DECREASED PERCENT BODY FAT BUT NOT BODY MASS IS ASSOCIATED WITH BETTER PERFORMANCE ON COMBAT FITNESS TEST IN MALE AND FEMALE MARINES

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ABSTRACT

Purpose: To investigate the association between body mass (BM), fat free mass (FFM), and percent body fat (BF%) with CFT performance in male and female Marines. **Methods:** 210 male (22.4 ± 2.6 yrs) and 84 female (22.6 ± 2.8 yrs) Marines were categorized separately and grouped into quintiles according to BM (kg), FFM (kg) and BF%. Kruskal Wallis test or one-way ANOVA, as appropriate, were used to determine if significant differences in CFT total and component scores existed between groups of subjects classified into quintiles of BM, FFM and BF% (0.05, two-sided). **Results:** No significant differences in CFT scores were observed between BM quintile, in either men or women. No significant differences in CFT scores were observed between FFM quintiles in men. Total CFT score (p=0.002), MTC (p=0.014), MANUF (p=0.008) and AL (p=0.014) were all significantly different among FFM quintiles in women, with significant differences observed between the lowest and highest quintile for all variables, as well as between the lowest and third for Total CFT, MANUF and AL. Total CFT score (p=0.007), MTC (p=0.001) and MANUF (p=0.022) were significantly different among BF% quintiles in men, with significant differences observed between the lowest and highest quintiles for Total CFT and MANUF, as well as the lowest and third quintiles and the lowest and highest quintiles for MTC. Total CFT score (p=0.008), MTC (p=0.033) and AL (p=0.016) were significantly different among BF% quintiles in women with significant differences observed between the lowest and highest quintile for Total CFT score and the second and highest quintiles for MTC. **Conclusions:** No significant relationship was observed between BM classification and CFT performance. In female Marines, a significant relationship existed between FFM classification and CFT performance. For both male and female Marines, a significant relationship existed between BF% classification and CFT performance. Male and female Marines in the lowest BF% quintile had better CFT scores than those in higher quintiles.

INTRODUCTION

- Higher percent body fat (BF%) has been reported as a predictor of reduced running performance and muscular strength
- The Marine Corps designed the Combat Fitness Test (CFT) to emphasize functional fitness related to operational demands
- Three, equally weighted, components include an 880 yard endurance course (movement to contact: MTC), a 30 pound ammunition lift (AL) and a 300 yard shuttle run that includes combat related tasks (maneuver under fire: MANUF)

METHODS

- 210 male (22.4 ± 2.6 yrs) and 84 female (22.6 ± 2.8 yrs) Marines from Camp Lejeune, NC
- Bod Pod Body Composition System (Life Measurement Instruments, Concord, CA) assessed body composition
- Subjects were categorized separately and grouped into quintiles according to BM (kg), FFM (kg) and BF% as seen in **Table 1**
- Kruskal Wallis test or one-way ANOVA, as appropriate, were used to determine if significant differences in CFT scores existed between quintiles of BM, FFM and BF% (0.05, two-sided)
- If required, post hoc analysis was conducted using a Bonferroni correction

Table 1. Quintile Cutoff Points

	20th P	40th P	60th P	80th P
Female FFM (kg)	43.83	47.26	49.44	52.30
Male BF%	13.5	17.0	20.4	24.1
Female BF%	19.6	22.5	26.3	28.0

RESULTS

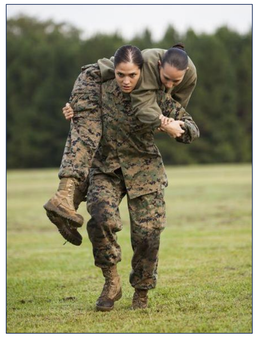
- No significant differences in CFT scores were observed between BM quintile, in either men or women
- No significant differences in CFT scores were observed between FFM quintiles in men
- Total CFT score, MTC, MANUF and AL were all significantly different among FFM quintiles in women
- Total CFT score, MTC and MANUF were significantly different among BF% quintiles in men
- Total CFT score, MTC and AL were significantly different among BF% quintiles in women **(Table 2)**

Table 2. Relationship between fat free mass and percent body fat by quintile and performance on the Combat Fitness Test

		Q1 (≤ 20th P)			Q2 (> 20th P AND ≤ 40th P)			Q3 (> 40th P AND ≤ 60th P)			Q4 (> 60th P AND ≤ 80th P)			Q5 (> 80th P)			p-value
	CFT Components	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	N	Mean	SD	
Female FFM (kg)	CFT Total Score	17	288.59	9.27	17	293.47	9.75	17	**297.00**[a]	3.76	17	290.76	8.79	16	**297.19**[a]	5.44	0.002*
	MTC (sec)	17	211.18	14.97	17	201.06	17.70	17	203.41	13.41	17	213.41	18.18	16	**196.88**[a]	17.44	0.014*
	MANUF (sec)	17	201.53	21.46	17	182.29	29.63	17	**179.76**[a]	13.24	17	191.82	24.24	16	**175.25**[a]	20.13	0.008†
	Ammo Can Lift (reps)	17	59.18	8.25	17	67.59	15.36	17	**70.35**[a]	11.75	17	66.06	12.30	16	**74.00**[a]	16.10	0.014*
Male BF%	CFT Total Score	43	290.93	9.78	42	290.00	8.43	42	286.07	10.29	43	286.30	12.93	40	**283.28**[a]	11.44	0.007*
	MTC (sec)	43	168.88	13.10	42	172.60	12.22	42	**179.29**[a]	15.90	43	177.51	19.00	40	**180.78**[a]	14.58	0.001*
	MANUF (sec)	43	141.95	18.40	42	142.12	15.70	42	146.48	16.63	43	147.70	17.94	40	**154.10**[a]	21.31	0.022*
	Ammo Can Lift (reps)	43	97.19	9.24	42	95.98	7.39	42	97.67	9.70	43	96.74	9.66	40	95.40	7.79	0.885*
Female BF%	CFT Total Score	17	296.41	7.28	17	295.12	6.74	17	292.18	8.48	17	294.41	8.33	16	**288.38**[a]	9.23	0.008*
	MTC (sec)	17	201.00	13.48	17	199.29	21.44	17	203.82	17.74	17	206.41	12.63	16	**216.56**[b]	15.64	0.033†
	MANUF (sec)	17	176.59	25.46	17	184.24	22.95	17	191.12	22.80	17	184.94	26.21	16	194.94	19.52	0.215†
	Ammo Can Lift (reps)	17	71.76	17.01	17	66.24	13.38	17	63.00	8.63	17	73.71	14.64	16	61.75	9.75	0.016*

Time written in seconds *Kruskal Wallis test. †One way ANOVA
[a] Significant difference from Quintile 1 [b]Significant difference from Quintile 2

CONCLUSIONS



- All Marines in this study met CFT passing criteria
- No significant relationship was observed between BM classification and CFT total or component performance
- In female Marines, a significant relationship existed between FFM classification and CFT performance
- Both male and female Marines, a significant relationship existed between BF% classification and CFT performance
- Male and female Marines in the lowest BF% quintile had better CFT scores than those in higher quintiles

PRACTICAL APPLICATION

- Increased BF% in men and women might be detrimental to performance on total CFT score and its components
- Increased FFM mass in women might be beneficial to performance on total CFT score and its components
- Percent body fat may be a better indicator of predicting performance on CFT than body mass

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