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ORIGINAL ARTICLE

"Making weight" during military service is related to binge eating and eating pathology for veterans later in life

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Abstract

Purpose "Making weight" behaviors are unhealthy weight control strategies intended to reduce weight in an effort to meet weight requirements. This study aimed to examine a brief measure of making weight and to investigate the relationship between making weight and weight, binge eating, and eating pathology later in life.

Methods Participants were veterans [$N = 120$, mean age 61.7, mean body mass index (BMI) 38.0, 89.2% male, 74.2% Caucasian] who were overweight/obese and seeking weight management treatment. Participants completed the making weight inventory (MWI), a measure of making weight behaviors engaged in during military service, and validated measures of eating behavior. Analyses compared participants who engaged in at least one making weight behavior (MWI+) versus those who did not (MWI−).

Results The MWI had good internal consistency. One-third of participants were MWI+ and two-thirds were MWI−. The most frequently reported behavior was excessive exercise, reported in one-quarter of the sample, followed by fasting/skipping meals, sauna/rubber suit, laxatives, diuretics, and vomiting. MWI+ participants were significantly more likely to be in a younger cohort of veterans, to be an ethnic/racial minority, and to engage in current maladaptive eating behaviors, including binge eating, vomiting, emotional eating, food addiction, and night eating, compared to the MWI− group. Groups did not differ on BMI.

Conclusions One-third of veterans who were overweight/obese screened positive for engaging in making weight behaviors during military service. Findings provide evidence that efforts to "make weight" are related to binge eating and eating pathology later in life. Future research and clinical efforts should address how to best eliminate unhealthy weight control strategies in military service while also supporting healthy weight management efforts.

Keywords Making weight · Military · Veterans · Obesity · Eating disorders

This article is part of topical collection on males and eating and weight disorders.

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Introduction

Eating disorders, disordered eating, and overweight are all occurring at high rates in both active duty military service members (ADSMs) and veterans, and these rates are similar or higher than rates observed in civilians [1–6]. Most alarming is that rates for overweight have been escalating in both of these populations [7, 8]. It appears that may be the case with eating disorders as well [9], although the latter may be due to greater recognition of eating disorders in the ADSM and veteran populations. Emerging research has begun to investigate factors that may be placing ADSMs and veterans at greater risk for these problems, particularly unique features of military life such as trauma, PTSD, and

combat exposure, among others [1, 3–6, 10–18]. One aspect of military life that may be a contributing factor, but that is poorly understood, is "making weight."

Making weight is defined as meeting a pre-established weight cutoff for qualification purposes. Unhealthy and extreme weight control strategies intended to reduce weight, in an effort to meet weight requirements, are called making weight behaviors. Examples of making weight strategies include fasting, vomiting, and diuretic or laxative use. These are behaviors also observed in patients with eating disorders. Typically, these strategies are used over a short period of time, such as hours, days or sometimes weeks, and are not associated with long-term weight loss.

Military personnel are required to pass bi-annual physical fitness tests, including mandatory weigh-ins with strict body composition requirements [19]. These weigh-ins are intended to address military concern about the impact of overweight/obesity and the consequences for health and well-being, military readiness, and costs associated with early attrition, reduced productivity, and medical care. Each DoD service branch has its own fitness approach, obesity and fitness screening methods, remediation plan and weight management program, that addresses body composition [20]. For example, the US Navy Operational Fitness and Fueling System (NOFFS) provides sailors with physical fitness and nutrition information to maintain peak physical readiness. The Navy Physical Fitness Assessment (PFA) then evaluates sailors' physical health, ability, and endurance to ensure they are prepared for the demands of service [19]. PFA failures are not uncommon (e.g., 4% in 2013–2014; 128 sailors on average) largely due to failure to meet body composition standards [19, 21]. Service members who fail must participate in a mandatory training program, or attend the Navy weight management program, ShipShape. Few studies have investigated the specific programs used by military service branches for weight management, but efforts, specifically one for ShipShape (e.g., [22]), are underway. A review of the broader literature on weight management programs with military service member participants, including those not supported by the DoD, do suggest that weight management interventions are effective for weight loss [23]. However, the dissemination of these programs, and how weight loss translates into military physical fitness and readiness, are unknown [23].

Failure to "make weight" at weigh-ins carries significant consequences for military personnel including additional training burdens, stigma, and potential separation from service. Failure to meet PFA standards three times in the most recent 4-year period can result in risk of administrative separation from the Navy [24]. Between 1992 and 2006, almost 24,000 soldiers were discharged from the military for exceeding maximum body fat requirements [19]. Thus, the high stakes associated with making weight may place military personnel at risk for engaging in extreme behaviors to meet these requirements. Older studies have suggested that military personnel engage in unhealthy weight loss strategies, including purging, diuretic and diet pill use, and dieting and fasting, around physical fitness and readiness testing [20–24]. These types of unhealthy weight loss strategies, including unhealthy dieting, are known to be related to eating disorders and binge eating in civilian, predominately adolescent, samples (e.g., [25, 26]).

Recently, a systematic qualitative study identified the need to meet military weight requirements as a critical stressor and potential risk factor for long-term unhealthy eating habits in women veterans [17]. To our knowledge, more recent studies on unhealthy weight management behaviors used during military service, either in active duty service members or male veterans, are lacking. A related body of literature suggests problems associated with making weight are not limited to the ADSM and veteran population. Participation in sports with "standardized" weight requirements (jockeying, wrestling, boxing, etc.) [27–30] has demonstrated increased risk for disordered eating behaviors.

To date, there is no measure of making weight behaviors. Given the significant eating and weight problems in the veteran population, and the absence of measures to assess making weight, we developed a new measure, the making weight inventory (MWI) to specifically examine this construct. Here we present data from the measure in a sample of veterans who were overweight/obese presenting for weight management treatment. We aimed to: (1) determine the internal consistency of the MWI; (2) determine the prevalence of making weight behaviors overall, and by sex and race/ethnicity; and (3) compare those who screened positive and negative on the MWI on measures of current weight, binge eating, and related eating pathology. The ability to systematically screen for and measure making weight behaviors have the potential to target modifiable risk factors of military service that could be contributing to the rise of eating disorders, and associated eating and weight problems, observed in military and veteran populations.

Materials and methods

Participants

The original sample consisted of 126 veterans who were overweight/obese who attended a MOVE! weight management orientation session at VA Connecticut Healthcare System (VA CT) between October, 2014 and November, 2015. One hundred and twenty ($N = 120$) participants of the original 126 completed the MWI measure and data from these participants were used for the present study. MOVE! is a 16-week, group-based behavioral weight management

intervention that focuses on education, motivation enhancement, problem solving, and goal setting related to dietary change and increasing physical activity. Patients who are referred for, and interested in, weight management services attend an orientation session to learn about the program and different options for participation. All Veterans Health Administration (VHA) facilities nationwide are required to have some form of the MOVE! program, if not several programs differing in intensity. Given that orientation sessions are designed to provide information about the program and options for participation, not all veterans who attended these sessions went on to enroll in MOVE! This study was approved by Institutional Review Board at VA CT. Participants were not compensated, received no other incentives for participation, and written consent was waived with implied consent, as the data collected were part of routine clinical care. Participants were included if they: (1) were a veteran, (2) were self- or clinician referred for weight management services, and 3) attended an in-person MOVE! orientation session at VA CT within the timeframe data were collected. Research data were anonymized with study identification numbers.

Procedure

All participants completed a battery of self-report questionnaires that were collected as part of routine clinical care for MOVE! at VA CT. Upon entering the orientation sessions, veterans received a questionnaire packet provided by MOVE! clinicians and research assistants. Packets were completed before and/or after the formal presentation about the MOVE! program, and returned to the clinicians or research assistants who ensured completeness of all questionnaire items. A waiver of written informed consent was sought to analyze data.

Assessment measures

Demographics

Age and sex was self-reported by participants on the questionnaire. Information about race and ethnicity was extracted from the electronic health record. BMI was also extracted from measured height and weight data from the electronic medical record, and the weight used was measured at the orientation session on the same day the questionnaire packet was completed.

The Making Weight Inventory (MWI)

The MWI is a 6-item self-report measure designed specifically for this study. The questionnaire asks, "When you were in service, how frequently did you use the following to make weight?" The six compensatory behaviors assessed were: vomiting, laxative use, diuretic use, fasting/skipping meals, excessive exercise, and use of sauna/rubber suit. The first five items were chosen to be consistent with compensatory behaviors for the Diagnostic and Statistical Manual for Mental Disorders, Fifth Edition [31], diagnosis of bulimia nervosa. The sixth item was chosen based upon a qualitative review of eating disorder symptoms and diagnoses in the US military [2], and articles from the making weight literature in sports [27, 29]. The response set for each item was a 7-point Likert scale from 0 (never) to 6 (always). The measure created was purposefully brief to reduce participant burden in this clinical setting, and so that the query could be adapted for other settings (e.g., "When you played competitive sports, how frequently did you use the following to make weight?"). Internal consistency for the MWI was good with Cronbach's Alpha equal to .79.

The VA Binge Eating Screener (VA-BES)

The VA-BES is a single item question taken from the 23-item MOVE! 23 questionnaire, a clinical tool developed by the VHA to assess the individual needs of patients participating in the MOVE! program nationally. The item states, "On average, how often have you eaten extremely large amounts of food at one time and felt that your eating was out of control at that time?" Response options are: "Never", "< 1 time/week", "1 time/week", "2–4 times/week", "5+ times/week". The VA-BES has a sensitivity of 88.9 and a specificity of 83.2, for identifying cases of BED, using a response of greater than or equal to two binge episodes per week [32]. The VA-BES is also predictive of weight loss using a cutoff of greater than never [33].

Questionnaire of Eating and Weight Patterns—Revised (QEWP-R)

The QEWP-R is a 28-item self-report measure that assesses symptoms of eating and weight disorders [34–36]. The QEWP-R has been shown to have good convergent validity with other measures of eating pathology, particularly the Eating Disorder Examination-Questionnaire (EDE-Q) [35]. Assessment of current, regular use of compensatory behaviors to prevent weight gain was used for the present study (e.g., "During the past 3 months, have you prevented weight gain by using any of the following, on average, at least once per week (circle any that apply): vomiting, laxatives, water pills, fasting, and excessive exercise."

Eating Disorder Examination-Questionnaire (EDE-Q)

The EDE-Q [37] is the self-report version of the well-established investigator-based Eating Disorder Examination

(EDE) Interview [38]. The EDE = Q is the gold standard for assessing eating disorder diagnoses and eating disorder pathology. One sample item includes, "Has your weight influenced how you think about (judge) yourself as a person?". A 7-item version of the EDE-Q was used for the present study and demonstrated good internal consistency with Cronbach's alpha equal to .86. Good convergent validity has been reported in other studies, e.g., [39].

Yale Emotional Overeating Questionnaire (YEOQ)

Overeating in response to emotions was assessed by a self-report measure, the Yale Emotional Overeating Questionnaire (YEOQ). The YEOQ has nine items assessing frequency of eating an unusually large amount of food given the circumstances in response to feelings of anxiety, sadness, loneliness, tiredness, anger, happiness, boredom, guilt, and physical pain over the past 28 days. One sample item includes, "On how many days out of the past 28 days have you eaten an unusually large amount of food given the circumstances in response to feelings of Anxiety (worry, stress, nervousness)?". The YEOQ is an expanded version of the 6-item Emotional Overeating Questionnaire (EOQ) [40]. Internal consistency in the present study was excellent with Cronbach's alpha equal to .95.

Night Eating Questionnaire (NEQ)

The 14-item NEQ assesses the behavioral and psychological symptoms of Night Eating Syndrome (NES) One sample item includes, "Do you have cravings or urges to eat snacks when you wake up at night?". The measure has demonstrated adequate internal consistency, with Cronbach's alpha equal to .77 in the present study, and concurrent validity, and an acceptable positive predictive value for identifying the presence of NES [41]. A score of ≥ 25 is indicative of screening positive for NES [41].

Modified Yale Food Addiction Scale (mYFAS)

The mYFAS is a 9-item short version of the self-report YFAS, a measure of food addiction [42]. The YFAS and mYFAS were developed to be analogous to the diagnostic criteria for substance dependence as noted in the DSM-IV-R. One sample item includes, "Issues related to food and eating decrease my ability to function effectively (daily routine, job/school, social or family activities, health difficulties).". Internal consistency of the mYFAS was excellent with Cronbach's alpha equal to .91 for the present study.

Insomnia Severity Index (ISI)

The ISI assesses for both the presence and severity of insomnia symptoms. One sample item includes, "How noticeable to others do you think your sleep problem is, in terms of impairing the quality of your life?". The 7-item ISI scale has proven to have high levels of both sensitivity and specificity, in addition to convergent validity, and excellent internal consistency [43]. Internal consistency was excellent with Cronbach's alpha equal to .94 for the present study.

Data analytic plan

Data analyses were performed using SPSS version 24 (IBM, Armonk, NY). Demographic information (e.g., age, sex, race/ethnicity) and making weight behaviors were analyzed using basic means, standard deviations, frequency counts, and correlations. Participants were grouped into those who reported engaging in at least one making weight behavior (MWI+) and those who did not (MWI−). Chi square tests were used to assess MWI+ and MWI− group differences for binge eating and compensatory behaviors. A series of one-way analysis of variance (ANOVAs) was used to assess differences between MWI+ and MWI− groups for continuous variables, and analyses of covariance (ANCOVAs) with age and race as covariates were used to confirm findings from the ANOVAs. For BMI, alpha level was set at $p < .05$ for statistical significance. Bonferroni correction was used for the eating behavior analyses and alpha level was set at $p < .01$ for statistical significance.

Results

Demographic information

Participants were predominantly male ($n = 107$; 89.2%) with a mean age of 61.7 years (SD = 8.65) and average BMI of 38.0 kg/m^2 (SD = 7.30). Roughly three-quarters ($n = 89$; 74.2%) of participants identified as white or Caucasian, 20.8% ($n = 25$) as black or African American, 4.2% ($n = 5$) as "other," and .8% ($n = 1$) as missing.

Making weight behaviors

Overall, forty participants (33.3%) engaged in a minimum of one making weight behavior at least some of the time prior to weighing in (MWI+) during military service. The most frequently reported compensatory behavior was excessive exercise (25.6%), followed by fasting/skipping meals (19.3%), sauna/rubber suit (10.2%), laxatives (7.6%), diuretics (4.3%), and vomiting (1.7%). MWI+ participants were significantly younger than those who

did not engage in any making weight behavior [MWI−; $M = 57.4$ (10.3) vs. $M = 63.9$ (6.8); F (1118) = 17.0, $p < .001$]. The proportion of women who were MWI+ was 53.8% (7/13), while the proportion of men who were MWI+ was 30.8% (33/107; $X^2 = 2.76$, $p = .097$). The proportion of non-white/non-Caucasian participants who were MWI+ (60%; 18/30) was significantly greater than the proportion of white/Caucasian participants who were MWI+ (23.6%; 21/89; $X^2 = 13.5$, $p < .001$).

Current binge eating and compensatory behaviors

Almost three-quarters (84/118; 71.2%) of the sample reported engaging in any current binge eating, but a greater proportion of the MWI+ group engaged in this behavior (32/38, 84.2%) compared to the MWI− group (52/80, 65.0%; $X^2 = 4.64$, $p = .031$). Similarly, a greater proportion of the MWI+ group endorsed current binge eating at least once a week (22/38, 57.9%) compared to the MWI− group (25/80 = 31.3%; $X^2 = 7.63$, $p = .006$). In addition, a greater portion of the MWI+ group engaged in at least one current compensatory behavior such as vomiting, laxatives, water pills, fasting or excessive exercise (21/39, 53.8%) compared to the MWI− group (19/74, 25.7%; $X^2 = 8.86$, $p = .003$).

Differences among groups

ANOVAs were performed comparing MWI+ and MWI− groups. In terms of eating pathology, the MWI+ group endorsed significantly more overall eating pathology, emotional eating, and symptoms of food addiction, than the MWI− group (p's all < .01). The MWI+ group also endorsed significantly more night eating and symptoms of insomnia than the MWI− group (p's < .01). MWI+ and MWI− groups did not differ on current BMI. Analyses were rerun with age and race as covariates given their significant relationships with the MWI. Significant findings remained unchanged and adjusted findings are presented in Table 1.

Discussion

To our knowledge, this is the first study to examine a measure of making weight behaviors for use in a military population. One-third of veterans in this study reported engaging in some form of making weight behaviors during their military service. Younger cohorts of veterans, non-white veterans, and women veterans were more likely to report engaging in making weight behaviors suggesting that these subgroups are at increased risk of engaging in unhealthy weight loss strategies while in service. Veterans endorsed a range of making weight behaviors, the most common being excessive exercise, followed by fasting/skipping meals, and inappropriate compensatory behaviors similar to those observed in bulimia nervosa (laxative, diuretic use, and vomiting). Interestingly, about 10% of the sample reported use of a sauna or rubber suit to make weight, although this compensatory behavior is frequently observed in studies of wrestlers [27, 29].

We found the MWI to be an internally consistent measure that discriminated between those who did and did not endorse making weight behaviors. Individuals who engaged in military compensatory behaviors were more likely to endorse current pathological eating behaviors, particularly binge eating. This finding is especially important given that rates of binge eating in the veteran population have not only found to be extremely high [44] but binge eating has also been associated with increased medical and psychiatric morbidity [44], healthcare utilization and cost [45], and poor weight loss outcome [33] among veterans. Individuals who engaged in military compensatory behaviors were more likely to endorse current compensatory behaviors

Table 1 Results of analyses of covariance (ANCOVAs) comparing those who did (MWI+; $n = 40$) and did not (MWI−; $n = 80$) engage in military making weight behaviors

	Overall *M* (SD)	MWI+ *M* (SD)	MWI− *M* (SD)	*F*	*p*
Body mass index (BMI)	38.02 (7.30)	38.9 (6.79)	37.58 (7.54)	.09	.769
Overall Eating Pathology (EDE-Q)	3.13 (1.49)	3.95 (1.13)	2.71 (1.48)	11.88	.001
Emotional Eating (YEOQ)	1.23 (1.47)	2.06 (1.75)	.81 (1.10)	15.39	.000
Food Addiction (mYFAS)	.65 (1.21)	1.16 (1.59)	.39 (.87)	11.40	.001
Night Eating (NEQ)	15.13 (6.93)	18.13 (7.93)	13.67 (5.90)	7.88	.006
Insomnia (ISI)	10.69 (8.23)	14.92 (7.49)	8.49 (7.77)	9.00	.003

Note: Covariates included age and race. *BMI* body mass index, *EDE-Q* Eating Disorder Examination-Questionnaire, *YEOQ* Yale Emotional Overeating Questionnaire, *mYFAS* Modified Yale Food Addiction Scale, *NEQ* Night Eating Questionnaire, *ISI* Insomnia Severity Index

(e.g., vomiting) that are characteristic of bulimia nervosa. Military making weight behaviors were also associated with emotional eating and food addiction later in life, and discriminated between veterans with sleep problems such as night eating and insomnia. Our results were consistent with qualitative findings of women veterans [17] in which the need to meet military weight requirements was identified as a military stressor related to poor eating habits, and negative sequelae.

There are critical clinical implications of our findings. DoD policy makers and supervisors need to be made aware of, and educated about, how to address unhealthy eating and weight practices in a way that is non-judgmental and supportive of ADSM's careers. Addressing making weight behaviors may necessitate a multi-prong approach that could include: (1) screening for these behaviors, (2) interventions to address these behaviors, and (3) ensuring that existing DoD programs that target fitness, obesity and fitness screening, and remediation and weight management, do not inadvertently trigger or escalate these problem behaviors.

Our findings suggest that further development of the making weight construct is justified. For example, future studies could examine eating pathology "after," as well as "before" weigh-ins. This may aid in better understanding the short-term cascade of other pathological eating behaviors, such as binge eating, that may be exacerbated from the extreme restriction or unhealthy weight control behaviors associated with making weight. Other stressors, beyond mandatory weigh-ins, also warrant further attention. For example, stressors identified among women veterans include pressure to lose weight after pregnancy, limited time to eat during basic training and deployments, and food insecurity [17]. Illuminating potentially modifiable factors (e.g., greater military support for women veterans during the postpartum period) could provide valuable information for how best to implement weight and physical fitness screening.

Further investigation of mandatory weigh-ins has the potential to inform other populations with high stake weigh-in requirements, such as collegiate and professional athletes. This line of research could also inform whether there are in fact inadvertent negative sequelae related to obesity screening in primary care settings or weigh-ins at clinician visits. Medical visit weight monitoring has become universally embraced despite evidence to suggest that not knowing one's weight is associated with reducing future weight gain [46] and lowered risk of disordered eating [47, 48].

A number of limitations should be considered in light of our findings. The present study was conducted in a small sample of older, predominately Caucasian, and predominantly male veterans attending a weight management program. Our sample was not large enough to perform analyses by gender and race. We hypothesize that rates of making weight behaviors would be higher in younger cohorts of veterans given our finding that younger age was related to scores on the MWI. In addition, we did not collect branch of service for this study and it is likely that demands to make military weight differ by branch and may have affected outcomes. Findings may have been influenced by recall and self-report biases. Finally, this correlational study design is limited in that we cannot infer that making weight behavior in the military was a cause of eating pathology later in life. Nonetheless, the MWI has potential utility as a screening tool to assist in identifying individuals who struggle with weight and eating issues in the military.

Conclusions

In summary, we examined a new measure to assess making weight behaviors used in anticipation of military weigh-ins. The results of the current study offer the first empirical investigation of the association between making weight behaviors during military service and maladaptive eating behaviors, such as binge eating, that are associated with morbidity and healthcare utilization later in life. This line of research has potential policy implications with regard to how to effectively assess for unhealthy and extreme weight control strategies in relation to military weigh-ins.

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Data availability The datasets generated and/or analyzed during the current study are not publicly available due to privacy protections regarding the use and distribution of VA data.

Compliance with ethical standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical approval All procedures performed in studies involving human participants were in accordance with the ethical standards of the institutional and/or national research committee (Human Studies Subcommittee at the VA Connecticut Healthcare System) and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. This article does not contain any studies with animals performed by any of the authors.

Informed consent Waiver of informed consent was granted by IRB at VA CT Healthcare System.

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