Original Research

Physical Profile of Air Force Special Warfare Trainees

KIMBERLY A. FEENEY†1, BRIDGET F. MELTON‡2, HELEN W. BLAND‡3, GREG A. RYAN‡4, and CODY R. BUTLER‡5

1Department of Health and Human Performance, Concordia University – Chicago, River Forest, IL, USA; 2Department of Health Sciences and Kinesiology, Georgia Southern University, Statesboro, GA, USA; 3Department of Health Policy and Community Health, Georgia Southern University, Statesboro, GA, USA; 4Department of Health Sciences, Piedmont University, Demorest, GA, USA; 5U.S. Air Force Special Warfare Training Wing, San Antonio, TX, USA

†Denotes graduate student author, ‡Denotes professional author

ABSTRACT

International Journal of Exercise Science 16(4): 924-931, 2023. Physical fitness testing in the military is commonly used to assess whether service members are physically capable of performing the diverse physical tasks that may be required for their job. Body composition can influence an individual's ability to physically perform. This study aimed to analyze the general physical profile of U.S. Air Force (USAF) special warfare candidates by assessing body composition results and physical assessment scores collected over the past four years. Male candidates (*n* = 1036) were 18.2 years to 39.5 years of age (*M* = 23.5, *SD* = 3.9) and weighed 78.8 kg (*SD* = 8.3) with a BMI of 25.0 (*SD* = 2.0) at 11.8% body fat (*SD* = 3.3) as measured using bioelectrical impedance. Body composition and fitness scores were similar to those noted in U.S. Navy special warfare candidates as well as individuals in other elite tactical units. These results highlight the normative body composition profile of individuals assessing for advanced military career fields.

KEY WORDS: Military trainees, body composition, fitness, special operations

INTRODUCTION

Within athletes, there are clear links between body composition and the ability to perform specific physical tasks (6,22). However, tactical professionals often must perform a more diverse set of tasks than sport-specific athletes, ranging from moving their body weight over obstacles or rough terrain to carrying heavy loads over varying distances (1,4,13). Additionally, recent research has linked poor body composition and physical ability to increased injury rates and on duty attrition rates in military personnel (25). Due to the potential impact poor personnel physical ability and body composition has on national security, research is warranted in determining body composition standards for different military populations.

Although the United States military has assessed anthropometric and body composition measures of service members for decades, this traditionally has been performed to address health risks rather than performance (8,20). In addition to testing body composition, the military typically utilizes fitness testing to screen for health, risk of injury, and determine if a service member is physically capable of performing the mission set to which they are assigned (10,19). Traditional fitness testing assesses muscular or cardiovascular endurance abilities through events such as timed runs, push-ups, and sit-ups or crunches (2,9). However, an individual's ability to physically perform their unit's mission contributes to the overall readiness of the organization and can be instrumental in preventing serious injury or death for the individual or their teammates and there is little evidence that this style of testing adequately measures success in combat (2,3).

Military organizations have begun developing occupational-based fitness tests in an attempt to improve their ability to assess force fitness and mission capability (2,3,21). The United States Air Force (USAF) Special Warfare Training Wing (SWTW), an organization that trains airmen who are attempting to qualify for one of several physically rigorous career fields, has recently transitioned to using variants of an Air Force-developed occupational fitness test in addition to a traditional calisthenic-based fitness test (21). This allows for the assessment of a broader scope of fitness ability, including power, muscular endurance, agility, and cardiovascular endurance (21). Around the same time, USAF SWTW also consolidated the selection courses of several career fields to create one standard Assessment and Selection (A&S) course to determine which candidates are potentially suitable to continue in training.

Given the recent changes in the USAF SWTW training pipeline fitness testing and selection process, the current physical profiles of candidates are unknown. The purpose of this study was to outline the physical fitness and body composition profiles of SWTW training pipeline candidates who have attempted A&S since its initiation and compare them to other military populations and normative standards.

METHODS

Participants
A total of 1,337 SWTW trainees completed at least one attempt at A&S since its initiation in 2018. The inclusion criteria for this study included all male students who have participated in the A&S course since its initiation. Any data points from subsequent attempts beyond the first were removed to ensure information only reflected the participant's profile at their initial course attempt. Data from female candidates were excluded due risk of deidentification as a result of the small number of female participants. Additionally, individuals who did not have either body composition or fitness testing data were excluded from the analysis. This data analysis was determined to be exempt from a detailed review and participant consent by the 59th Medical Wing Clinical Research Division and Concordia University – Chicago IRB review teams due to the use of deidentified private information. This research was carried out fully in accordance with the ethical standards of the International Journal of Exercise Science (18).

Protocol

All data were collected by SWTW civilian, military, and contract employees from 2018 through 2022. Both the Individual Fitness Test (IFT) and Candidate Fitness Test (CFT) were proctored by individuals who were trained on correct test administration and exercise form to ensure consistent administration and grading. The IFT is comprised of maximal pull-up, sit-up, and push-up repetitions, each within a 2 min period. There was a minimum of a 2 minutes (min) rest period between each of these events. Participants then ran 1.5 miles for time, after which there was a 30 min rest period. Finally, participants completed a 500-meter (m) surface swim following a 10 min rest period. All portions of the test were completed while wearing a military physical fitness uniform. The CFT began with a 3-mile loaded march with 60 lb of equipment. Participants rested for up to 30 min and then completed a standing long jump, pro-agility test, 3 repetition trap bar deadlift, and pull-ups. This was followed by a 100-yard farmer's carry using 53 lb kettlebells and a 300 m shuttle repeat. Finally, after 30 min rest, participants completed a 1,500 m swim with fins on. The entirely of the CFT was completed in a military combat uniform and boots. All candidates received familiarization training prior to each test which demonstrated appropriate form and outlined parameters for each test event.

Height was measured to the nearest tenth of an inch using a stadiometer (Dectecto, Missouri). Weight and body composition were measured using one of six InBody 770 (InBody USA, California) devices co-located in one room. InBody measurements occurred in the morning. Participants were encouraged to drink 16-20 oz fluid about 1 hour prior to testing and void prior to the test. Additionally, participants were instructed not to eat or exercise for at least 3 hours prior to the test. Participants removed shoes, socks, and heavy outer clothing prior to testing and wiped their hands and feet with an InBody Tissue, per manufacturer recommendations. A member of the nutrition team who had been familiarized with the manufacturer guidelines for administering the test ensured participants were positioned appropriately on the device. Participants were provided directions on how to input their user identification for the test in order to ensure their body composition data could be added to their profile within the organization's database. Recorded body composition components included body weight (lb), body fat mass (lb), lean mass (lb), skeletal muscle mass (lb), body mass index (BMI), and percent body fat. Fat Free Mass Index (FFMI) was calculated (FFMI = lean mass (kg)/(height (cm)^2)) to provide a height-controlled reference point for lean mass. All measurements were then converted to standard units prior to analysis. Additionally, the date of the anthropometric and body composition data collection was recorded. Although body composition testing and fitness testing were performed on different days based on each individual's progression through the training program, 98.7% of IFT testing and 77% of CFT testing were performed within 90 days of body composition test completion.

Statistical Analysis

Descriptive statistics (mean ± S.D.) were calculated for all physical testing and body composition measures in the study. Frequencies were calculated for demographic information. All data analysis was performed using IBM Statistical Package for the Social Science (SPSS) (version 28).

RESULTS

Of the candidates evaluated, 49.8% successfully completed A&S on their first attempt (*n* = 666). For each first attempt at the course, 31.1% of candidates self-initiated elimination (*n* = 429), 12.4% were medically pulled (*n* = 166), and 5.7% were removed for performance issues (*n* = 76). Candidates ranged from 18.2 years to 39.5 years of age (*M* = 23.5, *SD* = 3.9).

The general body composition profile of each candidate is outlined in Table 1. The scores for each candidate on the occupational-based fitness test are outlined in Table 2. On the IFT, which is typically performed earlier in the training process than the CFT, candidates performed 14.2 pull-ups (*SD* = 3.3), 67.7 sit-ups (*SD* = 8.6), and 57.1 push-ups (*SD* = 10.0). On average, the 500 m swim was completed in 607.7 sec (*SD* = 76.0; 10.13 minutes), while the run was completed in 577.1 sec (*SD* = 32.4; 9.61 minutes).

Table 1. Anthropometric and Body Composition Profile of Candidates.

	n	Mean	SD	Range (min – max)
Height (cm)	1,036	177.4	6.5	159.5 – 195.8
Body mass (kg)	1,036	78.8	8.3	54.5 – 106.5
BMI (kg/m²)	1,036	25.0	2.0	19.0 – 31.4
Lean mass (kg)	1,036	69.6	7.6	47.7 – 94.8
FFMI (kg/m²)	1,036	22.1	1.6	16.9 – 27.2
Skeletal muscle mass (kg)	1,036	39.8	4.5	26.6 – 54.4
Fat mass (kg)	1,036	9.3	2.9	2.1 – 25.4
Percent body fat (%)	1,036	11.8	3.3	3.0 – 31.0

Table 2. Candidate Fitness Test Scores and Passing Standards.

	n	Mean	SD	Range	Minimum Passing Standard
Broad Jump (cm)	775	249.0	19.3	182.9 – 322.6	190.5
Agility test (left) (sec)	776	4.9	0.2	4.3 – 5.6	5.75
Agility test (right) (sec)	776	4.9	0.2	4.5 – 5.8	5.75
3 repetition deadlift (kg)	776	155.9	17.5	102.7 – 184.1	102.3
Pull-ups (repetitions)	775	14.8	3.5	5 - 34	8
Farmer's carry (sec)	775	20.1	2.1	15 – 28	31
300 yard shuttle (sec)	776	67.3	3.1	60 - 78	82.5
1,500 m swim (sec)	774	1,896.1	186.7	1,387 – 2,852	2,630
3 mile ruck (sec)	776	2,327.9	240.0	1,605 – 2,808	≤3,000

DISCUSSION

The goal of this study was to outline the physical characteristics of USAF SWTW candidates prior to their first attempt at the organization's A&S course. A general body composition profile was created using data from every candidate with valid body composition data in the

organizational database, which represents 77.5% of the candidates participating in the pipeline during the study period. Although the mean BMI falls within the overweight range, body fat analysis indicates that most of the candidates do not have excessive body fat levels. The mean body fat percentage falls just below the "good" range of 12-23% for males based on ACSM guidelines (12). Additionally, the mean FFMI exceeded the 75th percentile for males based on NHANES III data (11). Likewise, the push-up and 1.5 mile run results suggest above-average muscular endurance and cardiovascular power levels (12). The 1.5 mile run test has been validated as a tool for measuring cardiorespiratory fitness with the average run finish time indicating an excellent VO_2 max for a male in their third decade of life (12,16).

Research evaluating physical norms in this and similar military populations is limited. A review of fitness profiles of a range of elite tactical athletes, including special operations and Special Weapons and Tactics law enforcement teams, found similar power and agility as the candidates in this study, as the mean of means of broad jump scores was 234.3 cm (SD = 0.39) and average pro-agility time was 5.2 sec (15). Mean sit-ups, push-ups, and pull-ups in the examined populations ranged from 56.5-62.5 repetitions, 56.5-64.5 repetitions, and 7.7-9.0 repetitions, respectively, indicating similar muscular endurance profiles to SWTW candidates (14). Furthermore, the same review noted a mean of means of BMI of 25.2 kg/m², which was very similar to the studied population. The population in the current student had a slightly lower mean body fat percentage (11.8%) compared to previous researched populations (15.1%) (15). Walker et al. (2011) developed a profile of 109 individuals who successfully completed one SWTW training pipeline, noting similar age (M = 23.3 years, SD = 2.9), weight (M = 80.8 kg, SD = 6.6), and body fat (M = 12.4%, SD = 3.1). Flemming et al. (1995) noted that a cohort of Naval Special Warfare assessment candidates (n = 39) were 22.0 years (SD = 2.4) with an average body fat measured in an undisclosed method of 10.4% (SD = 2.2). Although body fat percentage was lower in this population, height (M = 177.7 cm, SD = 6.3) and weight (M = 76.0 kg, SD = 5.7) were similar (7).

While Navy special operations candidates seem to have a similar body composition profile, there are some differences noted among Army candidates. Soldiers entering the Small Unit Tactics phase of U.S. Army special operations training (n = 36) were slightly heavier (M = 83.6 kg, SD = 6.9) with 16.2% body fat (SD = 2.7) despite a similar height of 177 cm (SD = 6) (14). However, this portion of training occurs after the Army selection course. In comparison, Farina et al. (2022) noted that for individuals entering the U.S. Army special operations selection course, the mean of the second and third quartile of candidates based on body fat percentage were 17.3% (SD = 0.7) and 20.1% (SD = 0.9), respectively, while the mean of the second and third quartiles of body mass were 79.5 kg (SD = 1.8) and 86.0 (SD = 1.9) as measured by dual x-ray absorptiometry. This suggests that participants may enter that specific assessment course at a higher weight and body fat than USAF SWTW candidates.

There are some limitations to this observational study. Participants do not receive additional points in the CFT for exceeding standards, such as by deadlifting more than 350 lb or completing more than 15 pull-ups. Therefore, it is possible some candidates may not have performed at a

maximal effort after maxing out the scoring for one test to preserve performance in subsequent events. However, there is also a drive to compete for the ability to stay in the pipeline, and better fitness test results are associated with a higher likelihood of success in other special operations pipelines (4,24). SWTW participants have their body composition analyzed using bioelectric impedance via an InBody 770. Although these devices have demonstrated some degree of reliability in healthy, active young adults, it may underestimate body fat levels in leaner individuals (17,23). Therefore, the lower range of body fat levels may be artificially decreased. Additionally, the two fitness tests administered to candidates can occur months or even years apart, with body composition measurements typically occurring between the tests, providing a general outline of the physical profile over a period of time rather than a single snapshot.

This study provides a baseline profile for both body composition and physical fitness for candidates wishing to train for elite Air Force job specialties. This information has implications for both recruitment and development efforts. Obesity has been determined to be a threat to national security due to influences on both lack of fit individuals to serve as well as increasing prevalence of injury and missed duty days among individuals already in the military (25). However, the fitness and body composition profile of these candidates demonstrate the need to ensure appropriate distinction between overweight or obese status using BMI and excess adiposity. These results highlight the body composition and fitness requirements required for an opportunity to assess elite USAF units. Further research should focus on assessing FFMI as a predictor of performance or injury risk in the military as well as changes in body composition during special operations training pipelines.

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