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Moderate exercise improves cardiac hypertrophy in female aged mice

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Age-related diastolic dysfunction has a significant impact on the elderly health, in fact the left ventricular filling is impaired, limiting intense exercise tolerance and reducing the quality of life. Pathological hypertrophy is commonly associated with up-regulation of fetal genes, fibrosis, cardiac dysfunction, fat deposits and increased mortality. Regular and moderate physical activity improves cardiac performance in elderly people. Type 5 cyclic nucleotide phosphodiesterase (PDE5) regulates intracellular cGMP levels and its increased expression has an important role in the development of cardiac hypertrophy (1). Our hypothesis is to assess if moderate exercise modulates PDE5 expression and reduces cardiac hypertrophy in old mice. CD1 female mice were grouped in young (2 months) sedentary (YS), young trained (YE), old 20 months sedentary (OS) and old old trained (OE). Exercise was performed at moderate intensity (speed of 13 m/min, for 30 minutes) on tapis roulant for 5 days/week. Morphometric (left ventricular weight/tibial length ratio) and histological (cardiomyocyte size) analyses showed that cardiac hypertrophy is present in OS compared to YS and YE and significantly reduced in OE group compared to OS. Moderate exercise also attenuated cardiac fibrosis in OE group. Molecular analysis revealed that hypertrophic markers such as ANP, BNP, GATA 4 and NKX 2.5 were significantly down-regulated in OE group. SIRT1 and PPARα, two regulators of oxidative stress and fat metabolism, were up-regulated in aged trained mice. PDE5 expression is down-regulated after exercise in OE group. These results suggest that exercise leads to a beneficial effect in old mice. Interestingly PDE5 expression correlates with the anti-hypertrophic effect of training in old mice.

References

[1] Pokreisz et al. Ventricular phosphodiesterase-5 expression is increased in patients with advanced heart failure and contributes to adverse ventricular remodelling after myocardial infarction in mice. Circulation 2009 119:408-16.