U.S. Army Reserve Component Holistic Health and Fitness Pilot Evaluation

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Abstract

Purpose: The U.S. Army's Holistic Health and Fitness (H2F) program consists of five domains: physical readiness, nutritional readiness, mental readiness, spiritual readiness, and sleep readiness. This presentation summarizes data on injuries, physical fitness, body composition, and other health factors for U.S. Army Reserve Command (USARC) soldiers participating in the baseline phase of a H2F Pilot Program.

Methods: Twenty-one USARC units are participating in the Pilot, with each unit assigned to one of three implementation groups: 1) maximum intervention including in-person education modules and app-based physical training guidance; 2) moderate intervention with fewer resources; and 3) no intervention. Surveys were administered to participating units in late 2021 to collect baseline data on recent injuries, fitness, obesity, and health behaviors. Data were linked to medical records and Army Combat Fitness Test performance. Descriptive statistics were calculated to characterize the health status of Reserve Command (RC) soldiers. Multivariable regression was used to identify risk factors for injuries, obesity, and factors associated with passing the ACFT.

Results: Among 2,095 baseline survey respondents, more than a quarter (28%) of men and over one third (35%) of women reported at least one injury in the previous 12 months. Injuries were most often strains (19%) and sprains (12%), involved the lower back (21%) and knees (19%), and were associated with running (22%) and weightlifting (18%). Significant baseline risk factors for injury among men identified by multivariable analysis were age ≥ 35 y, BMI ≥ 27.5 kg·m-2, moderate weekly exercise, no sprint training, and ≤ 5 h·night-1 sleep. Injury risk factors among women were age ≥ 35 years, BMI ≥ 30 kg·m-2, and moderate/high perceived stress. More than one-quarter (27%) of men and 17% of women were obese; factors associated with obesity included older age and slower times on the ACFT 2-mile run. Among RC soldiers who took the ACFT as of December 2021, 69% passed; factors associated with passing included BMI < 27.5 kg·m-2 and participation in physical training. Results during the follow-up phase (2023) will be collected and compared with baseline (2021) for all three implementation groups to quantify the impacts of the Pilot program.

Conclusions: Injuries and risk factors in this Reserve population are similar to those reported in other military populations, despite differing exposures. Recommendations to improve modifiable risk factors such as BMI, physical training, and sleep will be emphasized, after consideration of future multivariable analysis results.

Military Impact: Results will inform future USARC Holistic Health and Fitness policy and implementation.

Background

- On 1 October 2020, the Army adopted new doctrine for the physical and non-physical readiness training of Soldiers, the comprehensive H2F System.[1]
  - The five domains of the H2F System include physical readiness, nutritional readiness, mental readiness, spiritual readiness, and sleep readiness.
  - H2F also operationalizes a new Army Physical Fitness Test, the Army Combat Fitness Test (ACFT), which consists of six events to assess physical performance: dead lift, standing power throw, hand release pushups, sprint-drag-carry, plank, and 2-mile run.
  - All components of the Army are implementing H2F; all Reserve Component Soldiers must have an ACFT on record by 1 April 2024.[3]
- The USARC developed an innovative model to pilot H2F among selected USARC groups.
  - Twenty-one USARC Troop Program Units (TPUs) in the southeast geographical region of the United States were identified by the USARC to participate in the H2F Pilot Program.
  - The USARC has strategically assigned TPUs to the three groups to achieve a comparable population in each group (1,000-1,200 RC Soldiers per group).
  - Two implementation groups are executing pilot program strategies and one comparison group is not implementing specific H2F programming beyond required ACFT participation and Army-wide H2F guidance.
  - H2F strategies include virtual education with expert instructors, app-based customized physical training, online educational resources, and connections to unit physical therapist, dietician, and human performance advisor. One of the two implementation groups is participating in all of these efforts, and the other is conducting all of the H2F activities except virtual education and app-based training.
- The first phase of this project, reported here, investigated baseline ACFT performance, body composition, injury rates, and injury details such as injured body part and mechanism of injury, before the effects of H2F implementation. The second phase (late 2023) will compare baseline results to post-H2F results across implementation groups.[4]

Methods

- Data collection
  - An electronic survey was administered to 3,926 U.S. Army Reserve Component Soldiers in July-December 2021.
  - Respondents reported demographics, personal characteristics, injuries in the previous 12 months, physical fitness test performance, physical training activities, health behaviors, and health knowledge.
  - Survey responses were linked to fitness test and body composition records in the Defense Training Management System.
- Data analysis
  - Descriptive summaries of injury details were prepared.
  - Multiple logistic regression models were used to determine variables significantly associated with experiencing at least one physical training-limiting injury. Variables for age, BMI, race, ethnicity, lifetime tobacco use, and ACFT 2-mile run time (aerobic fitness) were included in regression models *a priori*, and other variables were selected through stepwise modeling. Physical training-limiting injuries were identified as self-reported injuries in which the respondent also answered that their physical training needed to be somewhat or completely modified due to the injury. Obesity was defined as having a BMI ≥ 30 kg/m^2.[5]

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Results

- 2,095 electronic survey responses were collected. Survey respondents were predominantly male (72%), white (60%), had an average age of 31, and had an average BMI of 27 with 22% reporting height and weight consistent with obesity.
  - Compared to the overall U.S. Active-Duty Army population,[6] the USARC H2F Pilot population had a higher proportion of women, had a higher proportion of Black Soldiers, were older, and had a higher average BMI.
- 28% of men and 35% of women reported at least one injury in the previous 12 months. **Table 1**
  - Over half (51%) of all injuries occurred when activated/on-duty. Injuries were most often strains (19%) and sprains (12%), involved the lower back (21%) and knees (19%), and were associated with running (22%) and weight lifting (18%).
- For men, factors associated with experiencing a physical training-limiting injury (p<.05) were regularly sleeping ≤5 hours per night, age ≥35 years, no participation in weekly sprint training, 157-360 minutes of weekly exercise, and BMI ≥27.5 kg/m2. Over 3 hours of weekly resistance training and ACFT Standing Power Throw performance of 7.2-9.8m were marginally associated with injuries (p=0.05-0.10). **Table 2a**
- For women, factors associated with experiencing a physical training-limiting injury (p<.05) were age ≥35 years, BMI ≥30 kg/m^2, and moderate or high perceived stress. Engineer occupation was marginally associated with injuries (p=0.10). **Table 2b**

Table 1. Leading injury types, body parts, and activities by sex (n=858 injuries)

Men n=589 injuries n (%)		Women N=269 injuries n (%)	
Injury Type			
Strained muscle	120 (20)	Strained muscle	43 (16)
Sprained joint	80 (14)	Overuse muscle pain	27 (10)
Pain	66 (11)	Sprained joint	25 (9)
Runner's knee (pain on/around the kneecap)	41 (7)	Pain	25 (9)
Overuse muscle pain	31 (5)	Fracture	10 (4)
Injured Body Part			
Lower back	128 (22)	Knee	54 (20)
Knee	119 (20)	Lower back	49 (18)
Shoulders	67 (11)	Shoulders	38 (14)
Ankle	45 (8)	Ankle	20 (7)
Foot	32 (5)	Foot	18 (7)
Injury Activity			
Running	128 (22)	Running	62 (23)
Weightlifting	106 (18)	Weightlifting	45 (17)
Lifting heavy objects	65 (11)	Lifting heavy objects	35 (13)
Sports	31 (5)	Walking/hiking	13 (5)
Walking/hiking	19 (3)	Sports	21 (8)

Table 2a. Risk factors for physical training-limiting injuries, Men (n=1,517 male survey respondents)

	n (% injured)	OR (95% CI)	P-value
Weekday average sleep hours			
≤5	**260 (27)**	**2.23 (1.44-3.47)**	**<0.01**
6	363 (21)	1.36 (0.89-2.08)	0.15
7	437 (18)	1.34 (0.88-2.02)	0.17
≥8	356 (13)	Ref	-
No response	101 (16)	-	-
Age			
17-24	492 (13)	Ref	-
25-34	562 (17)	1.17 (0.81-1.69)	0.40
35-44	**290 (27)**	**1.76 (1.16-2.67)**	**<0.01**
≥45	**173 (29)**	**2.15 (1.34-3.46)**	**<0.01**
Weekly minutes of sprint training			
None or <5 minutes	**874 (20)**	**1.94 (1.05-3.60)**	**0.03**
5-25 minutes	228 (14)	1.09 (0.54-2.22)	0.80
26-60 minutes	299 (20)	1.77 (0.92-3.39)	0.09
≥ 61 minutes	116 (13)	Ref	-
Total weekly exercise			
None or <20 minutes	472 (16)	0.83 (0.55-1.26)	0.38
20-156 minutes	349 (16)	Ref	-
157-360 minutes	**351 (25)**	**1.87 (1.22-2.87)**	**<0.01**
≥360 minutes	345 (19)	1.19 (0.73-1.96)	0.49
BMI			
≤24.9	462 (12)	Ref	-
25.0-27.49	400 (18)	1.27 (0.85-1.90)	0.35
≥27.5	**655 (25)**	**1.70 (1.17-2.49)**	**<0.01**
Weekly minutes of resistance training			
None or <5 minutes	746 (18)	Ref	-
5-60 minutes	336 (17)	0.76 (0.51-1.14)	0.19
61-180 minutes	238 (21)	1.07 (0.68-1.68)	0.78
≥181 minutes	197 (24)	1.58 (1.00-2.50)	0.05
ACFT Standing Power Throw performance			
≤7.7 meters	438 (13)	Ref	
7.8-9.2 meters	434 (18)	1.44 (0.98-2.12)	0.07
≥9.3 meters	413 (18)	1.28 (0.85-1.92)	0.23
No record	232 (34)	-	-
Race			
White	988 (18)	Ref	-
Black or African American	348 (21)	1.16 (0.82-1.64)	0.40
Asian	54 (20)	1.14 (0.54-2.40)	0.73
Multi-racial	65 (26)	1.73 (0.93-3.22)	0.08
Other (includes American Indian, Alaskan Native, Hawaiian, Pacific Islander)	62 (19)	0.85 (0.42-1.72)	0.66
Ever used tobacco products			
Yes	511 (22)	1.25 (0.93-1.67)	0.14
No	1,006 (18)	Ref	
Hispanic ethnicity			
Hispanic	256 (18)	1.16 (0.79-1.70)	0.46
Non-Hispanic	1261 (19)	Ref	-
ACFT 2-Mile Run time			
<17.4 minutes	395 (14)	Ref	-
17.4-19.8 minutes	395 (16)	1.03 (0.68-1.55)	0.90
≥19.9 minutes	394 (17)	1.03 (0.67-1.56)	0.31
No record	333 (30)	-	-

Table 2b. Risk factors for physical training-limiting injuries, Women (n=593 female survey respondents)

	n (% injured)	OR (95% CI)	P-value
Age			
17-24	210 (20)	Ref	-
25-34	216 (23)	1.12 (0.68-1.84)	0.65
≥35	**137 (37)**	**2.01 (1.18-3.43)**	**0.01**
BMI			
≤24.9	272 (20)	Ref	-
25.0-27.49	138 (25)	1.21 (0.72-2.04)	0.48
27.5-29.99	61 (30)	1.53 (0.77-3.03)	0.22
≥30	**92 (37)**	**1.95 (1.09-3.47)**	**0.02**
Perceived stress			
Low	234 (21)	Ref	-
Moderate or High	**305 (28)**	**1.67 (1.08-2.58)**	**0.02**
No response	24 (29)	-	-
MOS category			
Engineer	55 (35)	1.86 (0.89-3.88)	0.10
Medical	166 (31)	1.47 (0.82-2.64)	0.20
Military Police	97 (18)	0.86 (0.42-1.79)	0.69
Supply & Logistics	125 (21)	0.75 (0.40-1.42)	0.38
Other	120 (23)	Ref	-
ACFT 2-Mile Rub time			
<20.8 minutes	177 (19)	Ref	-
≥20.8 minutes	177 (21)	0.99 (0.57-1.72)	0.97
No record	209 (33)	-	-
Hispanic ethnicity			
Hispanic	125 (23)	0.92 (0.54-1.57)	0.76
Non-Hispanic	438 (26)	Ref	-
Race			
White	256 (26)	Ref	-
Black or African American	241 (25)	0.83 (0.51-1.36)	0.45
Asian	13 (23)	0.76 (0.19-3.05)	0.70
Multi-racial	26 (31)	0.87 (0.34-2.24)	0.78
Other (includes American Indian, Alaskan Native, Hawaiian, Pacific Islander)	27 (15)	0.51 (0.16-1.59)	0.24
Ever used tobacco products			
Yes	89 (22)	0.77 (0.43-1.38)	0.38
No	474 (26)	Ref	-

Limitations

- Survey responses are subject to recall bias.
- Because the USARC H2F Pilot population was made up of selected units from the southeast region of the U.S., results may not be applicable to all U.S. Army Reserve soldiers.
- Both injuries and potential risk factors were assessed at the same time, therefore causal relationships between potential risk factors and injuries cannot be discerned.

Conclusions & Next Steps

- US Army Reservists are a unique understudied population.
- Injuries and risk factors in this Reserve population were comparable to those reported in other military populations, despite differing exposures.
  - Lower extremity injuries during physical activity were the most frequent injuries in this Reserve population, as seen in Active Duty populations.[7-9]
  - Risk factors for injury based on poor sleep, older age, physical activity types and frequencies, and higher BMI are comparable to injury risk factors observed in Active Duty populations.[10,11]
- Impacts of H2F Pilot initiatives on this population will be assessed during the follow-up phase of the project (currently underway).[4]