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An Evaluation of Army Wellness Center Clients' Health-Related Outcomes

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Abstract

Purpose: To examine whether Army community members participating in a best-practice based workplace health promotion program (WHPP) experience goal-moderated improvements in health-related outcomes.

Design: Pretest/posttest outcome evaluation examining an autonomously participating client cohort over 1 year.

Setting: Army Wellness Center facilities on 19 Army installations.

Participants: Army community members sample (N = 5703), mostly Active Duty Soldiers (64%).

Intervention: Assessment of health risks with feedback, health assessments, health education classes, and health coaching sessions conducted by health educators at a recommended frequency of once a month for 3 to 12 months.

Measures: Initial and follow-up outcome assessments of body mass index (BMI), body fat, cardiorespiratory fitness, blood pressure, and perceived stress.

Analysis: Mixed model linear regression testing for goal-moderated improvements in outcomes.

Results: Clients experienced significant improvements in body fat (−2% change), perceived stress (−6% to −12% change), cardiorespiratory fitness (+6% change), and blood pressure (−1% change) regardless of health-related goal. Only clients with a weight loss goal experienced BMI improvement (−1% change). Follow-up outcome assessment rates ranged from 44% (N = 2509) for BMI to 6% (N = 342) for perceived stress.

Conclusion: Army Wellness Center clients with at least 1 follow-up outcome assessment experienced improvements in military readiness correlates and chronic disease risk factors. Evaluation design and follow-up-related limitations notwithstanding results suggest that best practices in WHPPs can effectively serve a globally distributed military force.

Keywords

population health, employee assistance programs, workplace, primary prevention, military, fitness, nutrition, stress management, weight control, army wellness centers

Purpose

The US Army must maintain a healthy force that has the physical, mental, emotional, and behavioral capabilities to adapt to and cope with adversity. Unhealthy lifestyles and behavior—including inadequate physical activity, poor dietary habits, and chronic stress—are prevalent among Army community members and undermine the Army's ability to maintain a healthy force. Among Active Duty Army personnel, 69% and 57% report engaging in recommended amounts of moderate-intensity and vigorous-intensity aerobic activity, respectively, 75% report engaging in recommended levels of strength training, only 4% to 10% report consuming fruits and vegetables at least 3 times per day, and 45% report an overall high level of stress.[1-4] Unhealthy lifestyles and behaviors often culminate in overweight and obesity,[5-7] and elevated rates of overweight and obesity have been observed among Active Duty Army (52% and 16%, respectively),[4] military retirees (38%-39% and 22%-33%, respectively), and family members of Active Duty military (27% and 20%, respectively).[8] Unhealthy behaviors

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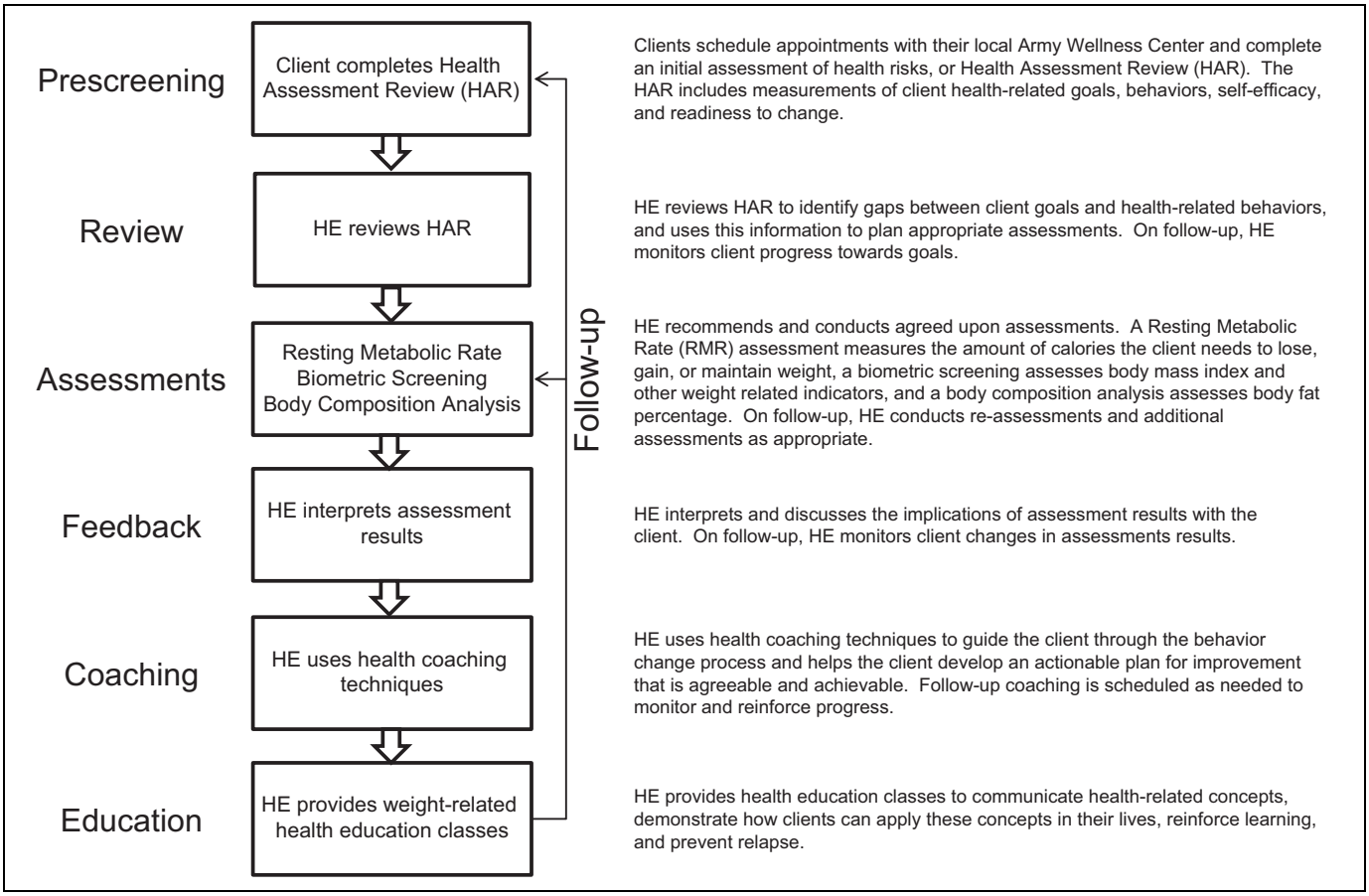

Figure 1. Sample AWC workflow for overweight/obese client. AWC indicates Army Wellness Center.

and weight impede soldiers' ability to meet Army body composition standards, which puts them at risk for nondeployment or discharge, increases soldiers' lifetime risk of developing behaviorally mediated chronic diseases,[9,10] and may lower productivity.[11,12] Together, weight-related medical problems and productivity losses were estimated to cost the Military Health System's TRICARE program an unsustainable $3.3 billion in fiscal year 2014.[13]

As an employer, the US Army can do a great deal to address the prevalence of unhealthy behaviors and associated chronic disease risk throughout the Army community. The literature on Workplace Health Promotion Programs (WHPPs) offers valuable insight into how population-wide health can be impacted in a work setting. Multiple studies, systematic reviews, and meta-analyses converge on the conclusion that WHPPs can improve employees' health-related behaviors and mitigate chronic disease risk factors.[14-22] As part of a comprehensive plan to transition the Army toward a proactive, prevention-focused system for health, the Army Office of the Surgeon General tasked the Army Public Health Center (APHC) with developing and implementing a standardized workplace wellness education model to deliver synchronized, primary prevention services to the Army community.

The Army Wellness Center (AWC) model was designed to deliver individual- and group-based health education services that promote and sustain healthy lifestyles and improve overall well-being among Army community members—including Active Duty Soldiers, family members, retirees, reservists, and civilians. The model is based on principles of the transtheoretical model,[23] the health belief model,[24] and the social ecological model.[25,26] The AWC health educators (HEs) deliver the model by conducting health assessments, providing feedback and education, and coaching their clients through 6 core programs. The core programs are Health Assessment Review (HAR), Physical Fitness, Healthy Nutrition, Stress Management, Tobacco Education, and General Wellness Education. Army Wellness Center clients begin their participation in the program by completing an initial HAR in which they self-report on their health status and health risk factors and with which AWC HEs use to assess health risks and guide clients through one or more of the remaining 5 core programs. Clients schedule appointments with HEs to participate in various goal-related health assessments, health coaching sessions, and health education classes and are encouraged to return for follow-ups (Figure 1). Health educators encourage clients to complete follow-up HARs every 30 days, so that services can be adjusted accordingly.

Army Wellness Centers are strategically located on Army installations in the United States, Europe, and Northeast Asia. Their locations are based on Army Staffing Installation Plan data, which project the positioning of troop populations

Table 1. Overview of Army Wellness Center Core Programs, Program Components/Subcomponents, Assessments/Measures, and Equipment/Tools.

Core Program	Component and Subcomponent	Assessment/Measure	Equipment/Tool
(1) Health assessment review	Health Assessment Review	Self-reported health-related goals, health-related behaviors, self-efficacy to change health-related behaviors, readiness to change health-related behaviors, and stress levels (adapted from[30])	Health Assessment Review (HAR)
	Biometric Assessment	Body mass index	Weight scale with height rod
		Blood pressure	Blood pressure monitor
		Resting heart rate	Blood pressure monitor
		Waist girth/waist circumference	Measurement tape
(2) Healthy nutrition	Metabolic testing[31]	Resting metabolic rate • Indirect calorimetry	*Cosmed* FitMate Pro
	Group-based healthy nutrition education classes		
(3) Physical fitness[31]	Cardiorespiratory Fitness	Estimated $.VO_{2max}$[32] • Direct gas analyzer	*Cosmed* FitMate Pro and treadmill or cycle ergometer
	Flexibility	Sit and reach test	*Novel* Flex Tester
	Strength	Static grip strength	Spring-loaded hand dynamometer (static grip strength)
		Static back strength	Dynamometer platform (static back strength)
	Body composition analysis	Body fat percentage	
		• Air displacement plethysmography	*Cosmed* Bod Pod
		• Ultrasound	*BodyMetrix* Pro
		• Bioelectrical impedance	*Body Stat* Technology
(4) Stress management	Biofeedback	High, medium, and low coherence	HeartMath emWave2
	Stress management techniques (deep breathing, guided imagery, and muscle relaxation)	Perceived stress	10-item Perceived Stress Scale (PSS-10)[33]
(5) Tobacco education	Tobacco habit assessment, tobacco free living education, Army Medical Home referral for tobacco cessation services	Self-reported measures of tobacco use	Health Assessment Review (HAR)
(6) General wellness education	Health coaching and group-based health education classes on healthy lifestyle and sleep habits	No assessment	No equipment

Abbreviation: $.VO_{2max}$, estimated maximum oxygen consumption.

throughout the world over time. The strategic implementation goal is for AWCs to be located on installations with the highest concentration of soldier populations, which are generally known as Forces Command installations.

Each AWC is staffed with a dedicated team of allied health professionals that includes a director, HEs, and health promotion technicians. The number of HEs assigned to each AWC is based on the size of the beneficiary population on the installation. Staff members hold National Commission for Certifying Agency recognized credentials—from the American College of Sports Medicine, the National Commission for Health Education Credentialing, the National Strength and Conditioning Association, and the American Council on Exercise—and are educated in theories of behavior change.[23-27] They are trained to provide motivational interviewing-based health coaching[28] and assessment of health risks with feedback and health education (AHRF+HE).[14] The AHRF+HE involves collecting information about an individual's health-related behaviors or indicators, using that information to identify health risks, and providing feedback and education according to health risks. Dedicated staff, behavior change theory, motivational interviewing, and AHRF+HE are common elements

Table 2. Client Goals of Interest, Associated Dependent Variables, and Sample Sizes.

Initial Goal	Dependent Variable	Initial Assessment, n	Most Recent Follow-Up Assessment, n (%)	Number of Days Between Initial and Most Recent Follow-Up, Mean (Median)
Lose body fat	Body fat percentage	4525	1082 (23.9%)	126.6 (84.0)
Lose weight	Body mass index (BMI)	5011	2217 (44.2%)	84.7 (28.0)
Reduce stress	Perceived stress scale total score	5639	768 (13.6%)	179.9 (155.5)
Improve general fitness	$.VO_{2max}$	1966	110 (5.6%)	195.3 (186.0)
Lower blood pressure	Total blood pressure	4839	1909 (39.5%)	84.2 (24.0)

Abbreviation: $.VO_{2max}$, estimated maximum oxygen consumption.

of effective WHPPs[14,29] and are represented in the core programs that AWCs provide. Table 1 shows an overview of the 6 core program components, assessments/measures, and equipment/tools used. Details about AWC model are outlined elsewhere.[34,35]

The AWC model is applied at all levels of the social ecological model.[25,26] For instance, AWC staff provide health education and coaching to influence client knowledge and attitudes about health risks (individual level), they contact clients to remind them of appointments and personally stated goals (interpersonal level), they interface with Army Medical Home staff to encourage client referrals from Medical Home providers to AWC staff when appropriate (organizational level), they market their services and provide program monitoring data at local Army community health promotion coalition meetings that are led by installation leaders who collaborate on Army community health and readiness initiatives (community level), and they provide health education and health coaching services to clients to help them meet Army Soldier policy requirements to maintain physical readiness (eg, body composition) standards (policy level).

An initial process and outcome evaluation of the AWC model helped establish the feasibility of model implementation and identified the need to enhance program standardization and data collection.[36] Results suggested that program participation was associated with significant improvements in clients' body mass index (BMI), blood pressure, muscle strength, flexibility, and cardiorespiratory fitness over time. However, potential confounding variables were not measured or incorporated into statistical models, data were not systematically collected, and only 5 AWCs were examined in this initial evaluation. An enterprise information management system has since been developed and implemented to systematically collect data, and 14 additional sites have implemented the AWC model with improved assessment and data collection standardization.

The current public health evaluation addresses limitations identified in this initial evaluation of AWCs.[36] It examines whether AWC clients experience health-related improvements over time after statistically accounting for alternative explanations (eg, client characteristics and program participation measures) and use data systematically collected from more sites. The objective is to assess whether AWC clients experience goal-related changes in their disease risk factors—including body fat, BMI, perceived stress, cardiorespiratory fitness, and blood pressure—after participation in AWC services.

Methods

This evaluation was approved as ethical public health practice by the APHC's Public Health Review Board. All clients signed a health-care records disclosure form explaining that their information could be used or disclosed to government organizations to perform Department of Defense–approved research or evaluation.

Sample

All Army community members are eligible to participate in AWC services, but AWCs are marketed and staffed to serve those who can benefit from increasing their healthy behaviors and lowering their chronic disease risk—which includes, for example, the 17% of Active Duty Soldiers identified as obese.[37]

The sample was a cohort of Army community member clients—including Active Duty Soldiers, family members, retirees, reservists, and civilians—who voluntarily began participating in AWC services at one of 19 operational AWCs located on Army installations in the United States and Europe between October and December 2013 ($N = 5703$). Participation was free and open to all Army community members and participation was not mandated by their command. The sample primarily learned about the availability and accessibility of AWC services through word of mouth from coworkers, friends, or family members and secondarily learned about it through their primary care doctor, health-care provider, or clinic staff (Table 2). Sample cohort data were collected for 1 year after initial participation and data were analyzed in 2015.

Intervention

Army community members initiated participation in the program by contacting their local AWC to make an appointment. Clients completed an initial HAR wherein they completed the American College of Sports Medicine's Risk Stratification for exercise and reported their health-related goals, health-related behaviors (including physical activity level, diet and nutrition habits, and sleep habits), self-efficacy to change health-related behaviors, and readiness to change health-related behaviors. Army Wellness Center HEs used HAR information provided by clients to assess clients' health risks, give clients feedback about those risks, and recommend health assessments,

education, and coaching in one or more program areas (Table 1) to help clients address their risks and achieve their goals. The frequency, intensity, and duration of the intervention were based on recommendations made by AWC HEs and agreed upon by clients. General guidance was for clients to reengage or follow-up with the AWC at least once a month, over the course of 3 to 12 months. Reminder e-mails were sent to clients once a month. Figure 1 provides an example workflow for an overweight AWC client.

Measures

A single, centrally managed database that is simultaneously accessible by AWC staff and clients worldwide was used to collect HAR and assessment/measurement data over time. Health Assessment Review data included client demographics, goals, and health-related behaviors—including the 3 health-related behaviors of physical activity, (un)healthy food consumption, and sleep. For each health-related behavior, clients self-reported their self-efficacy to change ("I feel confident and competent to improve my ___"; from 1 = almost never true, 7 = almost always true; $\alpha = 0.84$) and readiness to change ("Indicate your readiness to improve your ___"; from 1 = I won't do it, 6 = I am still doing it; $\alpha = 0.81$). A general self-efficacy to change health-related behaviors score was calculated for each client by averaging their self-efficacy scores across all 3 health-related behaviors (possible range from 1 to 7), and a general readiness to change health-related behaviors score was calculated for each client by averaging their readiness to change scores across all 3 health-related behaviors (possible range from 1 to 6). These calculated scores were included in regression models as described in the Analysis section. Assessment/measurement data included body fat percentage, BMI, estimated maximum oxygen consumption ($.VO_{2max}$), perceived stress scale (PSS-10, $\alpha = 0.89$),[33] and blood pressure and were all measured using validated anthropometric or biometric technology by trained HEs (Table 1).

Design

Changes in risk factors for disease were examined using an intervention group only, pretest/posttest design that focused on clients with at least 1 follow-up assessment and compared their initial to their most recent assessment. We excluded clients without at least 1 follow-up assessment (Table 2), clients whose body composition was assessed using different tools at each assessment (n = 399), and the top and bottom 0.5% of each dependent variable (n = 9 to n = 51 each) to normalize distributions. Total N's included in analyses and the average number of days between initial and most recent assessment are shown in Table 2.

Analysis

Data were analyzed across all 19 AWC sites because soldiers/clients are geographically mobile and thus often begin their participation in AWC services at one location and continue their participation at another. Preliminary analyses identified the health-related goals that clients most commonly set and the availability of initial and follow-up assessment data. To examine whether clients experienced goal-consistent changes after accounting for known associates of these changes, data were entered into mixed model linear regression analyses using SAS 9.2 (Cary, North Carolina). Between-subject factors included clients' goal setting (set or not), sex, age, military status (Active Duty Soldier, family member, retiree, reservist, civilian, or other), general self-efficacy to change health-related behaviors, general readiness to change health-related behaviors, days between initial and most recent assessment, and number of assessments. Within-subject factors included assessment point (initial vs most recent). A 2-way interaction term between clients' goal setting and assessment point examined whether changes from initial to most recent measurement depended on client goal. All continuous predictors were centered at their mean.

Results

Client Characteristics

Clients were mostly Active Duty (64.4%) male (56.8%) soldiers, between the ages of 26 and 35 (37.6%) with an average age of $\bar{X} = 34.6$ years, who were most commonly informed about the AWC by a coworker, friend, or family member (26.8%) or primary care doctor, health-care provider, or clinic staff (13.6%; Table 3). Clients most commonly set goals to lose body fat (78.3%), lose weight (69.0%), improve general fitness (61.4%), reduce stress (39.2%), and/or lower blood pressure (17.6%; Table 3).

Clients reported often, usually, or almost always having the self-efficacy to improve their diet and nutritional habits (70.6%), physical fitness (77.7%), sleep (49.7%), and stress management (66.6%; Table 4). They most commonly reported being in the preparation stage (ie, I will do it) with regard to improving their diet and nutritional habits (38.8%), improving their sleeping habits (33.5%), and improving their stress management (39.2%) and in the maintenance stage (ie, I am still doing it) with regard to improving their physical fitness (33.8%).

Do Clients Experience Goal-Related Changes in Risk Factors for Disease?

Body fat. Approximately half of clients (49.0%; n = 530) decreased, 32.8% (n = 355) increased, and 18.2% (n = 197) experienced no change in body fat percentage. In the regression analysis, the assessment point effect was significant, $B = -.59$, SE = 0.26, $t(1059) = -2.27$, $P < .05$, 95% CI: −1.10 to −0.08, but the interaction between assessment point and body fat loss goal setting was not significant ($P > .05$; Table 4). This suggests that clients experienced a significant decrease in body fat between initial (adjusted $\bar{X} = 28.87\%$, SE = 0.59) and most

Table 3. Client Characteristics.[a]

Characteristic	N = 5703
Sex, n (%)	
Male	3237 (56.8)
Female	2466 (43.2)
Age, mean (SD)	34.6 (10.7)
Military status, n (%)	
Active Duty	3670 (64.4)
Family member	1119 (19.6)
Civilian	526 (9.2)
Retiree	172 (3.0)
Reservist	80 (1.4)
Other	49 (0.9)
Learned about the AWC, n (%)	
Coworker, friend, or family member	1530 (26.8)
Primary care doctor, health-care provider, or clinic staff	777 (13.6)
Unit commander, leader, or supervisor	593 (10.4)
Website	147 (2.6)
Advertisement, flyer, brochure, poster, bulletin	64 (1.1)
In-processing or orientation brief	57 (1.0)
Self-referred	54 (0.9)
AWC staff	46 (0.8)
News media/article	43 (0.8)
Fitness center	34 (0.6)
Other program or initiative	31 (0.5)
Other	749 (13.1)
Client goals, n (%)	
Lose body fat	4468 (78.3)
Lose weight	3935 (69.0)
General fitness	3499 (61.4)
Reduce stress	2236 (39.2)
Lower blood pressure	1006 (17.6)

Abbreviation: AWC, Army Wellness Center; SD, standard deviation.
[a]Clients could select more than 1 goal, so client goal percentages do not add up to 100%.

recent assessment (adjusted $\bar{X} = 28.23\%$, SE = 0.59, mean difference = −0.64%, percent change = −2.3%, t (1060) = −6.62, $P < .001$), which was similar in magnitude regardless of whether or not they set a goal to lose body fat.

Weight. Approximately half of clients (46.0%; n = 1018) decreased, 35.1% (n = 777) increased, and 19.0% (n = 422) experienced no change in BMI. In the regression analysis, the assessment point effect was not significant, $P > .05$, but the interaction between assessment point and weight loss goal setting was significant, $B = -20$, SE = 0.05, t (2170) = −3.89, $P < .001$, 95% CI: −0.31 to −0.10 (Table 5). This suggests that BMI change depended on whether clients set a goal to lose weight or not. Specifically, only clients who set a goal to lose weight saw a significant decrease in BMI between initial (adjusted $\bar{X} = 30.88$, SE = 0.25) and most recent assessment (adjusted $\bar{X} = 30.64$, SE = 0.25, mean difference = −0.25, percent change = −0.8, t (2170) = −9.11, $P < .001$).

Stress. Over half of clients (56.0%; n = 430) decreased, 37.8% (n = 290) increased, and 6.3% (n = 48) experienced no change in PSS-10 total score. In the regression analysis, both the assessment point effect, $B = -.67$, SE = 0.31, t (745) = −2.17, $P < .05$, 95% CI: −1.27 to −0.06, and the interaction between assessment point and stress reduction goal setting, $B = -1.19$, SE = 0.48, t (745) = −2.49, $P < .05$, 95% CI: −2.13 to −0.25, were significant (Table 6). Clients who set a goal to reduce stress saw a larger decrease in average PSS score between initial and most recent assessment (adjusted $M_{initial} = 15.66$, $SE_{initial} = 0.56$, adjusted $M_{mostrecent} = 13.81$, $SE_{mostrecent} = 0.56$, mean difference = −1.86, percent change = −11.9%, t (745) = −5.08, $P < .001$) compared to clients who did not set a goal to reduce stress (adjusted $M_{initial} = 11.65$, $SE_{initial} = 0.50$, adjusted $M_{mostrecent} = 10.99$, $SE_{mostrecent} =$

Table 4. Mixed Model Linear Regression of Body Fat Percentage on Client Characteristics and Program Exposure.[a]

Predictor	Level	Estimate	SE	*df*	*t*	*P*	95% CI
Intercept		29.91	0.76	1, 1048	39.27	<.001[b]	28.42 to 31.41
Goal to lose body fat	Set	6.28	0.65	1, 1048	9.72	<.001[b]	5.01 to 7.55
Sex	Male	−8.69	0.53	1, 1048	−16.36	<.001[b]	−9.74 to −7.65
Age		0.20	0.02	1, 1048	8.15	<.001[b]	0.15 to 0.25
Status	Family member	1.10	0.67	1, 1048	1.65	>.05	−0.21 to 2.42
	DA civilian	−1.11	0.80	1, 1048	−1.40	>.05	−2.67 to 0.45
	Reservist	0.52	1.74	1, 1048	0.30	>.05	−2.90 to 3.93
	Retiree	2.29	1.36	1, 1048	1.69	>.05	−0.37 to 4.96]
	Other	−1.88	2.26	1, 1048	−0.83	>.05	−6.31 to 2.56
Self-efficacy		−0.93	0.22	1, 1048	−4.26	<.001[b]	−1.35 to −0.50
Readiness to change		−1.29	0.34	1, 1048	−3.80	<.001[b]	−1.95 to −0.62
Days between assessments		−0.004	0.002	1, 1048	−1.94	>.05	−0.01 to 0.00004
Number of assessments (log transformed)		0.03	0.62	1, 1048	0.05	>.05	−1.18 to 1.25
Assessment point	Most recent assessment	−0.59	0.26	1, 1059	−2.27	<.05[c]	−1.10 to −0.08
Assessment point × goal to lose body fat		−0.06	0.28	1, 1059	−0.21	>.05	−0.61 to 0.49

Abbreviations: DA, Department of Army; SE, standard error; CI, confidence interval; AIC, akaike information criterion; BIC, Bayesian Information Criterion.
[a]$\chi^2(1) = 1802.82$, $P < .001$, AIC = 12619.4, BIC = 12619.7. Covariance structure is compound symmetry. Estimation method is maximum likelihood. N = 1061 unique clients are included in analysis. Reference group for status is Active Duty.
[b]$P < .001$.
[c]$P < .05$.

Table 5. Mixed Model Linear Regression of Body Mass Index on Client Characteristics and Program Exposure.[a]

Predictor	Level	Estimate	SE	*df*	*t*	*P*	95% CI
Intercept		24.19	0.26	1, 2159	94.65	<.001[b]	23.68 to 24.69
Goal to lose weight	Set	4.89	0.20	1, 2159	24.36	<.001[b]	4.50 to 5.29
Sex	Male	2.17	0.21	1, 2159	10.26	<.001[b]	1.76 to 2.59
Age		0.02	0.01	1, 2159	2.49	<.05[c]	0.005 to 0.04
Status	Family member	1.27	0.27	1, 2159	4.71	<.001[b]	0.74 to 1.80
	DA civilian	0.90	0.33	1, 2159	2.75	<.01[d]	0.26 to 1.54
	Reservist	−0.40	0.75	1, 2159	−0.53	>.05	−1.88 to 1.07
	Retiree	1.68	0.57	1, 2159	3.00	<.01[d]	0.57 to 2.79
	Other	0.87	0.99	1, 2159	0.88	>.05	−1.08 to 2.82
Self-efficacy		−0.42	0.09	1, 2159	−4.90	<.001[b]	−0.59, −0.25
Readiness to change		0.04	0.13	1, 2159	0.27	>.05	−0.22 to 0.30
Days between assessments		−0.0003	0.001	1, 2159	−0.28	>.05	−0.002 to 0.002
Number of assessments (log transformed)		0.47	0.26	1, 2159	1.84	>.05	−0.03 to 0.98
Assessment point	Most recent assessment	−0.04	0.04	1, 2170	−0.95	>.05	−0.13 to 0.05
Assessment point × goal to lose weight		−0.20	0.05	1, 2170	−3.89	<.001[b]	−0.31 to −0.10

Abbreviations: DA, Department of Army; SE, standard error; CI, confidence interval; AIC, akaike information criterion; BIC, Bayesian Information Criterion.
[a]$\chi^2(1) = 5665.69$, $P < .001$, AIC = 18633.5, BIC = 18730.1. Covariance structure is compound symmetry. Estimation method is maximum likelihood. N = 2172 unique clients are included in analysis. Reference group for status is Active Duty.
[b]$P < .001$.
[c]$P < .05$.
[d]$P < .01$.

Table 6. Mixed Model Linear Regression of Perceived Stress Scale Score on Client Characteristics and Program Exposure.[a]

Predictor	Level	Estimate	SE	*df*	*t*	*P*	95% CI
Intercept		12.33	0.52	1, 735	23.51	<.001[b]	11.30 to 13.36
Goal to reduce stress	Set	4.01	0.50	1, 735	8.08	<.001[b]	3.04 to 4.99
Sex	Male	−0.86	0.51	1, 735	−1.67	>.05	−1.86 to 0.15
Age		−0.06	0.02	1, 735	−2.75	<.01[c]	−0.11 to −0.02
Status	Family member	0.44	0.63	1, 735	0.70	>.05	−0.79 to 1.68
	DA civilian	−0.20	0.75	1, 735	−0.26	>.05	−1.68 to 1.28
	Reservist	−1.73	1.70	1, 735	−1.02	>.05	−5.06 to 1.60
	Retiree	0.21	1.23	1, 735	0.17	>.05	−2.21 to 2.63
Self-efficacy		−1.73	0.22	1, 735	−7.75	<.001[b]	−2.17 to −1.29
Readiness to change		−0.82	0.35	1, 735	−2.38	<.05[d]	−1.50 to −0.15
Days between assessments		−0.002	0.002	1, 735	−0.80	>.05	−0.01 to −0.002
Number of assessments (log transformed)		−1.06	0.70	1, 735	−1.51	>.05	−2.43 to 0.32
Assessment point	Most recent assessment	−0.67	0.31	1, 745	−2.17	<.05[d]	−1.27 to −0.06
Assessment point × goal to reduce stress		−1.19	0.48	1, 745	−2.49	<.05[d]	−2.13 to −0.25

Abbreviations: DA, Department of Army; SE, standard error; CI, confidence interval; AIC, akaike information criterion; BIC, Bayesian Information Criterion.
[a]$\chi^2(1) = 239.26$, $P < .001$, AIC = 9665.3, BIC = 9739.1. Covariance structure is compound symmetry. Estimation method is maximum likelihood. N = 747 unique clients are included in analysis. Reference group for status is Active Duty.
[b]$P < .001$.
[c]$P < .01$.
[d]$P < .05$.

0.50, mean difference = −0.67, percent change = −5.7%, t (745) = −2.17, $P < .05$).

General fitness. There were not enough follow-up fitness assessment data to confidently analyze and interpret regression analysis results. However, over two-thirds of clients (68.1%, n = 75) increased, 31.0% (n = 34) decreased, and 0.9% (n = 1) experienced no change in estimated $.VO_{2max}$. Overall, clients experienced an average increase of 2.22 mL/kg/min, or a +5.7 percent change, $P < .001$.

Blood pressure. Over half of clients (53.8%, n = 1027) decreased, 43.7% (n = 835) increased, and 2.5% (n = 47) experienced no change in total blood pressure. In the regression analysis, the assessment point effect was significant, $B = -1.88$, SE = 0.46, t (1857) = −4.07, $P < .05$, 95% CI: −2.78 to −0.97 (Table 7), suggesting that clients experienced a significant decrease in total blood pressure between initial (adjusted $\bar{X} = 204.57$, SE = 0.96) and most recent assessment (adjusted $\bar{X} = 206.82$, SE = 0.96, mean difference = −2.25, percent change = −1.1%, t(1858) = −5.41, $P < .001$). Moreover, the

Table 7. Mixed Model Linear Regression of Total Blood Pressure on Client Characteristics and Program Exposure.[a]

Predictor	Level	Estimate	SE	*df*	*t*	*P*	95% CI
Intercept		193.20	0.84	1, 1847	230.93	<.001[b]	191.56 to 194.84
Goal to lower blood pressure	Set	11.83	1.10	1, 1847	10.77	<.001[b]	9.68 to 13.99
Sex	Male	10.67	0.89	1, 1847	12.00	<.001[b]	8.93 to 12.41
Age		0.24	0.04	1, 1847	5.85	<.001[b]	0.16 to 0.32
Status	Family member	0.51	1.14	1, 1847	0.44	>.05	−1.73 to 2.75
	DA civilian	3.08	1.39	1, 1847	2.21	<.05[c]	0.35 to 5.82
	Reservist	1.60	3.36	1, 1847	0.47	>.05	−5.00 to 8.19
	Retiree	8.30	2.44	1, 1847	3.39	<.001[b]	3.50 to 13.09
Self-efficacy		−1.11	0.36	1, 1847	−3.07	<.01[d]	−1.82 to −0.40
Readiness to change		−0.13	0.57	1, 1847	−0.22	>.05	−1.25 to 0.99
Days between assessments		−0.004	0.003	1, 1847	−1.19	>.05	−0.01 to 0.003
Number of assessments (log transformed)		0.32	1.15	1, 1847	0.28	>.05	−1.93 to 2.57
Assessment point	Most recent assessment	−1.88	0.46	1, 1857	−4.07	<.001[b]	−2.78 to −0.97
Assessment point × goal to lower blood pressure		−2.03	1.07	1, 1857	−1.89	>.05	−4.13 to 0.08

Abbreviations: DA, Department of Army; SE, standard error; CI, confidence interval; AIC, akaike information criterion; BIC, Bayesian Information Criterion.
[a]$\chi^2(1) = 532.95$, $P < .001$, AIC = 31515.4, BIC = 31603.8. Covariance structure is compound symmetry. Estimation method is maximum likelihood. N = 1859 unique clients are included in analysis. Reference group for status is Active Duty.
[b]$P < .001$.
[c]$P < .05$.
[d]$P < .01$.

interaction between assessment point and blood pressure goal setting was not significant, $P > .05$, suggesting that the decrease in total blood pressure was similar in magnitude regardless of whether or not clients set a goal to reduce blood pressure.

Discussion

Army Wellness Centers were developed to provide individual- and group-based health education and coaching services to improve military preparedness and reduce risk factors for chronic, behaviorally mediated disease. This evaluation examined associations between AWC clients' participation in the program and changes in their risk factors based on their health-related goals. Results will be used to help improve AWC services and provide insight into the benefits that may be realized as WHPPs are adapted for and implemented in military settings.

Clients who returned for at least 1 follow-up assessment generally experienced improvements in chronic disease risk factors, often regardless of their goals. Improvements in body fat, BMI, perceived stress, cardiorespiratory fitness, and blood pressure were observed. Results were consistent with multiple studies, systematic reviews, and meta-analyses, concluding that the intervention components commonly included in WHPPs can effectively increase health-related behaviors and reduce risk factors for chronic disease.[14,15,17-22,38-40] The magnitude of improvements observed between initial and most recent assessment of body fat, BMI, perceived stress, cardiorespiratory fitness, and blood pressure was generally small and consistent with those observed in studies of WHPPs and health behavior change interventions ($d = 0.1$-0.4).[15,17-22,38-41]

Although small in magnitude, interventions that have small effects can have important public health relevance when delivered to a large segment of the population.[42] As such, it may be possible to increase AWCs' public health relevance by ensuring that they have a large reach and serve a large portion of the population in need. Even small improvements in weight have been shown to have large positive impact on military readiness. For example, based on US population-level data from the National Health and Nutrition Examination Surveys, a 1% decrease in weight and body fat could increase the size of the US military-age population meeting Army weight and body fat standards, and thereby potentially eligible for military service, by more than 600,000 men and 1 million women.[43]

Army Wellness Center clients generally saw improvements regardless of the health-related goals they set out to achieve. One possible explanation for this is that any given health-related behavior has the potential to impact multiple outcomes. For example, if a client sets a goal to improve his or her physical fitness and he or she develops health-related behaviors in support of this goal, those behaviors may then also result in improvements in other outcomes, such as perceived stress or blood pressure.[44] Another possible explanation is that participation in AWC services may make health-related behaviors in general more salient, regardless of the specific health-related behaviors being coached, and this may result in improvements in risk factors that were not necessarily targeted by clients.[45] When change is made in one behavior, self-efficacy for change in another behavior can increase.[46] On the other hand, BMI improved only among clients with a weight loss goal and perceived stress improved more among clients with a stress management goal. Initial outcome measure differences by client goal may explain why. Clients with a weight loss goal were initially *obese* on average, whereas clients without this goal were initially *normal* on average. Similarly, average perceived stress was initially higher among clients with versus without a stress management goal. Thus, there may

have been more room for improvement among clients with versus without these goals.

Limitations

This public health evaluation did not include a control or comparison group, which would have permitted causal inferences about AWC participation and improvements. This was partially offset by statistically accounting for known associates of changes in health behaviors and disease risk factors. This limitation will be further addressed during a second phase with the inclusion of control and comparison groups, as the evaluation process involves increasingly rigorous designs over a program's lifecycle. In addition, fewer than 50% of clients had follow-up assessments, limiting the generalizability of findings to those clients who were in need and/or motivated to be reassessed. To mitigate the effects of this limitation, analyses controlled for client self-efficacy and stage of change at program initiation. Relatedly, conclusions about the association between estimated $.VO_{2max}$ and AWC participation were limited due to a particularly low follow-up assessment rate for this outcome. This may at least partially be attributed to the fact that $.VO_{2max}$ assessments require longer preparation times and may require more effort than other AWC assessments. For instance, estimated $.VO_{2max}$ assessments require clients to refrain from food, drink, tobacco, or medication for at least 5 hours prior to assessment and can only be done while the client is active for an extended period of time on a treadmill or stationary bike. In comparison, body fat assessments only require clients to refrain from these same things for 2 hours prior to assessment and can be done while the client is sitting/not active. Thus, it is possible that clients are generally less likely to meet the guidelines for $.VO_{2max}$ assessment (and thus less likely to be eligible to participate in a follow-up assessment) and/or less likely to want to reengage in the added effort required to participate in $.VO_{2max}$ assessment follow-ups. Lastly, stress-related outcome data were self-reported and thus susceptible to response bias. However, all other dependent variables were measured using validated anthropometric or biometric technology by trained HEs.

Conclusions

Army community members' participation in the AWC WHPP is associated with improvements in multiple intermediate health outcomes. This finding suggests that the WHPP approach to improving soldiers' risk factors for disease holds promise for improving military members' health and readiness. It also more generally provides a demonstration that theory-based behavior change interventions and other best practices in workplace wellness can be standardized across an enterprise to serve a globally distributed and mobile population in diverse settings. By empowering soldiers through the process of healthy behavior change, AWCs are poised to prepare soldiers for the military challenges of today and decrease disease risk among the Army community members of tomorrow.

SO WHAT?

What is already known on this topic?

Unhealthy lifestyles among Army community members increase this population's risk of developing behaviorally mediated chronic diseases, culminate in unsustainable health-related costs to the Department of Defense, and challenge the Army's maintenance of a healthy force.[1-7,9-12] Workplace health promotion programs (WHPPs) can effectively reduce health-related risk factors for chronic disease,[14,15,17-22,38-40] particularly when they incorporate the best practices of assessing health risks with feedback and health education.[14]

What does this article add?

Little is known about the extent to which best practices in WHPPs can effectively serve a globally dispersed and mobile military community. Although there is a growing literature documenting community health-related issues in military populations, there is less work examining efforts and interventions to address these issues. A WHPP that standardizes best practices to serve Army community members is evaluated for its potential to reduce risk factors for disease using an implementation research approach. Evidence documented herein suggests that WHPPs can provide viable support to Army community members seeking to make health-related improvements.

What are the implications for health promotion practice or research?

A WHPP model that is rooted in best practices, routinely monitored and evaluated, and standardized to serve a geographically dynamic population may be an effective component of a comprehensive strategy to maintain a healthy military force. Additional implementation research is needed to identify barriers and facilitators to WHPP program engagement and reengagement in military settings, and stronger tests of model effectiveness that incorporate comparison or minimal treatment control group designs are also needed. Increasing our understanding of factors underlying Army community member engagement in WHPPs and factors facilitating model effectiveness in this population will help advance military-based health promotion practice.

Authors' Note

Dr L. Omar Rivera developed the project plan, managed data collection, completed the majority of analyses, and assisted in manuscript writing. Dr Jessica Ford completed some of the analyses and assisted in manuscript writing. Dr Meredith Hartzell assisted in manuscript writing. Mr Todd A. Hoover provided consultation on the project. Dr L. Omar Rivera and Mr Todd A. Hoover had a role in

developing the data collection tools used to collect data for this project. Dr L. Omar Rivera, Dr Meredith Hartzell, and Mr Todd Hoover have ongoing full access to the data collected for this project. The views, opinions, and/or findings contained in this manuscript are those of the authors and should not be construed as an official Department of the Army position, policy, or decision unless so designated by official documentation.

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