

Exercise Improves Vascular Dilator Reactivity in Chronically Stressed Rats with Pre-existing Metabolic Syndrome

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The prevalence of the metabolic syndrome (MetS) and chronic stress/depression is rapidly increasing as well as an increased risk for poor cardiovascular outcomes. Poor cardiovascular outcomes produced by each of these disease states are caused by impaired vascular function. It is not known if comorbidity between the MetS and chronic stress has a confounding effect on the cerebrovascular system. It is known that exercise is an effective intervention to improve vascular dysfunction. Obese Zucker Rats (OZR) are used as a representative model of the MetS, where their lean counterparts (LZR) are considered healthy controls. To induce depressive symptoms in these rodents, an Unpredictable Chronic Mild Stress (UCMS) protocol was administered to mimic daily, chronic stress. **PURPOSE:** To determine if UCMS has a confounding effect on cerebrovascular dysfunction in OZR and to what degree an exercise intervention can improve this vascular dysfunction. **METHODS:** OZR and LZRs were separated into experimental groups including: control, UCMS, and UCMS plus exercise. The middle cerebral artery (MCA) was isolated and exposed to increasing doses of acetylcholine to assess endothelial function. TEMPOL was also used to determine the role of oxidant stress in modulating reactivity via vasodilation. **RESULTS:** LZR MCAs experienced a 30% decrease in dilation after UCMS but with added exercise, MCA dilation was improved by 15%. Dilation response in OZR MCAs was attenuated by approximately 40%. This impairment was recovered by exercise and increased dilation by 50% from UCMS alone. TEMPOL incubation improved dilation in OZR control MCAs but did not have an effect on LZR control MCAs. Dilation responses in both OZR and LZR UCMS MCAs were improved to almost control values with TEMPOL incubation but with exercise, TEMPOL did not augment dilation. **CONCLUSIONS:** Chronic stress has a confounding effect on cerebrovascular dysfunction in rats with pre-existing metabolic syndrome. Exercise proves to be an effective intervention to improve microvascular reactivity in comorbidity between the MetS and chronic stress.

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