Relations of Exercise, Self-Appraisal, Mood Changes and Weight Loss in Obese Women: Testing Propositions Based on Baker and Brownell's (2000) Model

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ABSTRACT: *Background:* Obesity is a prominent modifiable health risk factor. Treatments of severe caloric restrictions and educational interventions have had minimal sustained effects on weight loss. Physical activity may have significant indirect effects on weight reduction associated with changes in psychological variables, although explanatory models are lacking. *Methods:* Relationships based on Baker and Brownell's model of exercise, self-appraisal, mood change, and weight loss were tested with obese (body mass index ≥30) women initiating a supported exercise and nutrition information program over 6 months. *Results:* Exercise participation was associated with significant improvements in mood, body image, and exercise-related self-efficacy. When changes on measures of these factors were simultaneously entered into a multiple regression equation, a significant portion of the variance in exercise session attendance was accounted for ($R^2 = 0.26$, $F(7, 52) = 2.57$, $P < 0.05$), with changes in tension ($\beta = -0.34$) and physical self-concept ($\beta = 0.33$) making significant unique contributions. Exercise session attendance was significantly correlated with weight and body composition changes ($r = -0.30$ to -0.47). The indirect effect of exercise on weight loss was estimated at 0.23. As hypothesized, less improvement in depression was significantly associated with less improvement in weight and body composition (r values = 0.23 to 0.29). *Conclusions:* Physical activity and exercise may have positive effects on sustained weight loss due to associated changes in self-appraisal and mood factors. Early incorporation of moderate exercise into weight management treatments may have considerable value beyond just energy expenditure. Continued testing of explanatory models is warranted. **KEY INDEXING TERMS:** Exercise; Weight loss; Behavioral; Psychosomatic; Emotional. **[Am J Med Sci 2008;335(3):198–204.]**

Recent reports indicate that approximately 65% of American adults are either overweight (body mass index [BMI; kg/m^2] = 25.0 to 29.9) or obese (BMI ≥30), with 30% being obese.[1] Obesity is a prominent modifiable risk factor for type 2 diabetes, heart disease, hypertension, and stroke. Although it is clear that a combination of restriction of energy intake and increase in energy expenditure will reduce weight, individuals' responses to treatments have been of limited success.[2] Unfortunately, weight loss treatment components have often been atheoretical, based on little more than clinical observation and judgment. The use of diets alone has been definitively deemed ineffective for sustained weight control, as have interventions based on education[3]; however, they persist. The best predictor of maintained weight loss is regular physical activity.[4,5] However, attrition from exercise programs is typically 50% to 60% within just the first several months after initiation.[6,7] Although during the weight loss phase (typically the initial 6 months) exercise is often thought to play a less important role than change in eating behavior,[8] adoption of regular physical activity may have benefits for weight reduction not typically cited.

Self-management and self-regulatory skills required for adherence to exercise may generalize to persistence with a reduced calorie diet. It is also possible that improvements in mental health and self-efficacy factors, often associated with physical activity,[9,10] are also associated with weight loss. Because relapse into an overeating pattern may be prompted by low mood including symptoms of depression,[11] physical activity may also serve to reduce relapse due to its positive psychological effects, even for those not affected by clinical depression or other mood disorders.[12,13] Baker and Brownell[14] recently

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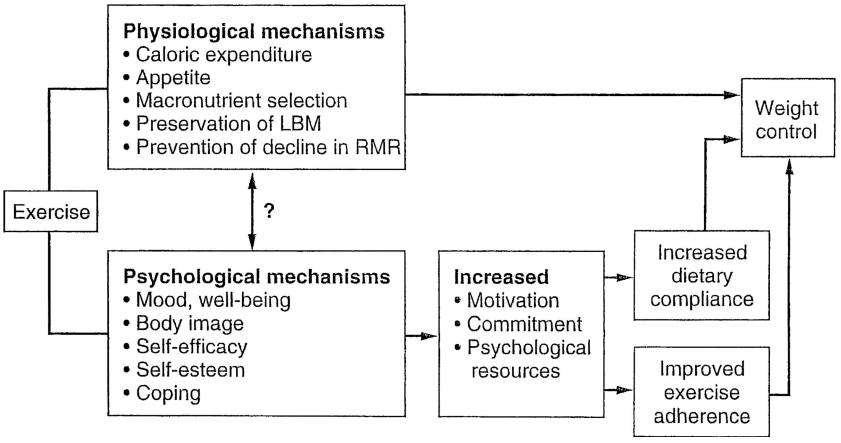

Figure 1. Proposed mechanisms and potential pathways linking exercise and weight control within the Baker and Brownell model. LBM, Lean body mass; RMR, resting metabolic rate. From C. Wood Baker and K. D. Brownell, "Physical Activity and Maintenance of Weight Loss: Physiological and Psychological Mechanisms," in Physical Activity and Obesity (edited by C. Bouchard), page 315, Figure 16.1. © 2000 by Human Kinetics Publishers. Adapted with permission from Human Kinetics (Champaign, IL).

proposed a model that included hypothesized relationships between physical activity, changes in psychological factors, and weight loss (see Figure 1). Within the model, they suggest that positive changes in moods such as depression, anxiety, and energy level are associated with exercise and lead to both better adherence to an exercise program and a healthier psychological climate where commitment to a weight loss program becomes easier. It was also suggested within the model that unfavorable changes in mood might be associated with weight loss failure.

Also accommodated within the Baker and Brownell model are key tenets of self-efficacy theory.[15] Related to physical activity, self-efficacy is thought to influence behaviors through the components of task self-efficacy (ie, perceived physical capabilities) and self-regulatory efficacy (ie, perceived self-management competencies), as well as perceptions of changes in one's body associated with effort given.[16] Baker and Brownell proposed that factors such as body image and physical self-concept could be improved through regular physical activity, increasing persistence with a program of caloric reduction and exercise. They state, "These positive changes in body image, irrespective of numbers on the scale, may help prevent discouragement and resignation [within a weight-loss program]. . .."[14 (p 322)] Although related research is sparse, significantly improved self-perception and perceived physical attractiveness associated with an exercise program of several months was found in both middle-aged adults and previously inactive adolescent females.[17,18] Improvements in satisfaction with one's body, even when physical changes were minimal due to a conservative physical activity program that emphasized adherence over initial fitness gains, were found in formerly sedentary obese women.[19] Baker and Brownell suggested that perceptions emanating from physical activity participation may generalize to other weight loss behaviors such as eating. They state, "Increases in exercise self-efficacy could influence eating self-efficacy and dietary compliance through a more general sense of weight-loss self-efficacy."[14 (p 323)] Their hypothesis, that enhanced self-management and self-regulatory skills related to exercise maintenance lead to increased self-efficacy and better productivity in weight loss, is supported in specific studies,[20] and within self-efficacy theory itself.[15]

To summarize the Baker and Brownell model,[14] it was suggested that participation in an exercise program would induce positive changes in mood, body image, and exercise-related self-efficacy. These changes would promote adherence to exercise and appropriate eating through enhanced motivation and commitment. Weight reduction would follow proportionally from these changes. Additionally, they suggested that a negative change in mood (eg, increased depression or dejection) would be associated with weight loss failure. Thus, hypotheses for the present study are as follows:

1. Participation in a moderate exercise program will be associated with significant improvements in tension, depression, fatigue, vigor, body areas satisfaction, physical self-concept, and exercise-related self-efficacy.
2. Changes in the above psychological factors will be significantly related to exercise program attendance.
3. Exercise program attendance will be significantly, negatively related to changes in weight and body composition.
4. A significant, positive bivariate correlation will be found between changes in depression scores and changes in weight and body composition (eg, less improvement in depression would be associated with less reduction in weight and body fat).

Methods

Participants

Women who volunteered to be a part of this research by responding to advertisements in local newspapers were randomly separated into a treatment group and wait-list control group. Inclusion criteria consisted of (a) minimum age of 21 years, (b) being obese (BMI ≥30), (c) no regular exercise in the previous 6 months, (d) having a goal of