

The Influence of Physical Strain During Caloric Deprivation on Cardiac Function in Extreme Military Training

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Aim: The study examined the combined effect of physical exertion and caloric deprivation on cardiac function in elite combat unit training.

Methods: 39 physically fit, healthy soldiers who participated in the training comprised the study population. The training lasted 85-100 hours during which time the soldiers participated in strenuous military exercises with no food intake. Anthropometric measurements, comprehensive echocardiographic examination and blood samples were taken before and immediately after the training.

Results: All soldiers had excellent cardiovascular performance (mean VO₂ max 59 ml/kg/min). Participants' mean weight reduction was 5.7±0.95Kg. Following training all soldiers were relatively hypovolemic with significant increases in plasma urea (pre 32.6±7.4, post 44.2±10.7mg/dL, p<0.001), creatinine (1.1±0.1 to 1.4±0.1mg/dL, p<0.001) and urine osmolarity (692±212 to 1094±140 mmol/Kg, p<0.001). Observed echocardiographic changes include a proportional decrease in mitral E and A wave inflow velocities, as well as tissue Doppler E' and A' of the mitral annulus with no change in E/A, E'/A' and E/E' ratios (table 1). There was no elevation in plasma Troponin T levels (all values< 0.01ng/mL). Surprisingly, post training BNP levels were significantly lower than baseline values (9.6±6.9 vs. 1.6±2.4pg/mL, p<0.001). BNP levels post training correlated with urea values post training. Change in BNP levels correlated positively with the change in weight and change in mitral E wave velocities.

Conclusions: In this elite group of soldiers, no adverse cardiac effects were documented despite significant metabolic and physiologic stress. The relative hypovolemia might have contributed to the observed decrease in BNP levels.

Parameter	Mean difference (post-pre)	P value
E mitral (cm/s)	-10.32	<0.001
A mitral (cm/s)	-4.72	0.019
E/A mitral	0.03	0.76
Deceleration time (msec)	-9.05	0.097
TD-derived lateral E' MV (cm/s)	-1.94	0.003
TD-derived lateral A' MV (cm/s)	-0.83	0.010
E'/A' mitral	-0.05	0.51
E/E' mitral	-0.11	0.46
TD-derived Lateral S' (cm/s)	-0.05	0.893