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Aerobic Exercise Preconditioning Prevents Behavioral Deficits in an Ovariectomized Rat Model of Post-traumatic Stress Disorder

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Objective Post-traumatic Stress Disorder (PTSD) occurs in people who suffers reparative shocking, scary, or dangerous event. Evidences demonstrate that PTSD is associated with cognitive decline and depression. In the general population, women tend to show higher incidence of PTSD compared with men. Using the the ovariectomized rat model, the present work was designed to investigate the potential beneficial effect of aerobic exercise on the prevention of PTSD.

Methods Adult Sprague-Dawley male rats were randomly divided into the following four groups (n = 8-10 in each group): 1) naïve control group; 2) ovariectomized group (OVX), 3) OVX with PTSD group (OVX + PTSD), 4) OVX + exercise group (OVX + Exe), and 5) OVX + PTSD + exercise (OVX + PTSD + Exe). For exercise pretreatment groups, the rats were subjected to 30 min of treadmill exercise (30 min/day, 5 days / week) for continuous 4 weeks. Open field test and elevated plus maze were used to measure behavioral changes from day 59 to day 66. Hippocampal levels of 17 β -estradiol (E2) and brain-derived neurotrophic factor (BDNF) level were measured.

Results 1. Results of open field and elevated plus maze test revealed that OVX animals exposed to PTSD showed obvious anxiety-like behavior compared to OVX animals without exercise. Intriguingly, anxiety-like behavior in OVX + PTSD group was significantly improved by aerobic exercise pretreatment in ovariectomized animals after PTSD. 2. Hippocampal levels of E2 and BDNF levels in the OVX + Exe group were significantly increased after aerobic exercise compared to these from OVX without exercise group.

Conclusions These findings demonstrated that aerobic exercise preconditioning can efficiently prevent anxiety-like behavior in the ovariectomized rats subjected to PTSD, a mechanism could be associate with the increased levels of E2 and BDNF induced by exercise treatment.