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2022 NSCA TACTICAL ANNUAL TRAINING

#NSCATactical22

CONFLICT OF INTEREST STATEMENT

I have no actual or potential conflict of interest in relation to this presentation.

DISCLAIMER

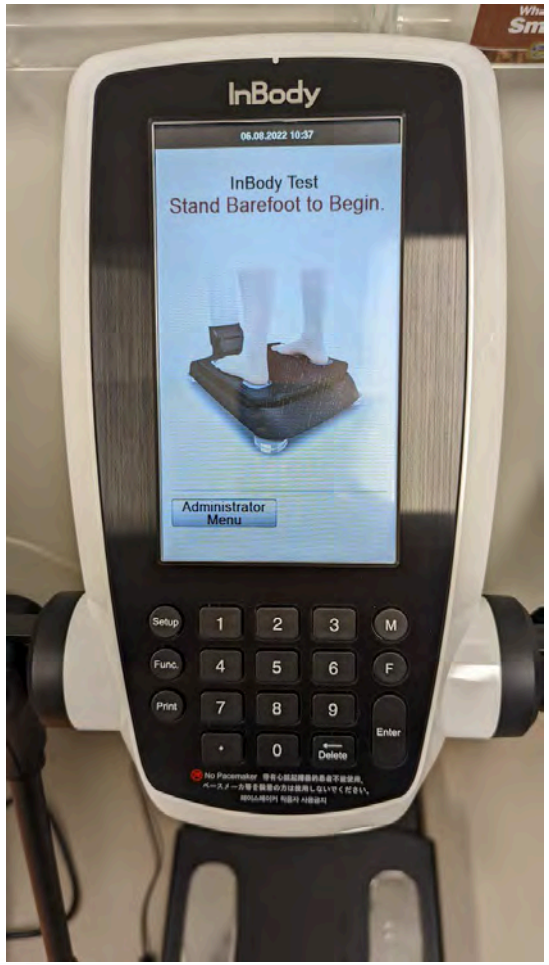
The views in this presentation are those of the author, and do not necessarily reflect the official position or policy of the United States Air Force, the NSCA, the Department of Defense, or the U.S. Government

Learning Objectives

1. Benefits of Body Composition Assessment
2. Practical Applications for Setting up a Body Composition Assessment Program

Benefits of Body Composition Assessment

- Can be used to identify health risks
  - Heart disease
  - Sudden cardiac death
  - Hypertension
  - Type 2 diabetes
  - Metabolic syndrome
  - Hypogonadism



Body fat % and Sudden Cardiac Death in Firefighters

- Sudden Cardiac Deaths (SCDs) account for roughly 50% of line-of-duty deaths among United States Firefighters
- For every SCD, there are an estimated 17-25 additional non-fatal line-of-duty cardiovascular events (heart attack, stroke, etc.)

› Int J Environ Res Public Health. 2021 Jan 5;18(1):339. doi: 10.3390/ijerph18010339.

Influence of Body Composition on Post-Exercise Parasympathetic Reactivation of Firefighter Recruits

David J Cornell [1 2 3], Sabrina E Noel [1 2 4], Xiyuan Zhang [2], Kyle T Ebersole [5 6]

"Reducing overall BF (vs. BMI or WC) should be prioritized to improve the post-exercise autonomic nervous system recovery of firefighter recruits."

Int J Environ Res Public Health. 2021 Sep 28;18(19):10190. doi: 10.3390/ijerph181910190.

Predictors of Arterial Stiffness in Law Enforcement Officers

Jason M Keeler [1 2], Bradley S Fleenor [1 3], Jody L Clasey [1], Arnold Stromberg [4], Mark G Abel [1]

Affiliations + expand

PMID: 34639495 PMCID: PMC8508055 DOI: 10.3390/ijerph181910190

Free PMC article

Abstract

Background: Compare arterial stiffness among law enforcement officers (LEOs) versus general population normative values and identify predictors of arterial stiffness in LEOs.

Methods: Seventy male LEOs (age: 24-54 years) completed body composition, blood pressures, physical activity level, and carotid-femoral pulse wave velocity (cfPWV) measurements. T-tests and regression analyses were utilized to compare LEO data to normative data and predict cfPWV, respectively.

Results: Compared to similar age strata within the general population, cfPWV was lower among LEO's under 30-years (mean difference = -0.6 $m \cdot s^{-1}$), but higher among LEOs 50-55-years (mean difference = 1.1 $m \cdot s^{-1}$). Utilizing regression, age, relative body fat, and diastolic blood pressure explained the greatest variance in LEO's cfPWV (adj. $R^2 = 0.56$, $p < 0.001$).

Conclusion: This investigation demonstrated that arterial stiffness may progress more rapidly in LEOs and LEOs' relative body fat and blood pressure may primarily affect arterial stiffness and risk of CVD.

Can be used to improve accuracy of VO2max testing

- Metabolic carts assume every subject is 0% body fat
- Body fat O2 consumption during exercise is negligible
- Variations in body fat% will result in VO2max measurement error
- Body fat has no effect on maximal aerobic capacity, though it does affect submaximal VO2
- Calculating VO2max using fat-free mass, rather than total body mass, greatly reduces the body mass bias inherent in VO2max fitness tests

Int J Obes Relat Metab Disord. 2000 Jul;24(7):841-8. doi: 10.1038/sj.ijo.0801241.

Total body fat does not influence maximal aerobic capacity

M Goran [1], D A Fields, G R Hunter, S L Herd, R L Weinsier

Conclusion: The major influence of body weight on VO2max is explained by FFM; FM does not have any effect on VO2max. Fatness and excess body weight do not necessarily imply a reduced ability to maximally consume oxygen, but excess fatness does have a detrimental effect on submaximal aerobic capacity. Thus, fatness and VO2max should be considered independent entities.

Randomized Controlled Trial > Eur J Prev Cardiol. 2015 Sep;22(9):1171-9.
doi: 10.1177/2047487314557962. Epub 2014 Nov 7.

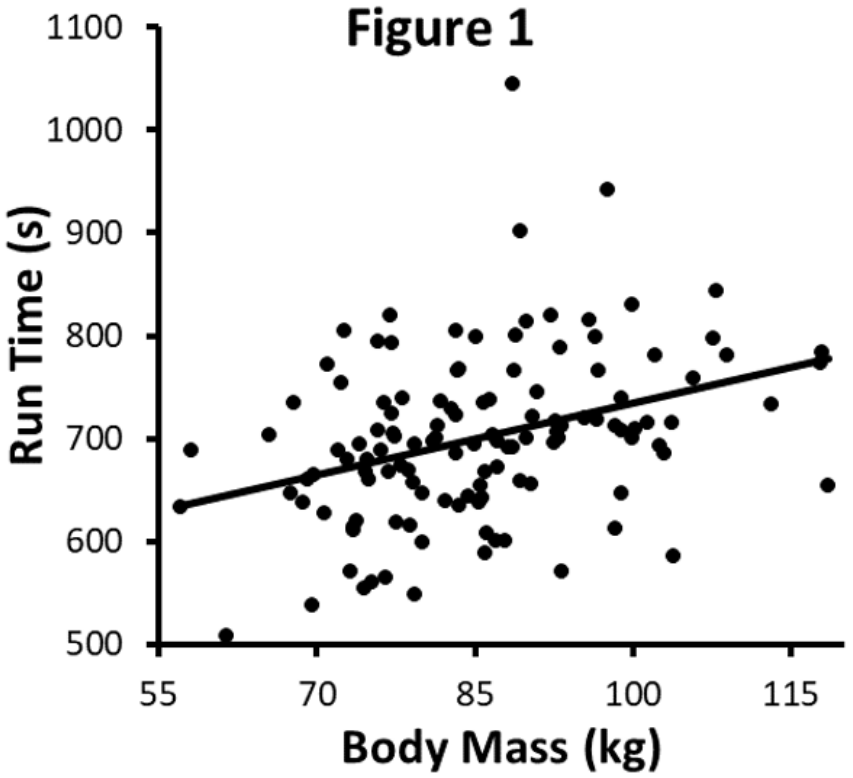
Cardiopulmonary fitness is a function of lean mass, not total body weight: The DR's EXTRA study

Benno Krachler [1], Kai Savonen [2], Pirjo Komulainen [3], Maija Hassinen [3], Timo A Lakka [4], Rainer Rauramaa [2]

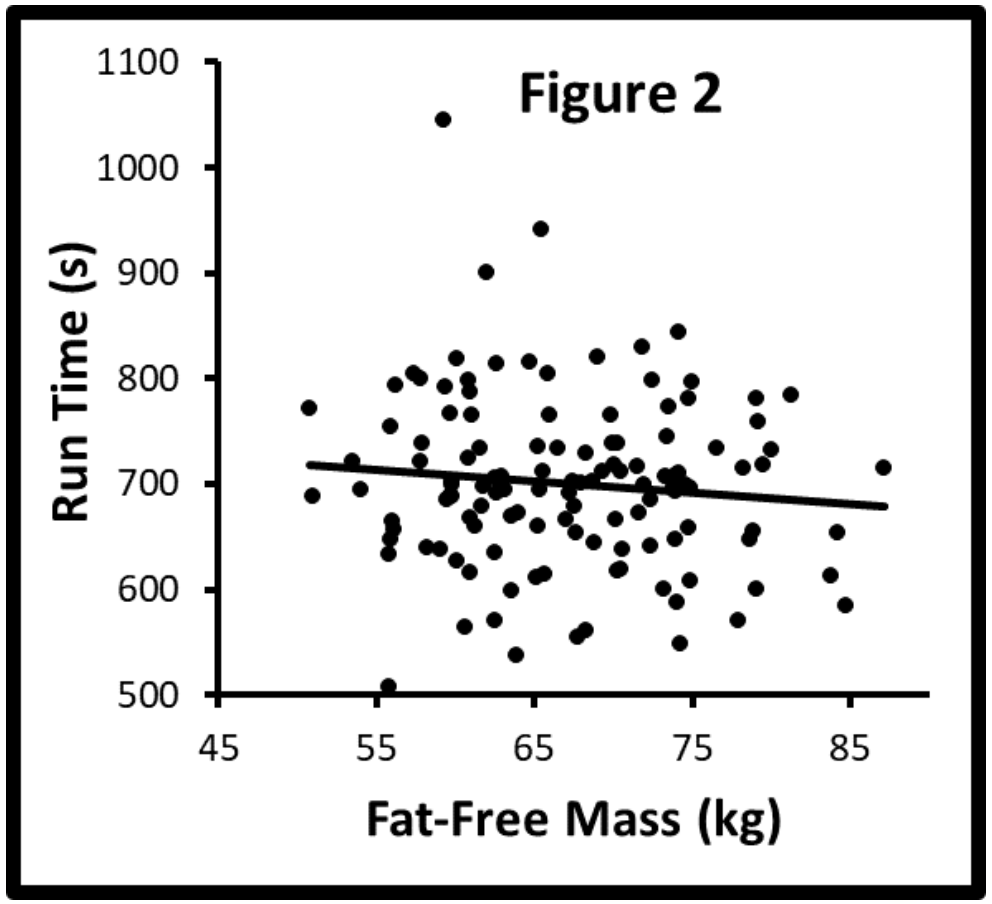
Methods: A population based sample of 578 men (body mass index (BMI) 19-47 kg/m(2)) and 592 women (BMI 16-49 kg/m(2)) 57-78 years of age. Peak VO2 was assessed by respiratory gas analysis during a maximal exercise test on a cycle ergometer. We studied the validity of the weight-ratio and the lean mass-ratio standards in a linear regression model.

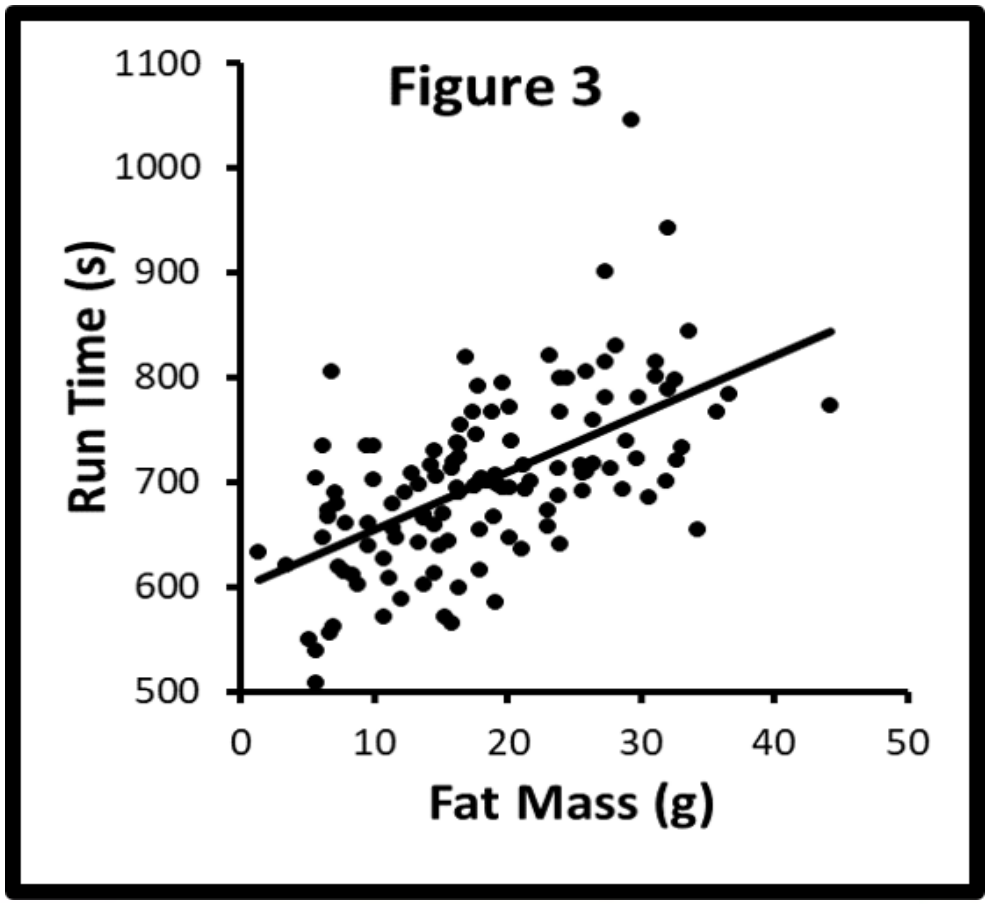
Conclusions: For comparisons of cardiopulmonary fitness across different categories of body mass, the lean mass-ratio standard should be used.

Body Fat Effects on Physical Fitness Test Scores



Body Fat Effects on Physical Fitness Test Scores





Body Fat = Added External Load: No Difference in PT Test Performance

Med Sci Sports. Fall 1978;10(3):194-9.

Effect of experimental alterations in excess weight on aerobic capacity and distance running performance

K J Cureton, P B Sparling, B W Evans, S M Johnson, U D Kong, J W Purvis

PMID: 723510

Abstract

To experimentally investigate the effect of excess body weight or fat on maximal oxygen uptake (Vo2 max) and distance running performance, the metabolic response to maximal and submaximal treadmill running and the 12-min run performance were measured in six subjects under each of four added-weight (AW) conditions: normal body weight and 5, 10, and 15% additional external weight, added to the trunk. AW was found to systematically and significantly decrease Vo2 max expressed relative to the total weight carried (ml/min.dg TW), maximal treadmill (TM) run time and 12-min run distance, but not to systematically affect Vo2 max (1/min) or Vo2 max (ml/min.kg FFW). An increase of 5% AW was found, on the average, to decrease Vo2 max (ml/min.kg TW) 2.4 ml, the TM run time 35 sec and the 12-min run distance 89 m. These decreases were a direct consequence of the increased energy cost of running at submaximal speeds. It was concluded that changes in excess body weight can influence Vo2 max expressed relative to body weight and distance run performance independent of any change in cardiovascular capacity. Failure to distinguish the metabolic effects of body fatness from the influence of cardiorespiratory capacity may result in misleading interpretation of distance run test scores.

Mil Med. 2021 Jul 24;usab315. doi: 10.1093/milmed/usab315. Online ahead of print.

Anthropometrics and Body Composition Predict Physical Performance and Selection to Attend Special Forces Training in United States Army Soldiers

Emily K Farina [1], Lauren A Thompson [1], Joseph J Knapik [1], Stefan M Pasiakos [1], James P McClung [1], Harris R Lieberman [1]

Results: Lower percentage body fat and fat mass predicted better performance on all assessments: Army Physical Fitness Test (APFT), pull-ups, SFAS run, loaded road march, obstacle course, and land navigation ($P \leq .05$).

Body Fat and Injury Risk

› BMC Musculoskelet Disord. 2018 May 22;19(1):161. doi: 10.1186/s12891-018-2061-3.

Association between stress fracture incidence and predicted body fat in United States Army Basic Combat Training recruits

Joseph J Knapik [1], Marilyn A Sharp [2], Scott J Montain [2]

Conclusions: Low %BF was associated with higher SF risk in BCT; higher %BF was associated with higher SF risk among men but not women.

Body Fat and Injury Risk

Review > J Obes Metab Syndr. 2021 Jun 30;30(2):132-140. doi: 10.7570/jomes20100.

Does Obesity Affect the Severity of Exercise-Induced Muscle Injury?

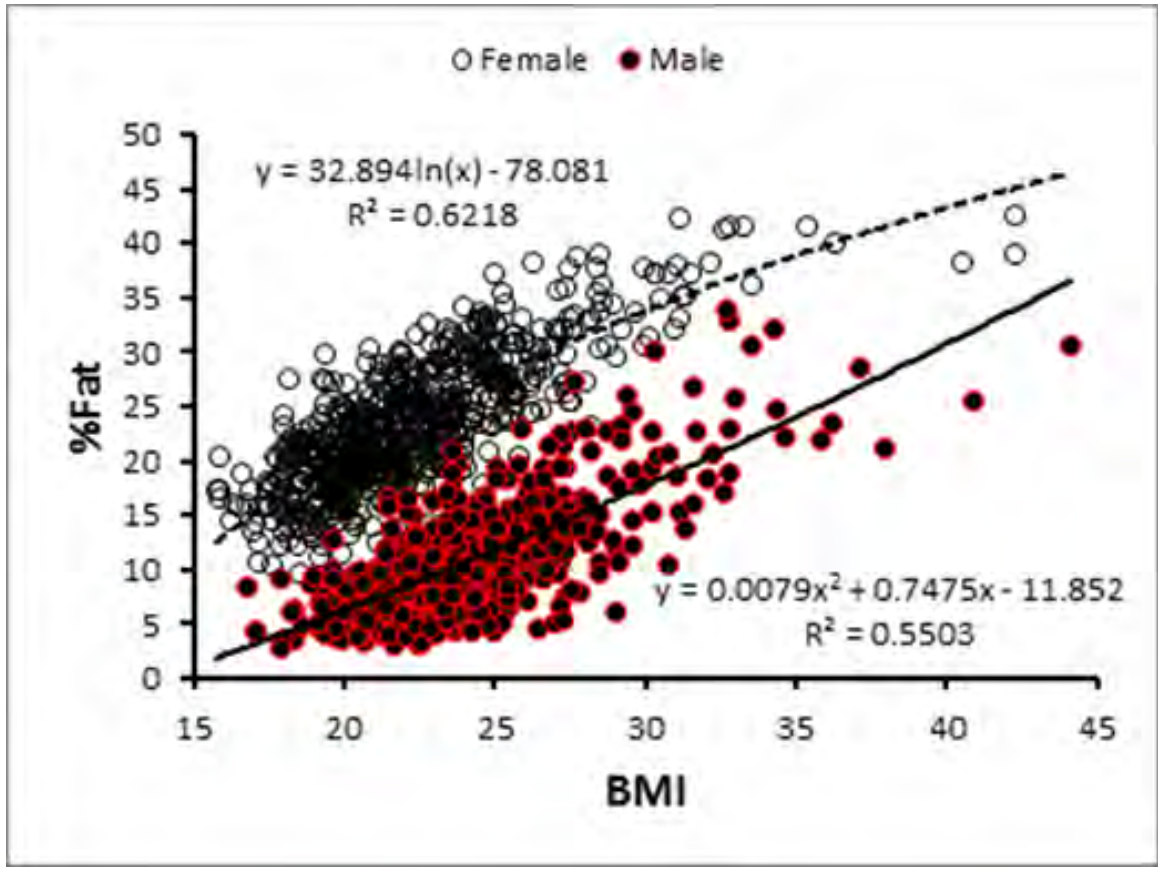
Jooyoung Kim [1], Jin Hwan Yoon [2]

The potential mechanisms resulting in these outcomes include structural changes in the cell membrane induced by high fat levels, increased inflammatory responses due to adipose tissues, reduced muscle satellite cell activation and myogenesis due to lipid overload, differences in muscle fiber distributions, and sedentary behaviors.

Other Benefits of Body Composition Assessment

- Improves accuracy of exercise prescriptions/dietitian consults
- Provides a “before” picture
- Permits progress to be tracked objectively
- Results can be an “epiphany moment” for clients
- Improvements are self-reinforcing to clients

Practical Applications of Setting Up a Body Composition Program



Equipment: Bod Pod

Bod Pod 2.0

Benefits of Using the Bod Pod

- High degree of client “buy-in.”
  - Independent of BMI, waist circumference, waist-to-height ratio, race, ethnicity.
- It is a cold, heartless machine. ☺
- Valid, repeatable, consistent results.
- Largely free of human error.
- Quantifiable way to track progress.
- Produce research-grade data which can be easily reproduced and shared for a variety of purposes.

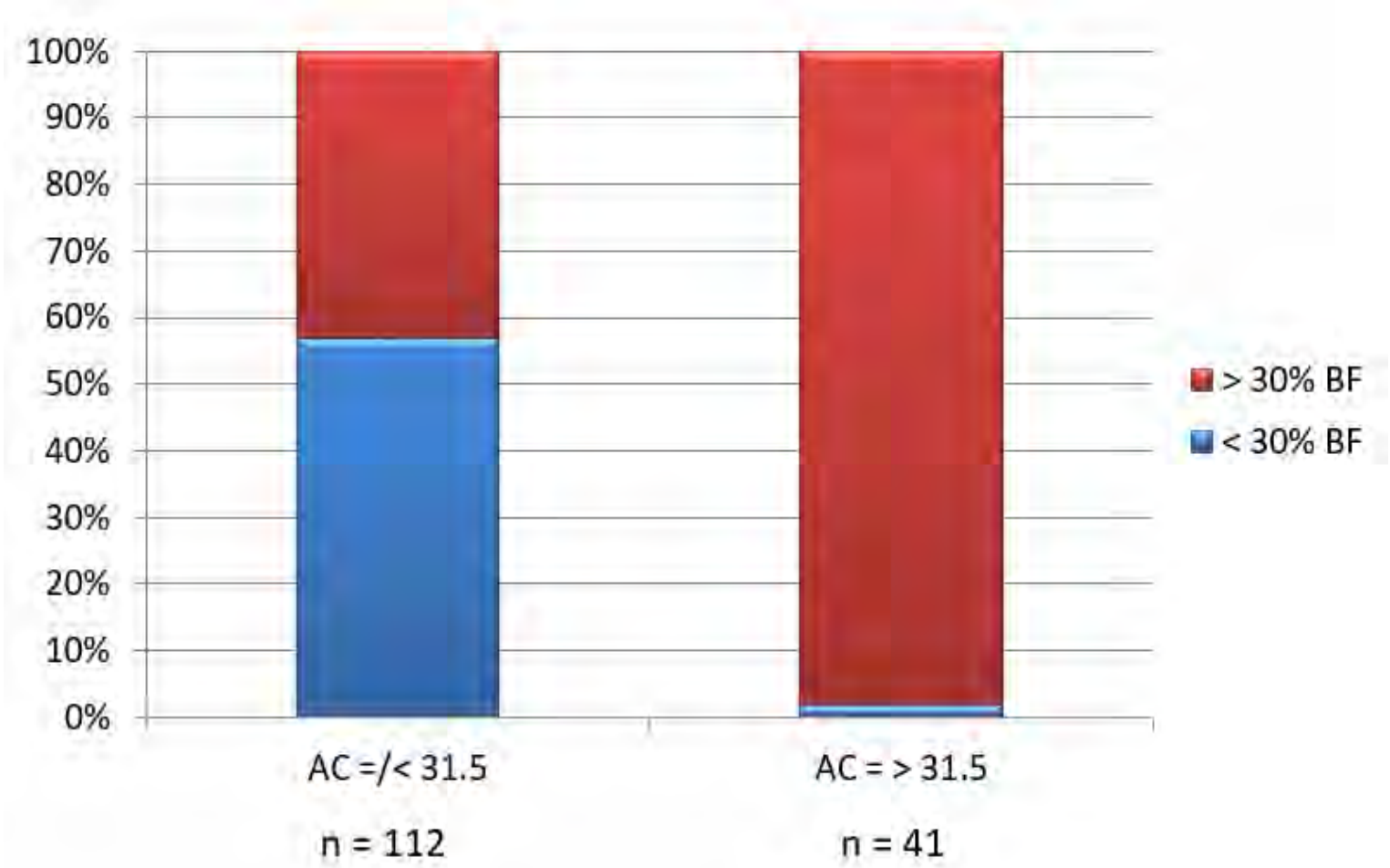
Front Physiol. 2022 Mar 31;13:868627. doi: 10.3389/fphys.2022.868627. eCollection 2022.

Circumference-Based Predictions of Body Fat Revisited: Preliminary Results From a US Marine Corps Body Composition Survey

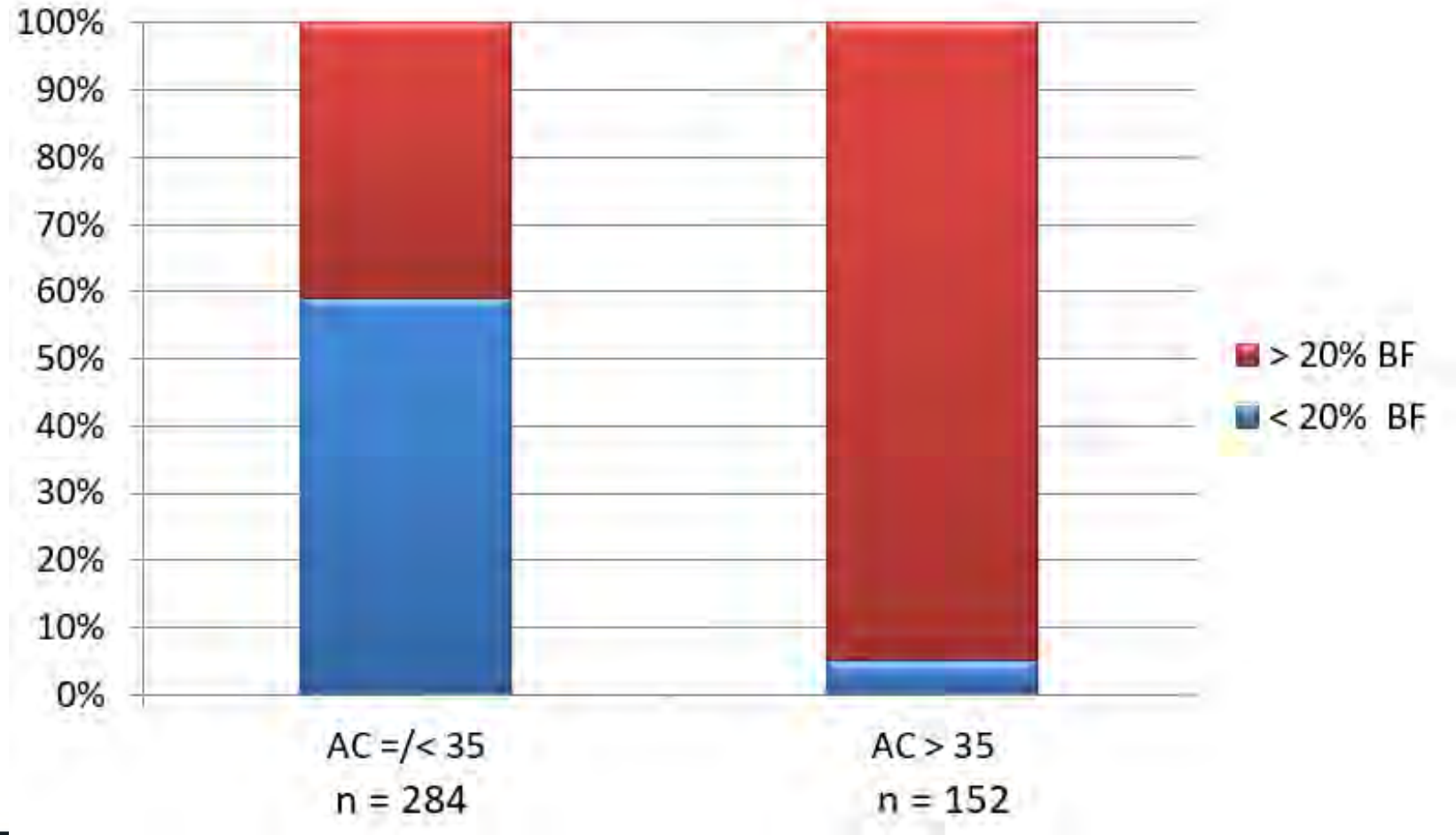
Adam W Potter [1], William J Tharion [2], Lucas D Holden [2 3], Angie Pazmino [1 3 4], David P Looney [2], Karl E Friedl [5]

Conclusion: The AC %BF provides a field expedient method for the US Marine Corps to classify individuals for obesity prevention, but does not provide research-grade quantitative body composition data.

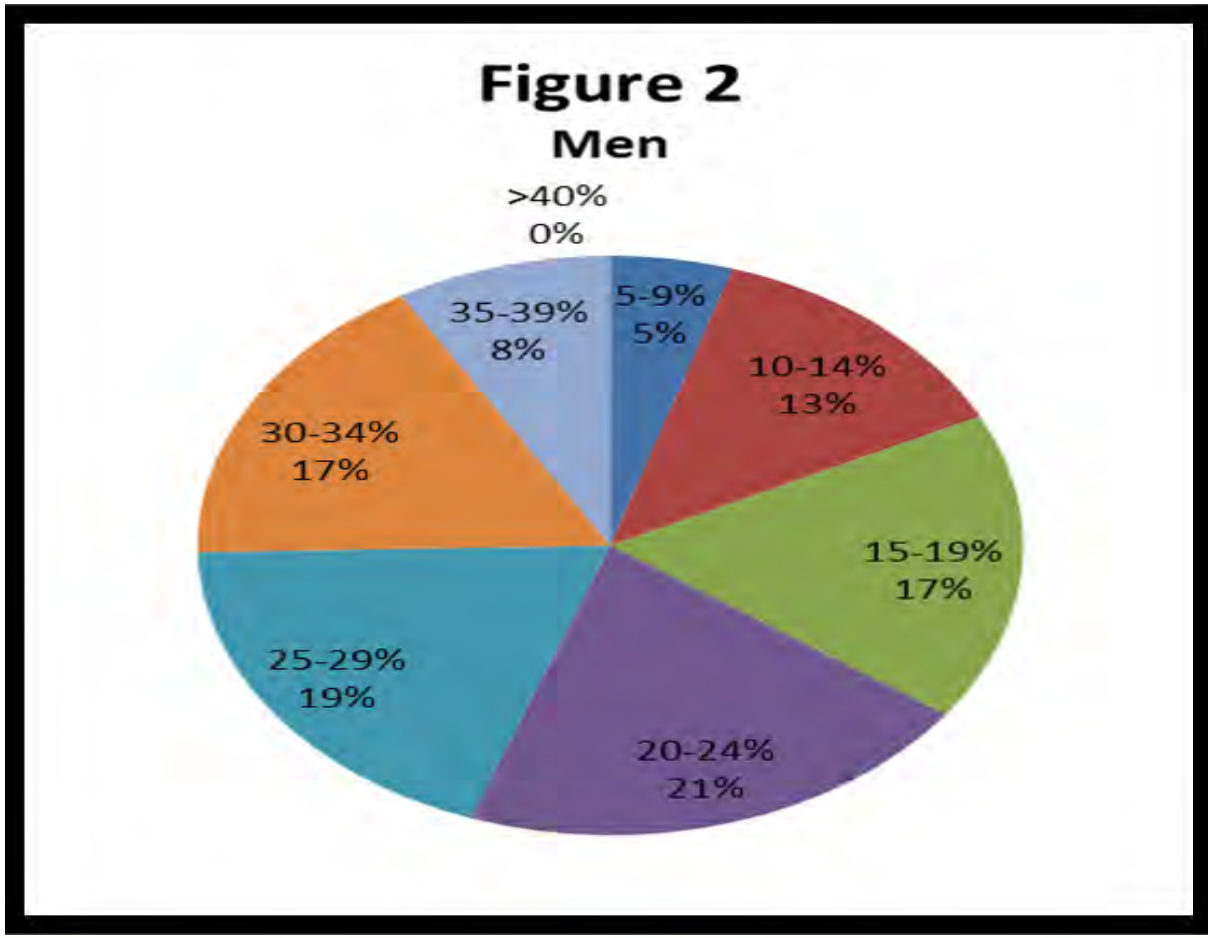
Abdominal Circumference/Body Fat%, Females

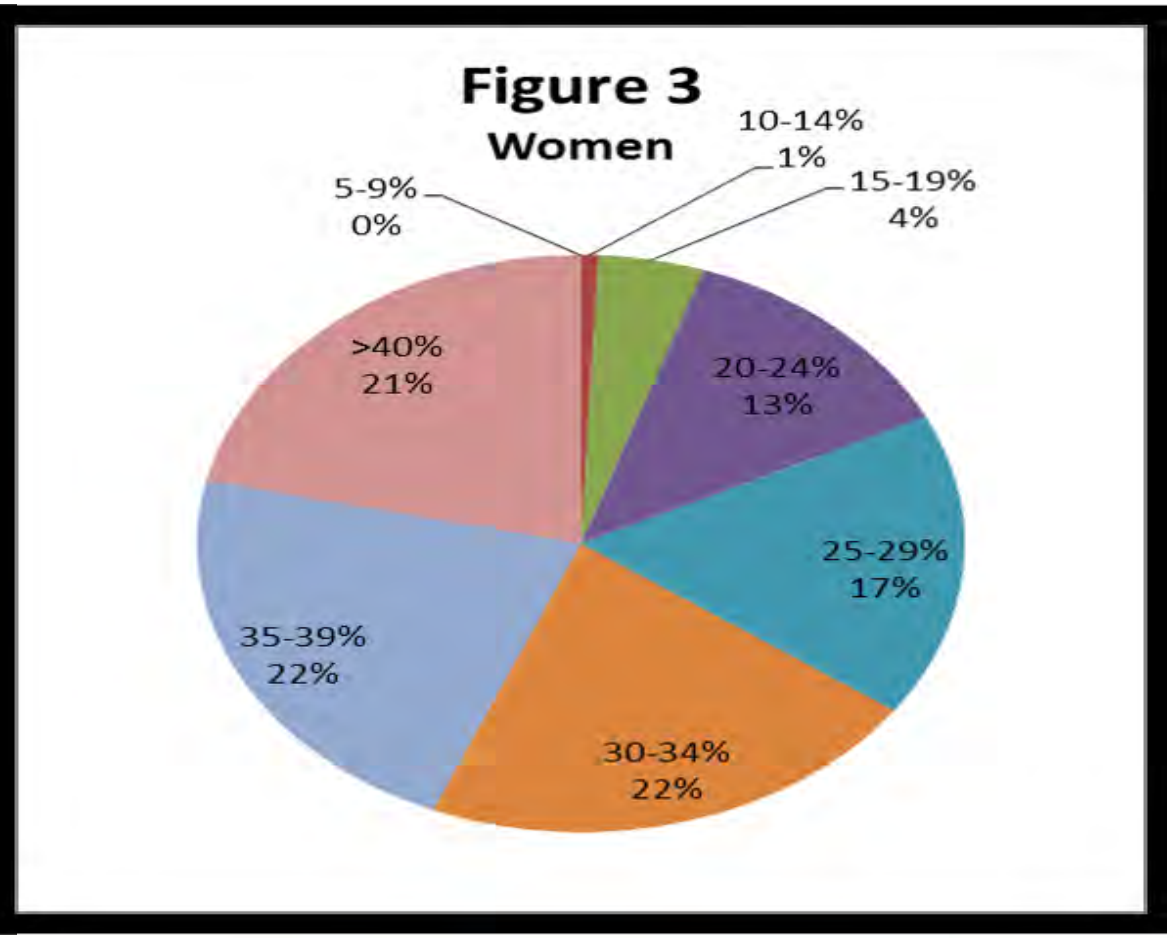


Abdominal Circumference/Body Fat%, Males

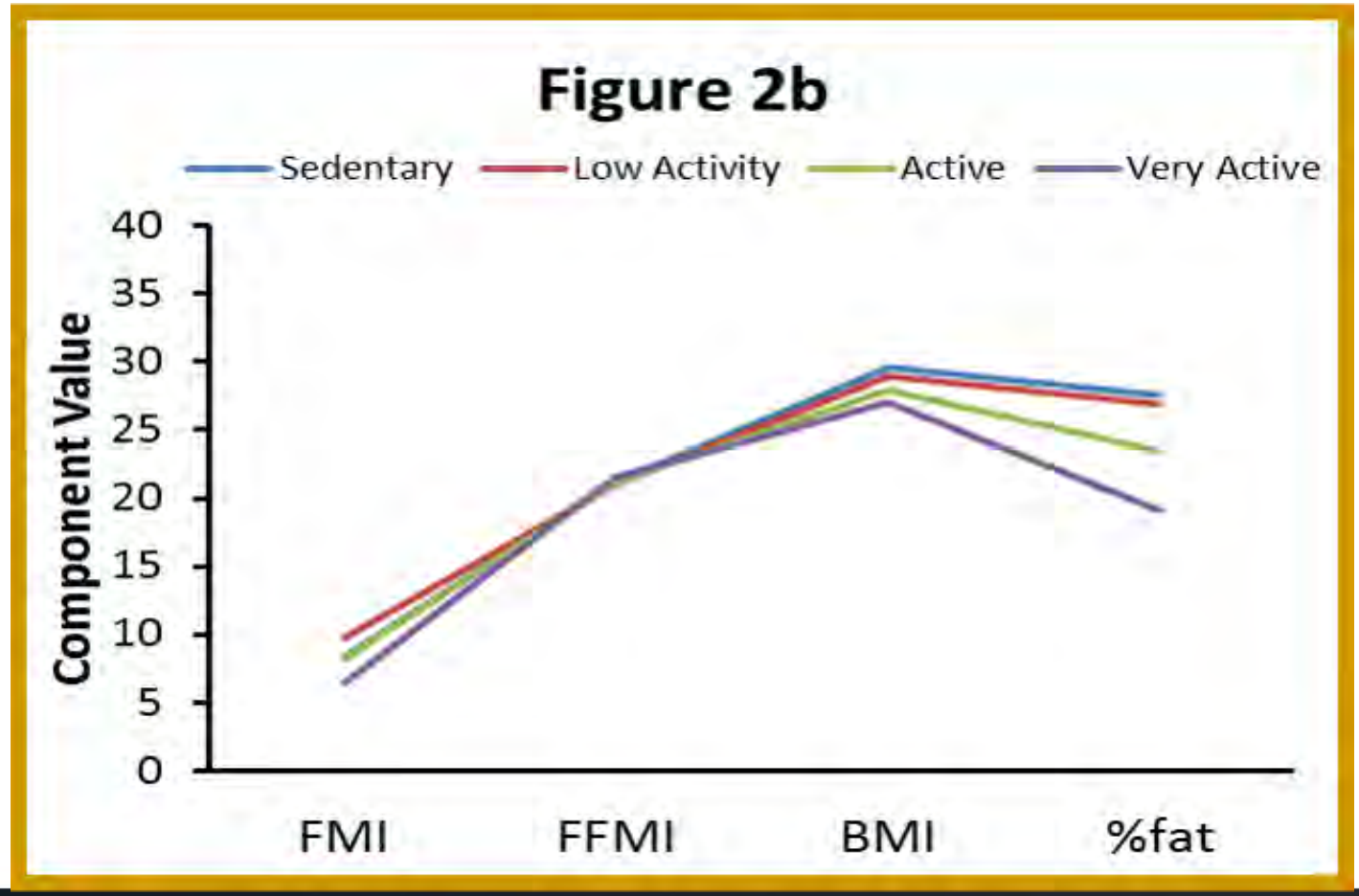


Body Fat % Active Duty, Pre-COVID-19

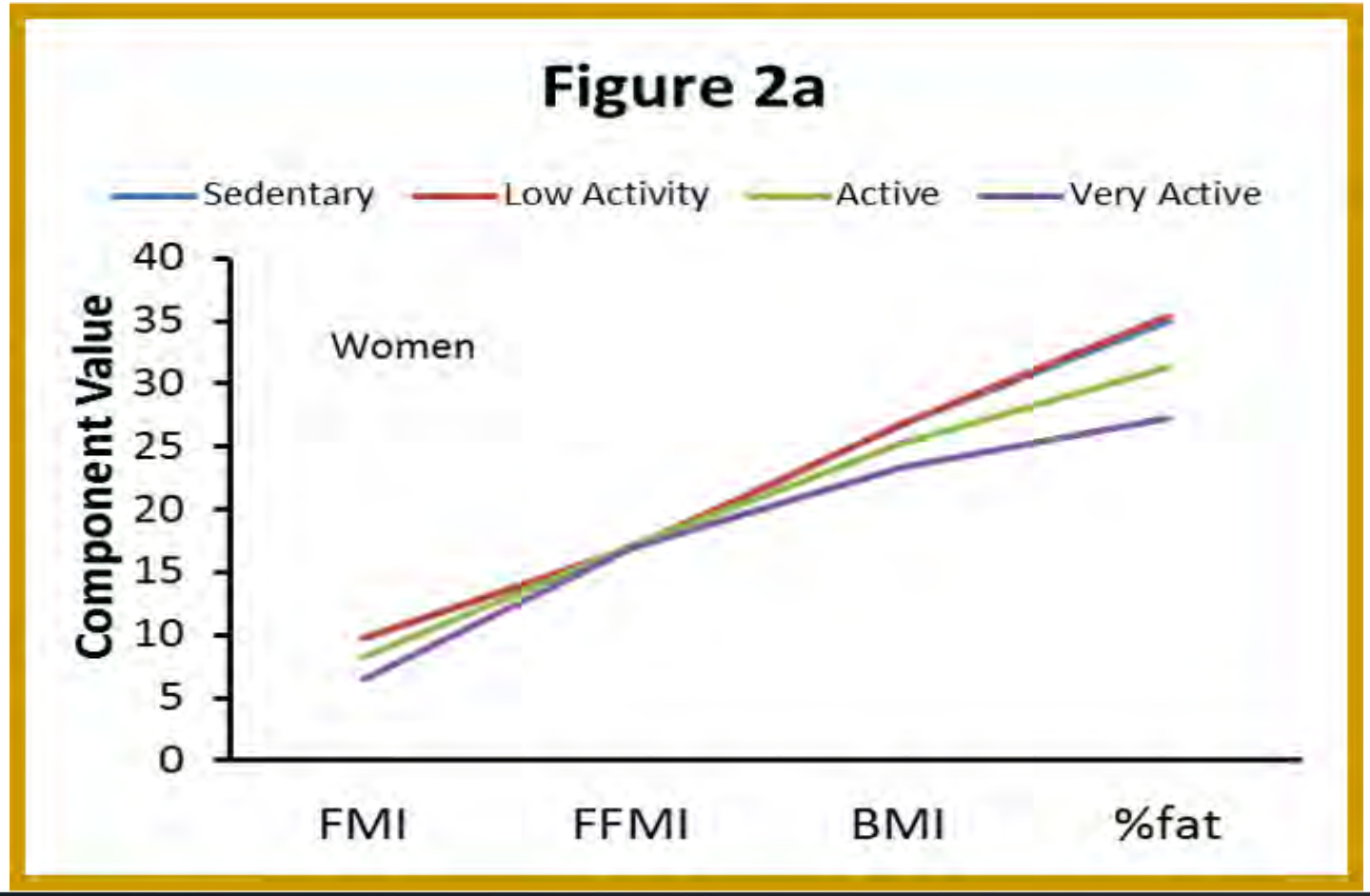




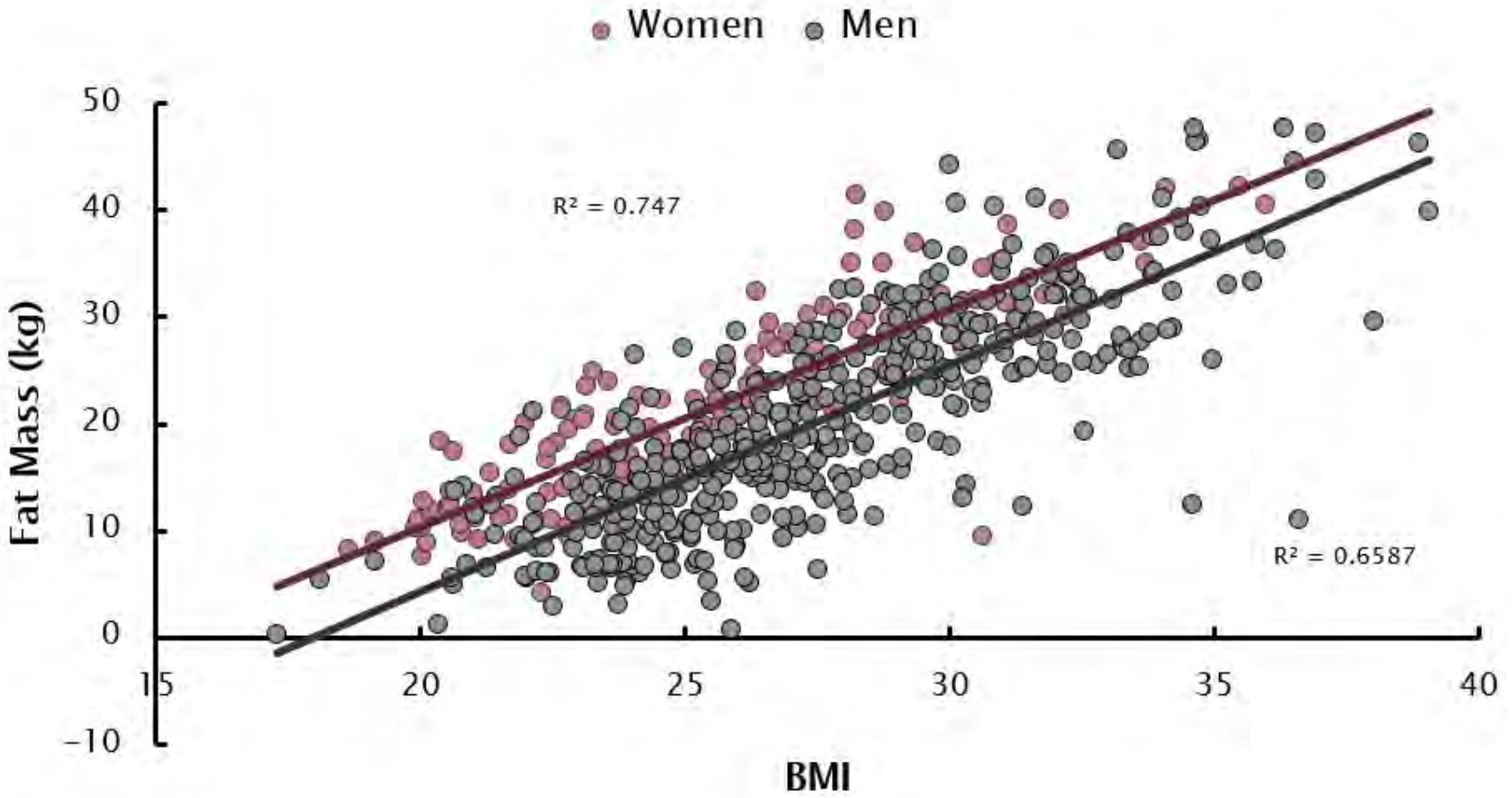
FMI, FFMI, BMI, % Body Fat and Self-Reported PA, Males



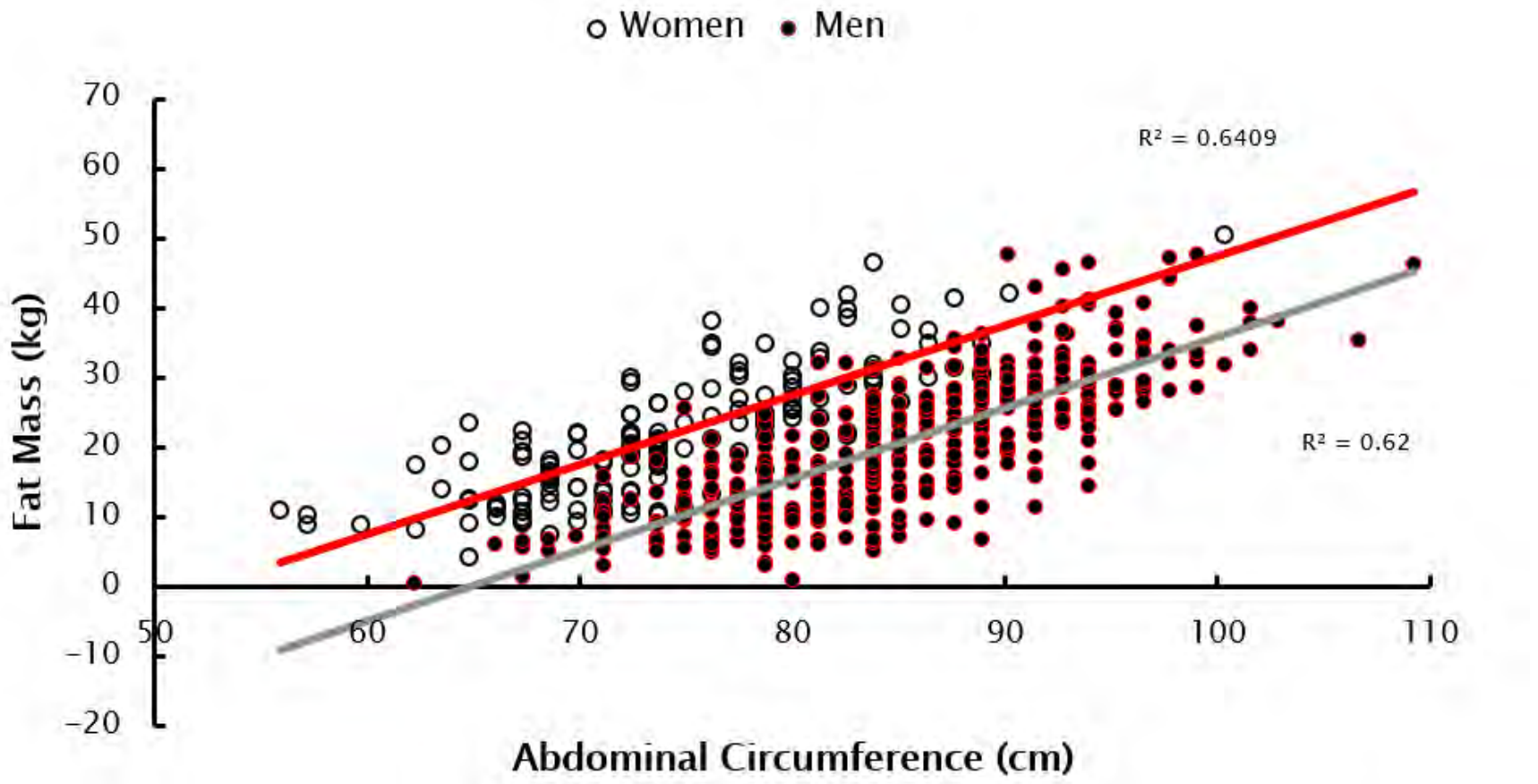
FMI, FFMI, BMI, % Body Fat and Self-Reported PA, Females



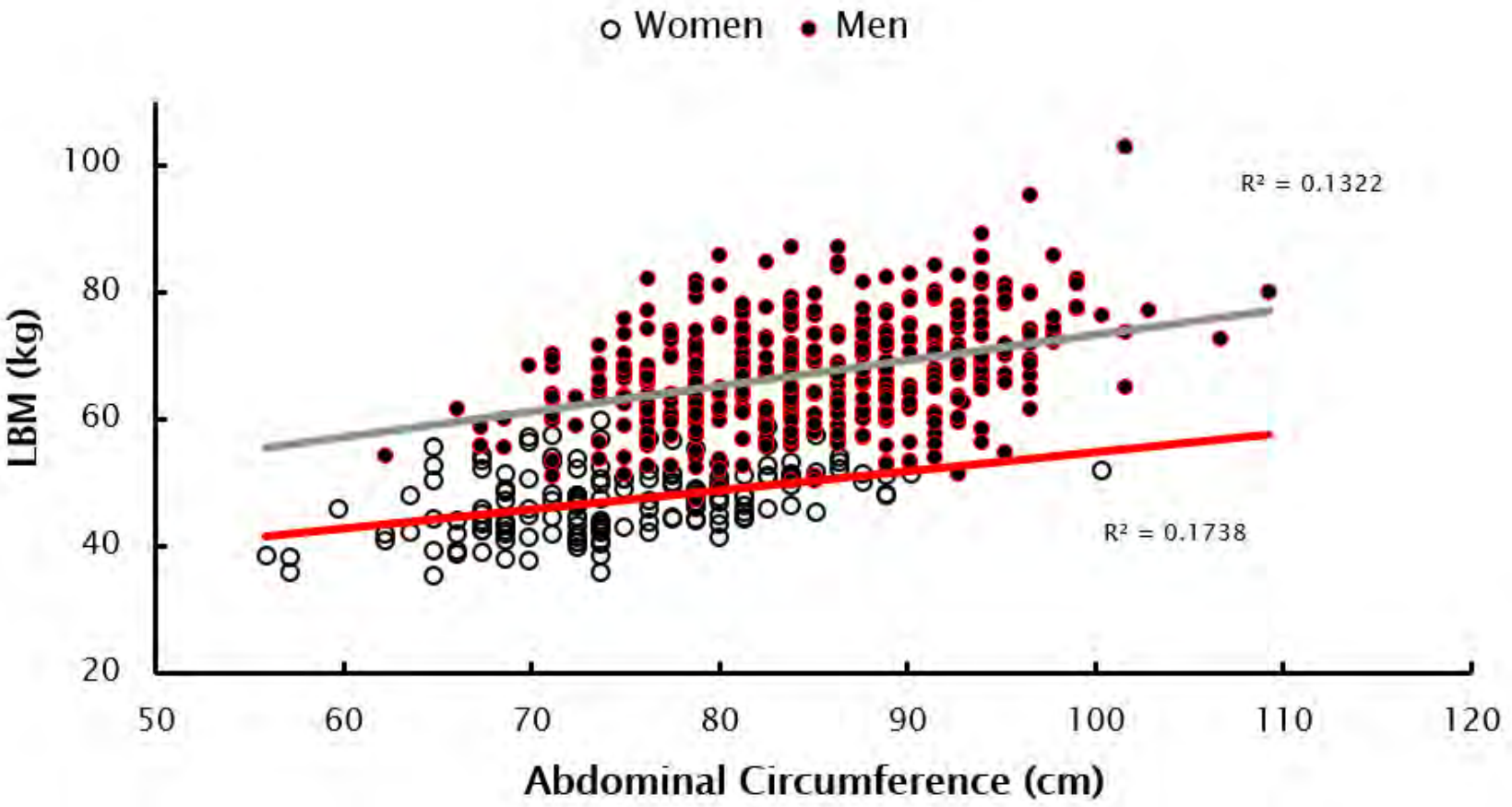
BMI/Total Body Fat Mass, Men/Women

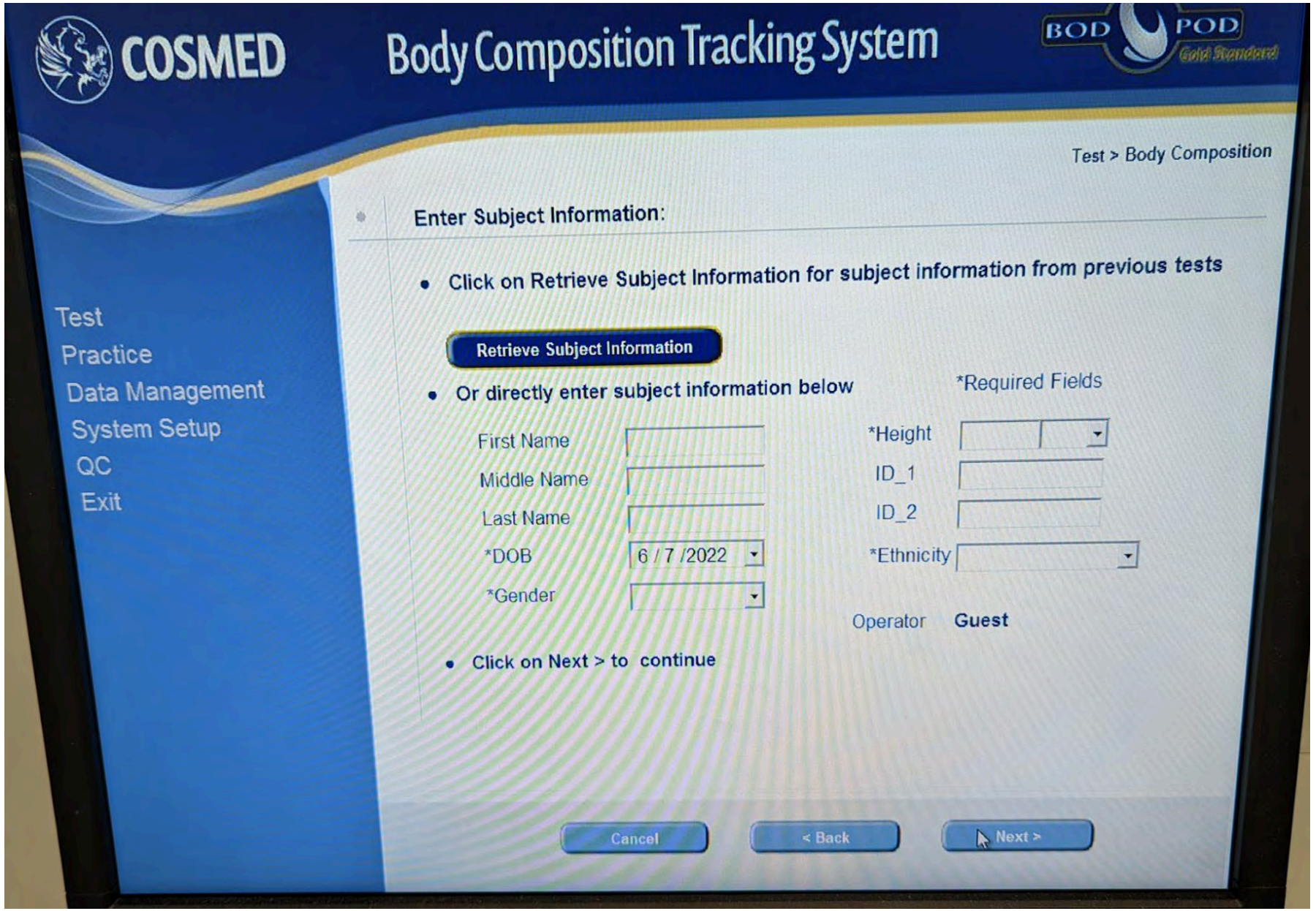


AC/Total Body Fat Mass, Men/Women



LBM/AC Relationships, Men/Women




COSMED
Body Composition Tracking System
BOD POD
Gold Standard
Test > Body Composition
Test
Practice
Data Management
System Setup
QC
Exit
Enter Subject Information:
Click on Retrieve Subject Information for subject information from previous tests
Retrieve Subject Information
Or directly enter subject information below
*Required Fields
First Name
Middle Name
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*DOB
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*Gender
*Height
ID_1
ID_2
*Ethnicity
Operator
Guest
Click on Next > to continue
Cancel
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Next >

Int J Exerc Sci. 2021 Aug 1;14(4):687-695. eCollection 2021.

Conservative Clothing Effects on Body Composition Assessment by Air Displacement Plethysmography

Shaun L Orvell [1], Kasuen Mauldin [1], John Gieng [1]

Affiliations + expand

PMID: 34567368 PMCID: PMC8439696

Free PMC article

Clin Nutr ESPEN. 2022 Apr;48:356-360. doi: 10.1016/j.clnesp.2022.01.018. Epub 2022 Jan 24.

Implications of face mask use on body composition assessment by air-displacement plethysmography

J C DiNatale [1], K M Crowe-White [2], A C Ellis [1], X Yang [3], P Thaitrong [1]

Affiliations + expand

PMID: 35331513 DOI: 10.1016/j.clnesp.2022.01.018

PLoS One. 2022 Apr 15;17(4):e0267089. doi: 10.1371/journal.pone.0267089. eCollection 2022.

The impact of subject positioning on body composition assessments by air displacement plethysmography evaluated in a heterogeneous sample

Raluca Horhat [1 2], Monica Miclos-Balica [1], Paul Muntean [1], Sandra Popa [1], Irina Sima [1], Bogdan Glisici [1], Onisim Cîrja [1], Adrian Neagu [1 2 3], Monica Neagu [1 2]

Affiliations + expand

PMID: 35427395 PMCID: PMC9012354 DOI: 10.1371/journal.pone.0267089

Int J Environ Res Public Health. 2021 Oct 12;18(20):10693. doi: 10.3390/ijerph182010693.

Reliability of Repeated Trials Protocols for Body Composition Assessment by Air Displacement Plethysmography

Paul Muntean [1 2 3], Monica Micloș-Balica [1 2], Anca Popa [1], Adrian Neagu [1 2 4], Monica Neagu [1 2]

Bod Pod Disadvantages

- Cost! (40K-60K, depending on model and pricing structure.)
- Cannot test anyone < 18 years old (unless one purchases pediatric add-on = 9K.)
- Can test max four subjects per hour.
- Not portable (it has wheels, so can be moved within a building.)
- Bod Pod has a 3% “rogue” error rate.
- Subjects don’t always follow pre-test instructions.

How we use the Bod Pod at KAFB

- Most commonly used for weight management
- Tag-team approach: Bod Pod + EXRX + MNT
- Ideally, collect risk factor data (BP, HbA1c, lipids) at same time
- Reassess Bod Pod + risk factors in 3-6 months
- Biggest improvement in one year – 15% loss of BF, no loss of FFM
- Subjects can self-refer
- Also used for PT test failures, personal validation, identification of eating disorders

InBody (Multifocal Bioelectric Impedance)

InBody Advantages/Disadvantages

- Price ($5,000-16,000, depending on model.)
- Highly portable; only weighs 30 lbs. (270)
- Completed test in 15-60 seconds (depending on model.)
- Testing can be conducted in shorts/t-shirt, so can be in a public area.
- Not as accurate as Bod Pod/DXA.
  - Better at FFM vs. FM; higher test-retest variability.
- Two studies comparing 270 to 570/770 found no significant differences in BF accuracy.
- Changes can be tracked, but results not interchangeable with Bod Pod/DXA.


AluminumTrailer.com
377th MEDICAL GROUP


InBody 270


InBody 270


InBody 270

How we use the InBody at KAFB

- Dual use: when not at a remote location, it is housed in Pediatrics, so they can test their patients “No…Johnny’s not “big-boned”… ☺
- Two more have been purchased; these will be housed in our active duty clinics. InBody assessments will become part of AD annual physicals. All AD will have an InBody assessment, which goes into their medical record.
- The providers will have access to that information, and can refer patients who need assistance in weight control to the dietitian/exercise physiologist.

Thank You!

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KIRTLAND AIR FORCE BASE