SEX DIFFERENCES IN MARKERS OF PERFORMANCE FOLLOWING THE ARMY COMBAT FITNESS TEST AMONG ROTC CADETS

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Abstract

Purpose: This study assessed differences between sexes in their recovery from performing the Army Combat Fitness Test (ACFT) while consuming military-style meals-ready-to-eat (MRE) for 3 days.

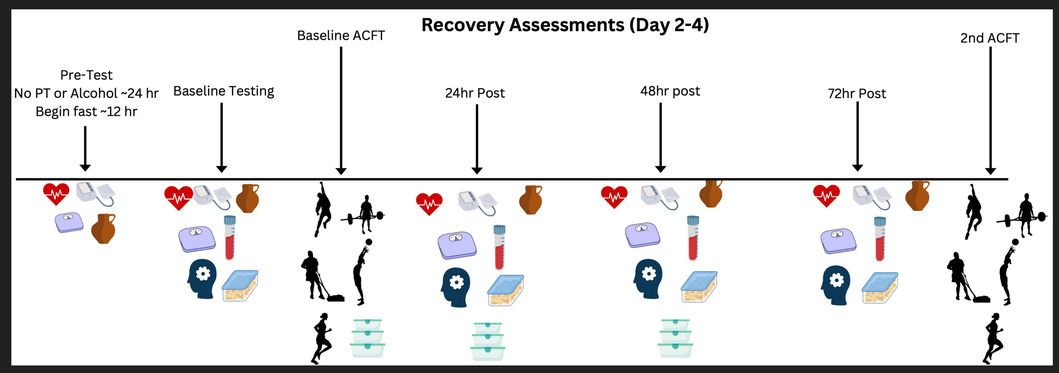
Materials and Methods: Twenty-three (n=23, 17 males and 6 females) Corps of Cadet members participated in the study. For baseline (BL) testing, day 1, participants reported to the lab in a fasted state and consumed an MRE meal (≈1,250 kcals, 145 g carbohydrate, 45 g protein, 60 g fat) for breakfast, waited four hours, then performed a standard ACFT. Participants returned to the lab on days 2 and 3, were fed an MRE for breakfast and sent home with two, for lunch and dinner. On day 4, participants returned to consume an MRE for breakfast, then repeated the ACFT four hours later. The ACFT performance variables included a 3-repetition maximum deadlift (MDL), standing power throw (SPT), hand-release push-ups (HRP), Sprint-Drag-Carry (SDC), plank (PLK), and a two-mile run (2MR) with the addition of a vertical jump. Relative load per each ACFT task was calculated by dividing the task metric by the participants' weight. Data were analyzed using a general linear model (GLM) with repeated measures and mean percent change from BL with 95% confidence intervals.

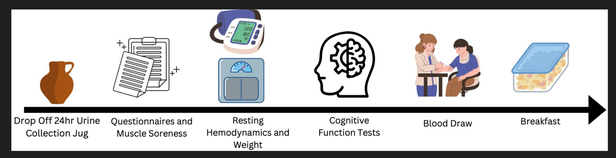
Results: GLM analysis revealed no overall time (p=0.252, η^2 =0.457) nor time x sex (p=0.457, η^2 =0.365) effects for any ACFT performance variables. Univariate analysis revealed sex effects for the vertical jump (p<0.001, η^2 =0.498), MDL (p<;0.001, η^2 =0.632), SPT (p<;.001, η^2 =0.478), SCD (p<0.001, η^2 =0.776), and 2MR (p=0.007, η^2 =0.303), wherein males performed better than females. Percent change from BL analysis (Figure 1) revealed males had a greater MDL load (4.3% [0.7, 7.8], p=0.019), a longer PLK (33.7% [17.2, 50.1], p<0.001), and a better overall total ACFT score (6.7% [1.2, 12.2], p=0.020) compared to their BL values. Conversely, females did not display the same outcomes (Figure 1), even demonstrating a decrease in SPT (-12.1 % [-24.2, -0.1], p=0.049). Additionally, when accounting for the relative load, percent change from BL analysis revealed males had a greater relative MDL load (3.2 % [0.2, 6.3], p=0.034) and total ACFT score (5.0 % [1.1, 8.9], p=0.014), while the females had a shorter SPT (-26.7 % [-51.1, -2.2], p=0.034) compared to their BL values.

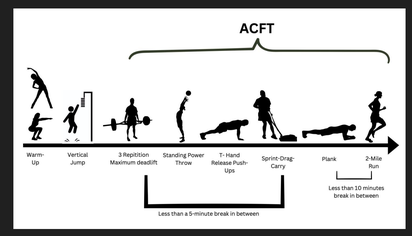
Conclusions: These data show that males generally have greater ACFT performance scores than females, with males also demonstrating improved performance on the ACFT following 3 days (72h) of recovery.

Practical Application: These data provide insight into the sex difference in ACFT performance and highlight potential areas of focus (i.e., resistance training and conditioning) for females to improve their scores.

Experimental Design







Figures

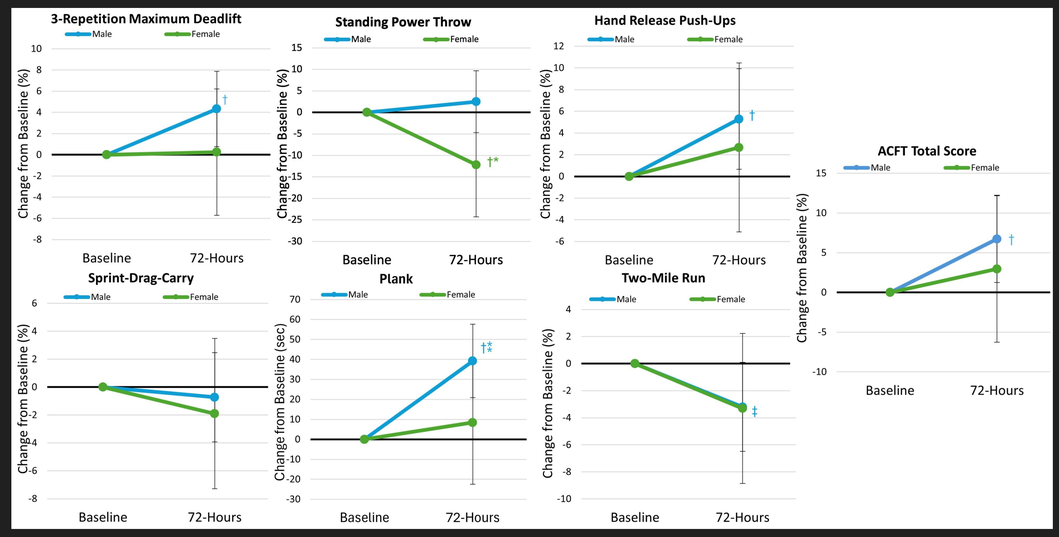


Figure 1. . Army Combat Fitness Test, percent change from baseline analysis results. † = p ≤ 0.05 difference from baseline; ‡ = p ≥ 0.05 - p<0.10 difference from baseline; * p < 0.05 difference between sex; ⁑ p > 0.05 to p <0.05 difference between sex.

Background

The current ACFT utilizes an age and sex based scoring stratification to account for physiological differences to allow for equal access to advancement and individualized assessment of physical fitness level . With the recent memorandum issued by the Secretary of Defense to re-examine the fitness standards used in the military, it is important to understand how men and women recover differently from the ACFT as it is both a fitness standard and predictor of occupational performance. The introduction of the new Army Fitness Test (AFT) removes the standing power throw and gender based scoring for combat roles, but maintains the other five events. Therefore, analyzing the differences in recovery from the ACFT may provide valuable insight to the AFT, as both assessments are comprised of identical events. Additionally, this investigation may enhance understanding of sex-based differences in recovery from occupational tasks due to the correlation between the ACFT and occupational tasks.

Methods

- Randomized, double-blind, placebo-controlled, and crossover design.
- 23 TAMU Corps of Cadet members (17 men and 6 women) were recruited.
- Consumed pork- or plant-based MREs over a 3 day period.
- Completed a battery of questionnaires and cognitive testing, had their subjective muscle soreness assessed with an algometer and VAS rating scale, and donated a fasting (>12 hour) blood.
- Performed ACFT on baseline day and 72 hours later.
- Recovery assessed at 24, 48, and 72 hours.

Statistical Analysis

Data were analyzed by General Linear Model (GLM) univariate analyses with repeated measures using weight as a covariate and mean and percent changes from baseline with 95% confidence intervals.

Results

Army Combat Fitness Test:

- Multivariate analysis → no time effect (p=0.252, η^2 =0.457),no sex time effect (p=0.457, η^2 =0.365)
- Univariate analysis → revealed sex effects for the vertical jump (p<0.001, η^2 =0.498), MDL (p<0.001, η^2 =0.632), SPT (p<;.001, η^2 =0.478), SCD (p<0.001, η^2 =0.776), and 2MR (p=0.007, η^2 =0.303)
- Percent Change → males: MDL (4.3% [0.7, 7.8], p=0.019), PLK (33.7% [17.2, 50.1], p<0.001), overall total ACFT score (6.7% [1.2, 12.2], p=0.020). Females: SPT (-12.1 % [-24.2, -0.1], p=0.049).

Conclusions

The main findings of this study males generally outperformed females in the ACFT while also showing limited performance degradation or performance improvement at 72 hours compared to females.

Practical Application

These data suggest females might need increased strength training programs to improve performance and enhanced recovery after intense exercise compared to their male counterparts.

Acknowledgements

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