Department of the Air Force

Innovate, Accelerate, Thrive – The Air Force at 75

Body Composition Standards

AFMRA/SG3OI

27 June 2023

DACOWITS RFI #6

- In December 2022, via RFI 7, the Committee asked the Military Services to provide updates to their physical fitness training programs. There have been numerous changes to the Military Services' Body Composition (Body Fat) Assessments. In order to better understand these new policies across the military, the Committee requests a briefing from the Army, Navy, Marine Corps, Air Force, Space Force, and Coast Guard on the following:
- a. Provide an overview of your Service's Body Composition (Body Fat) Assessment process for the past 5 years. If the process has changed within this time period, provide the impetus for the change(s), as well as describe what exactly was modified.
- b. Cite the anthropometric research utilized to support your Services' Body Composition (Body Fat) Assessment policy.
- c. Provide photos that demonstrate how Service members' body fat is assessed (by gender).
- d. What is the margin of error associated with your Services' Body Composition (Body Fat) Assessment process (e.g., percentage range)?
- e. Method of Body Composition (Body Fat) Assessment has either increased or decreased separations (broken down by gender). Provide data/metrics for the last 5 years.

Overview

- 2004 – 2020: Body Composition assessed via Abdominal Circumference (AC) measurement taken during Physical Fitness Assessment (PFA)
  - Permanent waiver of methodology in DoD 1308.3 (2002) to use AC in place of "body fat taping"
  - Scored component--contributed 20% of overall PFA score
  - Tactical pause during pandemic
- Dec 2020: CSAF removed AC as a "scored" component of PFA
  - Aggressive AC reduction attempts & exertional collapse associated w/Sickle Cell Trait (SCT)
  - Negative Airman/Guardian perception (height bias)
  - AF/SG & AF/A1 tasked to establish new body composition assessment/program policy
- Mar 2022: Revised DoDI 1308.03 published
  - Multiple options for assessing body composition ("BF calculations, waist-to-height ratio, abdominal circumference, height-weight screening, or any combination thereof")
- Apr 2023: Implemented new body composition assessment/program using Waist to Height Ratio (WHtR)
  - Initial year considered an informal/adaptation phase
  - AFMAN 36-2912, Air Force Body Composition Program, in draft

Assessment Methods - Comparative Analysis

Measurement Goals

- Minimize Bias
(known measurement differences by race, ethnicity, gender, & height that don't reflect actual body composition)

- Maximize Precision
(the same result when the same person is measured multiple times)

- Minimize Cost
(purchase & sustainment of required equipment)

- Minimize Workload
(required manpower & time to measure)

Measure	Potential Bias	Precision	Resources/ Cost	Time/ Manpower
Body Mass Index (BMI)*	↑	XXX	$$	1
Abdominal Circumference (AC)	↑	XXX	$	2
Waist-to-Height Ratio (WHtR)	↔	XXX	$	2
Circumference-Based (2 or 3 point body fat taping)	↑	XX	$	2
Skinfold Thickness	↔	X	$$	2
Bio-Electrical Impedance	↓	X	$$$	1
BodPod	↓	XXXX	$$$$	3
DXA	↓	XXXXX	$$$$$	3
2D Digital Photo /Phone "app"	↔	X	$$?	3

*May only be used to "screen" individuals

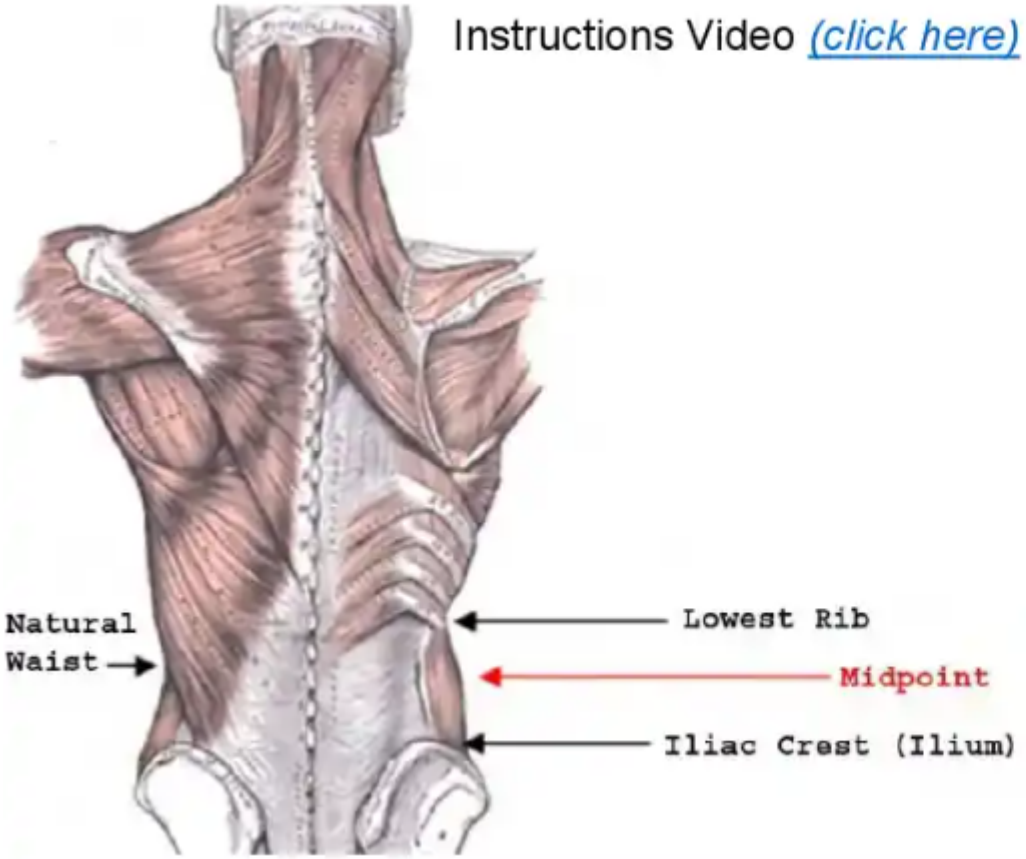
Waist-to-Height Ratio (WHtR)

- **Aligns with DoDI 1308.03**
- **Assessment of central adiposity (abdominal fat)[1]**
  - **Better discriminator of overall health risk than total adiposity[2]**
  - **Predicts cardiometabolic risk[3]**
- **Validated across diverse populations[4]**
  - **Scales for height differences**
  - **Gender neutral**
- **Simple equation (Waist (in) / Height (in))**
  - **Meets standard: ≤ 0.49**
  - **Meets standard (Increased Risk): 0.50 to 0.54**
  - **Exceeds standard (High Risk): ≥ 0.55**

Measurement

The Test Administrator must read the following instructions to all Airmen prior to the BCA

Instructions Video *(click here)*



A measurement will be taken on bare skin, from the right side of the member's waist, at the midpoint between their lowest rib and the top of their hip bone (iliac crest). The tape measure must be flat on the bare skin and should not compress the skin.

Before the waist measurement, the member may adjust their clothing, so it does not fall over their waist during the measurement. The member may assist the administrator by holding the tape in place when the midpoint has been identified and the tape is around the waist.

The member must let go of the tape and relax the arms to their side, standing at the position of attention before a measurement is recorded. The member is not allowed to hold their breath or suck in their waist during the assessment. The administrator will record the measurement at the end of a normal exhale.

Three measurements will be taken rounding down to the nearest ½ inch. If any of the measurements differ by more than one inch from the other two, an additional measurement will be taken. The three closest measurements will be added together, divided by three, and rounded down to the nearest ½ inch. This value will be recorded as the waist measurement.

Historical Data/Metrics

	2018				2019			
	Total Tested	BC (component) Failure	Total Percent	# Separations (BC Failure)	Total Tested	BC (component) Failure	Total Percent	# Separations (BC Failure)
AD (Female)	60890	719	1.2%	40	60294	759	1.3%	36
ARC (Female)	16308	268	1.6%	0	16024	326	2.0%	5
AD (Male)	248255	2487	1.0%	126	239083	2428	1.0%	77
ARC (Male)	46225	845	1.8%	2	44924	981	2.2%	9

2020 – 2022 (Body Comp not assessed)

Backup Slides

Method Analysis – Manual

Method	Description	Advantages	Disadvantages
Abdominal Circumference (AC)	AC measured at iliac crest	• Simple to execute/implement • Measures central adiposity – good predictor of cardiometabolic risk • Fast • Low cost	• Not sensitive to stature • Inconsistent • "Unpopular" among Airmen
Circumference-Based Body Fat Taping	Calculates estimated total body fat% based on 2 or 3 measurements Men: height, neck circumference & abdominal circumference Women: height, neck circumference, waist circumference & hips.	• Methodology used by DoD for >30years	• Relatively large potential for error – most notably in women • Less correlation to abdominal obesity
Waist-to-Height Ratio (WHtR)	Circumference of abdomen divided by height (Waist/Height) Data can be correlated to total body fat%	• Simple to execute/implement • Measures central adiposity – good predictor of cardiometabolic risk • Less risk of bias - Accounts for height differences - Consistent across diverse populations • Fast • Low Cost	• Utilizes "unpopular" waist measurement
Skinfold Thickness	Measure thickness of skinfolds (subcutaneous fat) at a range of sites (up to 19) on the body to estimate lean body mass/body fat%	• Quick, simple measurement • Low cost	• Less accurate in obese populations • Requires significant training and skill in performing measurement (painful) • High variability

Method Analysis – Technology

Method	Description	Advantages	Disadvantages
Bioelectrical Impedance Analysis (BIA)	Utilizes electrical conductivity between various body tissues (e.g. muscle, fat, bone, etc.) due to variations in water content. (In Body, Tanita). Estimates body fat% based on assumptions of hydration status.	• Perceived as "new" technology • Fast • Easy to use	• Does not distinguish b/t total vs abdominal adiposity • Heavily influence by hydration status – results vary 10-20% • Less accurate with larger individuals • Cost/impact of maintaining equipment, standardization, calibration
Dual-Energy X-Ray Absorptiometry (DXA)	Whole-body x-ray that provides a detailed snapshot of body composition, including how body weight breaks down into fat & lean tissue.	• Gold standard for measuring body composition • Can distinguish between abdominal obesity vs total obesity • Also assesses/measures bone density	• Cost and manpower intensive • Radiation exposure
Air Displacement Plethysmography (BOD POD)	Measures body volume & thoracic gas volume (volume of gas contained within the chest during plethysmography) to calculate body fat% & lean tissue	• Accurate with individual variation	• Does not distinguish between total vs abdominal adiposity • Time to execute (approx. 15 minutes) • Cannot eat/drink 3 hours prior • Must wear minimal clothing (tight underwear or speedo type bathing suit) • Claustrophobia • Expensive
3-D Digital Imaging (Photo/App)	Uses vitals (height, weight, gender) and photos to make body measurements to then estimate body fat	• "New" technology • May identify abdominal obesity • Can be performed in non-clinical setting	• Accuracy issues • Minimal standardization