Psychological Predictors of Weight Loss Based on Participants’ Predispositions: Obesity Treatment Implications

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ABSTRACT

Introduction: Treatments for obesity focused on improving self-regulation, self-efficacy, and mood demonstrated promise for inducing maintained weight loss. However, they might be improved if tailored to subjects’ psychological predispositions.

Methods: The study sample was of women (N = 139) with obesity (body mass index ≥ 30 kg/m²). After classification of the subjects as low self-regulation (n = 23), high negative mood (n = 16), high emotional eating (n = 24), low body satisfaction (n = 25), and no predisposition (n = 51), multiple regression models were fit.

Results: Changes in self-regulation, self-efficacy, and mood over 3 months significantly predicted 6-month change in weight (R² = 0.17–0.50). Except for the negative mood grouping, changes in self-regulation contributed most strongly to the explained variances in weight loss.

Conclusion: Findings contributed to the limited research on tailoring obesity treatments to individual psychological characteristics. Regardless of characteristics, the value of increasing self-regulatory skills to address lifestyle barriers and improving mood through increased physical activity was indicated.

INTRODUCTION

Although obesity is a common condition, behavioral (non-surgical/nonpharmacological) obesity treatments have typically been atheoretical, with consistently poor weight-loss outcomes beyond the initial 3 to 6 months. A novel behavioral intervention approach based on social cognitive theory and interrelations between treatment-induced improvements in self-regulation, negative mood, and self-efficacy demonstrated success at attaining and sustaining meaningful amounts of weight loss and contributed to an explanatory model. Treatments consistent with that model differed from other research based on social cognitive theory in that physical activity was suggested as a mechanism for psychological correlates of eating behavior changes.

It was thought that tailoring treatment emphases based on how subjects’ pretreatment psychological disposition differentially impacts effects of self-regulation, negative mood, and self-efficacy on weight could be both feasible and beneficial. With sufficient guidance emanating from new lines of research, such as our investigation, it was posited that this could be attained even for large-scale intervention applications, which might supplement efforts from physicians and other medical professionals with limited time for direct patient contact. Such a precision approach, in which emphases on treatment elements are adjusted as indicated, previously demonstrated viability within a community-based exercise adherence intervention.

Research indicates that frequent characteristics of individuals with obesity are low coping/self-regulatory abilities, negative mood, high degrees of emotional eating, and poor body satisfaction. Thus, these psychological attributes could be used to group subjects and compare effects emanating from the theory- and evidence-based treatment targets of increased self-regulation, reduced negative mood, and enhanced self-efficacy. The minimal research in this area has usually been limited by cross-sectional designs, analyses of characteristics not malleable through intervention (eg, age, number of weight-loss attempts), and constructs without theoretical bases.

Therefore, preliminary research on women within a behavioral obesity treatment was conducted. Based on a summary of previous findings, it was hypothesized that, when considered together, 3-month improvements in self-regulation, mood, and self-efficacy would significantly predict 6-month weight loss. It was a further aim of this research to evaluate which predictors are the most salient, and whether they differ based on subjects’ psychological predisposition. It was hoped that findings would facilitate adjustments of treatment architectures and emphases to maximize their weight-loss effects.

METHODS

Subjects

Subject data (N = 139; age range, 18–60 years) were from an ongoing program of research on weight management with goals different than our inquiry. Individuals volunteered through responses to print and electronic advertisements. Because females experience body image, mood, emotional eating, and weight issues differently than men, only women...
with obesity (body mass index ≥ 30 kg/m²) were included. Exclusion criteria were a medical contraindication for participation, psychotropic medication change within the previous 6 months, and present/soon-planned pregnancy. Postdata collection classification into groupings of psychological pre-dispositions were based on a baseline score at least 1 standard deviation in the unfavorable direction from the overall sample mean (the least favorable 16%). In the minimal number of cases in which 2 or 3 predispositions per subject were identified (9%), the subject was classified as the one with the greatest difference from the mean. Subjects classified as low eating self-regulation (n = 23), high negative mood (n = 16), high emotional eating (n = 24), low body satisfaction (n = 25), and no identified predisposition (n = 51) did not differ significantly (p > 0.15) in age [overall mean, 42.1 ± 9.2 years (standard deviation)], body mass index (overall mean, 35.5 ± 3.4 kg/m²), reported family income [median, ~US$49,000/y (middle income)], or race/ethnicity (73% white, 23% black, 4% other). A university institutional review board approved the study protocol, and institutional review board-approved written consent was required from each subject prior to study start. Ethical requirements of the Helsinki Declaration and the American Psychological Association were followed throughout. Internal consistency averaged Cronbach’s α = 0.77 in women with obesity (0.74 in this sample), and 2-week test–retest reliability averaged 0.79.12

Body satisfaction was measured by the associated 9 items of the Multidimensional Body–Self Relations Questionnaire.13 Possible responses to areas of the body [eg, “mid torso (waist, stomach)”] range from 1 (very dissatisfied) to 5 (very satisfied), and a mean item score was calculated. In women, internal consistency was Cronbach’s α = 0.73 (0.77 in this sample), with 4-week test–retest reliability at 0.74.13

Eating self-efficacy was measured by the 20-item Weight Efficacy Lifestyle Scale,14 which aggregates feelings of ability to overcome barriers to healthy eating related to physical discomforts, positive activities, negative emotions, social pressures, and high food availabilities (eg, “I can resist eating even when high-calorie foods are available”). Possible responses range from 0 (not confident) to 9 (very confident), and were summed. Internal consistency within item groupings were Cronbach’s α = 0.76 to 0.8214 (0.79–0.83 in this sample).

Weight was measured to the nearest 0.1 kg by a recently calibrated digital floor scale. After a subject removed any heavy outer clothing (eg, coat) and footwear, the mean of 2 consecutive measurements was recorded.

Measures

Eating self-regulation was measured using a 10-item scale indicating current use of self-regulatory skills for controlling eating (eg, proximal goal setting/tracking, relapse prevention, cognitive restructuring).10 Responses ranging from 1 (never) to 4 (often) were summed. In adults with obesity, internal consistency was Cronbach α = 0.81 (α = 0.80 in this sample), and 2-week test–retest reliability was 0.74.10

Negative mood was measured by the 30-item Profile of Mood States–Brief scale of total mood disturbance,11 which aggregates dimensions of depression, anxiety, fatigue, anger, confusion, and vigor. Possible responses to items such as “sad” and “anxious” range from 0 (not at all) to 4 (extremely). These responses reflected feelings during the previous 7 days and were summed. Internal consistency averaged Cronbach’s α = 0.90 in women (α = 0.86 in this sample), and 3-week test–retest reliability averaged 0.70.11 Concurrent validity was indicated by correspondence with accepted mood measures (eg, Beck Depression Inventory, Manifest Anxiety Scale).11

Emotional eating was measured by the 25-item Emotional Eating Scale,12 which aggregates feelings that prompt an urge to eat related to depression (eg, “blue”), anxiety (eg, “on edge”), and frustration (eg, “irritated”). Possible responses range from 0 (no desire to eat) to 4 (an overwhelming urge to eat), and a mean item score was calculated.

Procedure

For the 6-month duration of this study, subjects participated in instruction in weight-loss processes and self-regulatory methods driven by tenets of social cognitive theory.3 The behavioral obesity treatment was administered in a combination of office and conference room settings by existing staff members of the study’s community health education sites. Although there was some individual time with instructors for personal goal setting and questions/concerns, most of the treatment was administered in small groups of 10 to 15 subjects with 1 instructor.

The protocol focused on increasing physical activity and healthy eating (eg, increasing fruit/vegetable intake, reducing sweets and unhealthy fats). Approximately 60% of treatment time was dedicated to the development of self-regulation skills [eg, cognitive restructuring (adjusting self-talk)], and relapse prevention (preparing for behavioral “slips,” and how to recover quickly) that could help overcome lifestyle barriers to healthy eating and increased physical activity. Approximately 25% of treatment time focused on methods to maintain a healthy diet (eg, stocking a healthy pantry, understanding food labels) and safe participation in a variety of physical activities (eg, cycling, group exercise). Other topics covered (~15% of treatment time) included body image, emotional eating, and recruiting social supports. Weekly self-weighing, logging of foods consumed...
and their corresponding calories, and limiting energy intake to 1200 to 1500 kcal/d (based on current weight) was suggested. Although governmental guidelines of 150 minutes per week of physical activity/exercise for health benefits were stated, it was also indicated that any increase could be beneficial.

Treatment time for each subject totaled approximately 11 hours, with sessions of 50 to 60 minutes occurring approximately every 2 weeks. Study staff not involved in instruction privately administered measures at baseline, month 3, and month 6, and conducted structured fidelity checks that indicated strong protocol compliance.

Statistical Analyses

SPSS version 26.0 (IBM Corporation, Armonk, NY) was used for the statistical analyses. The 11% of missing scores had no systematic bias in their missingness. This made available use of the expectation–maximization algorithm for imputation, enabling an intention-to-treat format and lagged variable analyses (ie, longer term score change predicted by an earlier change). In our investigation, this had the advantage of supporting the proposed directionality of tested relationships by assessing the prediction of changes in weight from baseline through month 6 via changes in the psychological factors from baseline through month 3. For the overall regression analyses, 112 subjects were required to detect a small to moderate effect of $R^2 = 0.10$ at the statistical power of 0.80, $\alpha = 0.05$. Variance inflation factors ranged from 1.11 to 3.24, indicating acceptable multicollinearity in the data. Because directionalities in relationships among study variables were established previously, significance was set at $\alpha \leq 0.05$ (1-tailed).

Based on previous suggestions for our analyses, gain (change) scores were unadjusted for their baseline value. After first computing bivariate intercorrelations between changes in eating-related self-regulation, negative mood, and eating-related self-efficacy over 3 months, and 6-month change in weight, multiple regression analyses with simultaneous entry of these psychological variables as predictors assessed change in weight. These analyses were completed separately for the overall sample, and subsamples identified as having no predispositions, low eating self-regulation, high negative mood, high emotional eating, and low body satisfaction. $R^2$ assessed the strength of the overall multiple regression models, followed up by analyses of $\beta$ values to determine contributions to the overall variances explained by the individual predictors.

Bivariate correlations of 0.19 to 0.29, 0.30 to 0.49, and 0.50 are considered small, moderate, and large, respectively. $R^2$ values of $\leq 0.12$, 0.13 to 0.25, and $\geq 0.26$ are considered small, moderate, and large, respectively.

RESULTS

Score changes and intercorrelations of study measures are given in Table 1. Except for the high negative mood grouping, change in self-regulation was the strongest bivariate predictor of weight loss, which was $-4.5\%$ for the overall sample; and $-5.1\%$, $-5.0\%$, $-4.8\%$, $-3.6\%$, and $-4.3\%$ for the low eating self-regulation, high negative mood, high emotional eating, low body satisfaction, and no predisposition subjects, respectively. Results of the multiple regression analyses are given in Table 2. The entry of presence/absence of a predisposition into step 2 of the model incorporating the overall sample indicated a significant change in effect ($AR^2 = 0.02$, $F_{1,134} = 2.97$, $p = 0.044$; unstandardized $\beta$ value $= 1.21$, standard error for the unstandardized $\beta$ value $= 0.70$, standardized $\beta$ value $= 0.14$, 95% confidence interval $= 0.048$–2.372). This supported subsequent analyses by grouping. There were large effect sizes for the low eating self-regulation, high negative mood, and high emotional eating groupings, and moderate effects for the others. Except for the high negative mood grouping, where improvements in mood and self-efficacy were strongest, change in self-regulation accounted for the largest portion of the explained variances in weight loss.

DISCUSSION

Findings extended the limited research on effects of obesity treatments based on subjects’ psychological characteristics, and implications for tailoring treatments based on those features. The longitudinal format was an advancement over the more frequent cross-sectional analyses in which associations among variables at a single time point fail to assess adequately the directionality of relationships (eg, positive mood inducing weight loss or weight loss bringing about a more positive mood) or their effects over the weeks/months of a treatment. Even considering these shortcomings, previous research indicates benefits of self-regulation, self-efficacy, psychological well-being, and body image on weight loss across subject types, with high self-control a trait predictive of success. Although body image was not accounted for here and should be in extensions of this research, the salience of focusing on self-regulation, mood, and self-efficacy was supported within our findings. Thus, the theory- and research-based predictive model on which our intervention was based was reinforced.

Overall, and for groupings of low eating self-regulation, high negative mood, high emotional eating, and low body satisfaction, improved self-regulatory abilities were the most salient predictor of weight loss. Thus, self-regulation warrants high degrees of treatment attention. For the high negative mood grouping, changes in mood and self-efficacy...
were, instead, most relevant (although not significant independent predictors within the corresponding multiple regression analysis). Research indicates that supported physical activity can benefit both mood and self-regulation. Therefore, evidence-based reinforcement of physical activity within treatments might benefit weight loss indirectly through such changes (i.e., physical activity as a possible vehicle of psychological correlates of weight change). In all but the low body satisfaction group (where the standardized β value = 0.32, p = 0.059), strengths of the significant bivariate correlations between changes in self-regulation and self-efficacy (Table 1) support research and theory, which suggests that when self-regulatory skills are newly used to overcome persistent barriers to healthy eating, self-efficacy increases. Based on our findings, medical practitioners should encourage patients to understand that success with weight loss is a process that requires both psychological and behavioral changes. An ability to use self-regulatory skills intentionally to overcome lifestyle barriers to changing eating and physical activity will likely be key, regardless of psychological predisposition. However, because this and other research suggest that ongoing attention to the process of behavior change is advantageous, including with adaptations based on individual characteristics, innovative referral sources may be required to supplement limited counseling time available from physicians. These might include interventions administered through community health centers, medically based fitness centers, and/or components of medical service providers with a high interest in preventive medicine.

<table>
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<tr>
<th>Groupings and variables</th>
<th>Mean</th>
<th>SD</th>
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<td>0.43***</td>
<td>-0.48***</td>
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<td>4. Change in weight (kg)</td>
<td>-4.26</td>
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<td>-0.43***</td>
<td>0.23**</td>
<td>-0.28***</td>
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<td>23.04</td>
<td>0.30*</td>
<td>-0.37**</td>
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<td>-0.39**</td>
<td>0.07</td>
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<td>-0.42*</td>
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<td>4.36</td>
<td>-0.62**</td>
<td>0.43*</td>
<td>-0.60**</td>
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<td>19.46</td>
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<td>0.53*</td>
<td>-0.51*</td>
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<td>5.97</td>
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<tr>
<td>2. Change in negative mood</td>
<td>-19.54</td>
<td>15.16</td>
<td>-0.29</td>
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<td>3. Change in eating self-efficacy</td>
<td>37.08</td>
<td>37.80</td>
<td>0.68***</td>
<td>-0.40*</td>
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<td>4. Change in weight (kg)</td>
<td>-4.52</td>
<td>4.48</td>
<td>-0.64***</td>
<td>0.17</td>
<td>-0.49**</td>
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<tr>
<td>Low body satisfaction (n = 25)</td>
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<tr>
<td>1. Change in eating self-regulation</td>
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<td>6.21</td>
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<tr>
<td>2. Change in negative mood</td>
<td>-13.56</td>
<td>9.85</td>
<td>-0.22</td>
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<tr>
<td>3. Change in eating self-efficacy</td>
<td>29.60</td>
<td>29.12</td>
<td>0.32</td>
<td>-0.49**</td>
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<tr>
<td>4. Change in weight (kg)</td>
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<td>3.90</td>
<td>-0.32</td>
<td>-0.01</td>
<td>0.14</td>
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*p < 0.05; **p < 0.01; ***p < 0.001 (1-tailed tests).
Changes in eating self-regulation, negative mood, and eating self-efficacy are baseline to month 3. Change in weight is baseline to month 6.
SD = standard deviation.

Table 1. Descriptive statistics and intercorrelations of change (gain) scores, by predisposition grouping

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Although the strengths of this study were its naturalistic setting that allowed generalizations of findings to applied venues, longitudinal inquiry sensitive to changes during the course of a treatment, and analyses of subjects with psychosocial characteristics consistent with high weight, limitations should also be identified. They include a specific sample of women only, a brief time frame, reliance on self-report measures, and no control/comparison group. Also, only the overall regression analysis was powered sufficiently, so the additional analyses should be interpreted with caution until replicated with larger sample sizes.

CONCLUSION

The findings of this investigation contributed to the limited theory-based research on tailoring obesity treatments to individual psychological characteristics so that outcomes will be improved. Specifically, an emphasis on improving individuals’ ability to use self-regulatory skills to deal with lifestyle barriers (which could also nurture self-efficacy through new-found feelings of ability), and improving mood through attention to physical activity, appeared warranted regardless of initial psychological characteristic. However, larger scale extensions of this research will likely enable more precise applications of even large-scale obesity interventions to supplement the limited time afforded physicians and other medical professionals to impact the behaviors and outcomes of their many patients with obesity. ♦

**Author Contributions**

James J Annesi was responsible for all aspects of the project and report.

**Disclosure Statement**

The author has no conflicts of interest to disclose.

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**References**


