

Role of fitness in a myocardial infarction event

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Purpose: Endurance training (ET) is known to have a beneficial outcome on the morphology and the functionality of the heart and have a preventive effect in case of a myocardial infarct (MI). However, these cardiac effects are dependent on the type, duration and intensity of ET. This study aims to validate a 4 weeks swimming protocol in female rats and investigate the cardiac alterations following ET and MI using high-resolution echocardiography.

Methods: 35 rats (Lewis female, 200-250g) followed a training protocol of 4 weeks during which ones they swam in a container filled with tap water (80 cm deep) kept at 32° C. Training was limited to 10 minutes on the first day and increased by 10 minutes each day until a maximum of 60 minutes for the last 3 weeks of the training protocol.

MI was performed on rats trained and untrained rats (as control) by the ligation of the left anterior descending coronary artery on week 5. Quality control of coronary ligation was assessed by troponin plasma level 24 hours post-ligation.

Cardiac function was assessed by high-resolution echocardiography pre and post MI (at 2- and 6-weeks), and a comparison between groups as well as between pre and post-intervention (ET or MI) were performed.

Results: We provide evidence that our model of ET increased the heart Mass/weight suggesting a cardiac hypertrophy. We showed that the hypertrophy was concentric in 2/3 of the animals and eccentric for 1/3 as defined with structural parameters. Indeed, the posterior and anterior walls thickness was increased in concentric while the volume of the left ventricle was increased for the eccentric response. Eccentric hypertrophy was also associated with an increased stroke volume and an increased time to peak for strain parameters suggesting a slower contractibility.

Following MI, the end diastolic and systolic volumes were similarly increased for both types of hypertrophy and also for untrained animals. Stroke volume had remained more elevated in eccentric respondents compared to concentric ones for up to 2 weeks post MI. This difference disappeared 6 weeks post MI.

Conclusion: Our study shows that female rats responded differently to a four weeks swimming training with either an eccentric or a concentric hypertrophy. ET prevented partially the acute reduction of the stroke volume induced by MI.

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