Optimal Body Composition For Performance of 101st Airborne (Air Assault) Soldiers

Author Block  Katelyn Fleishman1, Kim Crawford1, John Abt1, Timothy Sell1, Mita Lovalekar1, Takashi Nagai1, Jennifer Deluzio1, Russell Rowe2, Mark McGrail3, Scott Lephart, FACSM1. 
1University of Pittsburgh, Pittsburgh, PA.  
2Department of the Army, Stuttgart, Germany.  
3Department of the Army, Fort Campbell, KY.

Email: kaf14@pitt.edu

Abstract:
Research has shown that Soldiers meeting the Department of Defense body fat (BF) standard of ≤18% perform significantly better on a majority of physical fitness tests than those not achieving the standard. Questions remain about the BF threshold for optimal performance on various fitness tests of 101st Airborne (Air Assault) Soldiers.

PURPOSE: To assess the relationship between BF threshold and performance on tests of anaerobic power, aerobic capacity, and strength in order to determine body composition for optimal performance.

METHODS: Data from 153 male Soldiers of the 101st Airborne Division (Air Assault) was analyzed (age=28.5±7.0 yrs, height=1.79±.07 m, mass=86.2±13.4 kg). Each Soldier underwent tests of mean and peak anaerobic power (MAnP & PAnP), maximal oxygen uptake (VO2 max), and bilateral isokinetic strength testing of knee flexion/extension, shoulder internal/external rotation, and torso rotation. Body fat was determined with air displacement plethysmography. Maximal VO2, MAnP, PAnP, and cumulative strength (CS) rank were each plotted against BF and a best fit line was used to determine an inflection point for BF threshold. An independent t-test was calculated to determine significant differences between scores above and below each BF inflection point, and Spearman’s Rho was used to determine relationships between BF and performance.

RESULTS: Body fat was correlated with MAnP (r=-.646, p<0.01), PAnP (r=-.174, p<0.01), VO2 max (r=-.731, p<0.01), and CS rank(r=.541, p<0.01). Best fit lines indicated inflection points at 18% BF for MAnP and PAnP and at 14% BF for CS rank. Body fat had an inverse linear relationship with VO2 max. Mean anaerobic power was higher for Soldiers with BF <18% (8.2±0.66 versus 7.2±0.97 W/kg, p<0.01) and CS rank was higher for Soldiers with BF <14% (55.9±31.4 versus 84.9±36.2, p<0.01). There was no difference between groups for peak anaerobic power.

CONCLUSIONS: While BF and VO2 max had a linear relationship, a BF threshold may exist for MAnP and CS rank where an increase in BF decreases performance. Although a BF threshold was present for PAnP, the lack of distinction between groups may indicate that a variable independent of BF might also predict power performance. These findings provide insight in determining optimal body composition for task-specific physical readiness.