

Efficacy of a Pilot Internet-Based Weight Management Program (H.E.A.L.T.H.) and Longitudinal Physical Fitness Data in Army Reserve Soldiers

Robert L. Newton Jr., Ph.D., Hongmei Han, M.App.Stat., Tiffany M. Stewart, Ph.D.,
Donna H. Ryan, Ph.D., and Donald A. Williamson, Ph.D.

Abstract

Background:

The primary aims of this article are to describe the utilization of an Internet-based weight management Web site [Healthy Eating, Activity, and Lifestyle Training Headquarters (H.E.A.L.T.H.)] over a 12–27 month period and to describe concurrent weight and fitness changes in Army Reserve soldiers.

Methods:

The H.E.A.L.T.H. Web site was marketed to Army Reserve soldiers via a Web site promotion program for 27 months (phase I) and its continued usage was observed over a subsequent 12-month period (phase II). Web site usage was obtained from the H.E.A.L.T.H. Web site. Weight and fitness data were extracted from the Regional Level Application Software (RLAS).

Results:

A total of 1499 Army Reserve soldiers registered on the H.E.A.L.T.H. Web site. There were 118 soldiers who returned to the H.E.A.L.T.H. Web site more than once. Registration rate reduced significantly following the removal of the Web site promotion program. During phase I, 778 Army Reserve soldiers had longitudinal weight and fitness data in RLAS. Men exceeding the screening table weight gained less weight compared with men below it ($p < .007$). Percentage change in body weight was inversely associated with change in fitness scores.

Conclusions:

The Web site promotion program resulted in 52% of available Army Reserve soldiers registering onto the H.E.A.L.T.H. Web site, and 7.9% used the Web site more than once. The H.E.A.L.T.H. Web site may be a viable population-based weight and fitness management tool for soldier use.

J Diabetes Sci Technol 2011;5(5):1255-1262

Author Affiliation: Pennington Biomedical Research Center, Baton Rouge, Louisiana

Abbreviations: (ANOVA) analysis of variance, (APFT) Army physical fitness test, (BMI) body mass index, (H.E.A.L.T.H.) Healthy Eating, Activity, and Lifestyle Training Headquarters, (RLAS) Regional Level Application Software, (RRC) Regional Readiness Command, (STW) screening table weight

Keywords: Army Reserve, Internet, military, obesity prevention, weight management

Corresponding Author: Robert L. Newton Jr., Ph.D., Pennington Biomedical Research Center, 6400 Perkins Rd., Baton Rouge, LA 70808; email address robert.newton@pbrc.edu

Introduction

High prevalence of obesity affects all aspects of American society, including the armed forces.^{1–3} Men in the military show higher prevalence of obesity compared with women.^{3,4} The Department of Defense has reported that 62% of active duty personnel are overweight.⁵ The increased prevalence of overweight/obesity in the military may reflect increases in prevalence of overweight/obesity in the general population since 1990. For example, over a 13-year span, overweight in recruits increased from 23% to 27% and obesity increased from 3% to 7%.⁶ The increased overweight/obesity in military personnel likely adversely affects soldiers' combat readiness and health but may be alleviated by weight loss.⁷ Therefore, interventions promoting weight loss and/or weight maintenance for military personnel are needed to improve fitness for duty.

Numerous interventions designed to promote weight loss in military personnel have been conducted.^{8–16} These programs have typically used group-based behavior modification strategies, which have shown some success in promoting weight loss. However, these interventions have been conducted primarily with active duty personnel, and only one study has been conducted with Army Reserve soldiers.¹³ Reserve soldiers have reduced access to military weight loss resources because they are only required to serve one weekend per month. Therefore, Reserve soldiers are in need of a portable weight management tool, such as the Internet-based program tested in this study.

A number of Internet-based weight management interventions^{17–25} have been conducted. These programs generally have been shown to be successful in promoting and sustaining small weight losses.^{26,27} Most successful interventions have utilized a structured approach (e.g., lesson plans and regular contact with therapists) to behavior change and have personalized (e.g., provided individualized feedback) the Web site to the participant.²⁶ Only two Internet-based weight loss programs have been conducted in the military.^{9,28} Although both studies showed positive weight outcomes, they were limited to active duty personnel and one military base and neither assessed changes in body weight and physical fitness as measured by the Army physical fitness test (APFT).

The primary aim of this article is to describe the utilization of an Internet-based weight management Web site

[Healthy Eating, Activity, and Lifestyle Training Headquarters (H.E.A.L.T.H.)]²⁹ and its impact on weight and fitness using an uncontrolled single group outcome research design. This study represents the first to utilize an Internet-based intervention with Army Reserve soldiers, and it extends the findings of an earlier study conducted with active duty soldiers.²⁸

Methods

Participants

All participants were Army Reserve soldiers serving under the 94th Regional Readiness Command (RRC) based in Devens, MA. A base realignment and closure in September 2007 closed the 94th RRC and reassigned the units to the 655th Regional Support Group and 302nd Maneuver Enhancement Brigade. We estimate that 70–80% of the Army Reserve soldiers originally in the 94th RRC remained under the 655th and 302nd commands, with the remainder retiring, opting out of service, or transferring to another command.

This study utilized anonymous data collection procedures, meaning that an individual soldier was not identifiable from the data collection process. Soldiers were not required to provide written informed consent to participate in the study. The study was approved by Pennington Biomedical Research Center's institutional review board and the Army's institutional review board (U.S. Army Medical Research Materiel Command Human Research Protection Office).

Sources of Data Collection

Participant Data from the H.E.A.L.T.H. Web Site

There were 1499 Army Reserve soldiers who registered on the H.E.A.L.T.H. Web site. The H.E.A.L.T.H. Web site was also available to the soldier's civilian family members; however, the sample size ($n = 124$) was inadequate for conducting meaningful statistical analyses and is not described in this article. Using the Regional Level Application Software (RLAS) database, we estimate that a total of 2873 Army Reserve soldiers could have accessed the Web site over the course of the study.

Participant Data from the Regional Level Application Software Database

Baseline weight and fitness data were extracted from RLAS during a 2-year period (2005–2006) prior to the launch of

the H.E.A.L.T.H. Web site. Follow-up data were collected after the launch at 6-month intervals that corresponded with the twice annual APFT: January 2008 (capturing July to December 2007 testing), July 2008 (capturing January to June of 2008 testing), January 2009 (capturing July to December 2008 testing), and July 2009 (capturing January to June of 2009 testing). Army Reserve soldiers who had data at baseline and two of the four follow-up periods ($n = 778$) were included in the longitudinal data analyses. All RLAS data analyses contained within this article were conducted exclusively with this subset of 778 soldiers.

The reader should also note that the anonymous study design prevented the H.E.A.L.T.H. Web site and RLAS datasets from being linked. Therefore, we could not determine if weight and fitness changes were associated with H.E.A.L.T.H. Web site usage.

Intervention

H.E.A.L.T.H. Web Site

The H.E.A.L.T.H. Web site was initially developed for use with active duty soldiers at Fort Bragg, NC,²⁹ to assist soldiers in managing weight and increasing readiness. The H.E.A.L.T.H. Web site was subsequently modified for use within the 94th RRC by, e.g., incorporating exercise adaptations for colder weather and providing region-specific activities. Each Army Reserve soldier was given a code to access the H.E.A.L.T.H. Web site. They created their own logon identification and password. All passwords were encrypted on the server so that Army Reserve soldiers could not be identified. During their initial registration, each Army Reserve soldier was required to input demographic data (e.g., age, sex, ethnicity, years in military) and customize the meal, exercise, and lifestyle planners. Additional logins to the Web site were designed to foster long-term usage by allowing soldiers to access weight management tools such as dietary, exercise, and lifestyle planners; nutrition and physical activity educational materials; and personalized weight graphs.

Web Site Promotion Program

The Web site promotion program was designed to create awareness and promote regular utilization of the H.E.A.L.T.H. Web site. The program was administered by field coordinators living in New England who promoted the Web site by providing presentations, assisting the registration of soldiers onto the Web site, distributing promotional materials, and attending commander update briefings. The Web site promotion program was active for 27 months (phase I, April 1, 2007–June 30, 2009) and then ceased. Observation of H.E.A.L.T.H. Web site

usage continued for the following 12 months (phase II, July 1, 2009–June 30, 2010).

Measures

H.E.A.L.T.H. Web Site Data

Web site demographics included Army Reserve soldiers' age, sex, height, weight, ethnicity, and years of military service. The H.E.A.L.T.H. Web site utilization data included a record of soldier registration and usage of H.E.A.L.T.H. Web site tools. Soldier satisfaction with the H.E.A.L.T.H. Web site features was assessed via 14 questions, e.g., personalization, usefulness for health improvement, confusion, usefulness of graphics, Web site organization, and ease of reading. Likert scales (1 = strongly disagree, 4 = neutral, 7 = strongly agree) captured soldier responses, with higher scores indicating higher levels of satisfaction. The H.E.A.L.T.H. Web site data were captured across phases I and II.

Regional Level Application Software Data

Anthropometric Data: Height was measured to the nearest inch, and weight was measured to the nearest 0.5 lb. (0.23 kg). There was no standard equipment required across unit facilities for measurements conducted during the baseline period. Following baseline, Detecto wall-mounted stadiometers (Model 3PHTRODWM) and Quick Medical digital scales (Model HD314) were installed in all unit facilities and were utilized to conduct all subsequent measurements. Army Reserve soldiers were in stocking feet and in standard uniforms for height and weight measurements. Body mass index (BMI) was calculated as weight (kg)/height (m²). Also, the Army derives a screening table weight (STW) based on height and sex to categorize soldier weight status. A soldier is considered out of compliance with Army regulations if their weight exceeds the STW.

Army Physical Fitness Test: The APFT measures physical fitness using the number of sit-ups and push-ups during a 2 min span, and the time needed to complete the two-mile run. These raw numbers are then converted into a 0–100 rating scale (higher score indicates better performance) based on the soldier's age and sex. A soldier must obtain a score of 60 on each component in order to pass the APFT. The RLAS data were captured during phase I.

Statistical Analyses

For the H.E.A.L.T.H. Web site data, all soldiers were classified by one of three categories: (1) low-use soldier, signed in with no returning or returned one time

after initial sign up; (2) medium-use soldier, used the H.E.A.L.T.H. Web site 2–8 times on separate days after the initial sign up; or (3) high-use soldier, used the H.E.A.L.T.H. Web site at least nine times on separate days after the initial sign up. Analysis of variance (ANOVA) and Chi-square analyses were used to test differences between low-, medium-, and high-use soldiers. The Poisson regression model was used to test if there was a significant decrease in new enrollment between phases I and II. Mean ratings were used to assess soldier satisfaction ratings.

Army Reserve soldiers in the RLAS database longitudinal subset were classified into three weight categories determined by their baseline weight: (1) exceeding the STW, (2) being at a warning weight (<5% below the STW), or (3) being under the STW (≥5% below the STW). PROC MIXED was used to conduct repeated measures ANOVA.³⁰ In the model, time, weight status, and the interaction of time and weight status served as independent variables, and actual weight (kg) and APFT scores served as dependent variables. Time was a repeated factor, and therefore change in weight from baseline to the end of phase I across weight categories represents the interaction effect. Three preplanned contrasts were conducted to test the differences in weight and APFT scores over 27 months among the three weight categories. Pearson correlations assessed the relationship between change in body weight and change in fitness scores. McNemar’s Chi-square test was used to compare the weight and fitness passing rates between baseline and the last available observation.

All tests were two-sided, and the statistical significance was defined at 0.05. All analyses were performed using commercially available software (SAS, version 9.1; SAS Institute, Inc., Cary, NC).

Results

Data Derived from the H.E.A.L.T.H. Web Site

Demographic Information

The Army Reserve soldiers were predominantly Caucasian (73.5%), had a mean age of approximately 30 years, and had a self-reported BMI in the overweight (BMI = 25–30)³¹ category (Table 1). A greater percentage of high-use compared with low-use Army Reserve soldiers were female ($p < .05$). There were no differences in BMI, age, ethnicity, or years of military service between soldier use types (Table 2).

Table 1.
Demographic Characteristics of Soldiers Using the H.E.A.L.T.H. Web Site^a

		<i>n</i>	Mean (SD)
Age	Women	253	31.1 (9.9)
	Men	1246	31.3 (9.8)
BMI	Women	186	26.7 (4.0)
	Men	747	28.1 (4.0)
		<i>n</i>	Percentage
Sex	Women	253	16.9%
	Men	1246	83.1%
Race	Caucasian	1102	73.5%
	African American	167	11.1%
	Other	230	15.3%
Years in military	Less than 5	267	17.8%
	5 to 10	265	17.7%
	More than 10	436	29.1%
	Not Entered	531	35.4%

SD, standard deviation.

^a Note that there are unequal numbers of participants for each of the demographic variables. Discrepant numbers are caused by the registration of some individuals who completed select demographic fields but omitted others.

Table 2.
Demographic Profile of Web Site Soldier Use Type^a

Soldier use	<i>N</i>	Age	BMI	Sex	Race	Military services
				% female	% white	% ≥ 10
Low	1381	31.3 ± 9.9	27.8 ± 4.1	16.2 ^b	73.4	45.3
Medium	100	31.2 ± 9.8	27.8 ± 3.9	24.0 ^c	77.0	42.1
High	18	30.7 ± 7.7	28.5 ± 3.5	33.3 ^{b,c}	66.7	47.1
<i>P</i> values		0.96	0.73	0.02	0.40	0.82

^a Analysis of variance and Chi-square analyses were used to test differences between low-, medium-, and high-use soldiers. Analysis of variance was used for continuous variable, and Chi-square analysis was used for categorical variables. Soldier use types: medium use used the Web site 2–8 times on separate days after the initial sign up on the Web site; high use or regular use used the Web site at least nine times on separate days after the initial sign up on the Web site.

^{b,c} Values with different superscripts are significantly different from each other.

H.E.A.L.T.H. Web Site Utilization

There were a total of 1499 Army Reserve soldiers who registered onto the H.E.A.L.T.H. Web site. Figure 1 depicts

the cumulative number of registrations through phase I (Web site promotion) and phase II (no Web site promotion). Cessation of the Web site promotion program resulted in significantly fewer registrations on the Web site [$\chi^2(1) = 761; p < 0.001$]. On average, 54 new Army Reserve soldiers registered per month during phase I compared with an average of four new registrations per month during phase II. As shown in **Table 3**, high- and medium-use soldiers spent similar amounts of time utilizing the food, fitness, and lifestyle planners. The average total logon time to the H.E.A.L.T.H. Web site was about 20 minutes per session.

Web Site Satisfaction

Average ratings were ~5 on a scale of 1–7 (see **Table 4**). These ratings indicate that, on average, soldiers ($n = 341$)

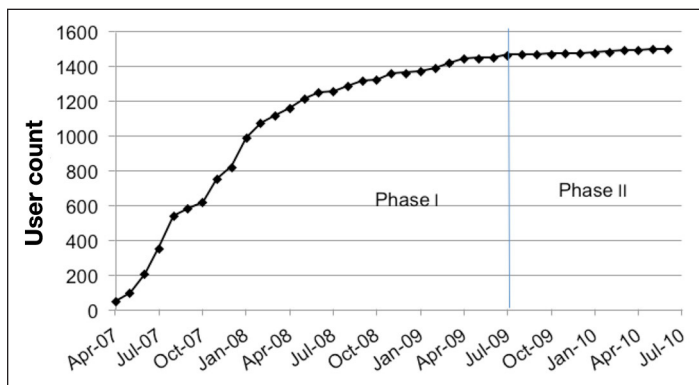


Figure 1. Cumulative graph of soldier new registration during the H.E.A.L.T.H. intervention. Phase I is defined as an active Web site promotion program. Phase II is defined by the absence of the Web site promotion program.

Table 3.
Participant Usage of H.E.A.L.T.H. Web Site Tools: Returning Logins by Participant Use Type^a

	Logins from medium-use soldiers (# of users = 100; # of logins = 341)		Logins from high-use soldiers (# of users = 18; # of logins = 380)	
	Login tool used	Minutes spent mean Mean (SD)	Login tool used	Login tool used Mean (SD)
Food planner	39.9%	9.1 (12.6)	43.7%	14.9 (22.7)
Exercise planner	33.4%	4.3 (7.0)	43.2%	7.3 (11.5)
Lifestyle planner	8.8%	2.0 (5.2)	5.5%	4.1 (14.7)
Average time spent per session		18.6 (23.9)		21.2 (30.5)

SD, standard deviation.
^a Soldier use types: medium use used the Web site 2–8 times on separate days after the initial sign up on the Web site; high use or regular use used the Web site at least nine times on separate days after the initial sign up on the Web site.

reported being moderately satisfied with the H.E.A.L.T.H. Web site.

Army Physical Fitness Test Data Extracted from the Regional Level Application Software Database Longitudinal Subset

Demographic Information

There was a subset of 778 Army Reserve soldiers with longitudinal data. A majority were men (88.4%) with an average age of 30 years and mean weight slightly below the STW (**Table 5**).

Weight Data

There were significant main effects for weight status [$F(2, 685) = 295.7; p < .001$], time [$F(4, 524) = 38.2; p < .001$], and their interaction [$F(8,525) = 2.2; p = .025$] for men (**Figure 2**). The main effect for weight status showed that body weight differed between men in different

Table 4.
Average Satisfaction Ratings for the H.E.A.L.T.H. Web Site^a

Question #	Question	Average soldier score
1	The Web site was easy to use (“user-friendly”).	5.03
2	The Web site was personalized. It provided customized feedback to me.	5.09
3	The Web site was useful and helped me in my attempts to improve my health.	5.08
4 ^b	I felt confused while using the Web site.	3.21
5 ^b	I felt lost while looking for information.	3.18
6	The use of graphics on the Web site helped me track my progress at changing my habits.	4.55
7	Did you find that creating an account on the Web site was helpful?	4.77
8	The Web site was well organized.	5.03
9	The Web site was easy to move around in.	4.98
10	The links were helpful.	4.97
11	The instructions on the Web site were clear.	5.01
12	Graphics and charts were attractive and visually pleasing.	5.12
13	Text was presented in a simple and straightforward way.	5.11
14	The Web site was easy to read.	5.16

^a Questions scored on a seven-point (1 = strongly disagree, 4 = neutral, 7 = strongly agree) Likert scale.

^b Questions 4 and 5 are reverse scored.

weight categories, while the main effect for time showed that all men gained weight over time. The interaction effect showed that men under the STW and at the warning weight gained significantly more weight from baseline to the end of phase I ($p < .007$) compared with men exceeding the STW. For women, there were significant main effects for weight status [$F(2, 86.9) = 44.4$; $p < .001$] and time [$F(4,74.5) = 5.54$; $p < .001$], with no interaction effect. Approximately 41.3% and 45.8% of Army Reserve soldiers exceeded the STW at baseline and at the end of phase I, respectively. This difference was statistically significant ($\chi^2 = 9.65$; $p = .002$), indicating that the prevalence of overweight increased over the 27-month study period.

Table 5. Baseline-Measured Demographics Derived from Men and Women Included in the Longitudinal RLAS Data Subset

	Women (n = 90)	Min	Max	Men (n = 688)	Min	Max
	Mean (SD)			Mean (SD)		
Age	27.0 (8.1)	18	53	29.2 (8.9)	17	59
Height (cm)	162.1 (5.9)	149.9	177.8	176.7 (6.8)	154.9	195.6
Weight (kg)	64.8 (9.9)	47.7	93.2	82.6 (12.7)	48.6	124.1
Weight deviation ^a	-2.0 (8.4)	-16.4	18.6	-1.1 (10.7)	-30.5	31.8
BMI	24.6 (3.2)	19.4	32.7	26.4 (3.6)	17.6	37.2

SD, standard deviation.
^a Weight deviation is STW subtracted from measured weight.

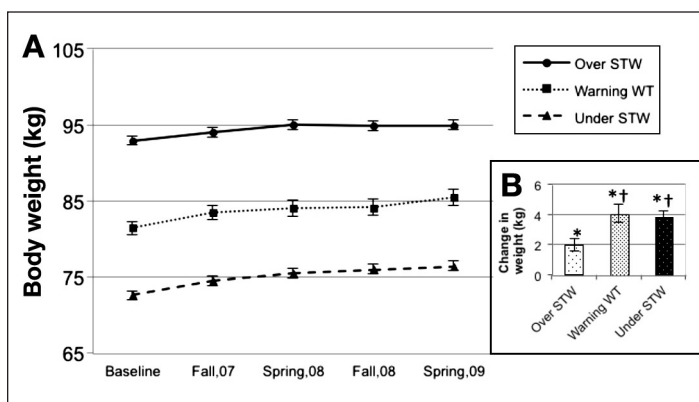


Figure 2. Men's body weight over the study period presented (A) as mean body weight values across all time periods by weight category and (B) as change in body weight by weight category. Over STW, Army Reserve soldiers over the STW; Warning WT, Army Reserve soldiers with a warning weight (1–5% below the STW); Under STW, Army Reserve soldiers with a weight below the STW (>5% below the STW). The asterisks represent a significant increase in weight from baseline to 27 months. The daggers represent change in weight different from over STW.

Physical Fitness Data

Significant main effects for weight status [$F(2,663) = 27.6$; $p < .001$] and time [$F(4, 509) = 5.4$; $p < .001$] were observed. The main effect for weight status showed that APFT scores were lower in Army Reserve soldiers exceeding the STW compared with Army Reserve soldiers in the other weight categories, while the main effect for time showed that APFT scores increased over time. Also, the significant interaction effect [$F(8, 510) = 2.5$; $p = .011$] showed that the change in scores for Army Reserve soldiers whose weight exceeded the STW was greater ($p = .003$) than the change in scores in Army Reserve soldiers who were under the STW (Figure 3) from baseline to the end of phase I. There was a significant relationship between change in APFT scores and change in body weight ($r = -0.41$; $p < .001$), such that increases in weight were associated with decreases in APFT scores. At both baseline and at the end of phase I, 72% of Army Reserve soldiers passed the APFT, and this difference was not statistically significant ($\chi^2 = 0.053$; $p = .819$).

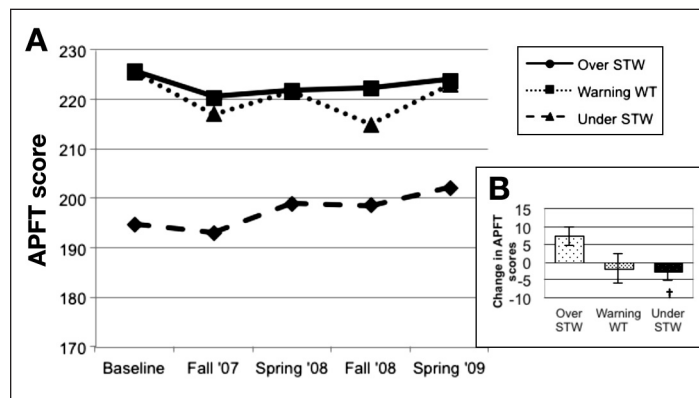


Figure 3. The APFT scores over the course of the study presented as (A) mean APFT scores at each measurement period by weight category and (B) change in APFT scores by weight category. Over STW, Army Reserve soldiers over the STW; Warning WT, Army Reserve soldiers with a warning weight (1–5% below the STW); Under STW, Army Reserve soldiers with a weight below the STW (>5% below the STW). The asterisk represents a significant increase in APFT score from baseline to end of phase I. The dagger represents a change in APFT score different from over STW.

Discussion

In this study, 1499 of an estimated 2873 (~52.2%) Army Reserve soldiers registered with the H.E.A.L.T.H. Web site, which suggests that an Internet-based program can reach a large percentage of soldiers in a relatively brief period. The importance of the Web site promotion program was demonstrated by the fact that there were significantly more registrations when it was active compared with when it was inactive. Repeated use of the H.E.A.L.T.H.

Web site was lower than expected, however. There were only 100 medium-use soldiers and 18 high-use soldiers, and these soldiers spent less than 50% of their time utilizing the main Web site tools (food, fitness, and lifestyle planners). We suspect that the infrequent long-term utilization may have been caused by the following factors. First, the number of units meeting for battle assembly weekend outnumbered the available field coordinators. There were two field coordinators who had to maintain communication with Army Reserve soldiers across 51 units based in 30 different facilities across 6 different states. This essentially resulted in the field coordinators meeting face-to-face with the same soldier only two to three times per year. Second, anonymity prevented us from sending emails. Therefore, there was no way for field coordinators to have direct electronic contact with the Army Reserve soldiers. Third, the public affairs office was disassembled 9 months after the H.E.A.L.T.H. Web site was launched. The public affairs office had been the only source of mass print and electronic information concerning the H.E.A.L.T.H. Web site that was communicated to all Army Reserve soldiers. All these factors limited our ability to communicate regularly with the population. In a previous study, we found that higher Web site utilization was associated with greater weight changes.¹⁹ Therefore, we recommend that future interventions involving soldiers find means of fostering regular Web site usage, such as the use of frequent prompts through newsletters, emails, and/or text messages.

The study found that the average soldier gained weight over the course of the study. This finding is consistent with other studies reporting increased weight in the general population³² and military.¹⁻³ Body weight was associated with APFT scores in that increasing weight during the 27-month study period was associated with decreases in APFT scores.

This study represents the second study that tested the utilization of the H.E.A.L.T.H. Web site. The initial study²⁸ also maintained the anonymity of soldiers and utilized a Web site promotion program. As noted earlier, the study was conducted with active duty soldiers at a single location. Nevertheless, the two studies yielded similar findings. The amount of time spent on H.E.A.L.T.H. Web site tools was similar in the two studies: medium users, 19.6 versus 18.6 min; high users, 18.4 versus 21.2 min. Also, the average Web site satisfaction ratings, per question, were similar in Ft. Bragg (5.1–6.1) and New England (4.6–5.2). The percentage of soldiers with repeated use of the H.E.A.L.T.H. Web site (medium- and high-use soldiers,

6.5% versus 7.9%) was also similar. Finally, the importance of the Web site promotion program was demonstrated in both studies. Our results extend those of the Fort Bragg study by demonstrating that increases in objectively measured weight were adversely associated with changes in APFT scores. As noted earlier, soldier weight increased over the 27-month study period, and there was a statistically significant decrease in the percentage of Army Reserve soldiers meeting the STW criterion.

Other interventions in military personnel have resulted in weight loss,^{8,10,11,14} though it is important to recognize study design differences when comparing the results of these programs with these findings. Importantly, we were unable to determine if weight changes were associated with H.E.A.L.T.H. Web site usage because of the anonymous study design, whereas previous studies were able to identify participants. In addition, previous studies utilized group- and/or clinic-based behavioral treatment approaches,^{10,14} and exclusively enrolled soldiers exceeding the STW, which resulted in a sample seeking weight loss treatment. By design, our population-based intervention was made available to all Army Reserve soldiers, irrespective of their weight status or intentions concerning weight management. Population-based interventions, such as this one, typically result in smaller treatment effects, and results are harder to detect.³³

Conclusions

The results of the study should be interpreted in the context of its limitations. One limitation was maintenance of anonymity of the identity of individual soldiers, which excluded the possibility of testing the association between H.E.A.L.T.H. Web site utilization and changes in body weight and fitness. Another limitation was failure to include a control group in the research design, which limits generalizability of the study. A randomized controlled trial is needed to address this limitation. We are currently conducting a randomized controlled trial with the Louisiana National Guard to determine the effectiveness of H.E.A.L.T.H..

Funding:

This project was supported by the Department of Defense (award number DAMD W81XWH-05-2-0082). In addition, this work was partially supported by the Nutrition Obesity Research Center grant P30DK072476 entitled "Nutritional Programming: Environmental and Molecular Interactions" sponsored by the National Institute of Diabetes and Digestive and Kidney Diseases.

Acknowledgment:

The authors acknowledge the Soldiers in the 94th RRC, 655th Regional Support Group and 302nd Maneuver Enhancement Brigade, members of the United States Army Research Institute of Environmental Medicine, and the staff at the Pennington Biomedical Research Center for their dedication, oversight, and efforts to make this study a success and this article possible.

References:

1. Poston WS, Haddock CK, Peterson AL, Vander Weg MW, Klesges RC, Pinkston MM, DeBon M. Comparison of weight status among two cohorts of US Air Force recruits. *Prev Med.* 2005;40(5):602-9.
2. Gantt CJ, Neely JA, Villafana IA, Chun CS, Gharabaghi SM. Analysis of weight and associated health consequences of the active duty staff at a major Naval medical center. *Mil Med.* 2008;173(5):434-40.
3. Lindquist CH, Bray RM. Trends in overweight and physical activity among U.S. military personnel, 1995-1998. *Prev Med.* 2001;32(1):57-65.
4. Haskell SG, Gordon KS, Mattocks K, Duggal M, Erdos J, Justice A, Brandt CA. Gender differences in rates of depression, PTSD, pain, obesity, and military sexual trauma among Connecticut War Veterans of Iraq and Afghanistan. *J Womens Health (Larchmt).* 2010;19(2):267-71.
5. Department of Defense. Survey of health related behaviors among active duty military personnel: 2008 survey Q&A. <http://www.health.mil/Content/docs/FINAL%20HB%20Survey%20QAs%2012152009.pdf>. Accessed November 15, 2010.
6. Hsu LL, Nevin RL, Tobler SK, Rubertone MV. Trends in overweight and obesity among 18-year-old applicants to the United States military, 1993-2006. *J Adolesc Health.* 2007;41(6):610-2.
7. McLaughlin R, Wittert G. The obesity epidemic: implications for recruitment and retention of defence force personnel. *Obes Rev.* 2009;10(6):693-9.
8. Smith TJ, Sigrist LD, Bathalon GP, McGraw S, Karl JP, Young AJ. Efficacy of a meal-replacement program for promoting blood lipid changes and weight and body fat loss in US Army soldiers. *J Am Diet Assoc.* 2010;110(2):268-73.
9. Hunter CM, Peterson AL, Alvarez LM, Poston WC, Brundige AR, Haddock CK, Van Brunt DL, Foreyt JP. Weight management using the internet a randomized controlled trial. *Am J Prev Med.* 2008;34(2):119-26.
10. Bowles SV, Picano J, Epperly T, Myer S. The LIFE program: a wellness approach to weight loss. *Mil Med.* 2006;171(11):1089-94.
11. Nelson MS, Robbins AS, Thornton JA. An intervention to reduce excess body weight in adults with or at risk for type 2 diabetes. *Mil Med.* 2006;171(5):409-14.
12. Simpson M, Earles J, Folen R, Trammel R, James L. The Tripler Army Medical Center's LE3AN program: a six-month retrospective analysis of program effectiveness for African-American and European-American females. *J Natl Med Assoc.* 2004;96(10):1332-6.
13. Lalich RA. An initiative to retain reserve soldiers failing to meet weight and physical fitness standards: the Wisconsin Army National Guard experience. *Mil Med.* 2001;166(3):204-7.
14. James LC, Folen RA, Page H, Noce M, Brown J, Britton C. The Tripler LE3AN Program: a two-year follow-up report. *Mil Med.* 1999;164(6):389-95.
15. Davis MK. A comprehensive weight-loss program for soldiers. *Mil Med.* 1996;161(2):84-8.
16. Dennis KE, Pane KW, Adams BK, Qi BB. The impact of a shipboard weight control program. *Obes Res.* 1999;7(1):60-7.
17. Harvey-Berino J, West D, Krukowski R, Prewitt E, VanBiervliet A, Ashikaga T, Skelly J. Internet delivered behavioral obesity treatment. *Prev Med.* 2010;51(2):123-8.
18. Harvey-Berino J, Pintauro S, Buzzell P, Gold EC. Effect of internet support on the long-term maintenance of weight loss. *Obes Res.* 2004;12(2):320-9.
19. Williamson DA, Walden HM, White MA, York-Crowe E, Newton RL Jr, Alfonso A, Gordon S, Ryan D. Two-year internet-based randomized controlled trial for weight loss in African-American girls. *Obesity (Silver Spring).* 2006;14(7):1231-43.
20. Funk KL, Stevens VJ, Appel LJ, Bauck A, Brantley PJ, Champagne CM, Coughlin J, Dalcin AT, Harvey-Berino J, Hollis JF, Jerome GJ, Kennedy BM, Lien LF, Myers VH, Samuel-Hodge C, Svetkey LP, Vollmer WM. Associations of internet website use with weight change in a long-term weight loss maintenance program. *J Med Internet Res.* 2010;12(3):e29.
21. Morgan PJ, Lubans DR, Collins CE, Warren JM, Callister R. The SHED-IT randomized controlled trial: evaluation of an Internet-based weight-loss program for men. *Obesity (Silver Spring).* 2009;17(11):2025-32.
22. Gabriele JM, Stewart TM, Sample A, Davis AB, Allen R, Martin CK, Newton RL Jr, Williamson DA. Development of an internet-based obesity prevention program for children. *J Diabetes Sci Technol.* 2010;4(3):723-32.
23. Webber KH, Gabriele JM, Tate DF, Dignan MB. The effect of a motivational intervention on weight loss is moderated by level of baseline controlled motivation. *Int J Behav Nutr Phys Act.* 2010;7:4.
24. Tate DF, Wing RR, Winnett RA. Using Internet technology to deliver a behavioral weight loss program. *JAMA.* 2001;285(9):1172-7.
25. Tate DF, Jackvony EH, Wing RR. A randomized trial comparing human e-mail counseling, computer-automated tailored counseling, and no counseling in an Internet weight loss program. *Arch Intern Med.* 2006;166(15):1620-5.
26. Saperstein SL, Atkinson NL, Gold RS. The impact of Internet use for weight loss. *Obes Rev.* 2007;8(5):459-65.
27. Van den Berg MH, Schoones JW, Vliet Vlieland TP. Internet-based physical activity interventions: a systematic review of the literature. *J Med Internet Res.* 2007;9(3):e26.
28. Stewart T, Han H, Allen RH, Bathalon G, Ryan DH, Newton RL Jr, Williamson DA. H.E.A.L.T.H.: efficacy of an internet/population-based behavioral weight management program for the U.S. Army. *J Diabetes Sci Technol.* 2011;5(1):178-87.
29. Stewart T, May S, Allen HR, Bathalon CG, Lavergne G, Sigrist L, Ryan D, Williamson DA. Development of an internet/population-based weight management program for the U.S. Army. *J Diabetes Sci Technol.* 2008;2(1):116-26.
30. Littell RC, Milliken GA, Stroup WW, Wolfinger RD. SAS system for mixed models. Cary: SAS Institute, Inc.; 1996.
31. World Health Organization. Obesity: preventing and managing the global epidemic. Geneva: World Health Organization; 1998.
32. Flegal KM, Carroll MD, Ogden CL, Curtin LR. Prevalence and trends in obesity among US adults, 1999-2008. *JAMA.* 2010;303(3):235-41.
33. Varnell SP, Murray DM, Janega JB, Blitstein JL. Design and analysis of group-randomized trials: a review of recent practices. *Am J Public Health.* 2004;94(3):393-9.