the psychosocial factors of self-regulation, self-efficacy, and overall mood more than when standard nutrition education is incorporated.

Keywords: weight loss, psychological factors, physical activity, behavioral medicine

Weight-loss treatments typically consist of education on the need to reduce caloric intake through a modified (hopefully healthy) diet. Comprehensive reviews of interventions and their outcomes strongly suggest that they have been largely ineffective, as most lost weight is typically soon regained and health risks are not meaningfully improved. A pattern of repeated weight loss and regain may even lead to an increase in health risks.

Even the most recent state-of-the art cognitive-behavioral methods (ie, methods emphasizing the self-regulation of thoughts, perceptions, and actions) focused on reducing caloric intake had disappointing outcomes of nearly complete weight regain, causing its developers to question the viability of any behavioral (nonmedical) weight-loss treatment.

Although exercise is the strongest predictor of maintained weight loss, it has typically been used as only an ancillary component of weight-loss treatments. The basis of the positive effect of exercise on weight loss in individuals with severe obesity remains unknown, as it is unlikely that such deconditioned individuals can exert enough energy to directly induce a meaningful reduction in weight from their physical activity outputs. Thorough investigation into the positive effects of exercise on weight loss has been specifically cited as a gap in treatment research requiring attention.

Baker and Brownell offered an explanatory model suggesting that exercise impacts weight loss through psychosocial pathways. They posited that exercise-induced improvements in mood (eg, depression and anxiety) and feelings of well-being, body image, self-efficacy (ie, feelings of ability), self-esteem, and coping with barriers lead to improved motivation, commitment, and psychological resources, which, in turn, are associated with an improved diet, more exercise, and weight control. In a series of studies, this model was extended, and it was suggested that when exercise is supported in ways that induce improved self-efficacy, mood, and self-regulatory skills usage (eg, self-talk, progress tracking), there is a carry-over of such changes to eating behaviors such as fruit and vegetable consumption. Such findings were supported by 1) self-efficacy theory and social cognitive theory, 2) recent research demonstrating the importance of self-regulation for improving health behaviors, and 3) how self-regulation for exercise appears to generalize to improvements in other health behaviors including improved eating. Exercise-induced improvements in mood were suggested to be related to improvements in emotional eating and weight loss.

Although this research has promise for informing a new and different approach to the behavioral treatment
of obesity—one where exercise is the *central* component through its effects on psychosocial predictors of improved eating—a number of research questions still require attention. For example, the pattern of changes in the proposed psychosocial variables is unknown. If changes in self-regulatory skill usage, self-efficacy, and mood are mostly made within the initial several months of treatment, then this time may be best used to emphasize behavioral skill development (eg, before focusing on nutritional information). Also unknown is whether specific training is required to induce changes in the usage of self-regulatory skills, self-efficacy, and mood related to improved eating, or if associated effects on these factors within an exercise context will generalize to eating to a point that additional improvement should not be expected. Although exercise supported by cognitive-behavioral means had previously been paired with treatments having either educational or cognitive-behavioral bases,9 a direct contrast of their temporal effects on the proposed predictors of behavior change (ie, changes in self-efficacy, self-regulation, and mood), or their degree of carry-over from exercise to improved eating, was not made. Moreover, it is not known whether the treatment-induced changes in self-regulatory skill usage, self-efficacy, and mood are the best predictors of increased exercise and improved eating, or if levels of these factors at treatment end are more salient? For example, if a 6-month time frame is used (because of its correspondence with actualization of change from the action stage to the maintenance stage suggested in the transtheoretical model),7 a contrast of an absolute self-efficacy score at Month 6 with change in score from baseline to Month 6 may yield important information. An improved understanding of this may affect treatment goals, or even whether individuals should be selected for tailored treatments based on their initial self-regulatory abilities, self-efficacy, or mood. Finally, it is a concern that earlier research tended to group together persons of varied ages and degrees of overweight/obesity. Because barriers to desired behaviors vary based on stage of life and degree of overweight (eg, younger adults may have additional barriers related to child care while extremely obese individuals may need to overcome great discomfort associated with exercise),16 findings may have been distorted.

Thus, the present research limited participants to middle age (ie, 35–54 years, as defined by the US Census) and a body mass index (BMI) of 35–50 kg/m², because of a high propensity for obesity-related health risks in this subgroup.17,18 Treatments incorporated cognitive-behaviorally supported exercise paired with either a standard nutrition education component or a nutrition component focused on improved eating though cognitive-behavioral methods. Based on a synthesis of the previous related research, the following hypotheses are given:

1. There will be significant improvements in the psychosocial predictors of self-regulation and self-efficacy for both exercise and managed (well-controlled) eating, and mood; and the outcome measures of volume of exercise and fruit and vegetable intake in both treatment groups, with improvements most pronounced in the cognitive-behaviorally supported nutrition group
2. Changes in the above psychosocial measures will be more strongly related to improvements in exercise and fruit and vegetable intake than corresponding scores at treatment end
3. Measures of self-regulation, self-efficacy, and mood will predict improvements in exercise volume and fruit and vegetable intake, with the self-regulation measure being the strongest unique contributor to the variances explained.

**Methods**

**Participants**

Middle age individuals responded to advertisements soliciting volunteers for a treatment at a YMCA focused on exercise and nutrition improvement. Inclusion criteria were age range of 35–54.9 years, a BMI of 35–50 kg/m², and no regular exercise within the previous year. Present or soon-planned pregnancy and use of medications for weight loss or a psychological condition were reasons for exclusion. A written statement of adequate health to participate was required from a physician. Appropriate institutional review board approval and written informed consent from all participants was obtained.

There was no significant difference in percentage of women (overall 81%), age (overall mean = 44.3 years, SD = 5.5), BMI (overall mean = 39.8 kg/m², SD = 4.1), and racial make-up (overall 52% White, 46% Black, and 2% of other racial groups) between participants randomly assigned to cognitive-behavioral exercise support paired with either nutrition education (NutrEd group; n = 99) or cognitive-behavioral methods for nutritional change (Cog-BehNutr group; n = 101). Most participants were middle-class. There was minimal attrition from initial acceptance into the study to initiating participation (3%) that did not differ by group.

**Measures**

Because of the high number of self-report scales incorporated into the study, brief but valid instruments were selected to minimize participant burden and response distortions. Self-regulation skill usage for exercise (eg, “I set physical activity goals”) and self-regulation skill usage for managed eating (eg, “I purposefully address my barriers to eating appropriately”) were measured by an adaptation of a previously validated scale.19 As intended by its developers, the 10 items each of the 2 measures were based on the content of the present treatment. Responses ranged from 1 (Never) to 5 (Often). For the present version of the scale, internal consistency was
0.80 and 0.81, respectively; and test-retest reliability over 2 weeks was 0.86 and 0.74, respectively.7

Self-efficacy for exercise was measured by the Exercise Self-Efficacy Scale.20 It has 5 items that begin with the stem, “I am confident I can participate in regular exercise when,” (eg, “I feel I don’t have the time”), ranging from 1 (Not at all confident) to 7 (Very confident). Internal consistencies were reported to be 0.82 and 0.76, and test-retest reliability over 2 weeks was 0.90.21

Self-efficacy for managed eating was measured by the Weight Efficacy Lifestyle Scale.22 It has 5 subscales (Negative Emotions, Availability, Physical Discomfort, Positive Activities, and Social Pressure; eg, “I can resist eating even when others are pressuring me to eat”) derived from the hypothesized factors comprising self-efficacy for managed eating. Responses to its 20 items range from 0 (Not confident) to 9 (Very confident), and are summed for a total score. Internal consistency was reported to range from 0.70–0.90.22

Overall mood was measured by the Total Mood Disturbance scale, which is derived by aggregating scores on the 6 subscales (Depression, Tension, Fatigue, Vigor, Confusion, and Anger) of the Profile of Mood States Short Form.23 Respondents rate feelings over the past week on 30 items (eg, anxious, sad) ranging from 0 (Not at all) to 4 (Extremely). Internal consistency ranged from 0.84–0.95, and test-retest reliability at 3 weeks averaged 0.69.23

The Godin Leisure-Time Exercise Questionnaire24 was used to measure volume of exercise completed over the previous week. Respondents entered frequencies of strenuous (“heart beats rapidly”; eg, running), moderate (“not exhausting”; eg, fast walking), and light (“minimal effort”; eg, easy walking) exercise for “more than 15 minutes” per session. The responses were multiplied by 9, 5, and 3 standard metabolic equivalents (METs), respectively, and then summed. Construct validity was supported by significant correlations between questionnaire scores and accelerometer and VO2max measurements of exercise volume, and test-retest reliability over 2 weeks was reported to be 0.74.24

Measurement of fruits and vegetables consumed over the previous week was based on a scale derived from the US Food Guide Pyramid and its descriptions of possible foods and portion sizes.25 Responses to items of fruits and vegetables consumed “in a typical weekday (Monday through Friday)” and “in a typical weekend day (Saturday and Sunday)” were recorded and given a weight of 0.71 (5/7) for the weekday response, and 0.29 (2/7) for the weekend response. Test-retest reliability assessments over 2 weeks averaged 0.82; and concurrent validity was suggested through significant correlations with considerably longer, more invasive, food frequency questionnaires.26 Adequacy of this measure was indicated for both its responsiveness in the context of the present treatments and to minimize participant burden and distorted responses.27 Research suggests that fruit and vegetable consumption, alone, is a predictor of appropriate eating, overall caloric consumption, and body weight.28,29

Weight was measured in kg through use of a calibrated digital scale.

Procedure

Before providing informed consent, individuals were informed (in lay terms) that, if agreement to participate is given, he/she would be randomly assigned to a group-based nutritional component that would be paired with exercise support that consisted of a series of one-on-one meetings with a YMCA wellness professional. Each participant was then provided full access to a YMCA wellness facility and received an orientation to processes associated with his/her assigned group. The 6-month exercise support treatment component was identical in both groups and consisted of a previously validated protocol of cognitive-behavioral methods within 6, 1-hour meetings with a certified YMCA wellness leader.30 The one-on-one sessions included an orientation to exercise apparatus and facilities available. Widely used recommendations for volume of weekly exercise (150 minutes of moderate cardiovascular physical activity)31 were described, but it was also indicated clearly that any volume of exercise may be beneficial. The great majority of meeting time was spent on an array of self-regulatory/self-management methods (eg, productive self-talk, relapse prevention) intended to support ongoing exercise. Long-term exercise goals were identified, documented, and broken down into process-oriented short-term goals where ongoing progress was tracked graphically to increase feelings of competence (ie, self-efficacy). Behavioral contracting was also used where specific agreed-upon types of progress with exercise (eg, increasing weekly cardiovascular exercise from 45 minutes per week to 80 minutes per week within 1 month) were agreed upon and formalized.

The nutrition treatment components varied by group. In the NutrEd group, a standardized array of 6, 1-hour group sessions of nutrition information32 was administered from the start of Month 2 through Month 4. Sessions were led by certified YMCA wellness leaders. They included instruction in understanding macronutrients, use of the US Food Guide Pyramid, and menu planning.

The Cog-BehNutr group had the identical format and meeting times as the NutrEd group. Treatment components differed, however, by focusing primarily on cognitive-behavioral techniques such as setting caloric goals and logging daily food and calorie intake, regular self-weighing, cognitive restructuring, relapse prevention training, cues to overeating, and mood-enhancement strategies such as deep breathing and abbreviated progressive muscle relaxation. The need to increase fruit and vegetable consumption was similarly emphasized in both nutrition treatment conditions in every session.

Instructors were blind to the purposes of the research. Fidelity of the protocols was monitored by YMCA supervisors in cooperation with study administrators. Assessments were administered in a private area at baseline, Month 3, and Month 6.
Data Analyses

An intention-to-treat analysis was used. Multiple imputation was incorporated for the 14% of missing cases. Significance level was set at \( \alpha = 0.05 \) (2-tailed), throughout. The Bonferroni adjustment was applied where appropriate. Considering the planned assessment of 3 psychosocial factors’ prediction of eating and exercise change, to detect a small-medium effect size of \( f^2 = 0.075 \) at the power level of 0.90 (\( \alpha = 0.05 \)), an overall minimum sample size of 192 was required.

Based on recent suggestions for this type of analysis, actual score changes (rather that changes adjusted for baseline value) were used. To evaluate changes in the behavioral predictors of exercise (ie, self-regulation for exercise, exercise self-efficacy, and mood) and well-managed eating (ie, self-regulation for eating, self-efficacy for managed eating, and mood) and the outcome measures of volume of exercise and fruit and vegetable consumption at 3 times (baseline, Month 3, Month 6), a series of mixed model repeated-measures ANOVAs were first calculated. This method has the advantage of simultaneously analyzing both within- and between-group changes. Corresponding effect sizes are expressed as partial eta-square (\( \eta^2_p \)) where 0.010, 0.059, and 0.138 denote small, moderate, and large effects, respectively. Next, considering aggregated data, linear bivariate correlations between changes over 6 months in exercise volume and fruit and vegetable consumption, and 1) changes in their respective predictors and 2) each predictor’s score at Month 6, were contrasted by utilizing a test for correlated correlations using conversions to \( z \)-scores. After first determining whether change over 6 months or score at Month 6 was more strongly associated with exercise and fruit and vegetable consumption change, those terms were simultaneously entered as predictors within multiple regression models. All analyses were conducted using SPSS software, version 15.0 (SPSS, Chicago, IL).

Results

There was no significant difference at baseline in age, BMI, proportion of males to females, proportion of racial groups, or any of the self-report measures between participants with missing data and participants whose data were present for Month 3 and Month 6. For both groups, descriptive statistics of scores at baseline, Month 3, and Month 6 are given in Table 1. There were no significant differences between the NutrEd and Cog-BehNutr groups at baseline for any of the measures.

For the behavioral measures, self-efficacy for managed eating demonstrated a significant overall improvement from baseline to Month 6, \( F_{1,198} = 71.09, P < .001, \eta^2_p = 0.264 \), and from Month 3 to Month 6, \( F_{1,198} = 13.16, P < .001, \eta^2_p = 0.062 \). Significant overall improvements were found from baseline to Month 6 for self-regulation for exercise, \( F_{1,198} = 151.50, P < .001, \eta^2_p = 0.433 \), exercise self-efficacy, \( F_{1,198} = 14.80, P < .001, \eta^2_p = 0.070 \), mood, \( F_{1,198} = 96.59, P < .001, \eta^2_p = 0.328 \),

Table 1  Descriptive Statistics of Study Scores at 3 Times

<table>
<thead>
<tr>
<th>Measure</th>
<th>NutrEd group (n = 99)</th>
<th>CogBeh Nutr group (n = 101)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Baseline</td>
<td>Month 3</td>
</tr>
<tr>
<td>Exercise self-efficacy</td>
<td>30.04</td>
<td>33.24</td>
</tr>
<tr>
<td>Self-regulation for eating</td>
<td>99.85</td>
<td>32.97</td>
</tr>
<tr>
<td>Weight efficacy lifestyle</td>
<td>8.62</td>
<td>22.50</td>
</tr>
<tr>
<td>Volume of exercise (METs)</td>
<td>6.26</td>
<td>22.50</td>
</tr>
<tr>
<td>Fruit and vegetable intake</td>
<td>4.63</td>
<td>5.09</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>115.14</td>
<td>113.32</td>
</tr>
</tbody>
</table>
and self-regulation for managed eating, $F_{1,198} = 146.60, P < .001, \eta^2_p = 0.452$; but not from Month 3 to Month 6. Between-group differences were found for baseline to Month 6 improvements for self-regulation for eating, $F_{1,198} = 5.92, P = .016, \eta^2_p = 0.029$, and mood, $F_{1,198} = 4.52, P = .035, \eta^2_p = 0.022$, where improvements were significantly greater for the Cog-BehNutr group.

For the outcome measure of fruit and vegetable intake, significant overall improvements were found from baseline to Month 6, $F_{1,198} = 51.90, P < .001, \eta^2_p = 0.208$, and from Month 3 to Month 6, $F_{1,198} = 11.03, P = .001, \eta^2_p = 0.053$. Significant overall improvements were found from baseline to Month 6 for exercise volume, $F_{1,198} = 161.74, P < .001, \eta^2_p = 0.450$; but not from Month 3 to Month 6. For fruit and vegetable intake, between-group differences were found for improvements from baseline to Month 6, $F_{1,198} = 7.01, P = .009, \eta^2_p = 0.034$, and Month 3 to Month 6, $F_{1,198} = 5.86, P = .016, \eta^2_p = 0.029$; with the improvements greater for the Cog-BehNutr group. No between-group difference was found for increases in exercise volume.

Linear bivariate correlations between changes in exercise volume and fruit and vegetable intake, and 6-month changes in their respective predictors and each predictor at Month 6, were each significant (see Table 2). In each of the 6 cases, correlation coefficients were stronger in change scores when contrasted with the scores on the same measure at Month 6. Statistical significance was not, however, reached (Table 2). Based on these data, it was decided to use change scores (rather than scores at Month 6) as predictors in the planned multiple regression equations.

Multiple regression analyses indicated that changes in self-regulation for exercise, exercise self-efficacy, and

### Table 2 Differences in Linear Bivariate Correlations of Predictors of Exercise and Fruit and Vegetable Intake Changes (N = 200)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>Change from baseline to Month 6</th>
<th>Score at Month 6</th>
<th>Differences between correlations</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$r$</td>
<td>$r$</td>
<td>$z$</td>
</tr>
<tr>
<td>Change in volume of exercise</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-regulation for exercise</td>
<td>0.62</td>
<td>0.60</td>
<td>0.65</td>
</tr>
<tr>
<td>Exercise self-efficacy</td>
<td>0.28</td>
<td>0.27</td>
<td>0.13</td>
</tr>
<tr>
<td>Total mood disturbance</td>
<td>-0.52</td>
<td>-0.49</td>
<td>1.00</td>
</tr>
<tr>
<td>Change in fruit and vegetable intake</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Self-regulation for eating</td>
<td>0.42</td>
<td>0.33</td>
<td>1.41</td>
</tr>
<tr>
<td>Weight lifestyle efficacy</td>
<td>0.38</td>
<td>0.28</td>
<td>1.40</td>
</tr>
<tr>
<td>Total mood disturbance</td>
<td>-0.34</td>
<td>-0.23</td>
<td>1.62</td>
</tr>
</tbody>
</table>

*Note. All tests are 2-tailed. All bivariate correlations are $P < .001$.*

### Table 3 Multiple Regression Analyses for the Prediction of Changes in Exercise, Fruit, and Vegetable Consumption, and Weight (N = 200)

<table>
<thead>
<tr>
<th>Predictor</th>
<th>$\beta$</th>
<th>$SE_\beta$</th>
<th>$R^2$</th>
<th>$F$</th>
<th>$df$</th>
<th>$P$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome measure: change in volume of exercise</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta$ Self-regulation for exercise</td>
<td>0.47</td>
<td>0.15</td>
<td>0.45</td>
<td>52.52</td>
<td>3, 196</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>$\Delta$ Exercise self-efficacy</td>
<td>0.03</td>
<td>0.10</td>
<td></td>
<td></td>
<td></td>
<td>.631</td>
</tr>
<tr>
<td>$\Delta$ Total mood disturbance</td>
<td>-0.28</td>
<td>0.08</td>
<td></td>
<td></td>
<td></td>
<td>&lt;.001</td>
</tr>
<tr>
<td>Outcome measure: change in fruit and vegetable intake</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta$ Self-regulation for eating</td>
<td>0.25</td>
<td>0.02</td>
<td>0.21</td>
<td>17.49</td>
<td>3, 196</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>$\Delta$ Weight efficacy lifestyle</td>
<td>0.17</td>
<td>0.004</td>
<td></td>
<td></td>
<td></td>
<td>.031</td>
</tr>
<tr>
<td>$\Delta$ Total mood disturbance</td>
<td>-0.13</td>
<td>0.01</td>
<td></td>
<td></td>
<td></td>
<td>.103</td>
</tr>
<tr>
<td>Outcome measure: change in weight</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>$\Delta$ Volume of exercise</td>
<td>-0.40</td>
<td>0.02</td>
<td>0.28</td>
<td>37.25</td>
<td>2, 197</td>
<td>&lt;.001</td>
</tr>
<tr>
<td>$\Delta$ Fruit and vegetable intake</td>
<td>-0.22</td>
<td>0.21</td>
<td></td>
<td></td>
<td></td>
<td>.001</td>
</tr>
</tbody>
</table>

*Note. The Delta symbol ($\Delta$) adjacent to a measure denotes change in score from baseline to Month 6.*
mood accounted for a significant portion of the variance in change in volume of exercise (Table 3). Changes in self-regulation for eating, self-efficacy for managed eating, and mood explained a significant portion of the variance in fruit and vegetable intake (Table 3).

Weight change was addressed in post hoc analyses, with descriptive statistics included in Table 1. Weight demonstrated a significant overall improvement from baseline to Month 6, $F_{1,198} = 102.60$, $P < .001$, $\eta^2_p = 0.341,$ and from Month 3 to Month 6, $F_{1,198} = 37.53$, $P < .001$, $\eta^2_p = 0.159$; with a significantly greater improvement found for the Cog-BehNutr group from baseline to Month 6, $F_{1,198} = 7.51$, $P = .007$, $\eta^2_p = 0.037$. Multiple regression analysis indicated that change in exercise volume and fruit and vegetable consumption accounted for a significant 28% of the variance in weight change over 6 months (Table 3).

Discussion

The results suggest that emphasizing cognitive-behavioral methods applied to managed eating serves to better improve self-regulatory skills and mood when paired with behaviorally based exercise support and contrasted with standard nutrition education. Benefits of a well-constructed cognitive-behavioral intervention, with a strong focus on supported exercise, for inducing improved eating and weight loss was indicated. Most of the changes in self-regulation, self-efficacy, and mood occurred during the initial 3 months of treatment. Possibly, education on nutrition principles is best deferred until an initial period of self-regulatory skill development or, possibly, it is best integrated into the training of behavioral skills. Related longitudinal research will be required to determine the optimal shape and duration of treatment components for maintenance of changes in weight-loss behaviors. Although difficult to directly measure, the previously suggested carry-over from exercise program-induced psychosocial changes to corresponding eating-related changes was generally supported by the exercise-related cognitive-behavioral components being introduced 4–5 weeks before the nutrition-related components.

The finding that changes in the measures of the aforementioned psychological constructs were superior predictors of behavioral improvements than scores at treatment end suggests that weight-loss programs should seek to facilitate participants’ improvement (where ever they might start from), rather than look toward attainment of a particular standard. Such an emphasis on incremental progress may further improve self-efficacy through targeting and carefully highlighting participants’ gradual gains. In agreement with previous research, improvements in self-regulation, self-efficacy, and mood accounted for substantial portions of the variance in increased exercise and improved eating in this sample—leading to weight loss. The finding that self-regulation changes demonstrated the strongest independent contributions to the variances explained suggests that future treatments emphasize the development of those skills.

Limitations of this research included its field design that challenged experimental control, and potential social support and/or expectation effects from fellow participants and instructors. It has been suggested; however, that field-based research is a strength given that its findings may be easily and rapidly generalized to practice settings.

The use of volunteers and primarily women may have, however, adversely affected the carry-over of findings to practice. Volunteers may be especially motivated for change, and women tend to disproportionately volunteer for weight-loss treatments. Possibly, incorporating participants whose physicians mandate their participation (thereby minimizing effects of volunteerism), and utilizing sample sizes large enough where the sexes may be separately analyzed, will address these limitations in extensions of this research. In addition, although the instruments used were adequately validated, reliance on self-reporting of behaviors possesses inherent limitations (eg, from expectation effects). Although fruit and vegetable consumption, alone, was used as an indicator of overall eating changes, some recent research does not definitively support this. Thus, more comprehensive measurement of food intake is suggested for extensions of this research—especially when measurement methods (eg, completion of self-report instruments) do not impose undue time burdens on participants. Evaluating possible moderators of relationships of the psychosocial variables and exercise and fruit and vegetable intake changes such as age, sex, ethnicity, and initial degree of overweight will, undoubtedly, clarify the generalizability of the findings. Longer-term studies will be required to evaluate maintenance of effects, especially in regard to the resiliency of newly formed self-regulatory skills and the longer-term effects that exercise-induced mood improvements may have on emotional eating.

In summary, the findings served to inform development of theory-based, behavioral weight management treatment. Indications are that carefully supported exercise may be leveraged for important psychosocial changes that are predictive of well-managed eating, and should be incorporated as a central treatment component to break the cycle of repeated weight loss and regain. Thus, the development and longitudinal testing of a corresponding treatment for attaining and sustaining weight loss that emphasizes improvements in self-regulation, self-efficacy, and mood is warranted.

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References


