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Exploring Gender Differences in a Randomized Trial of Weight Loss Maintenance

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Abstract

The purpose of this study is to explore gender differences in reasons for losing weight, weight loss methods, and weight loss behaviors prior to and during a weight loss maintenance trial. This is a secondary analysis of data from a 24-month randomized controlled trial comparing Self-Directed or Guided phone-based weight loss maintenance interventions among adults who had intentionally lost ≥ 10% of their body weight in the year prior to enrollment. Participants reported their weight loss methods and reasons for recently losing weight at baseline. Dietary intake, physical activity, and dietary patterns were assessed at baseline, 12, and 24 months. Participants included 419 adults (18.4% men, age 47.0 ± 10.8, BMI 28.4 ± 5.0). Women were more likely than men to report having used an organized weight loss program during their weight loss (55.9% vs. 24.7%, $p < 0.001$) and to report improving personal esteem as a motivator (51.2% vs. 35.1%, $p = 0.01$). Men were more likely than women to report eating food from convenience stores at baseline (22.1% vs. 13.2%, $p=0.04$) and throughout the study but otherwise reported similar meal patterns (p's > 0.05). Men reported higher energy intake than women while physical activity was similar. Although more men self-directed their initial weight loss and more women utilized organized weight loss programs, behaviors reported during weight loss maintenance were similar. Futures studies are needed to understand if these results generalize to other men who have successfully lost weight and are participants in other weight loss maintenance interventions.

Keywords

Weight loss maintenance; gender differences; behavior; intervention

The prevalence of overweight and obesity are nearly equal among men and women in the United States (Ogden, Carroll, Kit, & Flegal, 2014). Despite similar weight loss needs, men are underrepresented in formal weight control programs or intervention trials (Pagoto et al., 2011; Robertson et al., 2014). This is problematic because men are not gaining the health benefits associated with weight loss program participation (e.g., Diabetes Prevention Program Research Group, 2009; The Look AHEAD Research Group, 2010). Further,

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because men are underrepresented in weight loss maintenance trials, it is unclear if these interventions are as effective for men as they are for women.

Men and women exhibit different attitudes and behaviors surrounding weight and weight management. Men with overweight are less likely to see themselves as overweight than women with overweight (Gregory, Blanck, Gillespie, Maynard, & Serdula, 2008; S. A. Tsai, Lv, Xiao, & Ma, 2016). Along with this misperception, men are less likely to report attempting to control their weight than women (Duncan et al., 2011; James, 2003; Kruger, Galuska, Serdula, & Jones, 2004; Lemon, Rosal, Zapka, Borg, & Andersen, 2009). This reduced interest in weight control is evident in studies of weight control. Specifically, reviews of behavioral weight loss programs have found that men make up only 27% of participants (Pagoto et al., 2011; Robertson et al., 2014). A second contributor to men's low participation in weight loss programs is that the programs that are available are seen as unappealing or designed for women's needs (Archibald et al., 2015; de Souza & Ciclitira, 2005; Sabinsky, Toft, Raben, & Holm, 2007). To address these concerns and engage men in prevention efforts, male-targeted weight loss programs have been tested and have demonstrated effectiveness in producing weight loss (e.g., Crane, Lutes, Ward, Bowling, & Tate, 2015; Hunt et al., 2014; Morgan, Lubans, Collins, Warren, & Callister, 2011). In their review of men-only weight loss programs, Young and colleagues only identified one program with follow-up greater than a year, suggesting that studies of men-only weight loss maintenance programs have not yet been conducted (Young, Morgan, Plotnikoff, Callister, & Collins, 2012). A recent review of mixed-gender programs concluded that within three studies focused on weight loss maintenance monetary contracts, Orlistat, and on-demand very low calorie diet meal replacements demonstrated equal effectiveness in producing weight loss maintenance in men and women (Robertson et al., 2016). However, weight loss maintenance remains a challenge for both men and women (Dombrowski, Knittle, Avenell, Araujo-Soares, & Sniehotta, 2014; MacLean et al., 2015).

Several trials have demonstrated the efficacy of interventions explicitly designed to improve weight loss maintenance (Jakicic, Marcus, Lang, & Janney, 2008; Perri et al., 2008; Perri et al., 2001; Svetkey et al., 2008; A. G. Tsai, Felton, Wadden, Hosokawa, & Hill, 2015; Wing, Tate, Gorin, Raynor, & Fava, 2006). Most weight loss maintenance trials to date have included a weight loss program first followed by a testing weight loss maintenance intervention(s). This design obscures the ability to examine how successful weight losers approach their initial weight loss when pursued outside of a randomized trial and if there are differences by gender in these approaches. The Keep It Off trial (Sherwood et al., 2013), as well as the Stop Regain trial (Wing et al., 2006), used an alternative design where participants were enrolled in a maintenance trial after successfully achieving a clinically significant weight loss (≥ 10% of initial weight). This study uses data from the Keep It Off study, to test among successful weight losers whether men and women in the trial differed at baseline in motivations or methods for weight loss used prior to entering the study and gender differences in behaviors or weight change during the experimental weight loss maintenance intervention period.

Methods

Participants and Procedures

Data for this analysis come from the 24-month Keep It Off randomized controlled trial (NCT00702455; Sherwood et al., 2013; Sherwood et al., 2011). The primary criterion for the trial eligibility was having experienced a verifiable intentional weight loss of at least 10% of their body weight in the previous year. Weight losses were verified via photographs or confirmation from friends or family members, an approach similar to that used in the National Weight Control Registry (Klem, Wing, McGuire, Seagle, & Hill, 1997). Other eligibility criteria were age of 18–65 and generally good health (Sherwood et al., 2011). Participants were recruited through community outreach and through HealthPartners Institute employee-, member-, and patient-based advertisements. As described elsewhere participants were randomized to either a phone-based weight gain prevention program or a self-help control group and then followed for 24 months (Sherwood et al., 2011). All study procedures were reviewed and approved by the HealthPartners institutional review board.

Measures

At baseline, 12 months, and 24 months post-randomization participants attended in-person assessment visits where their weights were measured using a calibrated digital scale (Seca 770 Medical Scale) by research staff masked to treatment assignment. Height was measured at baseline only (Seca 214 Portable Height Rod).

Initial weight loss—During the telephone screening for the study, participants were asked about their prior weight loss experiences. Participants were asked to report their highest weight in the past year and their current weight. These values were used to calculate their percent weight loss. Participants were asked how they achieved their recent weight loss, including whether they took part in an organized weight loss program. Participants were also asked to describe what motivated their weight loss attempt. The open-ended responses were reviewed by the Keep it Off study team and were coded as: related to health (e.g., improving current health, preventing future health problems), related to self-esteem (e.g., wanting to feel better about him/herself, improve appearance), or related to other reasons (e.g., to benefit family). Reasons for weight loss categories were not mutually exclusive.

Weight maintenance behaviors—Eating and exercise behaviors were assessed at baseline, 12 months, and 24 months. Dietary intake was assessed using the National Cancer Institute's web-based Diet History Questionnaire (DHQ; Subar et al., 2001). Total energy intake (kcals), percent calories from fat, daily servings of fruit and vegetables, and total energy intake adjusted for body weight (kcal/lb.) are reported here.

Eating patterns and food sources over the past week were assessed using a 10-item scale. Participants were asked on a five point scale (ranging from 0 times to 7+ times) how often they ate: breakfast, lunch, dinner, after 7 PM, snacks while watching television, meals while watching television, food at work, fast food restaurant food, sit-down restaurant food, and food purchased at a convenience store. Responses to these items were highly skewed and were therefore transformed into dichotomous variables. These responses were categorized

separating those who ate each meal seven days per week (versus < 7), those who ate snacks or meals while watching television 3 times or more (versus < 3), and those who ate after 7 PM 3 times (versus < 3), and those who never (versus ever) ate foods from work, fast food restaurants, sit-down restaurants, or from convenience store.

Physical activity was assessed using the Paffenbarger Physical Activity Questionnaire (Paffenbarger, Hyde, Wing, & Hsieh, 1986). This seven item questionnaire asks participants to report their walking, number of flights of stairs climbed, and any leisure time physical activity. This questionnaire is been used in prior weight control trials and is able to assess change in physical activity over time (e.g., Jeffery, Wing, Sherwood, & Tate, 2003) and has acceptable validity for assessing structured physical activity (Ainsworth, Leon, Richardson, Jacobs, & Paffenbarger Jr, 1993).

Analysis

Analyses were conducted using SAS 9.3. Baseline gender differences were tested using t-tests and chi-square. Changes in weight maintenance behaviors were tested using multilevel modeling regression using PROC MIXED for continuous variables and PROC GENMOD for binary outcomes. All analyses controlled for the effect of the treatment group. There were no significant interactions between gender, treatment group, and time (p's > 0.05; data not reported). There were no differences in assessment completion rates by gender at either 12 months (p = 0.40) or 24 months (p = 0.13).

Results

Baseline Information

Four hundred and nineteen participants were randomized into the Keep it Off trial and the majority returned for the 12 month (n = 363; 86.6%) and 24 month (n = 364; 86.9%) assessments. Table 1 describes the participants' baseline information. Men were significantly older and more likely to be married than women but otherwise similar with regard to demographic information. On average, both men and women were categorized as overweight at the study entry, although there was a trend for men to have a greater BMI. Men reported a smaller weight loss prior to study entry (15.0 ± 4.9% versus 16.4 ± 5.4%, p = 0.03).

Both men (74.0%; n = 57) and women (68.2%; n = 68.2%; p = 0.31) reported wanting to improve their health as a major motivator for losing weight. Women, however, reported losing weight to enhance their feelings of personal esteem more frequently than men (51.2%; n = 175 vs. 35.1%; n = 27; p = 0.01). Weight loss method also differed by gender. Women were nearly twice as likely as men to report using an organized weight loss program (55.9%; n = 191; vs. 24.7%; n = 19; Odds Ratio = 3.86, 95% confidence interval: 2.21, 6.76, p < 0.001).

Changes in Behavior

Although men had significantly higher weights over the course of the study (Table 2), there was no gender difference in the change in weight over time (Gender by Time interaction p =

0.62). Descriptively, between study entry and 24-months weight change was 7.03 ± 19.02 (*M* ± *SD*) pounds for men and 8.15 ± 17.0 pounds for women. Translated to percentage of lost weight regained, men regained 16.15% (± 46.22) of their lost weight and women regained 24.38% (± 53.14; p = 0.19).

There were no gender differences in level of physical activity at baseline, 12, or 24 months (Table 2). However, men reported greater caloric intake than women at baseline, 12, and 24 months ($p < 0.001$). Men also reported reduced intake at 12 and 24 months ($p < 0.05$) whereas women's total energy intake remained stable between 12 and 24 months. These dietary intake differences remained statistically significant even after adjusting for participant body weight. There were significant changes in percent calories from fat by gender over time. Women decreased their calories from fat between baseline and 12 months and 24 months ($p < 0.05$) while there was no significant change in men. Both men and women decreased their fruit and vegetable servings throughout the study. The eating patterns reported by men and women in this study were similar to each other and stable across the 24 month study (all p's > 0.05; baseline data presented in Table 1). The only exceptions were that men were more likely to purchase food at convenience stores at each time point and that both men and women reported a slight decrease in daily consumption of dinner during the study ($p = .04$).

Discussion

This secondary analysis of data from a randomized trial testing the efficacy of two telephone delivered weight loss maintenance interventions compared men and women who had intentionally lost weight in the year prior to entering the trial. This analysis examined whether men and women differed in reasons or methods for losing weight prior to study entry. Gender differences in weight loss maintenance methods used during the trial were also examined. The analysis indicated that, although men and women reported different motivation for and approaches to weight loss prior to their enrollment in the study, weight related behaviors at study entry were similar, including meal patterns and leisure time physical activity.

Women in this study were much more likely than men to report using an organized weight loss program to lose weight. This difference has been noted in surveys about weight loss attempts (Duncan et al., 2011; James, 2003; Kruger et al., 2004) and is also evident in evaluations of some commercial programs (e.g., Gudzune et al., 2015) and in participation rates in weight loss intervention trials (Robertson et al., 2014). It is noteworthy that the current study extended the gendered-difference in program participation versus self-directed weight loss attempts to successful weight losers.

Men in this study consistently reported consuming more calories per pound of body weight than women. This higher level of caloric intake may account for why men in this study had lost a significantly smaller proportion of their starting body weight than women or it may reflect men's higher resting energy expenditure. The men in this study reported decreasing the calories they consumed during the trial, although dietary patterns and servings of fruits and vegetables were similar between men and women. Despite the reported reduction in

calories, men experienced no additional weight change suggesting that this diet change was either insufficient to induce weight change, was a result inaccurate reporting (Dhurandhar et al., 2015), or was due to differential reduction in energy needs (e.g., Redman et al., 2009).

Few weight loss maintenance studies have reported on gender differences. A notable exception is the Weight Loss Maintenance study where all participants were given the same weight loss program and those who successfully lost weight were randomized to receive weight loss maintenance interventions. In this study, men achieved greater initial weight loss but were no more likely to maintain their reduced weight during the maintenance program than women (Svetkey et al., 2011; Svetkey et al., 2008). In both the Weight Loss Maintenance Study and the current study, there were no gender differences in weight maintenance suggesting that men and women experience similar responses to gender-neutral weight loss programs. However, it remains unclear if weight loss maintenance behaviors are similar in men and women outside of maintenance-focused interventions. Furthermore, because current treatment programs recruit a limited number of men, the men in this study and other maintenance programs may be unrepresentative of men overall with regard to their weight control behaviors.

This study has several strengths and contributes to what is currently known about gender and weight loss maintenance. This study is one of the few studies that have explored gender differences in weight loss maintenance. It is particularly notable that in this analysis, we assessed behaviors after weight loss was achieved as well as during the weight loss maintenance program. A limitation of this analysis is that the Keep it Off trial was not designed to test for gender differences and thus should be considered exploratory. Other limitations include a fairly homogeneous sample with regard to race/ethnicity and education, a relatively small number (n = 77, 18.4%) of men, and reliance on self-report of diet and physical activity behaviors which may include social-desirability bias. Finally, self-selection into the study may limit the generalizability of the results from this analysis to other successful weight losers.

Study results indicate that although men and women reported different initial weight loss methods, once in a weight loss maintenance study, their behaviors closely mirror each other. Although the findings suggest that the behaviors necessary for weight loss maintenance do not differ between men and women, the findings don’t preclude the potential importance of developing targeted weight loss and maintenance interventions for men. Given the paucity of research on men’s weight loss maintenance and low enrollment of men in weight loss maintenance programs, researchers should focus on how to encourage men to participate in weight control programs and how to increase awareness the importance of long term weight loss maintenance.

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Table 1

Baseline characteristics & reports of recent weight loss experiences by gender.

	Women	Men	*p*-value
N	342	77	
%	81.6%	18.4%	
Age, mean years (SD)	46.3 (10.9)	50.4 (9.3)	0.002
Educational Status			
College or graduate degree	217 (63.5%)	53 (68.8%)	0.37
Marital Status			0.04
Married/unmarried couple	233 (65.4%)	61 (79.2%)	
Divorced/widowed/separated	64 (18.8%)	11 (14.3%)	
Never married	54 (15.8%)	5 (6.5%)	
Employed for wages	297 (86.8%)	68 (88.3%)	0.73
Non-Hispanic white	296 (86.6%)	68 (88.3%)	0.68
Body mass index, kg/m^2, mean (SD)	28.3 (4.9)	29.4 (4.3)	0.08
% weight loss prior to study, mean (SD)	16.4 (5.4)	15.0 (4.9)	0.03
Reasons for losing weight			
Improve health	229 (68.2%)	57 (74.0%)	0.31
Improve personal esteem	172 (51.2%)	27 (35.1%)	0.01
Other reason	6 (1.8%)	2 (2.6%)	0.64
Weight loss method			
Organized weight-loss program	191 (55.9%)	19 (24.7%)	<0.001
Self-directed	151 (44.2%)	58 (75.3%)	
Daily self-weighing	159 (46.5%)	148 (52.0%)	0.39
Eating habits			
Breakfast daily	210 (61.4%)	50 (64.9%)	0.56
Lunch Daily	211 (61.9%)	46 (61.3%)	0.93
Dinner Daily	250 (73.3%)	53 (68.8%)	0.43
Meal while watching TV (3+ times/week)	158 (46.5%)	34 (44.7%)	0.94
Snack while watching TV (3+ times/week)	125 (36.8%)	29 (37.7%)	0.88
Eat after 7 PM (3+ times/week)	206 (60.2%)	46 (59.7%)	0.78
Ate in restaurants	237 (69.5%)	57 (74.0%)	0.43
Ate fast food	168 (49.1%)	35 (45.5%)	0.56
Ate employer provided food	150 (43.9%)	29 (37.7%)	0.32
Food from convenience stores	45 (13.2%)	17 (22.1%)	0.05

Note. Values are number (%) of gender, unless otherwise indicated.

Table 2

Change in weight, physical activity, and diet behaviors by gender, baseline through 24 months.

	Women[a]	Men[a]	Gender p-value	Time p-value	Gender × Time p-value
Weight, lb.			<0.001	<0.001	0.62
BL	168.1 (2.5)	205.1 (4.3)			
12 mo.	172.2 (2.5)	209.1 (4.3)			
24 mo.	176.2 (2.6)	213.1 (4.4)			
Physical Activity, kcal per week[b]			0.32	0.15	0.98
BL	1150 (1.1)	1346 (1.2)			
12 mo.	1090 (1.1)	1270 (1.1)			
24 mo.	1028 (1.1)	1198 (1.2)			
Calorie intake, kcal per day			<0.001	0.09	0.004
BL	1419 (40)	2016 (70)			
12 mo.	1394 (38)	1990 (72)			
24 mo.	1368 (42)	1964 (76)			
Calories adjusted for body weight, kcal per day per lb.			0.002	<0.001	0.03
BL	8.6 (0.2)	9.9 (0.4)			
12 mo.	8.3 (0.2)	9.6 (0.4)			
24 mo.	8.0 (0.2)	9.3 (0.4)			
Calories from fat, %			0.01	<0.001	0.03
BL	31.3 (0.5)	33.4 (0.8)			
12 mo.	32.0 (0.4)	34.1 (0.8)			
24 mo.	32.6 (0.5)	34.8 (0.9)			
Fruits, servings per day			0.44	0.003	0.65
BL	2.5 (0.1)	2.7 (0.2)			
12 mo.	2.4 (0.1)	2.6 (0.2)			
24 mo.	2.2 (0.1)	2.4 (0.3)			
Vegetables, servings per day			0.62	<0.001	0.15
BL	4.0 (0.2)	4.1 (0.3)			
12 mo.	3.7 (0.2)	3.8 (0.3)			

	Women[a]	Men[a]	Gender p-value	Time p-value	Gender × Time p-value
24 mo.	3.3 (0.2)	3.5 (0.3)			

[a] Model estimated means (standard error) reported. Analysis controlling for treatment group.

[b] Analysis conducted using log-transformed values, back-transformed values presented.

[*] Within group difference from baseline, $p < 0.05$.