

Alteration in cardiac uncoupling proteins and eNOS gene expression following high-intensity interval training in favor of increasing mechanical efficiency

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Background: High-intensity interval training (HIIT) increases energy expenditure and mechanical energy efficiency. The uncoupling proteins and nitric oxide have a role in energy efficiency. This study determined the alterations of cardiac UCP2, UCP3 and eNOS mRNA expression following HIIT compared with the sedentary rats.

Materials and Methods: Wistar rats were divided into five groups: control group (n= 12), HIIT for an acute bout (AT1), short term HIIT for 3 and 5 sessions (ST3 and ST5), long term training for 8 weeks (LT) (6 in each). The rats of the training groups were made to run on a treadmill for 60 minutes in three stages: 6-minute running for warm-up; 7 intervals of 7-minute running on treadmill with a slope of 5° to 20° (4 minutes with an intensity of 80-110% VO₂max and 3 minutes at 50-60% VO₂max); and 5-minute running for cool-down. The control group did not participate in any exercise program. The heart was extracted to analyze the level of UCP2, UCP3 and eNOS mRNA by RT-PCR.

Results: UCP3 expression of heart tissue was increased significantly following an acute training bout, but UCP2 and UCP3 mRNA were decreased significantly compared to those of control group after 8 weeks. Repeated HIIT caused a significant increase in eNOS expression in cardiac muscle.

Conclusion: This study indicates that long term HIIT decreases UCPs mRNA and increases eNOS mRNA expression in rat cardiac muscle. It appears that these alterations are physiological response to meet a need for a higher metabolic efficiency in this tissue.

Keywords: UCP2, UCP3, eNOS, High-intensity interval training