Brown adipose tissue activation by cold exposure in brazilian army tactical athletes

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INTRODUCTION

Militaries are considered tactical athletes once they have significant physical fitness and performance requirements. Despite that, most of them presents a high prevalence of obesity. Brown Adipose Tissue (BAT) activation is inversely correlated with Bone Mass Index. However, it is still not clear what happens with Fat Mass Index (FMI). The aim of this study is to compare BAT activation at different temperature exposures in a group of male military personnel with different FMIranges.

METHODS

Twenty-four male military from Brazilian Army were divided in two groups accordingto FMI values. Group 1 (Excess Fat): 38.9±2.4 years, FMI: 8.35±0.5 kg/m2 and group 2 (Obesity 1):38.1±0.5 years, FMI: 10.5 ± 1.1kg/m2. The maximum supraclavicular temperature (TSCVMax) and themaximum sternum temperature (TSTRMax) were register using the infrared camera E75 FLIR®, in two moments (Figure 1). First, after 30min exposure thermoneutral environment (22.6±0.2ºC). Second, after 5 min with hands submerged in a container with ice water at the temperature of 13.0±0,0ºC. The body composition was evaluated using double X-ray absorptiometry. Kolmogorov-Smirnov normality test applied and confirmed parametric approach. The data were analyzed by SPSS® 25.0, running ANOVA GLM ($p<0.05$). The images was set using FLIR Tools® software.

RESULTS

The body composition variables presented significant difference between groups. On the TSCVMax was observed a significant increase on the right (p=0.006) and left (p=0.004) sides, only in Group 1. The TSTRMax has no increase after cold exposure. The type of group has effect on the temperature changes in the supraclavicular regions.

DISCUSSION AND CONCLUSION

BAT thermogenesis increases the consumption of glucose and fatty acids and makes it a potential target for obesity treatment. The level of obesity estimated by FMI seem to interfere in the activation of BAT. The applied cold exposure protocol proved to be effective in increasing the temperature in the supraclavicular region for the Excess Fat group.

PRACTICAL IMPLICATIONS

We recommend the insertion of the brown adipose tissue assessment, using an infrared camera and following the cold exposure protocol mentioned here, as a tool to control the caloric expenditure of tactical athletes. Furthermore, we suggest that, for the analysis of the level of obesity, the calculation of the fat mass index be used instead of the body mass index, as it is more precise in the results

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FIGURES AND TABLES

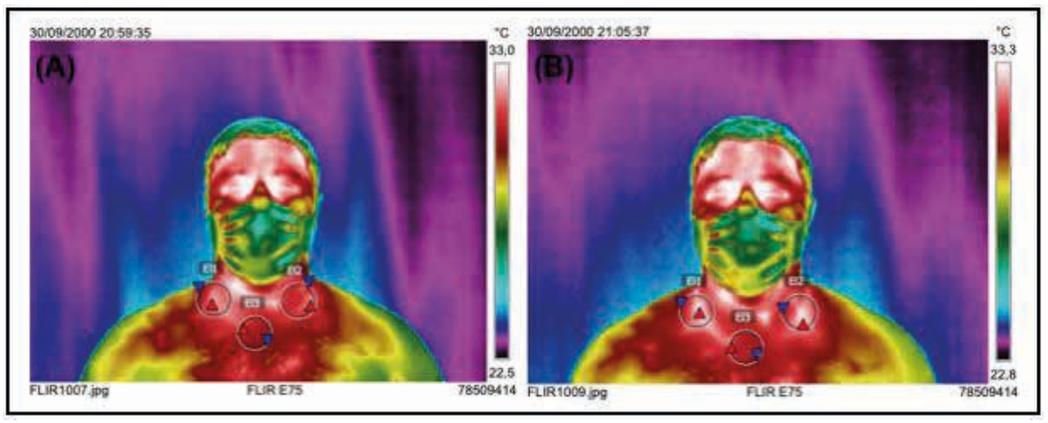

Figure 1. Thermal picture by infrared camera E75 FLIR, EI1 (Tscv max Right Side), EI2 (Tscv max Left Side), EI3 (Tstr max), thermoneutral environment (A) and cold temperature exposed (B).

Table 1 – Comparison between different temperatures of the supraclavicular region before and after exposure to cold.

Military Personnel	ROI	Temperature		
		Mean ± SD 23ºC	Mean ± SD 14ºC	*p*
Group 1 Excess Fat	$T_{SCV\ Max}$ (Right Side)	33.8 ± 0.3	34.4 ± 0.3	0.006*
	$T_{SCV\ Max}$ (Left Side)	33.6 ± 0.5	34.4 ± 0.3	0.004*
	$T_{STR\ Max}$ (Control)	32.5 ± 0.7	32.5 ± 0.4	0.711
Group 2 Obesity 1	$T_{SCV\ Max}$ (Right Side)	33.4 ± 0.4	33.7 ± 0.6	0.062
	$T_{SCV\ Max}$ (Left Side)	33.1 ± 0.6	33.7 ± 0.8	0.238
	$T_{STR\ Max}$ (Control)	32.7 ± 0.8	32.6 ± 0.4	0.622

ROI: region of interest; Tscv max: maximum supraclavicular temperature, Tstr max: maximum sternum temperature * P < 0.005 value obtained by t test two dependent sample test.

CONFICT OF INTEREST

The authors declare no conflict of interest.