

Self-Reported Physical Activity and Preaccession Fitness Testing in U.S. Army Applicants

CPT Marlene E. Gubata, MC USA*; David N. Cowan, PhD MPH*†; MAJ Sheryl A. Bedno, MC USA‡; Nadia Urban, MHS*†; COL David W. Niebuhr, MC USA*

ABSTRACT The Assessment of Recruit Motivation and Strength (ARMS) study evaluated a physical fitness screening test for Army applicants before basic training. This report examines applicants' self-reported physical activity as a predictor of objective fitness measured by ARMS. In 2006, the ARMS study administered a fitness test and physical activity survey to Army applicants during their medical evaluation, using multiple logistic regression for comparison. Among both men and women, "qualified" and "exceeds-body-fat" subjects who met American College of Sports Medicine adult physical activity guidelines were more likely to pass the fitness test. Overall, subjects who met physical activity recommendations, watched less television, and played on sports teams had a higher odds of passing the ARMS test after adjustment for age, race, and smoking status. This study demonstrates that self-reported physical activity was associated with physical fitness and may be used to identify those at risk of failing a preaccession fitness test.

INTRODUCTION

Military Entrance Processing Stations (MEPS) evaluate applicants wishing to enlist in the military for their fitness to serve. Army Regulation 40-501 establishes maximum accession weight-for-height and percent body fat limits.¹ Army applicants exceeding their age and sex-specific weight-for-height allowances are measured for percent body fat according to sex-specific body circumference-based equations.² There are currently no Army enlistment physical fitness standards.

Approximately two-thirds of the U.S. adult population are overweight or obese, and nearly one-quarter remains physically inactive.³ Over the past 5 years, exceeding weight/body fat allowances has consistently ranked as the most common reason for medical disqualification from enlistment in the Army, accounting for more than 20% of medical disqualifications in first-time active duty enlisted applicants.⁴ Because the U.S. young adult population serves as the military's applicant pool, civilian obesity and inactivity trends directly impact the military's ability to recruit personnel who are fit for duty.

Initiated in 2004, the Assessment of Recruit Motivation and Strength (ARMS) study tested and implemented a physical fitness screening test (ARMS test) to identify fit and motivated Army applicants whose body composition previously disqualified them from or delayed their entry into service. Recruits disqualified for exceeding maximum weight-for-height

or percent body fat standards were granted waivers for enlistment if they passed the ARMS test.⁵ The ARMS study included several physical activity questions. The goal of this report is to determine to what degree Army applicants' self-reported physical activity levels predicted objective physical fitness as measured by the ARMS test, among weight-qualified and those who exceeded body fat percent standards.

METHODS

During the study period, the ARMS test was administered to all Army (regular, National Guard, and Reserve) applicants at 6 of the 65 MEPS. These sites were selected, Atlanta, Georgia; Buffalo, New York; Chicago, Illinois; Sacramento, California; San Antonio, Texas; and San Diego, California, to generate a representative nationwide sample of Army recruits.

Applicants exceeding body fat (EBF) limits (greater than 30% body fat for males and 36% body fat for females) were granted automatic waivers for enlistment if they passed the ARMS test. The ARMS test included a 5-minute modified Harvard Step Test and maximum push-ups completed in 1 minute. Details on ARMS study methodology have been previously described.⁶ All applicants, including those weight qualified (WQ), were required to take the ARMS test; only EBF applicants were required to pass the test to enlist.

The ARMS physical activity study sample includes all active duty, Reserve, and National Guard applicants who passed through the 6 MEPS. Only those recruits over 18 years of age who signed an informed consent form were included in these analyses.

From April to September 2006, a physical activity survey was incorporated. The questionnaire included an activity-specific subset of the questions in the Youth Risk Behavior Surveillance System (YRBSS) biennial survey, sponsored by the Centers for Disease Control and Prevention.⁷ Applicants' physical activity was compared to the American College of

*Division of Preventive Medicine, Department of Epidemiology, Walter Reed Army Institute of Research, 503 Robert Grant Road, Silver Spring, MD 20910.

†Allied Technology Group, Inc, 1803 Research Boulevard, Suite 601, Rockville, MD 20850.

‡Occupational Health Clinic, Dwight D. Eisenhower Army Medical Center, 300 East Hospital Road, Fort Gordon, GA 30905.

The views expressed are those of the authors and should not be construed to represent the positions of the Department of the Army or Department of Defense.

Sports Medicine (ACSM) guidelines, which recommend at least 30 minutes of moderately intense cardiovascular exercise 5 days per week, or 20 minutes of vigorously intense cardiovascular exercise 3 days per week for adults.⁸ The questions and methods of scoring are given in Table I.

If an applicant visited the MEPS more than once (e.g., chose not to enlist immediately, lost some weight and retested later, or failed the initial test and returned to retest) multiple questionnaires might have been generated. When multiple questionnaires were administered to an individual, the average of the responses was used in analysis (16% of participants had more than one questionnaire). If multiple ARMS tests were taken, subjects whose results differed between tests (e.g., pass followed by fail or fail followed by pass) were excluded; only those subjects whose results were consistent (93.4% had all “passes” or all “fails”) were included in the analyses.

Performance on the ARMS test (pass vs. fail) was the outcome of interest. Analyses were stratified by sex and by ARMS study status (WQ or EBF). Demographic characteristics are described with means, standard deviations, frequencies, and percentages. Bivariate and multiple logistic regression analyses were used to determine the relationship between the physi-

cal activity questions and passing the ARMS test. Odds ratios (ORs) were adjusted for age, race, and tobacco use. All statistical analyses were performed using SAS versions 8.0 and 9.2 (SAS Institute, Cary, NC).

RESULTS

All participants completed a questionnaire, with 214 (2.3%) missing at least one survey question. Most of these subjects (*N* = 179) were missing only the question addressing participation in sports teams value. As shown in Table II, a total of 9,132 Army applicants who completed the physical activity survey were included for analysis, the majority of whom were white, male, non-smokers, and between 18 and 24 years of age. Overall, 61.8% of participants passed the ARMS test.

Nearly two-thirds (63%) of study subjects met the ACSM adult physical activity recommendations; most (70%) watched less than 3 hours of TV per day, and about one-third (35%) played on one or more sports teams in the past year. Table III presents the proportion of applicants passing the ARMS test for activity standard status, television watching, and sports participation, by body fat standard status and sex. For all

TABLE I. Activity Questions and Scoring

Question	Scoring Method
On How Many of the Past 7 Days Did You Exercise or Participate in Physical Activity for At Least 20 Minutes That Made You Sweat and Breathe Hard, Such as Basketball, Soccer, Running, Swimming Laps, Fast Bicycling, Fast Dancing, or Similar Aerobic Activities?	Met ACSM Standard if Answered 3 or More Days
On How Many of the Past 7 Days Did You Participate in Physical Activity for At Least 30 Minutes That Did Not Make You Sweat or Breathe Hard, Such as Fast Walking, Slow Bicycling, Skating, Pushing a Lawn Mower, or Mopping Floors?	Met ACSM Standard if Answered 5 or More Days
On an Average Day, How Many Hours Do You Watch TV?	Responses Coded as Less Than Three Hours or Three or More Hours
During the Past 12 months, on How Many Sports Teams Did You Play (Include Any Teams Run by Your School or Community Groups).	Responses Coded as One or More, or None

TABLE II. Descriptive Characteristics of Study Participants by Sex and ARMS Qualification Status

	Total, <i>N</i> (%)	Males		Females	
		EBF, <i>N</i> (%)	WQ, <i>N</i> (%)	EBF, <i>N</i> (%)	WQ, <i>N</i> (%)
Total	9132 (100)	800 (10.8)	6615 (89.2)	261 (15.2)	1456 (84.8)
Passed ARMS Test	5645 (61.8)	470 (58.8)	4194 (64.4)	180 (69.0)	801 (55.0)
Age					
18–24 Years	7670 (84.6)	689 (87.1)	5568 (84.8)	237 (92.2)	1176 (81.4)
25 Years and Older	1393 (15.4)	102 (12.9)	1002 (15.3)	20 (7.8)	269 (18.6)
Race					
White	6902 (75.6)	674 (84.3)	5111 (77.3)	169 (64.8)	948 (65.1)
Black	1479 (16.2)	54 (6.8)	958 (14.5)	76 (29.1)	391 (26.9)
Other	337 (3.7)	30 (3.8)	245 (3.7)	9 (3.5)	53 (3.6)
Declined to Respond	414 (4.5)	42 (5.3)	301 (4.6)	7 (2.7)	64 (4.4)
Tobacco Use					
No	6766 (74.1)	596 (74.5)	4811 (72.7)	205 (78.5)	1154 (79.3)
Yes	2216 (24.3)	192 (24.0)	1700 (25.7)	47 (18.0)	277 (19.0)
Missing	150 (1.6)	12 (1.5)	104 (1.6)	9 (3.5)	25 (1.7)
Mean Daily Number of Cigarettes Used among Smokers (SD)	9.2 (7.1)	9.0 (7.6)	9.4 (7.2)	8.5 (5.9)	8.2 (6.3)

comparisons by body fat standard status and sex, meeting adult activity standards was associated with a higher proportion of participants passing the test. For most comparisons, watching less than 3 hours of television per day and playing on a sports team, were also associated with a higher likelihood of passing the ARMS test.

Table IV presents the crude and adjusted odds of passing the ARMS test for study participants who met various physical activity recommendations or measures, with the 95% confidence intervals (CIs). The crude and adjusted ORs were similar, indicating that the association between the questions and fitness was not substantially confounded by age, race, or smoking status. Among both EBF and WQ men, those meeting the ACSM guidelines and those playing on a sports team were more likely to pass the ARMS test, with adjusted ORs ranging from 1.43 to 1.75. Watching less than 3 hours of television was not as strongly associated among men and was significant only among WQ.

Among the WQ women, the association with each question was statistically significant and generally similar to that seen among men. Among the EBF women, the interpretation is limited because of the small numbers of observations, and although the associations were generally positive, none were statistically significant.

TABLE III. ARMS Pass Rate for each Activity Questionnaire Response by Sex and ARMS Qualification Status

	Men		Women	
	EBF, <i>N</i> (% Passed)	WQ, <i>N</i> (% Passed)	EBF, <i>N</i> (% Passed)	WQ, <i>N</i> (% Passed)
Meets Adult Activity Standard				
Yes	373 (62.0)	2741 (66.6)	124 (72.1)	511 (58.6)
No	97 (49.0)	1452 (58.2)	56 (62.9)	290 (49.7)
Watches Less Than 3 Hours TV/Day				
Yes	351 (60.1)	2964 (64.9)	136 (69.0)	607 (57.4)
No	116 (54.5)	1217 (60.0)	43 (70.5)	191 (48.5)
Plays on ≥1 Sports Team				
Yes	193 (65.9)	1629 (68.8)	72 (73.5)	280 (64.5)
No	266 (54.5)	2480 (60.3)	102 (66.2)	503 (50.8)

DISCUSSION

In general, we found that those who met the physical activity recommendations, watched less television, and played on sports teams were more likely to pass the ARMS test, and that these findings were similar between WQ and EBF and between men and women. In addition, these associations were not substantially confounded by the potential risk factors of age, race, and smoking history.

Physical fitness has a substantial impact on recruits entering Basic Combat Training, and low premilitary service fitness levels are associated with training-related injuries and attrition.⁹⁻¹³ Recent analyses of medical records of ARMS participants has found that WQ male Army trainees who fail the 5-minute step challenge aspect of the ARMS test were at significantly increased risk of musculoskeletal injury in the first 90 days of service.¹⁴ Additionally, high levels of physical activity and fitness confer multiple health benefits in normal weight, overweight, and obese individuals.¹⁵⁻¹⁹

We found similar associations between activity measures and passing the fitness test for WQ and EBF subjects, confirming the general fitness benefits of activity for both normal and overweight individuals. This or a similar activity survey may have applications for other professions, such as police, firefighters, and emergency responders, for which physical fitness standards are required, but additional research is required before any programs are operationalized in any employment situations. Ideally, such research should include an evaluation of activity questions, validation of a fitness test, and measures of outcome, such as training success or risk of injury.

This report provides information that may be useful to military recruiters and policy makers as this brief questionnaire identifies those at increased risk of failing to pass a simple fitness test, and failing the test is a significant predictor of musculoskeletal injury. Recruiters could possibly use the questionnaire to identify those who should participate in additional premilitary physical training, while policy makers may consider using it to identify those who should undergo either closer preinduction examination or postinduction remedial training during later training.

TABLE IV. Crude and Adjusted ORs of Passing ARMS Test for Physical Activity Questions by Sex and ARMS Qualification Status

	Males		Females	
	EBF, OR (95% CI)	WQ, OR (95% CI)	EBF, OR (95% CI)	WQ, OR (95% CI)
Meets Adult Activity Standard				
Crude	1.70 (1.23-2.34)	1.43 (1.29-1.59)	1.52 (0.88-2.62)	1.44 (1.16-1.77)
Adjusted ^a	1.75 (1.26-2.44)	1.44 (1.30-1.60)	1.43 (0.81-2.50)	1.42 (1.15-1.76)
Watches Less Than 3 Hours of TV/Day				
Crude	1.26 (0.92-1.73)	1.23 (1.11-1.37)	0.93 (0.50-1.75)	1.43 (1.14-1.81)
Adjusted ^a	1.28 (0.93-1.76)	1.15 (1.03-1.29)	1.20 (0.61-2.38)	1.31 (1.03-1.67)
Plays on 1 or More Sports Teams				
Crude	1.61 (1.19-2.17)	1.45 (1.30-1.61)	1.41 (0.81-2.47)	1.76 (1.40-2.22)
Adjusted ^a	1.59 (1.17-2.16)	1.51 (1.36-1.69)	1.46 (0.82-2.59)	1.72 (1.36-2.19)

^aAdjusted for age, race, and smoking status.

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