

Sociodemographic Characteristics Associated with Pretreatment Weight Change in a Behavioral Weight Loss Intervention

Margaret Fahey (✉ mcfahay@memphis.edu)

University of Memphis <https://orcid.org/0000-0002-8672-8785>

Robert C. Klesges

University of Virginia

Mehmet Kocak

University of Tennessee Health Science Center

Gerald W. Talcott

University of Virginia

Rebecca A. Krukowski

University of Tennessee Health Science Center

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Abstract

Background. Three previous studies found that participants commonly experienced significant weight change before beginning a behavioral weight loss intervention. However, these findings are conflicting in regard to how pretreatment weight change is associated with eventual treatment outcome. Further, these studies measured weight loss outcomes only up to six-months. Thus, the current study aims to examine pretreatment weight change among a diverse sample of active duty military personnel engaged in a behavioral weight loss intervention. Additionally, this study will investigate potential sociodemographic characteristics that influence the relationship between pretreatment change and treatment outcome up to 12-months, as well as how pretreatment weight change is related to intervention adherence. **Methods.** Using secondary analysis of data from a behavioral weight loss intervention, pretreatment (i.e., screening to baseline visit) weight categories [loss (> 1.15% decrease), stable, or gain (> 1.15% increase)] were compared to % weight change from both screening and baseline visits to four and 12-months. **Results.** During pretreatment, 59.4% remained weight stable, 24.4% lost and 16.1% gained; and racial differences in group classification were found. In regression models, pretreatment weight categories did not predict baseline to four or 12-month outcomes; however, interactions with age were observed ($p = 0.038$; $p = 0.051$, respectively). Weight change category predicted screening to 4-month outcome ($p = .0005$); specifically, those who lost pretreatment weight were more likely to lose weight from screening to 4-months compared to those who gained or remained weight stable. Pretreatment weight loss was related to consuming more meal replacements by four ($p = .025$) and 12-months ($p = .012$) but was not associated with adherence to other intervention protocol. **Conclusions.** Current results suggest that sociodemographic differences might influence pretreatment weight change and its relationship to 12-month treatment success. Given that many individuals (40.5%) in the current sample experienced significant weight change before the intervention, results extend previous findings suggesting that weight loss trials should account for both screening and baseline visit weights when examining treatment results. Trial Registration: NCT02063178. Registered February 14, 2014.

<https://clinicaltrials.gov/ct2/show/NCT02063178?term=dissemination+of+look+ahead&rank=1>

Background

Weight Loss Intervention

Three previous studies found that many participants experienced significant pretreatment weight change, between the initial screening visit (SV) and first baseline visit (BV), before beginning behavioral weight loss interventions [1,2,3]. Importantly, one study indicated that pretreatment weight change was associated with in-treatment outcomes [2]. Although two other studies failed to find this relationship, pretreatment weight loss was associated with weight loss success when outcomes were compared to screening visit weight rather than baseline weight [1,3]. However, all previous studies observed the relationship between pretreatment weight change and weight loss over relatively short periods (i.e., 14 weeks and six months) [1,2,3]. In addition, previous samples were primarily female [1,2,3] and two were mostly White/Caucasian [1,2]. Given that the emerging literature on this topic suggests significant

pretreatment weight fluctuations are common [1,2,3], it will be important to explore potential sociodemographic factors that influence the relationship between early weight changes and intervention outcomes among racially and gender diverse samples.

Thus, the aim of the current study is to secondarily analyze data from a 12-month behavioral weight loss intervention; specifically, measuring pretreatment weight change in relationship to long-term outcomes (i.e., four and 12-months). In addition, the study aims to explore sociodemographic differences in pretreatment weight change, as well as potential differences in its relationship to treatment success among this diverse sample of active duty military personnel. Finally, this study will explore differences in pretreatment weight change in relationship to treatment self-monitoring adherence.

Methods

Procedure

The study was approved by the Institutional Review Board of the Wilford Hall Ambulatory Surgical Center in San Antonio, Texas and acknowledged by the Institutional Review Board at the University of Tennessee Health Science Center. Active duty military personnel [≥ 18 years of age, body mass index (BMI) ≥ 25.0 kg/m²] were recruited from Joint Base San Antonio. Participants were required to have reliable phone and computer access and have at least one more year left in their duty assignment (to facilitate follow-up). They also had to complete one week of daily dietary and physical activity self-monitoring and obtain a letter from their health care provider approving participation in the study. Exclusion criteria included having medical or psychiatric conditions that would impact their ability to participate in a weight management intervention, recent substantial weight loss, current or recent pregnancy, taking medication that affects weight, or having more than one failed military fitness test.

At the initial screening visit (SV), informed consent was obtained, and participants were asked to self-monitor diet and physical activity for a week and receive clearance from a healthcare provider. Subsequently, at the baseline visit (BV), participants were randomized at the individual level using a computerized block design to receive either a counselor-initiated (CI) or self-paced (SP) weight-loss intervention. Personalized weight loss, calorie, and exercise goals were the same across conditions and based on the Look AHEAD intensive lifestyle intervention. Each condition received a 12-month manualized behavioral weight loss program. However, the SP condition required more self-initiation to receive services (e.g., request intervention session or self-monitoring feedback). Across both conditions, participants were asked to monitor food intake and physical activity using the Lose It™ application or website. Participants were also encouraged to self-weigh daily using the Body Trace™ electronic scales and to replace two meals and a snack with meal replacements (e.g., Healthy Choice™, Smart Pop™ popcorn) for the first four-months to achieve calorie and fat goals. Up to 8-months, participants were encouraged to replace one meal a day with meal replacements and transition to conventional meals between months 9 and 12. With participant permission, self-monitoring data was accessed by

intervention counselors to facilitate feedback. Further details on study design and outcomes are reported [4,5].

Measures

Height (in centimeters) was measured using a wall-mounted stadiometer at SV and BV. At the SV, BV, four-month and 12-month visits, weight measurements were collected on a calibrated digital scale (Tanita BWB-800S). BMI (overweight: 25.0-29.9 kg/m² or obese: > 30 kg/m²) was calculated from BV measurements. If clinic weight was missing for follow-ups, BodyTrace™ weights closest (\pm 30 days) to these time points were used, based on the strong concordance between in-clinic and e-scale weight measurements [6]. After this step, missing weights at 4-months ($n = 13$) and 12-months ($n = 42$) were imputed as baseline weight carried forward as a conservative estimate of these participants' weight loss outcomes and consistent methodology with West and colleagues [1]. Participants identified gender (i.e., male, female), age (i.e., <30 years, 30-40 years, >40 years), ethnicity [i.e., (non-Hispanic/Latino, Hispanic/Latino)], and race [i.e., Caucasian, African American, and Other (i.e., race categories that were infrequently reported)] at SV. From SV to BV, individuals were categorized as those who lost weight (\geq 1.15% decrease), remained weight stable, and gained weight (\geq 1.15% increase) similar to previous studies [1, 2, 3]. This criterion is half of 2.3% used in research defining weight maintenance [7].

Results

Participant characteristics are provided in Table 1. Participants completed the SV and BV within 6 to 67 days apart [mean (M) = 14.6, standard deviation (SD) = 8.3] and experienced a median 0.2 kilogram (kg) weight decrease (M = -0.6 kg, SD = 1.71), corresponding to a median 0.07 % loss (M = -0.08, SD = 0.92). Most (59.4%) participants were categorized as weight stable, 24.4% as having lost weight and 16.1% as having gained weight. Using Wilcoxon Mann-Whitney and Kruskal-Wallis tests, there were no significant differences in gender, BMI, ethnicity, age, military rank, and intervention condition (i.e., CI versus SP) between weight change categories (Table 2). Individuals identified as African American and classified as Other race were more likely to gain weight (28% and 23.7%, respectively) compared to those identified as Caucasian (11.5%) ($p = 0.037$). Using Spearman's rank correlation, fewer days between SV and BV was associated with the weight stable category ($p < 0.001$).

Step-wise regression models examined pretreatment weight change categories in relationship to treatment outcome (i.e., percent weight change from BV to four-months and BV to 12-months, percent weight change from SV to four-months and SV to 12-months) after controlling for significant demographic covariates. Weight change category did not independently predict four-month outcome from BV ($p = .29$). However, an interaction of age and pretreatment weight change ($p = 0.038$) indicated that for individuals who gained weight pretreatment, each one-year increase in age was predictive of 0.28% (SE = 0.10%) increased 4-month weight loss. Pretreatment weight change category also did not independently predict BV to 12-month outcome ($p = .63$). A non-significant interaction trend of age and

weight change category ($p = 0.051$) indicated that for those who gained weight pretreatment, each one-year increase in age was predictive of 0.36% (SE = 0.12%) increased weight loss at 12-months.

After adjusting for significant covariates (i.e., gender, race, education, military grade, enrollment season, age, BMI, SV weight), weight change category predicted SV to four-month outcome ($p = .0005$). Those who lost pretreatment weight were more likely to lose weight at four-months (M = - 4.91 kg) compared to those who remained weight stable (M = - 2.32 kg) or gained weight (M = - 1.69 kg). Weight change category did not predict SV to 12-month outcome ($p = .19$).

Examining the relationship between pretreatment weight change and intervention adherence, Wilcoxon Mann-Whitney and Kruskal-Wallis tests revealed that pretreatment weight change category was related to number of meal replacement meals used at four-months ($p = .025$) and 12-months ($p = .012$). Specifically, those who lost pretreatment weight used more meal replacements during the intervention (M = 51.3 by four-months, M = 85.3 by 12-months) compared to those who gained weight (M = 31.3 by four-months, M = 48.1 by 12-months) or remained weight stable (M = 32.1 by four-months, M = 46.3 by 12-months). However, pretreatment weight change categories were not significantly related to self-weighing frequency, dietary, or exercise self-monitoring during the intervention.

Discussion

Similarly, to two previous studies, most individuals in the current sample remained within 1.15% of their weight from SV to BV [1,2]. However, a much smaller percentage of participants gained weight pretreatment compared to all previous findings (16% versus 23%, 29.7%, and 48.9%) [1,2,3]. Importantly, only West and colleagues (2011), like the current protocol, required dietary and exercise self-monitoring before BV. Participants in West and colleagues (2011) experienced weight gain at a more similar rate (23%) [2] as this study (16%), suggesting that self-monitoring between SV and BV, perhaps, protected some individuals from experiencing significant weight gain.

The current study had fewer days, on average, during the pretreatment period compared to the previous studies (M = 14.6 versus 39.4, 42.7, and 50) [1,2,3]. Because there was a shorter window between SV to BV due to individual randomization, perhaps, fewer participants had the opportunity to gain weight. And, not surprisingly, fewer days between SV and BV was associated with weight stability. However, only one previous study found a similar association between weight change and pretreatment length of time [3]. Yet, despite the short time window in the current study, almost half (40.5%) of individuals still experienced significant weight fluctuations. Current results are an extension of previous findings [1,2,3], suggesting that some participants start to make significant behavioral changes during pretreatment period of weight loss interventions and other participants may use the time between SV and BV to indulge in foods that they believe will be restricted once they begin the intervention. Thus, recommending that participants continue to engage in self-regulation behaviors (e.g., self-monitoring, self-weighing) beyond the potential behavioral run-in might provide support to those more vulnerable to early weight gains.

For example, individuals identified or classified as African American and Other race were more likely to gain weight during the pretreatment period compared to those identified as Caucasian, in this racially and ethnically diverse sample (i.e., 20% African American, 15% Other races; 23% Hispanic/Latino). This racial difference was contrary to all previous findings suggesting no demographic differences in pretreatment changes [1,2,3], even in the previous sample that was predominately Black [3]. Although there were no racial differences in the impact of these gains on eventual treatment outcome, future weight loss interventions might need to account for both SV and BV starting weights when examining racial differences in treatment efficacy, particularly if these findings are replicated in future research.

Consistent with two previous studies [1,3], pretreatment weight change was related to treatment outcomes when weight loss success was measured starting with the screening visit. In the current study, those who lost pretreatment weight were more likely to lose weight from SV to 4-months. However, the current study observed outcomes over a longer time compared to previous studies [1-3] and found that pretreatment weight change was not independently related to outcomes at 12-months when starting from either SV or BV weights. These findings indicate that pretreatment weight changes may be more influential to success earlier in treatment, especially when the pretreatment period is included when measuring treatment outcomes.

However, in the current study, sociodemographic differences influenced the relationship between the pretreatment period and outcomes. Among individuals who gained weight pretreatment, younger adults were more vulnerable to less weight loss compared to older individuals. Importantly, younger personnel in the current sample were also less likely to be retained for data collection, as well as experienced less weight loss overall [6]. It may be that weight gain before an intervention is more predictive of poor outcomes for younger participants. Perhaps, young adults are more likely to feel discouraged after experiencing pretreatment gains and could benefit from intervention support during this period [1]. Notably, these age group differences might be unique given that this sample was slightly younger than previous samples [1,2,3], since unfortunately, behavioral weight loss trials often underrepresent individuals between 18-35 years of age [8,9].

Surprisingly, pretreatment weight change was not related to most weight loss behaviors within the intervention (i.e., self-weighing, dietary, or exercise self-monitoring frequency), dissimilarly from past findings [2]. However, pretreatment weight loss was associated with replacing a higher frequency of meals and snacks with low calorie and fat alternatives. Findings indicate that perhaps, pretreatment behaviors are not predictive of engagement with all intervention protocol.

The potential limits to generalizability in the current sample of active duty military personnel should be acknowledged. This sample has access to additional weight loss resources (e.g., free fitness centers, healthcare) as well as participates in annually required fitness tests. Although the prevalence of overweight and obesity in the U.S. military is high (60.8%) [10], the current sample had lower starting weights compared to previous studies [6]. Yet, enrollment in this setting facilitated the inclusion of a younger and more racially, ethnically, and gender diverse sample compared to previous weight loss

research [8,9,11]. Finally, although there was no difference in pretreatment weight change and later randomization to either the CI or SP condition, distribution of pretreatment weight change categories might not have been perfectly randomized across the two treatment conditions [3].

Conclusions

Due to limited and conflicting literature, it is critical to explore the relevance of pretreatment weight change in relationship to treatment success. This study extends previous findings that indicate many adults experience significant weight change within a relatively short time period before beginning a weight loss intervention [1,2,3]. Perhaps, behavioral weight loss interventions should account for the potential influence of this period on treatment outcomes. For example, during screening, participants could be encouraged to either begin practicing weight loss behaviors or remain weight stable. In addition to dietary and physical self-monitoring as a behavioral run-in before BV, future interventions could also ask participants to begin daily self-weighing. Self-weighing before the intervention might facilitate weight stability, as well as give participants a “taste” of this behavior which is now commonly integrated in weight loss interventions [12,13]. In addition, as noted by Kerrigan and colleagues [2], it will be important for researchers to include multiple “starting points” (i.e., SV, BV, first week of treatment) when observing intervention outcomes, given the commonality of early treatment weight fluctuations. Finally, findings suggest that for some populations (i.e., younger adults), pretreatment weight change is more predictive of treatment outcomes.

Declarations

Ethical Approval and consent to participate. The study was approved by the Institutional Review Board of the Wilford Hall Ambulatory Surgical Center in San Antonio, TX and acknowledged by the Institutional Review Board at the University of Tennessee Health Science Center. Informed consent was obtained from all study participants.

Consent for publication. Not applicable.

Availability of data and materials. Data is available upon request.

Competing Interests. The authors declare that they have no conflicts of interest.

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Author's contributions. MCF- analysis and interpretation of data, drafting of manuscript; RCK- study conception and design, acquisition of data, analysis and interpretation of data; MK- analysis and interpretation of data; GWT - study conception and design, acquisition of data, analysis and interpretation of data; RAK- study conception and design, acquisition of data, analysis and interpretation of data, drafting of manuscript.

Abbreviations. screening visit (SV), baseline visit (BV), body mass index (BMI), counselor-initiated (CI), self-paced (SP), mean (M), standard deviation (SD), Enlisted (E), E1-E4 (enlisted), E5-E6 (non-commissioned officers), E7-E9 (senior non-commissioned officers), Officer (O), O1-O3 (Company Grade Officer), O4-O6 (Field Grade Officer)

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Tables

Table 1.

Study Sample

Demographic Characteristics	(%)
<u>Gender</u>	
Male	122 (49%)
Female	126 (51%)
<u>Age</u>	
< 30 years	66 (27%)
30-40 years	123 (50%)
>40 years	59 (24%)
<u>Race</u>	
African American	49 (20%)
Caucasian	163 (66%)
Other	36 (15%)
<u>Ethnicity</u>	
Non-Hispanic/Latino	192 (77%)
Hispanic/Latino	56 (23%)
<u>BMI Category</u>	
Normal	1
Overweight	139 (55%)
Obese	107 (43%)

Note: Body Mass Index (BMI)

Table 2.

Participant Characteristics by Pre-Treatment Weight Change Categories

	Pretreatment Weight Change			P-Value
	Loss	Stable	Gain	
Gender				.123
Male (%)	45.16	53.64	36.59	
Female (%)	54.84	46.36	63.41	
Race				.024
African American (%)	12.90	18.54	34.15	
Caucasian (%)	74.19	67.55	43.90	
Other (%)	12.90	13.91	21.95	
Ethnicity				
Non-Hispanic/Latino (%)	72.58	78.15	80.49	.58
Hispanic/Latino (%)	27.42	21.85	19.51	
Education				.28
Less than college (%)	41.94	52.32	56.10	
College or higher (%)	58.06	47.68	43.90	
Military Grade				.119
E1-E4 (%)	14.52	15.23	4.88	
E5-E6 (%)	38.71	45.70	43.90	
E7-E9 (%)	20.97	16.56	36.59	
O1-O3	11.29	5.96	2.44	
O4-O6 (%)	14.52	15.89	12.20	
Intervention Condition				.76
Counselor-Initiated (%)	52.54	50.00	45.00	
Self-Paced (%)	47.46	50.00	55.00	
Age (years) <i>M (SD)</i>	35.10 (8.10)	34.0 (7.40)	35.2 (6.50)	.72
Days from SV to BV <i>M (SD)</i>	15.50 (10.20)	11.0 (13.50)	15.00 (17.20)	.0014

Note. Military ranking; Enlisted (E) categories: E1-E4 (enlisted), E5-E6 (non-commissioned officers), E7-E9 (senior non-commissioned officers) and 2 Officer categories (O): O1-O3 (Company Grade Officer) and O4-O6 (Field Grade Officer); Mean (MD); Standard deviation (SD)

Supplementary Files

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