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PAPER

Pretreatment predictors of attrition and successful weight management in women

PJ Teixeira[1]*, SB Going[3], LB Houtkooper[3], EC Cussler[2], LL Metcalfe[2], RM Blew[2], LB Sardinha[1] and TG Lohman[2]

[1]*Department of Exercise and Health, Faculty of Human Movement, Technical University of Lisbon, Lisbon, Portugal;* [2]*Department of Physiology, Body Composition Research Laboratory, The University of Arizona, USA; and* [3]*Department of Nutritional Sciences, Body Composition Research Laboratory, The University of Arizona, USA*

OBJECTIVE: This study analyzed baseline behavioral and psychosocial differences between successful and nonsuccessful participants in a behavioral weight management program. Success was defined by commonly used health-related criteria (5% weight loss). Noncompletion was also used as a marker of a failed attempt at weight control.
SUBJECTS: A total of 158 healthy overweight and obese women (age, 48.0 ± 4.5 y; BMI, 31.0 ± 3.8 kg/m^2; body fat, 44.5 ± 5.3%).
INTERVENTION: Subjects participated in a 16-week lifestyle weight loss program consisting of group-based behavior therapy to improve diet and increase physical activity, and were followed for 1 y after treatment.
METHODS: At baseline, all women completed a comprehensive behavioral and psychosocial battery assessing dieting/weight history, dietary intake and eating behaviors, exercise, self-efficacy, outcome evaluations, body image, and other variables considered relevant for weight management. Participants who maintained a weight loss of 5% or more at 16 months (or 10% or more of initial fat mass) were classified as successful. Nonsuccessful participants were those who dropped out and completers who had not lost weight at follow-up.
RESULTS: Of all participants, 30% ($n = 47$) did not complete initial treatment and/or missed follow-up assessments (noncompleters). Noncompletion was independently associated with more previous weight loss attempts, poorer quality of life, more stringent weight outcome evaluations, and lower reported carbohydrate intake at baseline. In logistic regression, completion status was predicted correctly in 84% of all cases ($\chi^2 = 45.5$, $P < 0.001$), using baseline information only. Additional predictors of attrition were initial weight, exercise minutes, fiber intake, binge eating, psychological health, and body image. A large variation in weight loss/maintenance results was observed (range: 37.2 kg for 16-month weight change). Independent baseline predictors of success at 16 months were more moderate weight outcome evaluations, lower level of previous dieting, higher exercise self-efficacy, and smaller waist-to-hip ratio. Success status at follow-up was predicted correctly in 74% of all starting cases ($\chi^2 = 33.6$, $P < 0.001$).
CONCLUSION: Psychosocial and behavioral variables (eg, dieting history, dietary intake, outcome evaluations, exercise self-efficacy, and quality of life) may be useful as pretreatment predictors of success level and/or attrition in previously overweight and mildly obese women who volunteer for behavioral weight control programs. These factors can be used in developing readiness profiles for weight management, a potentially important tool to address the issue of low success/completion rates in the current management of obesity.
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Introduction

Current behavioral interventions to help overweight and obese individuals reduce and manage their weight are only modestly successful. Generally, the longer the follow-up period after treatment, the greater the number of people who regain weight close to pretreatment levels.[1] Moderate to large levels of attrition are also frequent, compromising internal and external validity of many published studies.[2]

***Correspondence: Dr PJ Teixeira, Faculdade de Motricidade Humana, Estrada da Costa, Cruz Quebrada, Lisboa 1495-688, Portugal.**
E-mail: pteixeira@fmh.utl.pt
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However, why some people succeed at adopting and sustaining behaviors associated with weight control while others, undergoing similar treatment programs, do not, remains largely unknown.[3] Personal factors (biological, psychological, behavioral), especially if they contribute to resistance to long-lasting change, should play a role in determining higher *vs* lower success rates, along with treatment characteristics, socioecological environmental circumstances, and potentially important interactions among the three.

Previous behavioral programs have shown pretreatment variables such as initial body weight,[4] a history of repeated diet attempts,[5] eating self-efficacy,[6] psychopathology,[7] and body image[8] to be significantly associated with subsequent weight loss. However, with few exceptions (eg eating self-efficacy), the number of studies available to determine the true association of these and other factors with success is limited to only a few, and research methodologies (eg psychosocial assessments) have varied substantially. In addition, other variables potentially relevant for the process of weight control have been insufficiently unexplored. Suggestive evidence indicates that general, self-regulatory efficacy,[9] an autonomous orientation,[10] weight-specific quality of life,[11] and exercise-related variables,[11] assessed before treatment, may also predict weight change.

Building on a previous report on predictors of short-term weight outcomes,[11] the objective of the present study was to identify baseline correlates of 16-month weight loss in previously overweight and obese women who participated in a 4-month behavioral weight management program. Baseline differences between successful and nonsuccessful women were analyzed, based on categories of success derived *a priori* from health-related guidelines.[12] A large psychosocial battery was examined, including several variables that have not been previously researched in this context. As attrition is a hallmark of nonsuccessful weight loss attempts, we report additionally on pretreatment differences between completers and noncompleters.

Methods

Subjects

Participants were recruited from the Tucson, Arizona area through newspaper and TV advertisements. Subjects were required to be between 40 and 55 y of age, have a BMI between 25.0 and 38.0 kg/m^2, be a nonsmoker, and be free from major illnesses to be eligible. The University of Arizona's Human Subjects Protection, Institutional Review Board approved the study and all participants gave written informed consent prior to participation. Previously, we reported on predictors of short-term weight loss in a subset of women participating in this research trial.[11] The present study, exclusively focused on long-term weight outcomes, reports on all of the 158 women who participated in the research study and who started the behavioral weight management intervention. It consisted of weekly group meetings for 16 weeks followed by random assignment to ongoing online contact or no contact, for an additional year. No differences in weight change between 4 and 16 months (the follow-up period) were observed between the online and no contact groups and data were pooled for this analysis. All participants agreed to refrain from participating in any other weight loss program for the duration of the study.

Intervention

Subjects met with the intervention team once a week in groups of approximately 25 subjects, for 150 min per session. They were encouraged to make progressive changes in their lifestyle (eating habits and physical activity), leading to a moderate daily energy deficit (less 1260–2090 kJ/day (300–500 kcal/day)). A weight loss of about 0.5 kg a week was targeted and individualized goals for energy intake and expenditure were provided to all subjects. Cognitive and behavioral strategies used to improve compliance included regular self-monitoring, self-efficacy enhancement, cognitive restructuring, relapse prevention and problem-solving skills, stress management, preventing emotional eating, and social support. Further details on the design and methods of this study are available elsewhere.[11]

Measurements

Pretreatment assessments included weight and body composition, exercise, dietary intake, and psychosocial variables. Body composition was assessed by dual energy X-ray absorptiometry (DXA, Lunar DPX-IQ, software version 4.6). Minutes per day and energy expenditure (kJ/day) from leisure-time moderate and vigorous physical activities (ie activities with METs >3.8, examples of which were provided to participants during the assessment interview) were estimated with the 7-Day Physical Activity Recall[13] and dietary intake was assessed with 3-day food records averaged from 1 weekend and 2 week days.

Dieting/weight history was assessed by a questionnaire developed specifically for this study and weight outcome evaluations were assessed with the Goals and Relative Weights Questionnaire,[14] which asks subjects to indicate their 'dream' weight, and weight values that they would be 'happy' with, they would consider 'acceptable', and that they would be 'disappointed' with, at the end of the program. To account for initial values, these variables are expressed as percent of initial weight (thus, the lower the percent value, the more stringent the attitude about each weight outcome and 'dream' weight). To assess quality of life, general (SF-36) and obesity-specific (Impact of Weight on Quality of Life-lite) measures were used,[15,16] and general social support was assessed by five items originally developed for the Medical Outcomes Study (MOS).[17] Depressive symptoms were measured with the Beck Depression Inventory.[18] Self-esteem was assessed with the Rosenberg's Self-

esteem/Self-concept questionnaire[19] and self-motivation was measured with the Self-Motivation Inventory.[20] The Binge Eating Scale,[21] the Eating Self-Efficacy Scale,[22] and the Eating Inventory[23] were used to measure variables related to eating behavior; the dimensions of cognitive restraint, eating disinhibition, and perceived hunger were derived from the Eating Inventory.

Self-efficacy for exercise was assessed with the Self-Efficacy for Exercise Behaviors Scale,[24] measuring beliefs that a person can 'stick with' an exercise program for at least 6 months under varying circumstances. The questionnaire has two subscales of 'resisting relapse' and 'making time' with five items each. The average of all items was used to produce the exercise self-efficacy score (Crombach's $\alpha = 0.84$). Exercise perceived barriers were assessed with items from the Exercise Perceived Barriers scale.[25] A two-item 'obstacles' subscale from the original instrument was not included in analyses due to very low internal consistency ($\alpha = 0.05$); items from the two remaining dimensions of 'time' (three items) and 'effort' (six items) were used to produce the two subscale scores and averaged to calculate the total exercise barriers score ($\alpha = 0.73$). Exercise social support was measured with 10 items from a scale developed to assess participation/involvement from family and friends with regard to one's exercise, the Exercise Social Support questionnaire.[26] From the original scale, three questions loading on a 'rewards/punishment' dimension were not included in the final analysis due to very low item–scale correlations and low internal consistency ($\alpha = 0.29$). The average of the 10 remaining items, loading on a single dimension ('participation/involvement'), was used to calculate the global exercise social support composite score ($\alpha = 0.87$).

Body image was assessed with the Body Shape Questionnaire, which measures concerns with body shape and 'feeling fat',[27] and also with the silhouette-based Body Image Assessment Questionnaire (self-ideal difference),[28] and the Body Cathexis Questionnaire, which assesses feelings towards various body parts or characteristics.[29] Internal consistency for all global scales and subscales varied between 0.72 (exercise self-efficacy, making time subscale) and 0.97 (body cathexis).

Attrition and success categories

In all, 47 participants (29.7%) did not complete assessments at 16 months (noncompleters). Of these, 22 women dropped out during the initial 4-month treatment phase and the remaining could not be reached for follow-up assessments at 16 months. The most prevalent reported reasons for dropping out during treatment were lack of time (35%), dissatisfaction with the program/staff (22%), personal life issues (17%), and health limitations (17%). Weight changes were analyzed for completers only and additionally by two procedures employed to include baseline data for all starting subjects, following an intent-to-treat model. These procedures were: (i) the baseline observation carried forward, where all dropped subjects were assumed to have returned to baseline weight by 16 months (BOCF), and (ii) a modified version of the last observation carried forward method, where the last measured weight was used as the final weight with 0.2 kg added per each month passed since the last lab assessment (LOCF+). The value of 0.2 kg was the approximate average monthly weight regain during follow-up in a recent review of similar studies.[30] Although other imputation methods are generally preferable,[31] sufficient weight information over time was not available to derive adequately missing data points. Also, since psychosocial characteristics were being used as predictors in primary analyses, they could not be employed in multivariate imputation models to derive missing weight data. The BOCF model, in particular, is conservative and offers acceptable protection against type I error.[32]

Two categories of success were defined, based on 16-month weight data. Successful participants ($n = 53$) were those who lost 5% or more of their initial body weight,[12] an outcome that generally represents a lower threshold for important physical health benefits.[33,34] Nonsuccessful participants ($n = 71$) were defined as those showing no weight loss or weight gain (ie weight change ≥ -0.5 kg) at 16 months (see Figure 1). The BOCF procedure was used to define success categories, thus classifying all dropouts as nonsuccessful (no change from baseline). All other participants ($n = 34$) were excluded from analyses comparing the two success categories. This procedure was chosen to identify two clearly distinct levels of success and minimize misclassification caused by using a single cutoff separating the two success levels.

Several subjects with weight losses smaller than 5% of initial weight displayed disproportionately larger fat losses, which were offset by noticeable increases in fat-free mass. To adjust for body composition changes, an additional success classification was created, where in addition to subjects losing 5% of initial body weight, subjects losing 10% or more of their initial fat mass were also categorized as successful, regardless of weight change. In the absence of specific health-related criteria for body fat loss, this was an arbitrary cutoff; however, it has face validity considering loss of body fat and not lean is considered health beneficial. In all, 10 additional subjects were considered as successful (total $n = 63$) using this procedure.

Statistical analysis

Analyses were completed using the Statistical Package for the Social Sciences (SPSS, version 11.5). Spearman's, rank-order correlation was used for psychometric variables since a majority displayed a significantly skewed distribution. Independent sample *t*-tests and analysis of covariance (ANCOVA) were used to compare baseline data for completers *vs* noncompleters and to compare subjects in different success categories. Logistic regression with backward stepwise selection was used to predict group classifica-

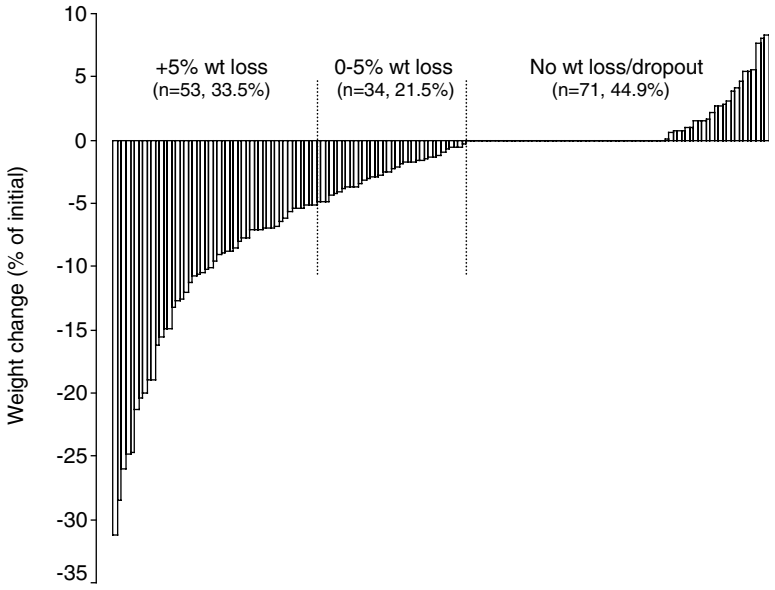

Figure 1 Individual percent weight changes at 16 months for 158 starting women.

tion at 16 months based on pretreatment variables. We selected a *P*-value of 0.157 and 0.05 for removal of predictors[35] and similar final models were obtained. We chose those models which maximized overall classification scores while also resulting in the most parsimonious *events per variable* ratio (an *event* defined as the number of positive or negative cases in the outcome variable, whichever is lower, that is, 43 and 57, respectively, for noncompletion and weight loss success); 10 or more events per independent variable, corresponding in our case to a maximum of four to five predictors per model, is considered adequate.[35]

Results

After the 4-month intervention program, average weight loss was 5.1 kg (−6.2% of initial weight) in the 136 completing subjects. At 16 months, completing participants ($n=111$) lost an average of 4.6 kg (−5.5%), while mean weight change for all 158 participants was −3.2 kg (−3.9%) using BOCF and −3.0 kg (−3.7%) using LOCF+. As shown in Figure 1, a large variability in individual weight change was observed with a range for completers at 37.2 kg, thereby providing adequate database to study individual differences in predictors of weight change. Average weight change for the successful group ($n=53$) was −9.5 kg (−11.5%), while nonsuccessful participants ($n=71$) gained 0.8 kg (+1.0%) using BOCF and gained 1.3 kg (+1.5%) using LOCF+. For subjects in the body composition-adjusted success category ($n=63$), mean weight change was −8.4 kg (−10.2%).

Table 1 shows differences between completers and noncompleters at baseline for body habitus, behavioral, and psychosocial characteristics. Noncompleters were heavier, less active, and reported consuming fewer calories and lower amounts of dietary carbohydrates and fiber. In addition, they had dieted significantly more often in the previous year and their weight had fluctuated more times during adulthood, compared to completers. Noncompleters also reported higher levels of binge eating at baseline. Completers displayed more accepting evaluations with regard to weight loss including a higher accepting dream weight, and had more positive scores for quality of life, psychological health, and body image. When analyses were replicated adjusting for baseline weight or BMI (ANCOVA), results were virtually unchanged, even for variables typically correlated with weight such as obesity-specific quality of life, weight outcome evaluations, and body image.

Few variables predicted weight change when only completers were used in the analysis. In contrast, when data for dropouts were included (intent-to-treat models), several pretreatment measures were associated with subsequent weight loss. They included an abdominal fat distribution, more frequent previous dieting, more stringent weight loss evaluations, and exercise perceived barriers (negative predictors), as well as weight-specific quality of life, self-motivation, eating and exercise self-efficacy, and a better body image (positive predictors).

Using the success criterion based exclusively on body weight (and BOCF), several significant differences were found between groups, most of which are depicted in Figure 2. In addition, at baseline, subjects who went on to lose and sustain 5% or more of their initial body weight also reported more minutes of exercise ($P=0.05$), higher total fiber consumption ($P=0.027$), and a poorer body image as indicated by a greater self-ideal difference in the Body Image Assessment Questionnaire ($P=0.026$). When similar com-

Table 1 Baseline differences between completers and noncompleters and correlation between baseline measures and changes in weight

	T-*test comparison*		*Correlation with weight change*		
	Completers	*Noncompleters*	*Completers*	*All subjects*	
				(LOCF+)	*(BOCF)*
Baseline value	*Mean*	*Mean*	ρ	ρ	ρ
n	111	47	111	158	158
Age (y)	48.2	47.5	−0.04	−0.05	−0.07
Body habitus					
Weight (kg)	83.2	87.9*	−0.04	0.08	0.06
BMI (kg/m^2)	30.4	32.7***	−0.04	0.14	0.12
Body fat (%)	44.0	45.9*	−0.09	0.02	0.02
Waist-to-hip ratio	0.82	0.83	0.14	0.16*	0.16*
Exercise					
Exercise (kJ/day)	558.0	431.6	−0.08	−0.12	−0.10
Exercise (min/day)	20.8	14.3*	−0.07	−0.14	−0.11
Dietary intake					
Total energy (kJ/kg/day)	100.5	90.8*	0.01	−0.08	−0.05
Fat (g/kg/day)	0.91	0.89	0.04	−0.03	0.04
Carbohydrates (g/kg/day)	2.96	2.51**	0.00	−0.11	−0.11
Protein (g/kg/day)	0.96	0.91	0.04	0.01	0.00
Calcium (g/day)	866.5	831.3	−0.02	0.01	0.00
Fiber (g/day)	19.5	16.0**	0.00	−0.12	−0.13
Weight/diet history					
Number of diets in previous year	1.76	3.28***	0.23*	0.22**	0.24**
Years at current weight	1.57	2.30	−0.04	0.08	0.06
Life frequency of weight ± 4.5 kg (10 lb)	1.71	2.09*	−0.09	0.00	−0.02
Age when started dieting	24.4	26.4	−0.15	0.02	−0.07
Weight outcome evaluations					
'Dream' weight (% of initial)	75.2	69.9***	−0.01	−0.16*	−0.18*
'Disappointing' weight loss (%)	96.7	94.2**	0.01	−0.10	−0.03
'Acceptable' weight loss (%)	90.8	86.4***	−0.02	−0.20**	−0.15*
'Happy' weight loss (%)	87.5	82.4***	−0.08	−0.27***	−0.21**
Quality of life and social support					
SF-36, physical	83.7	78.1*	0.09	−0.05	−0.05
SF-36, mental	77.2	70.2*	−0.01	−0.12	−0.10
Weight-specific quality of life	79.3	69.0***	−0.04	−0.15*	−0.15*
Social support	3.93	3.85	0.08	0.02	0.07
Psychological characteristics					
Depression	9.76	12.99**	−0.05	0.13	0.06
Self-motivation	3.61	3.48	−0.10	−0.15*	−0.15*
Self-esteem	8.59	7.90*	0.01	−0.10	−0.04
Eating behavior					
Binge eating	13.22	16.64**	−0.07	0.03	0.05
Eating self-efficacy[a]	3.68	3.90	0.12	0.21*	0.16
Cognitive restraint	8.82	8.62	−0.03	−0.05	−0.03
Disinhibition	9.64	10.15	0.04	0.01	0.05
Perceived hunger	6.55	6.51	−0.03	−0.04	−0.04
Exercise					
Exercise perceived barriers	2.99	3.04	0.20*	0.22**	0.17*
Exercise self-efficacy	3.86	3.78	−0.18	−0.25**	−0.18*
Exercise social support	2.50	2.53	0.06	0.00	0.05
Body image					
Body shape concerns	102.3	116.6**	−0.02	0.11	0.11
Body size dissatisfaction	3.26	3.74*	0.07	0.19*	0.17*
Body cathexis[b]	3.20	2.88***	−0.12	−0.18*	−0.22**

*$P<0.05$, **$P<0.01$, ***$P<0.001$. LOCF+, last observation carried forward with 0.2 kg/month added to the last measured weight (see text for details); BOCF, baseline observation carried forward (ie zero change from baseline for noncompleters). Higher scores indicate higher value for characteristic tested (eg higher quality of life, higher perceived hunger, more body concerns, etc). Since weight change was coded as baseline weight subtracted to 16-month weight, weight loss is represented by a *negative* weight change (thus, a negative correlation coefficient indicates a *positive* correlation with weight *loss*). [a]Owing to a procedural error, data for the Eating Self-efficacy Scale could only be collected from 111 participants (71 completers); for this questionnaire, higher scores indicate lower self-efficacy. [b]Higher scores indicate more positive feelings with regard to one's body.

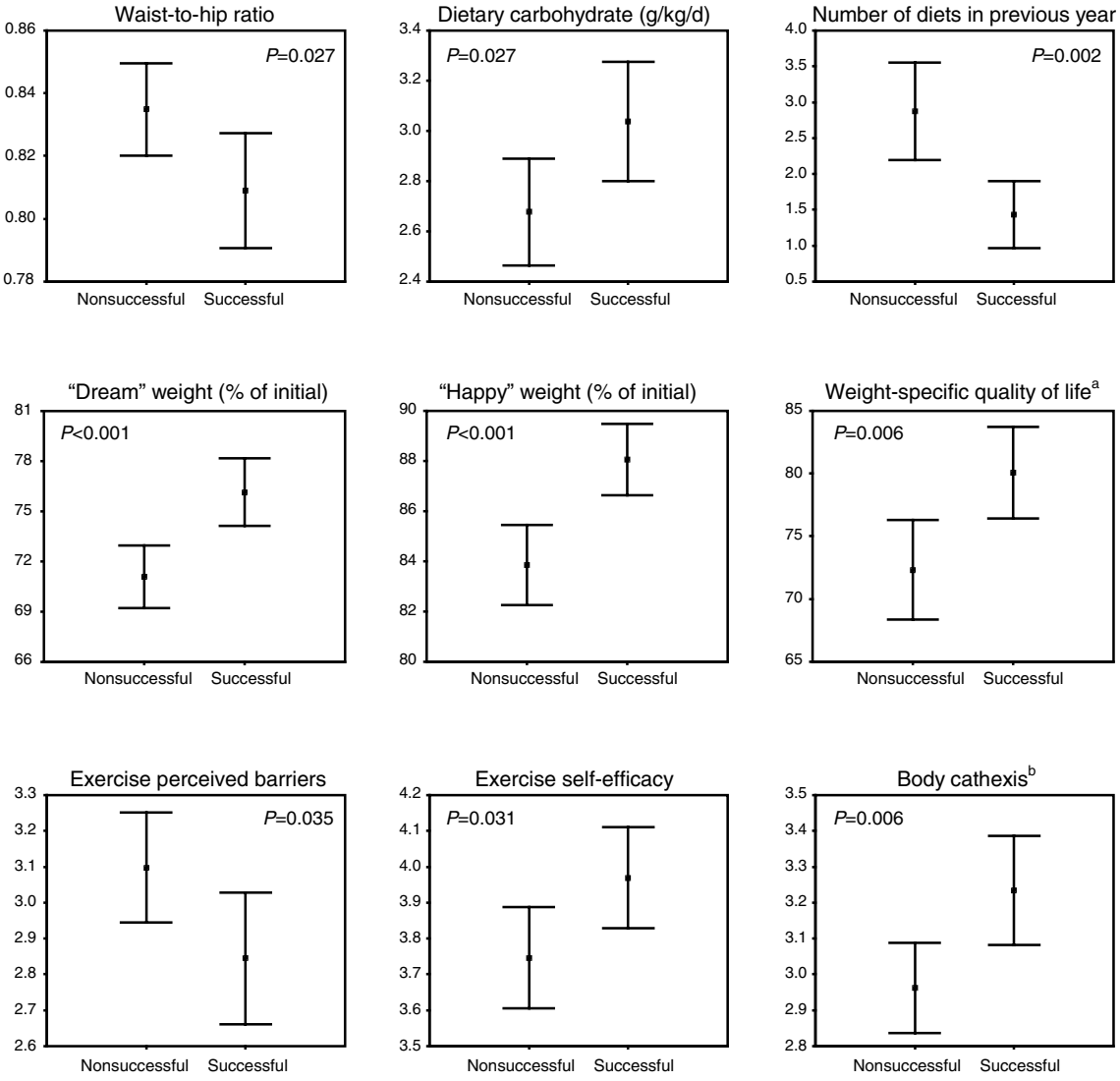

Figure 2 Significant baseline differences between successful and nonsuccessful participants. Successful participants ($n=53$) completed 16-month assessments and lost 5% of more of initial weight; nonsuccessful subjects ($n=71$) dropped out or completed the study without weight loss. [a]Total score from the IWQOL-lite Questionnaire. [b]A higher score indicates more positive feelings towards one's body.

parisons were performed using the success category adjusted for changes in body composition, the same variables emerged as significant.

Table 2 shows baseline differences for the different completion/success groups for various dimensions within the IWQOL-lite (weight-specific quality of life), exercise self-efficacy, and exercise perceived barriers questionnaires between completers and noncompleters and successful 'losers' *vs* nonsuccessful 'losers'.

Logistic regression was used to predict program completion *vs* noncompletion ($n=158$) and also to predict success at 16 months ($n=124$). The best model for program completion included baseline carbohydrate intake ($B=0.62$, $P=0.026$), the number of previous diets ($B=-0.23$, $P=0.012$), 'happy' weight loss evaluations ($B=0.12$, $P=0.001$), and quality of life ($B=0.04$, $P=0.004$). This model was highly sensitive to program completion (of 111 completers, only four were wrongly predicted to dropout) but 20 (45%) of the 44 eventual noncompleters were wrongly classified as completers ($\chi^2=45.5$, $P<0.001$). For weight loss success, the final model included the waist-to-hip ratio ($B=-7.77$, $P=0.024$), number of previous diets ($B=-0.29$, $P=0.012$), 'happy' weight loss evaluations ($B=0.12$, $P=0.002$), and exercise self-efficacy ($B=1.00$, $P=0.012$). Sensitivity for (correct) classification into the weight loss successful category was 68%, while specificity (percent of participants wrongly predicted as nonsuccessful) was 11% ($\chi^2=33.6$, $P<0.001$). Overall

Table 2 Baseline differences between completion and success groups for quality of life and exercise dimensions

	Completion		*Success*	
	Yes	*No*	*Yes*	*No*
Baseline value	*Mean*	*Mean*	*Mean*	*Mean*
n	111	47	53	71
Quality of life (IWQOL-lite)				
Physical functioning	75.7	68.9*	77.2	70.1*
Self-esteem	67.2	56.4**	70.6	59.9**
Sexual life	75.0	60.6**	72.4	66.1
Public distress	89.0	82.0*	90.2	84.1*
Work	89.7	78.5***	90.0	82.4*
Exercise				
Effort (perceived barriers)	2.90	3.08	2.78	3.08*
Time (perceived barriers)	3.18	2.96	2.98	3.12
Making time (self-efficacy)	3.75	3.67	3.84	3.66
Resisting relapse (self-efficacy)	3.96	3.90	4.10	3.83*

*$P<0.05$, **$P<0.01$, ***$P<0.001$ on *t*-test comparison.

percent of subjects correctly classified was 84.2 and 74.0%, respectively, for completion and 16-month weight management success.

Discussion

This study analyzed the association of several baseline personal factors with weight management outcomes after 16 months. Success was defined as relative weight/body composition changes during the study's period. In addition, study completion was considered as a separate marker of successful participation. Strengths of this study include success levels defined *a priori* from health-related criteria, assessment of body composition changes, a sufficient follow-up time to study weight loss and maintenance of weight lost, a large number and broad scope of baseline assessments, and the inclusion of all starting participants in statistical analyses, in addition to presenting completers-only results. Main results showed that more frequent previous dieting attempts, more stringent weight loss outcome evaluations, a lower weight-specific perceived quality of life, and lower exercise self-efficacy were associated with poorer long-term outcomes.

In the present study, differences at baseline were analyzed between eventual completers and noncompleters. In studying baseline determinants of weight loss success, completers-only analyses are particularly inadequate as participants presenting with more barriers to success at the start of the program are likely to be those who dropout preferentially. Accordingly, as we have shown before,[11] substantially different results emerge when analyzing predictors for completers only as opposed to using baseline data for all participants (see Table 1). We found that multiple baseline variables including initial weight, previous dieting, outcome evaluations, quality of life, depression, binge eating, and body image, distinguished between completers and non-completers.

A review of pretreatment predictors of completion in previous obesity treatment studies reveals mixed results. For example, attrition was positively[36–38] and negatively[39] associated with the number of previous diet attempts, positively[40] and negatively[41] associated with binge eating, and positively[42] and not associated[43,44] with initial weight/BMI level. Having higher initial weight loss expectations[36,38] and reporting higher emotional disturbance[39] also predicted noncompliance. Baseline depression was associated with poorer adherence, as measured by the number of sessions attended.[45] Using comparable methodologies as in the present report, three previous studies evaluated prediction of eventual completion status using multivariate models; these studies correctly classified subjects as completers or noncompleters in 55,[39] 62,[36] and 68–75% of cases,[38] using baseline information.

Unique to this study is the association of pretreatment quality of life measures with long-term outcomes. Scores for the obesity-specific IWQOL-lite and to a lesser extent for the more general SF-36 quality of life questionnaires were positively associated with study completion. Most dimensions (subscales) of the IWQOL-lite were also related with weight management success in bivariate analyses. Weight-specific quality of life, binge eating, depression, and body image (all significantly associated with study completion) were strongly intercorrelated in our sample and it is possible that quality life may have served as a surrogate measure for the other variables, with regard to their impact on program adherence. In fact, when quality of life was absent in the multivariate model for completion, depression and binge eating entered the model significantly, without much loss in its overall classification score (results not shown). The IWQOL-lite questionnaire evaluates several dimensions of functioning with a high specificity to weight-related issues and their perceived impact on well-being[46] and may become a useful tool in the future to help identify participants more likely to experience difficulties during treatment. We found that self-worth and work-related scores were particularly related to weight loss success and/or completion. In agreement with these findings, Bennett and Jones[38] have shown that the pretreatment score in an 'interference' measure ('How do you feel your weight affects your daily activities?') significantly predicted attrition, in a study very similar to the present report.

Excessively optimistic expectations are the norm in individuals seeking obesity treatment,[47] who typically place great value on reaching goal weights.[48] In the present study, prospective weight outcome evaluations reported at baseline were significantly more stringent in eventual noncompleters than in completers, suggesting that more realistic expectations towards weight loss are an important, independent cognitive indicator of readiness to complete treatment. It has been frequently argued that false hope and the desire to lose more weight than what realistically can be expected may

increase the likelihood of early disappointment and relapse upon smaller than wanted changes.[49,50] The present and our previous report[11] are the first studies to have shown empirical data to support this claim. Others recently reported that weight goals and dream weights were not associated with weight loss, in a completers-only follow-up analysis of a 8-week treatment program (47% attrition at 18 months).[51] It may be that having both positive *and* realistic weight loss expectations is the most beneficial trait regarding long-term outcomes. However, as the present study clearly shows (see Table 1), completers-only and all sample (intent-to-treat) analyses can produce substantially different results and caution must be exercised when comparing studies with different analytical procedures regarding noncompleters.[32]

We noticed that noncompleters reported lower energy intake and lower carbohydrate and fiber intake than completers. Several factors may account for these differences, including lower energy requirements for the former group of women, who had a higher percent body fat (thus less relative amounts of more metabolically active fat-free mass) and also reported increased levels of recent dieting, which could have induced temporary reductions in resting metabolism and energy intake.[52] More simply, noncompleters could also merely be dieting and in negative energy balance at a higher extent than completers, at study entry (which would agree with their most extensive dieting history). Compared to total energy expenditure estimates using an equation for overweight women derived from doubly labeled water studies,[53] completers' energy intake was 3% lower than predicted, while noncompleters reported about 12% less calories ingested than would be estimated. Thus, although the mean difference between the two groups is relatively small (616 kJ [147 kcal]) and was not statistically significant ($P=0.113$, data not shown), the possibility exists that noncompleters underestimated their energy and carbohydrate intake slightly more than completers, which could also help explain the results (assuming all participants were in energy balance at baseline).

In the behavioral treatment of obesity, previous participation in weight loss programs and previous dieting attempts are among the most consistent predictors of smaller weight losses, as shown in previous reviews[54,55] and more recent reports.[5,11,56] It is possible that volunteers for formal university-based weight loss programs represent a self-selected group among the overweight/obese population, which may be more resistant to treatment and include many individuals who have repeatedly failed to control their weight.[57] A closer inspection of our data showed that among the 26 women reporting four or more diet attempts in the previous year, 14 (54%) subjects did not complete the study, only three subjects lost more than 5%, and only one lost 10% or more of their initial weight at 16 months. Further, among 17 women initially reporting five or more recent attempts, only one was successful, that is, completed the study losing more than 5% of her initial weight. In sum, despite evidence in highly selected groups showing that long-term success is possible even after many previous failed attempts,[58] it appears that reporting a large number of recent dieting attempts (eg 4+) may foretell poor outcomes in volunteers for formal behavioral treatment programs.

Despite the existence of good motivation-based theoretical models for exercise intentions and behaviors,[59] exercise-related psychosocial correlates of weight loss have received little attention thus far. We have analyzed three exercise/physical activity variables as prospective predictors of weight loss and study completion. Scores in these variables were not associated with study completion. However, initial self-efficacy and perceived barriers to physical activity correlated with weight loss in a consistent manner across analyses, even in completers-only analysis. The scales used for exercise-related psychosocial variables are relatively short, simple to interpret, and could be used more frequently in the context of obesity treatment. In fact, continued motivation to be physically active is perhaps the single most important factor in long-term weight management and very recent evidence shows that high levels of exercise, even when temporarily interrupted by lapses,[60] can be adopted and sustained by a large number of participants, and are indeed predictive of larger weight losses.[61] More empirical research is needed to study attitudes and cognitions with regard to exercise and physical activity in the context of obesity treatment.

Results from this study should only be generalized to healthy, middle-aged, overweight or mildly obese women volunteering for formal weight loss treatment. Also, the large number of statistical tests may have increased chances of type I error in some of the more exploratory analyses (eg Table 1). Logistic regression analysis, which resulted in parsimonious predictive models, and the fact that associations were generally observed in the expected direction provide some evidence that chance alone was not responsible for our primary findings. Nevertheless, the validity of the present prediction models needs to be confirmed in separate samples.

In conclusion, pretreatment predictors of meeting established goals for long-term weight management were identified, including easily accessible variables such as dieting history, outcome evaluations, self-efficacy, and quality of life. These results largely confirm our earlier findings with regard to short-term weight loss[11] and contribute to the development of a research database of moderators of success in weight management, such as individual readiness profiles, which is slowly being established in the field.[55,62,63] The understanding that obese patients respond to any program in a very heterogeneous manner reinforces the importance of continuing to assess, prior to treatment initiation, if weight loss candidates are indeed *ready* for such task.[64]

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