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Adoption of diet-related self-monitoring behaviors varies by race/ethnicity, education, and baseline binge eating score among overweight-to-obese postmenopausal women in a 12-month dietary weight loss intervention

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Abstract

Recent research has identified self-monitoring behaviors as important strategies for both initial weight loss and weight loss maintenance, but relatively little is known about adopters and non-adopters of these behaviors. To test our hypothesis that key characteristics distinguish adopters from non-adopters, we examined the demographic characteristics and eating behaviors (e.g. restrained, uncontrolled, emotional and binge eating) associated with more frequent compared to less frequent use of these behaviors. Baseline demographic characteristics and eating behaviors, as well as, 12-month self-monitoring behaviors (i.e. self-weighing, food journaling, calorie counting) were assessed in 123 postmenopausal women enrolled in a dietary weight-loss intervention. Logistic regression models were used to test associations of self-monitoring use with demographic characteristics and eating behaviors. Non-Whites, compared to non-Hispanic Whites, were less likely to count calories regularly (adjusted OR: 0.36–95% CI: 0.13–0.97, $p < 0.05$), controlling for intervention arm and baseline BMI. Participants with a college degree or higher education were less likely to self-weigh daily (adjusted OR: 0.30, 95% CI: 0.13–0.67, $p = 0.01$) compared to individuals who attended some college or less. Those with higher baseline binge eating scores were less likely to count calories (adjusted OR: 0.84, 95% CI: 0.73–0.97, $p = 0.01$) compared to participants with lower binge eating scores. In summary, use of diet-related self-monitoring behaviors varied by race/ethnicity, education, and binge eating score in postmenopausal women

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who completed a year-long dietary weight loss intervention. Improved recognition of groups less likely to self monitor may be helpful in promoting these behaviors in future interventions.

Keywords

Weight loss; postmenopausal; women; demographic; psychosocial; behaviors; diet

1. Introduction

Previous research has identified diet-related self-monitoring behaviors such as self-weighing, maintaining food journals, and counting calories as important strategies for both initial weight-loss and weight-loss maintenance. While adherence to these behaviors may contribute to the effectiveness of behavioral interventions for weight loss, adoption of these behaviors might vary by demographic characteristics (e.g. age, race/ethnicity) and eating behaviors. For instance, daily weighing and food journal use have been found to be associated with older age among individuals enrolled in the National Weight Control Registry and in the Diabetes Prevention Program (DPP) clinical trial. In a large multi-ethnic sample of adults participating in a weight loss trial, African Americans were less likely to adhere to food journal use compared to non-Hispanic Whites. In studies of successful weight maintainers, daily self-weighing has been associated with higher dietary restraint and less disinhibition. However, it is unclear if demographic characteristics and eating behaviors vary across the constellation of self-monitoring behaviors common in dietary weight loss interventions and if previous findings also apply to postmenopausal women in the context of a weight loss trial. We hypothesized that there would be characteristics that distinguish adopters and non-adopters of self monitoring behaviors. Therefore, the objective of this study was to assess baseline differences in demographic characteristics and cognitive aspects of eating behaviors by diet-related self-monitoring behavior use among postmenopausal overweight-to-obese women enrolled in a year-long dietary weight loss intervention. To test our hypothesis that key characteristics distinguish adopters from non-adopters, we examined the demographic characteristics and eating behaviors (e.g. restrained, uncontrolled, emotional and binge eating) associated with more frequent compared to less frequent use of these behaviors.

2. Methods and materials

2.1 Participants

Participants in this study were part of a larger four-arm randomized controlled trial testing the individual and combined effects of dietary weight-loss and exercise interventions on circulating hormones and other outcomes. A full description of the parent trial has been detailed previously. This ancillary study focused on examining self-monitoring behaviors among 143 individuals randomized to one of two dietary weight-loss arms: 1) diet-induced weight-loss (Diet) or 2) diet-induced weight-loss + exercise (Diet + Exercise). For this observational study, only women who completed 12-month measures were included in the analytic sample (n=123, Diet n=59, Diet+ Exercise n=64). The Fred Hutchinson Cancer Research Center Institutional Review Board reviewed and approved all study procedures and all study participants provided written informed consent.

2.2 Lifestyle-Based Interventions

Detailed descriptions of the lifestyle-based interventions have been previously published. The dietary weight-loss intervention was based on the Look AHEAD (Action for Health in Diabetes) and DPP clinical trial diet interventions, with the following goals: total intake of 1200–2000 kcals/day based on baseline weight, < 30% calories from fat, and 10% reduction

in weight by 6-months with maintenance to 12-months. Registered dietitians (RD) with training in behavior modification delivered identical curriculum to both Diet and Diet + Exercise intervention arms; however, instruction groups were held separately to minimize contamination. Participants met individually with an RD at least twice, followed by weekly group meetings (5–10 women) for 6-months. Thereafter, participants attended group meetings once per month and also had phone or e-mail contact; however, those struggling with initial or maintenance of weight received additional RD assistance. Self-monitoring of weight and food intake was among the topics covered in the curriculum. Specifically, participants were asked to record all food eaten daily for at least 6 months or until they reached their individual weight loss goal (10%). Participants were also encouraged to self-weigh at home at least weekly throughout the entire year.

The goal of the exercise intervention was 45 minutes of moderate-to-vigorous intensity exercise at a target heart rate of 70–85% observed maximum, 5 days/week, by the 7th week. Participants attended > 3 sessions per week at the study facility, supervised by an exercise physiologist, and exercised the remaining two weekly sessions at home.

2.3 Eating Behavior Measures

Information on demographic characteristics and dimensions of eating behaviors were obtained by self-report at baseline. The revised 18-item Three Factor Eating Questionnaire (TFEQ-R18) developed by Karlsson et al was used to assess three dimensions of eating behavior: 1) restrained eating (restricting food intake to manage weight; 6 items), uncontrolled eating (losing control over food intake, along with subjective feelings of hunger; 9 items), and emotional eating (lacking ability to resist emotional cues; 3 items). TFEQ-R18 is a reduced version of Stunkard and Messick's Three Factor Eating Questionnaire (TFEQ) and has been validated in obese and non-obese populations. The method of scoring was based on the description provided by de Lauzon et al. Item scores ranged from 1 to 4 and subscales were summed into a scale of 0–100: $[(\text{raw score} - \text{minimum possible raw score}) / (\text{maximum possible raw score} - \text{minimum possible raw score})] \times 100$. The shorter 5-item version of the Binge Eating Scale was used to assess binge-eating severity and is based on Gormally's 16-item Binge Eating scale. A score of 0–3 is given for each response and summed up for a total of 15; higher scores indicate greater binge eating severity.

2.4 Self-Monitoring Behavior Measures

Information on the use of self-weighing and counting calories was obtained by self-report at 12-months pertaining to the previous 6-months. For self-weighing frequency, participants were asked: "How frequently do you weigh yourself? (on your own, not weighed by another person)". Response categories included: less than monthly, once a month, a specific number of times per week, daily, and more than once a day. While this single-item measure has not been validated against more objective measures, this approach to assessing self-weighing has been widely used in published studies and has been shown to be a good predictor of weight-related outcomes.

To assess the regular use of calorie counting, the following was asked: "Which of the following, if any, do you do most days of the week? Count how many calories you eat?" with "yes" and "no" as response categories. Previous research suggests that when the question is posed in this manner (ie. "do you do most days of the week"), it is a better reflection of habitual use of this behavior; however, further research is needed to confirm this. Lastly, the number of completed food journals submitted to a study dietitian from baseline to 6-months was used to assess food journal use. This time frame was selected

because all participants were given the same instructions regarding frequency of food journal use during the first 6-months of the intervention.

2.5 Statistical Analyses

Descriptive data are presented as means $\pm$ SD or proportions, as appropriate. Participants were classified into sub-groups based on their use of self-monitoring behaviors in order to distinguish more frequent versus less frequent users of these behaviors. Since most participants (88%) adhered to the instruction to weigh themselves at home at least weekly; response options were collapsed into two categories: 1) daily or more (n=45) and 2) less than daily (n=78). The variable for counting calories was coded as “no” (n=48) to counting calories most days of the week vs. “yes” (n=75). Food journal use was classified by median split of number of food journals submitted from baseline to 6 months (17 of maximum 25). T-tests or chi-square tests were used to compare demographic and psychosocial variables by categories of self-monitoring behaviors, as appropriate. Logistic regression was used to examine the associations between demographic and eating behaviors with each of the self-monitoring behaviors while adjusting for intervention arm and baseline body mass index (BMI). All statistical tests were two-sided with an alpha of <0.05 and all analyses were performed using STATA, version 10 (College Station (TX): STATA Corp).

3. Results

Baseline participant characteristics are presented in Table 1. Participants were on average 58 years old, primarily non-Hispanic White (84%), and highly educated (67% with at least a college degree). No differences in demographic characteristics were observed by intervention arm; however, scores for uncontrolled eating and emotional eating were higher in the Diet compared to the Diet + Exercise arm (Table 1). Frequency of self-monitoring behavior use was also examined by intervention arm, but no significant differences were observed (Table 1).

3.1 Relationship of Diet-Related Self Monitoring Behaviors with Demographic Variables

Self-weighing daily or more did not differ by age, race/ethnicity, or marital status. Women with at least a college degree were less likely to self-weigh daily compared to those with some college or less (adjusted OR: 0.30; 95% CI: 0.13–0.67, $p = 0.01$) (Table 2) even after adjusting for intervention arm and baseline BMI.

Race/ethnicity status was significantly associated only with counting calories ($p < 0.05$), although there was a trend toward higher food journal use ($p = 0.07$) among non-Hispanic White women. Adjusting for intervention arm and baseline BMI, non-Whites were less likely to count calories on most days of the week compared to non-Hispanic Whites (adjusted OR: 0.36; 95% CI: 0.13–0.97, $p < 0.05$) (Table 2).

3.2 Relationship of Diet-Related Self Monitoring Behaviors with Eating Behaviors

No detectable associations were observed between any of the self-monitoring behaviors with uncontrolled eating, restrained eating, or emotional eating (Table 2). Binge eating scores (mean $\pm$ SD) were significantly higher among participants who did not count calories (4.8 ± 3.1) compared to those who did count calories (3.6 ± 2.3) ($p = 0.01$). For every one-unit increase in binge eating score, there was an approximate 16% decrease in the odds of calorie counting (OR 0.84, 95% CI 0.73–0.97, $p = 0.01$), while adjusting for intervention arm and baseline BMI (Table 2).

4. Discussion

This study identified distinguishable characteristics by diet-related self-monitoring behaviors at the end of a year-long study and supports our hypothesis that key characteristics distinguish adopters and non-adopters of self monitoring behaviors. In this study, differences were observed by education status, race/ethnicity, and by binge eating score in some self-monitoring behaviors.

Few studies have reported on the demographic characteristics of individuals who frequently self weigh. Linde et al. found that older, non-Hispanic White adults were more likely to report frequent (weekly vs. < weekly) self-weighing at baseline in a weight loss trial; similar findings were observed by Butryn et al in their cohort study. Neither found an association of education with self-weighing behavior as observed in our study. The sample in this current study was limited to postmenopausal women, which likely diminished the role of age as a differentiating characteristic. Furthermore, compared to the aforementioned studies, this study assessed self-weighing at 12-months, rather than at baseline, which could have also contributed the difference in findings. Our findings suggest that lower education is not a barrier to daily self-weighing, and that more educated women may be more inclined to follow minimum recommendations (ie. “at least weekly”) when instructed in this manner.

In randomized controlled trials, dietary self monitoring (e.g. use of food journals and counting calories) tend to be good predictors of greater weight loss, particularly when individuals adhere to these behaviors early on in the intervention. Therefore, improving our recognition of baseline characteristics associated with greater adoption of these behaviors might help in our efforts to promote these behaviors in groups that experience greater difficulty with adherence to these behaviors. In this present study, non-White or Hispanic women were less likely to count calories and submit food journals compared to non-Hispanic Whites. This finding should be interpreted with caution since there were too few of non-White or Hispanic participants to be able to test associations within specific race/ethnic groups. However, the findings from the Weight-Loss Maintenance trial (N=1685; 44% African-American) found that the use of food records by African Americans was significantly less than their non-African American counterparts in the initial 6-month weight loss period and generally, minority groups, particularly Black women, generally lose less weight than non-Hispanic Whites in behavioral weight loss interventions. Nevertheless, future studies are needed to confirm these findings in African-Americans as well as other racial/ethnic groups.

Previous research has identified binge eating as a potential barrier to weight-loss success. In this sample, women who had higher baseline binge eating scores were less likely to count calories, suggesting that women with high scores in binge eating might have difficulty in counting calories. These findings differed from Smith et al. who reported a positive association between calorie-counting and overeating in a cross-sectional observational study. However, it is important to note that their study population consisted of both men and women and only 18% of their population was attempting to lose weight. In addition, binge eating in this study was assessed with the shortened version of the binge eating scale, whereas Smith et al based their assessment of overeating with the disinhibition scale from the original 51-item TFEQ.

In this current study, no significant differences were detected in baseline scores for restrained, uncontrolled and emotional eating by self-weighing or dietary self-monitoring behaviors (i.e. calorie counting and food journals). In the National Weight Loss Registry cohort, individuals who decreased their self-weighing frequency over one year had lower levels of cognitive restraint and higher levels of disinhibition. While this current study did

not assess change in eating behaviors over time, the difference in findings might also be attributed the use of different measures to assess eating behaviors. The National Weight Loss Registry study assessed disinhibition and cognitive restraint with the original TFEQ; however, in this current study, the TFEQ-R18 was used. The use of this measure is appropriate since it has been validated in obese adults; however, the difference in measures limits the ability to make comparisons across studies.

There are several limitations to our study. While the submitted food journals were objectively assessed, self weighing and calorie counting were assessed by self-report. There is the potential that bias such as social desirability could impact a participant's response such that behaviors promoted in the intervention might be over-reported, while the inverse would occur for behaviors that were discouraged. A single-item measure to assess self-weighing and calorie counting is also a limitation; therefore, more frequent assessments (e.g. weekly) and/or objective measures would improve assessment of these behaviors in future studies. Also, our small sample size and predominantly non-Hispanic White population limited our ability to fully examine differences by race or ethnicity and also limits the generalizability of these findings to other populations.

In summary, this study suggests that individuals who adopt self-monitoring behaviors may vary by baseline demographic characteristics such as educational status, race/ethnicity and binge eating score. Future studies are needed to confirm the findings in this study, particularly in various race/ethnic groups. Improved recognition of groups less likely to self monitor may be helpful in promoting these behaviors in future interventions.

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Abbreviations

DPP	Diabetes Prevention Program
RD	Registered dietitian
TFEQ-R18	The revised 18-question Three Factor Eating Questionnaire
BMI	body mass index

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Table 1

Baseline demographic characteristics and eating behaviors of postmenopausal women participating in a year-long dietary weight loss intervention, stratified by study arm

	Total N=123	Diet Only N=59	Diet+ Exercise N=64
DEMOGRAPHIC			
Age (years) mean $\pm$ SD	57.9 $\pm$ 5.0	57.6 $\pm$ 5.9	58.3 $\pm$ 3.9
Race/Ethnicity %(n)			
White, non-Hispanic	83.7(103)	83.1(49)	84.4(54)
Education %(n)			
College Grad or more	66.7(82)	61.0(36)	71.9(46)
Eating Behaviors^b mean $\pm$ SD			
Restrained Eating	43.8 $\pm$ 16.6	41.6 $\pm$ 15.6	45.9 $\pm$ 17.2
Uncontrolled Eating	34.5 $\pm$ 1.6	38.9 $\pm$ 18.2 ^a	30.5 $\pm$ 15.9 ^a
Emotional Eating	48.01 $\pm$ 25.1	53.3 $\pm$ 24.8	43.1 $\pm$ 24.5
Binge Eating (n=122)	4.1 $\pm$ 2.7	4.3 $\pm$ 2.9	3.9 $\pm$ 2.6
Self Monitoring behaviors (n)			
Self Weigh: Daily or more	45	18	27
count calories: yes	75	33	42
Food journal: median	66	37	29

^a p value <.001

^b Computed scores reported

for eating behaviors; sd: standard deviation

Table 2

Adjusted odds ratios for demographic characteristics and eating behaviors by self monitoring behaviors in postmenopausal women participating in a year-long dietary weight loss intervention

	Self Weight			Count Calories				Food Journals			
	Daily N=45	< Daily n=78	OR* 95% CI	Yes N=75	No N=48	OR* 95% CI	Median N=66	<Median N=57	OR* 95% CI		
Age mean ±SD	58.2 ± 5.2	57.8 ± 4.9	1.02 0.94–1.09	58.1 ± 5.1	57.6 ± 4.8	1.02 0.94–1.09	57.7 ± 4.7	58.2 ± 5.3	0.98 0.91–1.06		
Race % (n)											
White, non-Hispanic	84.4(38)	83.3(65)	ref	89.4(67) ^b	75.0(36) ^b	ref	89.4(59)	77.2(44)	ref		
non-White	15.6(7)	16.6(13)	0.92 0.33–2.54	10.6(8) ^b	25.0(12) ^b	0.36 ^b 0.13–0.97	10.6(7)	22.8(13)	0.38 0.13–1.06		
Education % (n)											
Some College or less	48.9(22) ^a	24.4(19) ^a	ref	34.7(26)	31.2(15)	ref	33.3(22)	33.3(19)	ref		
College Grad or more	51.1(23) ^a	75.6(59) ^a	0.30 ^a 0.13–0.67	65.3(49)	68.8(33)	0.81 0.37–1.77	66.7(44)	66.7(38)	1.09 0.51–2.36		
Eating Behaviors mean ± SD											
Uncontrolled Eating	34.5 ± 17.2	34.6± 17.7	1.00 0.98–1.03	33.3 ± 18.7	36.3 ± 15.4	1.01 0.98–1.05	34.3 ± 16.4	34.8 ± 18.7	0.99 0.97–1.01		
Restrained Eating	41.6 ± 19.4	45.1± 14.6	0.98 0.96–1.01	42.2 ± 17.4	46.4 ± 15.0	0.98 0.96–1.01	41.5± 15.2	46.7 ± 17.7	0.98 0.96–1.01		
Emotional Eating	46.2 ± 27.4	49.1 ± 23.8	1.00 0.98–1.01	45.3± 24.9	52.3± 25.0	0.99 0.97–1.00	48.3 ± 24.9	47.7± 25.6	1.00 0.98–1.01		
Binge Eating	4.3± 3.1	3.9 ± 2.5	1.07 0.93–1.22	3.6 ± 2.3 ^a	4.8 ± 3.1 ^a	0.84 ^a 0.73–.97	4.0 ± 2.8	4.1 ± 2.7	0.98 0.85–1.12		

Predictor Variables entered into logistic regression model independently.

^{*} Odds ratios adjusted for intervention arm and baseline BMI.

^a p value 0.01,

^b pvalue <0.05 CI: confidence interval OR: Odds Ratios

Race non-White (i.e. African American, Hispanic, Asian, Other) vs non-Hispanic White (reference)

Education: >College vs. < College (reference)

Self Weight: Daily or more vs. Less than daily (reference)

Count Calories: Yes vs. No (reference) mtr07056

Food Journals: Median vs. < Median (reference); median number of food journals is 17