

New horizon for the therapeutic modality of exercise on neuropsychiatric disorders

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Since discovery of the possibility that neuronal precursors cells can differentiate into neurons (Reynolds and Weiss, 1992), neurogenesis in the olfactory bulb (Tarozzo et al., 1995) and hippocampus (Eriksson et al., 1998) of the adult mammals has been confirmed. The hippocampus plays a major role in spatial learning and memory in animals as well as humans. Neurogenesis in the hippocampus occurs throughout postnatal life, and is influenced by environment and behavior factors. Many studies have focused on the modulating factors of the neurogenesis. Enriched environment, learning, electroconvulsive therapy, anti-depressive agents, acupuncture, and exercise have been suggested as the increasing factor for neurogenesis. Adult hippocampal neurogenesis is considered to be composed of several development stages: proliferation, differentiation, migration, targeting and synaptic integration, and various characteristic neuronal markers are expressed during the specific stages. Adult hippocampal neurogenesis is closely implicated with hippocampal functions and decreased hippocampal neurogenesis is associated with neurodegenerative disorders.

Exercise is known to have many beneficial effects on health, such as increasing of cardiovascular function, prevention of chronic diseases, and decreasing of body fat. Exercise improves learning ability and memory function, protects against neurodegenerative diseases, delays age-related cognitive decline, and alleviates symptoms of the developmental and neuropsychiatric disorders. Many studies have suggested the possibility that exercise can be a therapeutic modality for brain diseases. Neurogenesis induced by exercise is reported to be necessary in the hippocampal-dependent learning process. Suppression of hippocampal neurogenesis may

contribute to cognitive dysfunction in aging, dementia, epilepsy, and other brain inflammatory conditions. The fact that exercise increases neurogenesis has enabled new research on the role of exercise. Most widely studied effect of exercise is on the depression.

In our studies, treadmill exercise enhanced neurogenesis with increment of serotonin expression, which resulted in improvement of depressive symptoms (Baek et al., 2012). Treadmill exercise alleviated aging-induced memory impairment by enhancing neurogenesis (Kim et al., 2010). Kim et al. (2013) reported that exercise also accelerated maturation of neurons under the brain inflammatory conditions. These therapeutic efficacies of treadmill exercise can be ascribed to the enhancing effect of exercise on neurogenesis. Thus, the enhancing effect of exercise on neurogenesis may open new horizon for the treatment of many neuropsychiatric disorders.

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