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Socio-demographic, Anthropometric, and Psychosocial Predictors of Attrition across Behavioral Weight-Loss Trials

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Abstract

Preventing attrition is a major concern in behavioral weight loss intervention studies. The purpose of this analysis was to identify baseline and six-month predictors associated with participant attrition across three independent clinical trials of behavioral weight loss interventions (PREFER, SELF, and SMART) that were conducted over 10 years. Baseline measures included body mass index, Barriers to Healthy Eating, Beck Depression Inventory-II (BDI), Hunger Satiety Scale (HSS), Binge Eating Scale (BES), Medical Outcome Study Short Form (MOS SF-36 v2) and Weight Efficacy Lifestyle Questionnaire (WEL). We also examined early weight loss and attendance at group sessions during the first 6 months. Attrition was recorded at the end of the trials. Participants included 504 overweight and obese adults seeking weight loss treatment. The sample was 84.92% female and 73.61% white, with a mean (±SD) age of 47.35±9.75 years. After controlling for the specific trial, for every one unit increase in BMI, the odds of attrition increased by 11%. For every year increase in education, the odds of attrition decreased by 10%. Additional predictors of attrition included previous attempts to lose 50–79 pounds, age, not possessing health insurance, and BES, BDI, and HSS scores. At 6-months, the odds of attrition increased by 10% with reduced group session attendance. There was also an interaction between percent weight change and trial ($p<.001$). Multivariate analysis of the three trials showed education, age, BMI,

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and BES scores were independently associated with attrition (ps ≤.01). These findings may inform the development of more robust strategies for reducing attrition.

Keywords

attrition; weight loss; binge eating

1. INTRODUCTION

Obesity and its related co-morbidities remain a significant public health concern (1). Randomized clinical trials (RCTs) testing weight loss interventions have resulted in the identification of efficacious strategies to treat overweight and obesity (2, 3). However, participant attrition reduces the effectiveness of weight-loss RCTs. Premature withdrawal from weight loss trials can prevent participants from adopting healthful behaviors that support long-term weight loss (4). Additionally, important research information is lost, which not only can reduce internal and external validity, but also bias trial outcomes (5).

Highly variable attrition rates ranging from 10–80% have been reported in RCTs characterized by varying trial designs, interventions, and study duration (6–9). For example, in a 12-month RCT for weight loss, an attrition rate of 42% among overweight and obese participants was reported (10). Similarly, in shorter weight-loss RCTs lasting 12–16 weeks, attrition rates ranging from 20% to 50% were reported (8). Recognizing participant characteristics associated with attrition may enhance retention and the subsequent development of effective weight loss interventions (4).

Obesity researchers have identified factors linked to attrition in weight loss trials; inconsistent associations have been reported between baseline factors (e.g., depression, body mass index (BMI)) and attrition (7, 9, 11–16). An association between reported binge eating and rates of attrition has been published; however, the relationship has not been reliable (17, 18). A recent systematic review reveals there are no significant associations between pre-treatment weight-loss expectations among participants and attrition (19). Notably, the majority of studies described in the systematic review had methodological limitations such as a brief intervention duration and/or short follow-up period (9, 13, 14, 20, 21). Additionally, none of the studies reported attrition rates across multiple clinical trials for durations exceeding 12 months.

The purpose of this study was to conduct a secondary analysis of data from three RCTs of behavioral weight loss interventions, ranging from 18 to 24 months in duration, to identify socio-demographic, anthropometric, and psychosocial factors associated with participant attrition at baseline. Additionally, we also examined percent weight change and attendance to group sessions at six months as early predictors of attrition. For the purposes of this study, attrition was defined as *non-completion of the final end-of-trial assessment*, which is commensurate with current literature (8, 21) on the topic.

This study is unique in that it analyzes data from three RCTs (i.e., PREFER, SELF, and SMART) that were conducted over a 10-year period and included a diverse, pooled sample

of 504 adults. Variable selection included those drawn from more recently developed measures which assess not only participants' self-efficacy and hunger and satiety, but also important factors inconsistently associated with attrition in smaller trials such as health-related quality of life, depressive symptoms, and binge eating (7, 22). The rationale for including variables previously associated with attrition is to generate new evidence surrounding psychosocial factors and eating behaviors that may be related to attrition. Additionally, this study provides researchers with information to assist in identifying participants who may be at risk for RCT withdrawal.

2. RESEARCH METHODS AND PROCEDURES

2.1 Trial Design and Participants

PREFER, SMART, and SELF were RCTs targeting weight loss over an extended period that featured a standard behavioral intervention. The design, recruitment, and randomization procedures of PREFER, SMART, and SELF have been described in detail (23–25).

Individuals were eligible for RCT enrollment across all studies if they met the following criteria: (1) over 18 years of age, (2) BMI between 27 and 43 kg/m^2, (3) successfully completed a 5-day food diary at screening, (4) agreed to be randomly assigned to a treatment group, and (5) willing to provide informed consent. Individuals were ineligible if they met any of the following exclusion criteria: (1) has a medical condition requiring physician supervision of diet and/or physical activity, (2) is undergoing current pharmacological treatment that might affect weight, (3) has a physical limitation that restricted exercise ability, (4) current alcohol consumption of four or more drinks/day, (5) is participating in a weight-loss program or has used weight loss medication within the last 6 months, (6) is pregnant or intends to become pregnant during the trial period, (7) has a serious mental illness (e.g., schizophrenia), and (8) has a fasting plasma glucose level greater than 125 mg/dl at baseline.

Details of each trial are listed in Table 1. PREFER (Paving the Road to Everlasting Food and Exercise Regimes) was an 18-month trial (2002–2004) that examined the effect of dietary approaches and preferences using a 2×2 factorial design, which allowed participants to indicate their preference for one of two dietary options: a calorie-restricted, lacto-ovo-vegetarian diet or a standard calorie- and fat-restricted diet (n = 176) (25). Individuals first were randomized to their choice of treatment (yes/no) and subsequently to one of the two diets. The SMART (Self-monitoring and Recording Using Technology) study was a 24-month trial (2005–2009) that examined the effect of three self-monitoring methods on weight loss (n = 210) (23). Participants were randomized to use one of three strategies for self-monitoring their diet and physical activity: use of a paper diary, use of a personal digital assistant (PDA), or use of PDA + daily dietary feedback messages (PDA + FB). SELF (Self-Efficacy Lifestyle Focus) was an 18-month clinical trial (2008–2013) that examined the effect of a self-efficacy enhancement intervention (SE) on weight loss (n = 130). Participants were randomized to standard behavioral treatment (SBT) or to a SBT + SE weight loss intervention group; SBT + SE included one-to-one sessions that augmented the standard group sessions and targeted enhanced self-efficacy (24). The University of Pittsburgh, Institutional Review Board approved each trial.

2.2 Justification for Combining the Three Trials

Table 1 presents the participants' sociodemographic profiles in the three studies. While the three trials featured differences, all three delivered SBT for weight loss and were conducted in Greater Pittsburgh. In each study, all participants were given calorie goals that were determined by their weight and gender (i.e., at < 200 lb, women were prescribed a 1,200 kcal diet and men 1,500 kcal; at > 200 lb, women were prescribed a 1,500 kcal diet and men 1,800 kcal). Participants were also instructed to reduce fat consumption to less than 25% of their daily intake and participate in 150 minutes of physical activity weekly.

With the aim of understanding the factors affecting attrition, we completed analyses at 18 and 24 months—the time points indicating the end-of-study. The PREFER and SELF trials were conducted over 18-months, while SMART was conducted over 24 months. Although some may question the use of varying time points, to understand attrition, we needed to follow the original design of each study and measure attrition at the final assessment. Moreover, there were no significant differences in attrition across the three studies ($p = .06$). With the exception of age, sociodemographic and anthropometric factors did not differ by trial. Finally, our analyses controlled for study (PREFER, SELF, or SMART) in each model, and tested for interactions between study and each predictor.

2.3 Baseline and 6-Month Measures

Table 2 presents the baseline measures used across the three studies. With the exception of two scales, measures were the same across the three studies. The Beck Depression Inventory and the Hunger Satiety Scale were not used in SMART. Additionally, only two of the four cohorts in SMART completed the Weight Efficacy Lifestyle Questionnaire (WEL).

2.3.1 Socio-Demographic and Anthropometric Data—Baseline socio-demographic characteristics were obtained via a self-administered, standardized questionnaire. Trained staff performed the anthropometric measures (e.g., BMI and waist circumference). A Tanita Digital Scale (Tanita Corporation of America, Inc., IL) was used to record weight with the participant wearing light clothing and no shoes; height was recorded using a wall-mounted stadiometer. BMI was calculated as weight in kilograms divided by height in meters squared (kg/m^2). Percent weight change was defined as the percentage of change from the baseline weight. A Gullick II measuring tape evaluated waist circumference.

2.3.2 Psychosocial Data—*Barriers to Healthy Eating (BHE)* is a 22-item questionnaire that assesses participants' perceived barriers to healthy eating. The Likert response scale ranges from 1 (no problem) to 5 (a significant problem) to rate various situations or conditions (e.g., complexity of the regimen, and cost of foods) that can interfere with following the diet. Higher scores indicated the participants reported more diet-related barriers. The BHE scale, which was used in a previous weight loss study (26), has an internal consistency reliability (Cronbach's alpha) of 0.86 in our studies (27).

The Beck Depression Inventory-II (BDI) is a 21-item scale is used to assess participants' self-reported depressive symptoms (28). Higher scores indicate more severe depressive symptoms. The recommended score cut points for classifying depressive symptoms are as

follows: *minimal* (0–13), *mild* (14–19), *moderate* (20–28), and *severe* (≥29) (29). The BDI has high internal consistency; Cronbach's alpha coefficients are 0.81 for non-psychiatric populations (30).

The Hunger Satiety Scale (HSS), a 6-item scale, measures an individual's level of hunger and satiety. It consists of three components: *hunger* (i.e., *How hungry are you after meals?*), *satiety* (i.e., *How full are you after meals?*), and *taste* (i.e., *How tasty is your diet?*). A higher score reflects less hunger, greater satiety, and better taste. Cronbach's alpha coefficients for each subscale in our trials are as follows: taste0.76, hunger 0.60, and satiety 0.78 (31).

The Weight Efficacy Life-Style Questionnaire (WEL) assesses participants' level of confidence in resisting eating in varied situations and emotional states, with higher scores indicating more confidence. Responses to the 20 items on this questionnaire correspond to a 10-point Likert scale from 0 (i.e., *not confident*) to 9 (i.e., *very confident*) (32). The WEL contains five components: (1) *negative emotions* (i.e., *I can resist eating when I am angry*), (2) *availability* (i.e., *I can control my eating on the weekends*), (3) *social pressure* (i.e., *I can resist eating even when I have to say no to others*), (4) *physical discomfort* (i.e., *I can resist eating when I feel physically run down*), and (5) *positive activities* (i.e., *I can resist eating when I am watching TV*). Reported Cronbach's alpha coefficients from the literature range from 0.70 to 0.90 (32, 33).

The Binge Eating Scale (BES) is a 16-item multiple-choice instrument used to identify non-binge, moderate binge, or severe binge eating patterns among individuals. The total score range is 0–46, with a higher score (i.e., > 27) indicating more severe binging (34). This instrument was used in the screening phase of all three trials. Cronbach's alpha has been reported at .87–.88 among various samples of those who are obese (35, 36).

The Medical Outcomes Study, Short-Form Survey (MOS SF-36v2) is used to measure general health-related quality of life (HRQoL) and has domain scores ranging from 0 to 100. Higher values indicate a better state of health. The MOS SF-36v2 has two component summary scores: mental health and physical health (37). The MOS SF-36v2 has been used in several weight loss trials and has well-established reliability and validity (38, 39). Cronbach's alpha has been reported at >0.70 (39).

2.3.3 Adherence to Attending Group Sessions

Adherence to attending group sessions was defined as the number of sessions actually attended in the first 6 months/total number of sessions)*100.

3. ANALYSIS

Statistical analyses were conducted using SAS version 9.2 (SAS Institute, Cary, NC). To achieve trial independence, we excluded 11 SMART trial subjects and one SELF trial subject from the analyses because they were also participants in the earlier PREFER trial. The outcome variable was binary: participants who completed the final trial assessment were considered completers, and those who failed to attend the final assessment were non-completers. Descriptive statistics were computed as (1) means and standard deviations for

continuous variables and (2) frequencies and percentages for categorical variables. The significance level was set at 0.05 for two-sided hypothesis testing. Baseline characteristics were compared among trials using ANOVA for continuous variables and Chi-square tests for categorical variables. To examine the effect of each baseline predictor, percent weight change at 6 month and proportion of group sessions attended at 6 month on the probability of not completing the trial, logistic regression was used, with the model controlling for participation in a specific trial. We assumed no weight change at 6 month if subjects' weights at 6 month were missing. Baseline predictors that had [A] either p-values less than 0.20 or [B] significant interactions with the trial in these analyses were considered in the multivariate analysis. Results were expressed as odds ratios (ORs) and their corresponding 95% confidence intervals (CI). Sensitivity analyses were conducted for influential data points. The Hosmer Lemeshow test was used to test the goodness of fit of the multivariate model.

4. RESULTS

The pooled sample of the three trials (N = 504) was predominantly female (84.92%), white (73.61%), employed full-time (77.69%) and, on average, completed 15.57 years of formal education. The mean (± SD) age was 47.35 ± 9.75 years, with a mean BMI of 33.83 ± 4.18 kg/m^2. Of the 504 participants who provided the baseline measures and participated in the intervention, 100 (19.84%) did not complete the final 18- or 24-month assessment, making them non-completers. See Figure 1.

Table 3 details differences between the completers and non-completers of the behavioral weight-loss trials at baseline. Controlling for trial, for every one unit increase in BMI, the odds of attrition increased by 11% (OR=1.11, 95% CI: 1.06, 1.18). However, for every year increase in education, the odds of attrition decreased by 10% (OR = 0.90, 95% CI: 0.82, 0.98). Individuals who did not have health insurance had 3.125 times the odds of attrition compared to people with health insurance (OR = 0.32, 95% CI: 0.11, 0.96). Moreover, those with a history of intentionally losing 50–79 pounds had 1.92 times the odds of attrition compared to those with no history of such large weight loss (OR = 0.52, 95% CI: 0.29, 0.95). For every one unit increase in waist circumference, the odds of attrition increased by 2% (OR=1.02, 95% CI: 1.00, 1.04). Additionally, for every one unit increase in BDI (OR=1.05, 95% CI: 1.01, 1.09) and BES scores (OR=1.05, 95% CI: 1.02, 1.08), the odds of attrition increased by 5%. Furthermore, for every one unit increase in age, the odds of attrition decreased by 5% (OR=0.95, 95% CI: 0.93, 0.98). And finally, for every one unit increase in HSS score, the odds of attrition decreased by 7% (OR=0.93, 95% CI: 0.89, 0.98). Sex, race, employment status, and marital status were not significantly associated with attrition. No interactions were observed between these variables and a given trial.

There was a significant interaction between total WEL score and trial (p = 0.04) and between WEL positive activities and trial (p =0 .01). There also was a significant interaction between health-related quality of life (physical component) and trial (p = 0.04). That is, the association between total WEL score, the WEL positive activities subscale, health-related quality of life, and the probability of attrition was dependent on the specific trial.

At 6 months, for every one percent increase in adherence to attending group sessions, the odds of attrition decreased by 10% (OR=0.90; 95% CI: 0.89, 0.92). There was a significant interaction between trial and percent weight change at 6 months (p<.001). That is, the non-completers who were enrolled in the SMART trial were able to achieve a larger weight loss (−2.58%) than the non-completers who were enrolled in PREFER (−1.81%) and SELF (−0.83%).

To further examine the association between baseline factors and attrition, two multivariate logistic regression models were used to overcome the problem of measures not being present in all three trials (see Table 3). Multivariate analysis of the three trials showed that age ($p < 0.001$), education ($p < 0.01$), BMI ($p < 0.01$), and binge eating scores ($p = 0.01$) were significantly associated with attrition. Multivariate analysis of the PREFER and SELF trials showed that BMI ($p = 0.04$), the binge eating score ($p = 0.03$), and the history of losing 50–79 lb ($p = 0.01$) were independently associated with attrition. In this model, there were significant interactions between not only the HSS score and trial ($p = 0.02$), but also HSS score and age ($p = 0.02$).

4. DISCUSSION

This is the first study to investigate attrition across three RCTs that examined the effects of behavioral interventions for weight loss that were conducted over a 10-year period. Results revealed the baseline factors related to the highest odds of attrition in these trials were having a higher BMI, fewer years of education, a history of previous attempts to lose a large amount of weight (50–79 pounds), and no health insurance. Reduced group session attendance at 6 months was also related to increased odds of attrition. Across all of our three trials, multivariate results indicated younger age, fewer years of education, a higher binge eating score, and, a higher BMI were associated with attrition. This study also examined newer measures of hunger, satiety, and self-efficacy and confirmed several factors previously reported to be associated with attrition, such as higher BMI and binge eating behaviors.

Younger age has consistently been reported as a factor associated with attrition (9, 14, 40, 41) and an increased likelihood of missing consecutive data-collection visits (42). The relationship between age and attrition may be explained by the competing reponsibilities that are typically associated with young adulthood, such as the demands of parenting and familial responsibilities. Recently, to offset participant burden, investigators have used web-based interventions or have conducted trials in primary care offices; these approaches likely have been helpful, with documented rates of attrition between 5% and 15% (43–45). Older adults may be more able to commit to the requirements of a trial due to retirement and less demanding schedules (46). Moreover, older adults are more likely to have health insurance and engage in more frequent health service utilization, which may prompt a provider to encourage weight loss (47).

Consistent with other trials (6, 48), participants in this study who had a higher BMI were more likely to not complete the trial. Possible reasons may include (1) increased difficulty adhering to calorie- and fat-restricted diets, (2) being discouraged about needing to lose a significant amount of weight, and (3) possibly seeing the success of others in the trial that

began the study with a lower BMI. These findings are important as they can be applied during initial screening to identify these attrition risk factors and implement specific strategies to mitigate them.

The estimated prevalence of binge eating behaviors is as high as 23–55% among individuals seeking weight loss treatment (34, 49). Moreover, binge eating symptoms have been associated with trial attrition (17) and with poorer weight loss outcomes (50). Although this study excluded participants with evidence of a binge eating disorder (i.e., score > 27), baseline scores were significantly higher among non-completers than completers. This finding suggests a need to not only be alert for unreported binge eating, but also to provide additional support to participants who score in the upper quartile of the acceptable range of BES scores during screening.

Within our studies, those with the highest risk of attrition were those who had fewer years of education, no health insurance, higher BMI, attended fewer group sessions during the first 6 months, and had a history of previous attempts of losing 50–79 pounds. Socio-economic status, having a higher weight or BMI, and a history of more weight loss attempts have been established as recurrent challenges in successful weight loss (16, 51, 52). Reduced attendance has been found to be associated with attrition previously (16); stronger strategies may be needed to prevent excessive absenteeism in the early phase of the intervention (52). Additionally, providing supplementary support to those who exhibit the signs suggesting higher risk for withdrawal may prove useful (53–55).

This study had a few limitations. Similar to other behavioral intervention studies is its reliance on self-report psychosocial measures; moreover, some measures were not included in all three trials, and the length of follow-up varied. Although the generalizability of our overall findings may be limited due to the relatively homogenous trial population, there was 26% minority representation in the trials. Strengths of this study included an extensive battery of baseline measures, and a profile of participants in three weight loss intervention trials spanning over 10 years. Moreover, the trials on which we reported achieved a mean retention rate of 80% at 18 months and 85% at 24 months (SMART), which matched or exceeded rates reported for other weight-loss studies (54, 56). In addition, these results may be generalized to other RCTs targeting lifestyle changes, and can (1) enable researchers to identify attrition “red flags” among participants and (2) encourage the development of strategies to reduce early trial withdrawal (Table 4).

In summary, participant characteristics may provide clues about potential risk factors for non-completion in a weight loss intervention trial. Future attrition research should assess the relationship between the timing of participant dropout and interactions among participant socio-demographic profile, treatment, and trial length (4). In addition, future interventions should include strategies to reduce attrition in weight loss intervention trials.

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Highlights

- Participant characteristics provide clues for attrition risk in three weight loss trials.
- Fewer years of education and not having health insurance were associated with highest risk for attrition.
- Attending fewer group sessions in the first 6 months was associated with risk for attrition.
- History of previous attempts to lose 50–79 pounds was associated with risk for attrition.

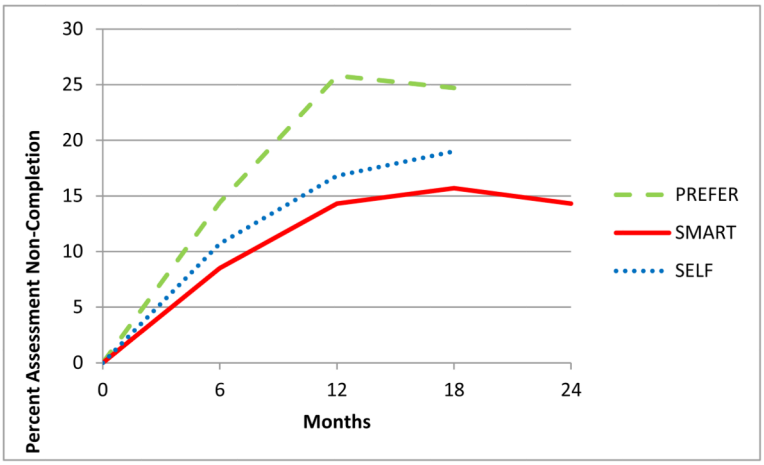

Figure 1.
Non-Completion of Assessment Over Time by Study.

Table 1

Description of Baseline Socio-Demographic Characteristics of Each Trial

Trial Description	Intervention	BMI(±SD)	Age*(±SD)	Years of Education (±SD)	Race	Marital Status	Income
PREFER (N=176, 2002–2004): Weekly group sessions for first 6 months; biweekly for months 7–9; monthly for months 10–12	SBT, Treatment Preference Yes vs. Treatment Preference No; LOV vs. Standard Diet	34.02±4.09	44.03±8.76	15.20±2.53	White: 70.45% Non- White: 29.56%	Never Married: 19.54% Married: 63.79% Other: 16.67%	<$10– 30,000: 16.67% $30– 50,000: 26.44% >$50,000: 56.90%
SMART (N=210; 2005–2009): Weekly for the first four months, every 2 weeks for months 5–12; monthly for months 13–18, 21	SBT, Self- Monitoring: Paper Diary vs. Electronic Diary	33.44±3.87	52.97±9.59	15.91±3.06	White: 77.89% Non- White: 22.81%	Never Married: 14.57% Married: 67.84% Other: 17.59%	<$10– 30,000: 16.49% $30– 50,000: 23.20% >$50,000: 60.61%
SELF (N=130, 2008–2013): Weekly for the first month, every 2 weeks in the second month, monthly for months 3–12; every 6 weeks for months 13–18	SBT vs. SBT + Self-Efficacy Enhancement	33.91±4.45	46.63±9.14	15.67±3.02	White: 71.32% Non- White: 28.67%	Never Married: 12.40% Married: 64.34% Other: 23.26%	<$10– 30,000: 13.39% $30– 50,000: 22.05% >$50,000: 64.07%

*significantly different by trial, p<.001

Note: SD: standard deviation; LOV: Lacto-Ovo-Vegetarian; Standard Diet: Calorie and Fat Control; SBT: Standard Behavioral Treatment

Table 2

Measures Used in the PREFER, SMART, AND SELF Trials

Measures	PREFER	SMART	SELF
Socio-demographic Characteristics	X	X	X
Medical History	X	X	X
Binge Eating Scale	X	X	X
Barriers to Healthy Eating	X	X	X
Beck Depression Index-II	X		X
Hunger Satiety Scale	X		X
Medical Outcomes Study - Short Form 36	X	X	X
Weight Lifestyle Self-Efficacy	X	X[a]	X
Body Mass Index	X	X	X
Waist Circumference (cm)	X	X	X

[a]Only 2 of the 4 cohorts completed the Weight Lifestyle Self-Efficacy

Table 3

Baseline Predictors of Study Attrition

Characteristics	Total Sample (N=504) M±SD or n (%)	Completers (n=404) M±SD or n (%)	Non- Completers (n=100) M±SD or n (%)	OR (95% CI)
Socio-demographic				
Age (years)	47.35±9.75	48.20±9.23	43.89±11.04	0.95 (0.93, 0.98)
Education (years)	15.57±2.88	15.74±2.90	14.88±2.70	0.90 (0.82, 0.98)
Employment Status	390 (77.69%)	318 (79.10%)	72 (72.00%)	0.67 (0.40, 1.12)
Full-time (ref= part- time)				
Ethnicity	371 (73.61%)	301 (74.50%)	70 (70.00%)	0.83 (0.51, 1.35)
White (ref =Non- white)				
Gender	428 (84.92%)	338 (83.66%)	90 (90.00%)	1.73 (0.85, 3.51)
Female (ref= male)				
Health Insurance	488 (97.21%)	394 (98.01%)	94 (94.00%)	0.32 (0.11, 0.96)
Yes (ref= no)				
Marital Status[a]	329 (65.54%)	262 (65.01%)	67 (67.68%)	1.36 (0.73, 2.52)
Married (ref=other)				
Marital Status[a]	79 (15.74%)	62 (15.38%)	17(17.17%)	1.40 (0.64, 3.05)
Never Married (ref =other)				
Anthropometric				
BMI *(kg/m^2)*	33.83±4.18	33.46±4.15	35.30±4.01	1.11 (1.06, 1.18)
Waist Circumference (*cm)*	105.26±12.80	104.61±12.81	107.89±12.48	1.02 (1.00, 1.04)
Psychosocial				
BHE	61.47±14.00	61.21±14.18	62.52±13.25	1.01 (0.99, 1.02)
BES	15.58±7.67	15.04±7.53	17.73±7.89	1.05 (1.02, 1.08)
BDI	7.68±7.00	7.13±6.99	9.54±6.75	1.05 (1.01, 1.09)
HSS	28.78±5.39	29.23±5.22	27.30±5.71	0.93 (0.89, 0.98)
MOS SF36-Mental	49.00±9.96	49.45±9.84	47.18±10.28	0.97 (0.95, 1.00)
MOS SF36-Physical	51.74±7.02	51.87±6.94	51.24±7.32	*b*
WEL				
Availability	16.68±8.35	16.66±8.48	16.77±7.93	1.00 (0.97, 1.03)
Negative Emotions	18.81±9.47	19.22±9.34	17.33±9.86	0.98 (0.95, 1.01)
Physical Discomfort	24.92±7.54	25.11±7.40	24.23±8.06	0.98 (0.95, 1.02)
Positive Activities	24.31±7.34	24.58±7.10	23.36±8.12	*b*
Social Pressure	22.18±8.58	22.00±8.63	22.81±8.42	1.01 (0.98, 1.04)
WEL Total	106.90±33.37	107.57±33.17	104.51±34.21	*b*
History of Weight Loss/Gain				
Intentionally lost 50–79 lbs.	422 (86.48%)	347 (88.07%)	75 (79.79%)	0.52 (0.29, 0.95)
Never (ref=1 or more times)				

[a] Missing data reported: completers (n=403); non-completers (n=99)

[b] This variable interacted with trial (p<.05).

Note: SD: Standard deviation; CI: Confidence Interval; BES: Binge Eating Scale; HSS: Hunger Satiety Scale; WEL: Weight Efficacy Lifestyle; MOS-SF-36v2: Medical Outcomes Survey-Short Form36; BHE: Barriers to Health Eating BDI: Beck Depression Inventory-II

Table 4

Red Flags for Potential Attrition of Participants in Behavioral Weight Loss Trials

- Higher BMI
- Binge eating behaviors
- Previous attempts to lose 50–79 pounds
- Younger age
- Fewer years of education
- No health insurance