

Weight Management for Veterans: Examining Change in Weight Before and After MOVE!

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In the year 2000, 31% of women and 40% of men receiving outpatient care at Veteran Affairs (VA) medical facilities were overweight (BMI ≥ 25 and < 30 kg/m²); 37.4% of women and 32.9% of men were obese (BMI ≥ 30 kg/m²). The purpose of the present study was to assess treatment effects of MOVE! Weight Management Program for Veterans by comparing the trajectory of change in weight postintervention (3, 6, and 12 months postenrollment) to a preintervention period (1, 3, and 5 years before enrollment). The sample consisted of 862 veterans participating in MOVE! at the Miami VA. All veterans participated in a 2-h Self-Management Support (SMS) session, which involved completion of a self-assessment questionnaire and a nutrition education group session. After completing SMS, veterans had the option of continuing with Supportive Group Sessions (SGS), which included 10-weekly group sessions led by a multidisciplinary team. Veterans served as their own controls in the analyses. Veterans gained 2 kg/year before enrolling in MOVE!. There were similar increases in weight across sex, racial/ethnic groups, and treatment condition. Weight for participants in SMS stabilized after enrollment whereas participants in SGS had an average weight loss of 1.6 kg/year. The preintervention slope for weight was significantly different from the postintervention slope, suggesting treatment effect. Findings from this study support the need for a lifestyle modification program such as MOVE! in primary care settings to assist overweight and obese patients in managing their weight.

Obesity (2011) **19**, 977–981. doi:10.1038/oby.2010.273

INTRODUCTION

According to data from NHANES 1999–2008, the national prevalence rates for overweight and obesity combined (BMI ≥ 25 kg/m²) increased from 64.5 to 68% and for obesity (BMI ≥ 30 kg/m²) from 30.5 to 33.8% among adults living in the United States (1). The high prevalence of overweight and obesity has also been observed among military veteran populations. Based on measured height and weight in 2000, 31% of women and 40% of men receiving outpatient care at Veterans Affairs (VA) medical facilities were overweight; 37.4% of women and 32.9% of men were obese (2). Obese veterans who use VA medical facilities are more likely to describe their overall health as fair or poor and report higher rates of arthritis, hypertension, and diabetes compared to overweight and normal weight veterans (3). Specifically, over 400,000 veterans have been diagnosed with diabetes and 10.7% of these veterans have renal disease (4). Obesity-related illnesses (e.g., diabetes and heart disease) create a major financial burden given the increasing costs of health care. Weight management programs aimed at helping individuals make lifestyle changes have been shown to result in sustained weight loss as well as reduced risks for chronic diseases (5), which may have

implications for veterans' health and quality of life as well as the costs of providing long-term care.

MOVE! Weight Management Program for Veterans (6) was designed to be a patient-centered intervention delivered by an interdisciplinary team comprised of hospital-based staff (e.g., primary care, endocrinology, nutrition, psychology, physical therapy, recreational therapy, and patient education). The program incorporates evidence-based treatments emphasizing long-term lifestyle change to improve nutrition and increase physical activity (6). MOVE! is a stepped intervention with increasing levels of intensity. Self-Management Support (SMS) entails completing a questionnaire, obtaining tailored self-help written materials, and receiving telephone follow-up to facilitate goal setting. Supportive Group Sessions (SGS) follows SMS and involves multidisciplinary group sessions and/or individual specialty consultation as needed (e.g., sleep evaluation). Each program component is not available at all VA facilities as implementation and structure of MOVE! is dependent on the staffing and resources available at local VA sites. MOVE! was implemented at VA facilities nationally in 2006. The Miami VA Healthcare System was a program pilot site and started MOVE!

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Received 13 April 2010; accepted 1 August 2010; published online 2 December 2010. doi:10.1038/oby.2010.273

in January 2005. Currently, the Miami VA Healthcare System offers SMS, SGS, and weight-control medications (see below for description of SMS and SGS as offered in Miami).

To our knowledge, there is no literature on weight trends for individuals before they enroll in weight management programs. Preintervention weight trends could serve as a control condition when examining postintervention change in weight in a nonrandomized sample. Therefore, the purpose of this present study was to model the trajectory of change in weight postintervention and compare it to that in the preintervention period to examine treatment effects. Differences in change in weight pre- and postintervention between treatment conditions (SMS and SGS) were also assessed. Finally, race/ethnicity and sex differences for change in weight postintervention were explored to examine the generalizability of MOVE! program results.

METHODS AND PROCEDURES

Participants

All aspects of this study were approved by the Miami VA Institutional Review Board. Participants included 1,000 veterans who enrolled in MOVE! at the Miami VA Healthcare System between 1 January 2005 and 24 April 2007. Participants were recruited into MOVE! by several means including being referred by their primary care provider if they were overweight/obese ($\text{BMI} \geq 25$) or met other salient inclusion criteria (6) such as being normal weight but hypertensive, and through advertisements in patient education materials. A total of 138 veterans were excluded from analyses as a result of missing data on the MOVE!23 questionnaire. The final sample consisted of 862 veterans.

Procedures

Only SMS and SGS were examined in this present study. Participants were not randomized, but instead self-selected into these treatment conditions. All veterans participated in SMS, which consisted of a 2-h nutrition education session. Veterans then had the option of enrolling and continuing in SGS (i.e., 10-weekly group sessions). In this present study, ~45% of veterans opted into SGS after completing SMS. Participation in SGS was open-ended in that veterans were given the option to repeat the group sessions.

MOVE!23 questionnaire. During the SMS session with the registered dietitian veterans completed the MOVE!23 questionnaire (www.move.va.gov/Move23.asp), which facilitated enrollment in the program. The MOVE!23 questionnaire is a multifactorial self-assessment

that consists of 23 items covering the following areas: demographic information (e.g., race/ethnicity); medical and psychiatric history; weight management history; perceptions of body size; physical activity, and eating habits; self-efficacy and readiness to change lifestyle habits; social support; and barriers to making lifestyle changes (6). This instrument is evidence-based and provides tailored feedback to patients based on their responses. The MOVE!23 questionnaire can be completed online or via hardcopy and takes ~20–25 min to complete. All participants included in this present study completed the paper and pencil version.

MOVE! intervention. In SMS and SGS, MOVE! participants were encouraged to set realistic and attainable goals and were instructed that a sustainable rate of weight loss was about 0.5–2 pounds/week. The 2-h nutrition education session in SMS was conducted in a group format led by a registered dietitian and focused on healthy eating and lifestyle change. During this meeting, patients completed the MOVE!23 questionnaire and received the MOVE! standard handouts (see <http://vawww.move.med.va.gov/handouts.asp?standard>). Veterans interested in further participation were enrolled in SGS, comprised of a 10-week (90-min per session) multidisciplinary group intervention, addressing nutrition, physical activity, and behavioral modifications. In January 2007, our SGS were expanded from 90 min to 120 min, adding 30 min of low impact activity to seven sessions and 30 min of recreational therapy to two sessions. Each group session focused on a particular theme, but was divided to include nutrition, physical activity, and behavioral health perspectives. Veterans received MOVE! handouts (www.move.va.gov/handouts.asp) each week to provide additional information on the topics discussed. **Table 1** includes a list of topics presented during SGS.

Weight measurements. Preintervention and postintervention weight in pounds was obtained from veterans' electronic medical records. Weight was measured and entered by the medical staff when the veteran attended his or her regularly scheduled medical appointment. Preintervention weights consisted of measurements from 5 years, 3 years, and 1 year before enrollment in the program. Postintervention weight consisted of measurements obtained at 3-, 6-, and 12-months postenrollment in MOVE!. A large window (± 3 months) was used for preintervention weights and at 12-month follow-up whereas a window of ± 1 month was used at 3- and 6-month follow-up to increase the likelihood of obtaining a valid weight value from the medical record.

Statistical analyses. To evaluate the change resulting from the intervention, our design relied on preintervention weight (up to 5 years prior) as the expected comparison. This quasiexperimental design has the features of an interrupted time series design (7), where

Table 1 MOVE! Supportive Group Sessions Condition (SGS): program outline

	Nutrition	Psychology
Session 1	Obesity-related health risks and benefits of small behavior changes	Maintaining motivation: identifying and overcoming barriers
Session 2	Nutrition basics; using a food log	Costs and benefits of behavior change
Session 3	Physical therapy: facts on fitness, developing an exercise program, and using a pedometer	
Session 4	Food guide pyramid and nutrition facts	Using goal setting to make and measure change
Session 5	Modifying meal plans	Planning ahead and managing impulses
Session 6	Healthy shopping and food label reading	Identifying and changing irrational ideas about food and eating
Session 7	Basics of a low-fat diet	Understanding emotions and behavior
Session 8	Coping with cravings	Coping with stress, anxiety, and depression
Session 9	Eating out: restaurant options	Eating with others and focusing on food
Session 10	Special occasion tips and maintaining success	Relapse prevention: tools for maintaining successful behavior change

Table 2 Sample characteristics (*N* = 862)

	Percent
<i>Race/ethnicity</i>	
White non-Hispanic	29.8
African American	36.4
Hispanic	26.3
Other	7.6
<i>Gender</i>	
Men	85.8
Women	14.2
Normal weight (BMI <25)	1.1
Overweight (BMI ≥25 and ≤29.9)	18.4
Obese (BMI ≥30)	80.5
Smoker (yes)	15.5
Hypertension	55.7
High blood cholesterol	46.8
Diabetes	29.2
Heart disease	18.6
<i>Health status</i>	
Excellent, very good, or good	55.1
Fair	32.7
Poor	12.2

participants serve as their own controls, and analyses compared the change in weight postintervention, to the expected change in weight based on the trajectory before the intervention.

Using Hierarchical Linear Modeling software version 6.03 (8), a mixed model approach was applied with a piecewise linear function being specified for each participant with an intercept at the start of the MOVE! program and two slopes: one before the intervention and one after the intervention. The piecewise approach allows the estimation of the two slopes separately but simultaneously. The mixed model estimates the average within person change, as well as individual differences in intercept and slope across persons. Time was measured in years. Covariates (i.e., race/ethnicity, sex, and treatment condition) were included as predictors of the intercept, slope before enrollment, and slope after enrollment. The two slopes were compared using linear contrasts. In addition, a mixed design, repeated measures ANOVA was conducted to explore the effect of the intervention on weight status at each follow-up time point (i.e., baseline to 3-months, 3–6-months, and 6–12-months). Difference between SMS and SGS for change in weight trajectories at pre- and postintervention was assessed in a separate analysis. To examine the generalizability of the program across racial/ethnic groups and sex, racial/ethnic groups as well as men and women were compared within treatment condition on change in weight at postintervention. Missing data were handled by applying full maximum likelihood.

RESULTS

Mean age for the 862 veterans at time of enrollment was 54.3 years (s.d. = 11.4). **Table 2** displays sample characteristics endorsed on the MOVE!23 questionnaire. The majority of the veterans met criteria for obesity and over half of the sample endorsed having high-blood pressure. **Table 3** presents treatment condition comparisons on age, BMI, and total number of medical and psychiatric conditions endorsed on the MOVE!23. Participants in the SMS condition were younger ($P = 0.001$),

Table 3 Treatment condition comparisons: mean (s.d.)

	Self-management support condition (<i>N</i> = 470)	Supportive group sessions condition (<i>N</i> = 392)
Age (years)	53.03 (12.3)	55.55 (10.4)
BMI (kg/m ²)	34.19 (6.1)	36.56 (6.9)
Total medical conditions	3.47 (2.5)	4.14 (2.6)
Total psychiatric conditions	1.89 (2.1)	2.60 (2.4)

All mean tests are significant at $P \leq 0.001$.

had significantly lower baseline BMI ($P < 0.001$), and had fewer number of medical conditions ($P < 0.001$) and psychiatric conditions ($P < 0.001$) than SGS participants. Despite treatment condition differences, there were no significant racial/ethnic group differences in BMI at time of enrollment ($P = 0.22$).

Veterans gained an average of 2 kg ($\beta = 4.32$ (pounds), s.e. = 0.32, $P < 0.001$) per year before enrolling in MOVE!. More specifically, there were no sex differences ($\beta = 0.93$, s.e. = 0.66, $P = 0.16$) and no difference between white non-Hispanics compared to Hispanics ($\beta = 0.51$, s.e. = 0.59, $P = 0.39$) for trajectory change in weight preintervention. There was a marginally significant difference in preintervention slope between white non-Hispanics compared to African-Americans ($\beta = 0.98$, s.e. = 0.53, $P = 0.07$). After enrolling in the program, veterans on average lost about 1 kg/year ($\beta = -2.07$ (pounds), s.e. = 0.48, $P < 0.001$) postintervention. A test of linear contrast (controlling for sex, race/ethnicity, and treatment condition) suggested that the slope before the intervention was significantly different from the slope after the intervention ($\chi^2(1) = 7.85$, $P < 0.01$), indicating treatment effect.

The graph in **Figure 1** displays the pattern of change in mean weight using the linear regression equations for SMS and SGS before and after enrolling in MOVE!. There was no significant difference in slope before enrolling in the intervention between the two groups ($\beta = 0.41$, s.e. = 0.44, $P > 0.05$), which suggests that participants in SMS and SGS were gaining weight at the same rate per year before enrolling. There was a significant treatment condition difference in body size at the start of the intervention ($\beta = 15.57$ (pounds), s.e. = 3.44, $P < 0.001$). Veterans who opted to continue with SGS weighed on average 7 kg more at the start of the intervention than veterans who only participated in SMS. Weight for veterans that only participated in SMS stabilized after enrollment in MOVE! ($\beta = 0.44$ (pounds), s.e. = 0.78, $P = 0.58$). However, participants in SGS lost, on average, 1.6 kg/year postintervention ($\beta = -3.58$ (pounds), s.e. = 0.78, $P < 0.001$). Based on *post-hoc* analyses from the repeated measures ANOVA, veterans in SGS demonstrated significant weight loss between the start of MOVE! and 3-month follow-up ($M = -2.91$ (pounds), s.e. = 0.47, $P < 0.001$) as well as 3–6-month follow-up ($M = -1.06$ (pounds), s.e. = 0.38, $P < 0.01$), but had a nonsignificant decline in weight from 6-month to 12-month follow-up ($M = -0.44$ (pounds), s.e. = 0.49, $P = 0.37$).

Because only the SGS condition resulted in significant weight loss, race/ethnicity, and sex differences at postintervention were assessed for those that participated in SGS. There were

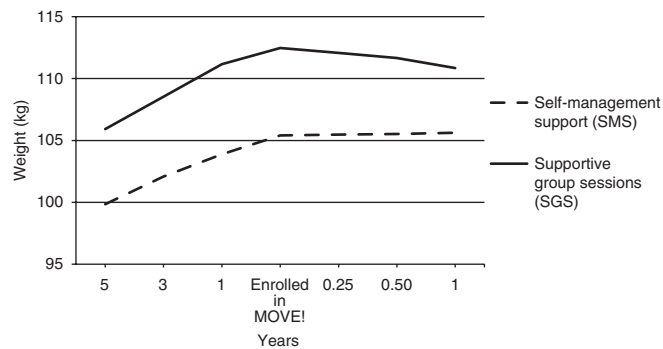


Figure 1 Trajectory of pre- and postintervention weights for MOVE! Self-Management Support (SMS) and Supportive Group Sessions (SGS) using linear regression equations. Preintervention is defined as 1, 3, and 5 years before enrollment in MOVE!; postintervention is 3 months (0.25 years), 6 months (0.5 years), and 12 months (1 year) after enrollment.

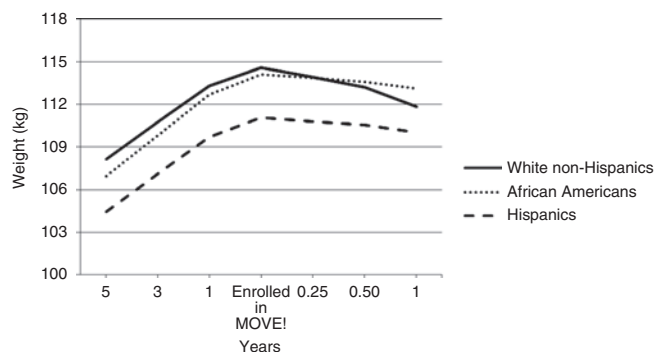


Figure 2 Trajectory of pre- and postintervention weights for white non-Hispanics, African Americans, and Hispanics using the respective linear regression equations. Preintervention is defined as 1, 3, and 5 years before enrollment in MOVE!; postintervention is 3 months (0.25 years), 6 months (0.5 years), and 12 months (1 year) after enrollment.

significant racial/ethnic group differences at postintervention. **Figure 2** presents the pattern of change in mean weight before and after enrolling in MOVE! for each racial/ethnic group. The postintervention slope for white non-Hispanics was significantly and marginally different from the postintervention slopes for African Americans ($\beta = 3.93$, s.e. = 1.96, $P < 0.05$) and Hispanics ($\beta = 3.93$, s.e. = 2.21, $P = 0.08$), respectively. More specifically, white non-Hispanics participating in SGS lost on average 2.7 kg/year ($\beta = -6.10$ (pounds), s.e. = 1.38, $P < 0.001$). African Americans had a marginally significant weight loss of 1 kg, on average, per year ($\beta = -2.21$ (pounds), s.e. = 1.25, $P = 0.08$). In contrast, Hispanics, on average, did not have significant weight loss after participating in SGS ($\beta = -2.22$ (pounds), s.e. = 1.49, $P = 0.14$). The nonsignificant weight loss among Hispanics is due to low power given that only 25% of participants in SGS were of Hispanic background. Men participating in SGS lost, on average, 1.8 kg/year ($\beta = -3.99$ (pounds), s.e. = 0.92, $P < 0.001$). On the other hand, women participating in SGS had a nonsignificant decline in weight ($\beta = -1.6$ (pounds), s.e. = 2.30, $P = 0.49$). Interestingly, there was no significant difference in postintervention slope ($\beta = 2.39$, s.e. = 2.48, $P = 0.34$) between men and women.

Perhaps the lack of significant difference in slope postintervention between men and women, despite an obvious difference in amount of weight loss, is also due to low power given that only 15% of participants in SGS were women.

DISCUSSION

The purpose of the present study was to model the trajectory of change in weight preintervention and compare it to change in weight postintervention in order to assess treatment effects of the Miami VA MOVE! program in a large sample of overweight and obese veterans. To our knowledge, this is the first weight management intervention study to assess the trajectory of weight change preintervention, allowing for assessment of change after the intervention with respect to preintervention weight trends. Racial/ethnic, sex, and treatment condition differences for these trajectories were also examined. Results indicated that veterans gained 2 kg/year before enrolling in MOVE!. Trajectory of change in weight postintervention suggested that veterans, on average, lost weight (i.e., ~1 kg/year). The effectiveness of the MOVE! intervention was supported given the significant difference between the preintervention slope and the postintervention slope. Introduction of MOVE! appeared to prevent further weight gain. Veterans who attended group sessions conducted by a multidisciplinary team had more weight loss than those only attending session designed to promote self-management.

The weight change trajectory for participants in SMS (i.e., 2-h group session with a dietitian) flattened after starting the MOVE! program. These findings suggest that participating in a brief nutrition education session helped veterans to maintain their baseline weight (i.e., weight at time of MOVE! enrollment) over a period of 1 year. Weight maintenance is an important accomplishment in that one must stop gaining weight in order to lose weight. At the start of the program, participants in SGS (i.e., 10-week interdisciplinary program) had significantly higher weight and thus higher BMI, were older, and endorsed more medical and psychiatric conditions compared to participants in SMS. Given that veterans self-select into additional program components, perhaps veterans with greater weight and comorbid medical/mental illness were more motivated or encouraged to seek additional help and therefore opted into SGS. Participants in SGS, on average, lost 1.6 kg/year, with majority of weight loss occurring in the 3 months after enrollment. Previous literature suggests that even moderate weight loss has health benefits (6) including a reduction in incident diabetes (9). Also, findings are generally consistent with those reported from a randomized trial comparing popular diets over a comparable time period (10).

Results of this study suggest that level of participation and other demographic factors may be important determinants of change following weight management intervention. Among those veterans participating in the SGS intervention, white non-Hispanics lost, on average, 2.7 kg/year postintervention. African Americans had a marginally significant weight loss of 1 kg/year and although Hispanics had the same amount of weight loss as African Americans, it was not significant. Men lost, on average, 1.8 kg/year and women participating in SGS

had a nonsignificant weight loss of 0.73 kg postintervention. The differences in weight outcomes between men and women and among the racial/ethnic groups may be related to an issue of power and/or a need for more culturally sensitive and relevant program components. MOVE! program materials have been translated and are available in Spanish though programs may be limited in their ability to deliver the program in Spanish. Greater sensitivity to cultural issues within the intervention program such as addressing the role of food within the culture and having bilingual and bicultural group facilitators may lead to better outcomes (11,12).

Given that the sample consisted of veterans, there may be some unique barriers or motivators to weight management that should be further addressed. For example, veterans who receive services at VA facilities tend to have more medical comorbidity, greater disability, and are less likely to have private health insurance (13). Although MOVE! is provided to veterans free of charge, veterans do not receive compensation for their participation in the program as in some randomized control trials. Future studies may involve examining the impact of monetary rewards on program participation, attrition, and weight loss maintenance.

Weight loss research has tended to evaluate the efficacy of specific behavioral treatments (14), and treatment effects are optimized by participant selection, controlled conditions, incentives, and resource intensive interventions (15). The present study evaluated the effectiveness of MOVE! as a large-scale, hospital-based program targeting overweight and obese veterans. While the results might underestimate intervention effects, it provides a more realistic estimate of change given the actual contingencies affecting both patients and treatment providers. Furthermore, the findings from this study support the implementation of a prevention oriented health program that has been called for by VHA policy and clinical practice guidelines.

With regard to limitations, the main threat to internal validity in our design is history, such as there being other factors in the veterans' environments that changed coincidentally with their start in the MOVE! program that could account for the change in weight. However, this is an unlikely threat because the coincidental change would have to be robust enough to affect a diverse sample of veterans in the same way at different times above and beyond enrolling in a weight management program. MOVE! enrollment is predominantly triggered by primary care staff responding to an annual clinical reminder such that it is offered to veterans on a yearly basis without regard to health status and/or recent diagnosis of weight-related condition.

Obesity is a biopsychosocial problem that impacts health outcomes, quality of life, and health care costs. As a result, weight management involves a multifactorial approach including lifestyle changes in nutrition, physical activity, and behavioral modifications. Findings from this study suggest the need for a multidisciplinary lifestyle modification program in primary care settings to screen for overweight/obesity, enhance patient motivation for change, and assist patients in setting nutrition and physical activity goals to promote weight management. The impact of the program should be further addressed by examining the implications of weight maintenance and weight

reduction on health outcomes (including number of newly diagnosed diabetes or cardiovascular disease cases as well as medication use) and health-care costs.

Furthermore, future studies should examine if the changes in weight are related to changes in lifestyle behaviors such as dietary intake and physical activity after enrolling in MOVE! Process analyses should also be conducted to examine which components of the program (i.e., group facilitators, session topics, and session materials) were the most or least effective for men, women, and racial/ethnic groups. This type of information could aid in developing materials or modules that are more culturally sensitive and tailored to the unique needs of specific high-risk groups (e.g., women and ethnic minorities).

ACKNOWLEDGMENTS

We would like to acknowledge the support and dedication of our MOVE! Team at the Miami Veterans Affairs Healthcare System as well as our VISN8 MOVE! Program partners. We owe a very special thanks to Kenneth R. Jones, PhD, National Program Director for Weight Management/MOVE!, and his staff at the National Center for Health Promotion and Disease Prevention, VHA Office of Patient Care Services, for their ongoing support and helpful comments.

DISCLOSURE

The authors declared no conflict of interest.

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