

Anti-apoptotic effect of exercise on neuropsychiatric disorders

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Despite the remarkable advance in medicine and science, the complete cure of neuropsychiatric disorders is still a challenging task. In the aging society, the prevalence of neurodegenerative diseases such as Alzheimer's disease and Parkinson's disease has rapidly been increased. The complex relationship of the community members induces serious mental diseases including depression. Increment in the developmental disabilities causes not only personal suffering but also many social problems. In order to aid in the treatment of neuropsychiatric disorders, the need for the alternative and complement methods has been raised.

Exercise is hobby in humans and it also serves as the technology in the games such as Olympics. Exercise is known to exert many beneficial effects on health. Exercise increase cardiovascular function, decreases body fat, and reduces the incidence of metabolic diseases. Recent studies have demonstrated that exercise improves learning ability and memory function, protects against neurodegenerative diseases, delays age-related cognitive decline, and alleviates symptoms of the developmental disorders. Exercise exerts neuroprotective effects through enhancing neurogenesis, increasing neurotrophic factors' expression, and inhibiting apoptosis. With the enhancing effect on neurogenesis, the suppressing effect on apoptosis is the most striking effect of exercise on neuropsychiatric disorders.

Apoptosis, known as programmed cell death, is a highly regulated process that enables the body to eliminate unwanted or dysfunctional cells. However, inappropriate or excessive apoptosis is a component of many neurodegenerative conditions.

Through our studies, suppressing effect of exercise on neuronal apoptosis has been demonstrated. Treadmill exercise promoted the recovery of motor function by suppressing apoptosis in the injured spinal cord (Jung et al., 2014). Kim et al. (2013) reported

that exercise inhibited hippocampal apoptosis under the brain inflammatory conditions. Treadmill exercise inhibited apoptotic dopaminergic neuronal loss through suppressing microglial activation in Parkinson's disease mice (Sung et al., 2012). Anti-apoptotic effect of exercise contributed to the improvement of depressive symptoms (Baek et al., 2012). Treadmill exercise could overcome traumatic brain injury by suppressing apoptosis in the hippocampus (Kim et al., 2010a). Treadmill exercise suppressed aging-induced apoptosis in the hippocampus, resulting in alleviation of memory impairment (Kim et al., 2010b). Treadmill exercise exerted as the mediator enhancing survival of Purkinje neurons in traumatic brain injury-induced indirect cerebellar injury (Seo et al., 2010).

In our studies, the therapeutic efficacy of treadmill exercise can be ascribed to the anti-apoptotic effect of exercise. Based on the previous studies, it is possible that exercise might be considered as the therapeutic modality for many neuropsychiatric disorders.

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