Letter to Editor

Cycling Exercise for Hippocampal Cognitive Function in Older People

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Dear Editor

Several studies have shown the effects of that physical exercise can improve cognitive function.[1] Cycling exercise, as part of aerobic exercise, has a beneficial effect on improving brain health, especially the hippocampus as a cognitive center. Physical exercise increases functional plasticity of the hippocampus by neurogenesis in the Dentate Gyrus, increasing dendritic complexity, spine density, and synaptic plasticity.[2]

In the elderly, there is a decline in cognitive abilities due to the normal aging process caused by a sedentary lifestyle and cognitive disorders such as dementia and Alzheimer's. Physical exercise can protect the nerves against neurodegenerative disease changes with a structured, individualized exercise program, intensity, and duration to maintain cognitive performance in older adults. Improved cognitive function due to physical exercise influences the expression of the Brain-Derived Neurotrophic Factor (BDNF) gene in the hippocampus, a part of the brain that plays an essential role in learning, memory, and other cognitive functions. BDNF is a neurotrophic factor in brain development, maintenance, and plasticity. BDNF contributes to the growth and development of nerve cells and supports cognitive function and memory development. Regular physical exercise can increase the production and expression of BDNF in the hippocampus. This means physical exercise can help increase the availability of BDNF in the brain, which is stored with various cognitive benefits, including improved memory, learning, and other cognitive functions.[3] Mechanisms involved in the relationship between physical exercise and increased BDNF gene expression in the hippocampus are increased blood flow to the brain during exercise, which can increase the supply of oxygen and nutrients to the brain cells, including the cells that produce BDNF. Physical exercise can also stimulate the production of neurotransmitters, such as serotonin, which contributes to increased BDNF.[4.]

A study showed that acute cycling exercise with moderate to vigorous intensity for 20 minutes, compared with a control condition of sitting rest can change the hippocampal subfield neurophysiology.[5] In the hippocampus, cognitive performance increased with 20 minutes of high-intensity cycling exercise as evidenced by salivary alpha-amylase levels in adults. Cycling exercise produced a strong increase in salivary alpha-amylase about six times higher.[6] Cycling also influences the response speed and the tasks that require attention. Increased hippocampal executive function by cycling outdoors for 16 weeks where function is a cognitive skill for managing oneself and directing behaviours towards certain goals by involving various mental

processes that help a person plan, organize, make decisions, solve problems, control impulses, and monitor action results.[7] 24 weeks of interactive cycling training had an effect also on the executive function of older adults with mild dementia; in addition, because this study had a combination of cognitive-aerobic training and one aerobic training group, the effectiveness of different interventional components could be identified. The results of this study can be used to recommend physical and mental activity for elderly people with dementia.[3]

It can be concluded that aerobic exercise, especially cycling both outdoors and indoors with moderate and heavy intensity, can improve the cognitive and executive function in the hippocampus of the elderly and can also be used as a therapy for sufferers of Alzheimer's and dementia.

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