

PHYSICAL EXERCISES POSITIVE IMPACT ON BRAIN PERFORMANCE WITH AGE

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Actuality. There are plenty of good reasons to be physically active. Among the most obvious ones there is one more reason which especially applies to those experiencing the brain fog that comes with age is that exercising changes the brain in ways that protect memory and thinking skills. Researchers say one new case of dementia is detected every four seconds globally. They estimate that by the year 2050, more than 115 million people will have dementia worldwide. Many studies have suggested that the parts of the brain that control thinking and memory (the prefrontal cortex and medial temporal cortex) have greater volume in people who exercise versus people who don't [4].

The **aim** of the research is to understand not only the immediate effects of a single exercise session but to find out how these immediate effects may build up to long-lasting, long-term brain benefits that have the potential to not only protect the brain from the negative cognitive and brain effects of aging but alleviate symptoms of the most common neurodegenerative diseases associated with aging. To achieve the set aim **the method** of thorough scientific literature analysis and synthesis was applied.

Presentation of the main material. Numerous scientists and research groups all over the world have conducted multiple tests among both rodents and different age groups of people to prove the point [2, 3, 5, 6]. Studies in rodents have documented the neuroanatomical, neurochemical, and cellular/molecular changes associated with long-term exposure to exercise. In humans, both behavioral and functional imaging approaches have started to identify the neuroanatomical systems modulated by long-term increases in exercise. Particularly, studies conducted separately by Vincent Walsh (Professor of Human Brain Research at UCL Institute of Cognitive Neuroscience in London) and Wendy Suzuki (Professor of Neural Science and Psychology at the New York University) have shown that a single bout of exercise alters behavior at the level of affective state and cognitive functioning in several key ways. In terms of affective state, acute exercise decreases negative affect, increases positive affect, and decreases the psychological and physiological response to acute stress. These effects have

been reported to persist for up to 24 hours after exercise cessation. In terms of cognitive functioning, acute exercise primarily enhances executive functions dependent on the prefrontal cortex including attention, working memory, problem solving, cognitive flexibility, verbal fluency, decision making, and inhibitory control. These positive changes have been demonstrated to occur with very low to very high exercise intensities, with effects lasting for up to two hours after the end of the exercise bout. Exercise helps memory and thinking through both direct and indirect means. The benefits of exercise come directly from its ability to reduce insulin resistance, reduce inflammation, and stimulate the release of growth factors – chemicals in the brain that affect the health of brain cells, the growth of new blood vessels in the brain, and even the abundance and survival of new brain cells. Indirectly, exercise improves mood and sleep, and reduces stress and anxiety. Problems in these areas frequently cause or contribute to cognitive impairment. Besides making memories stickier, exercise can help you focus and stay on task. Moreover, acute exercise is one of the most effective behavioral techniques for self-regulation of mood in healthy populations. [1]

How much exercise is required to improve memory? In a study done at the University of British Columbia, participants walked briskly for one hour, twice a week. That's 120 minutes of moderate intensity exercise a week. Standard recommendations advise half an hour of moderate physical activity most days of the week, or 150 minutes a week [4]. Still you should pay attention to your state of health and choose the most appropriate exercise to meet your needs and age. You may refer to the advice of the official website of the National Health Service in England: <https://www.nhs.uk/Livewell/fitness/Pages/sitting-and-sedentary-behaviour-are-bad-for-your-health.aspx>

Conclusions. To sum up we may state that studies in both rodents and humans have shown that long-term exercise is helpful in both delaying the onset of cognitive decline and dementia as well as improving symptoms in patients with an already existing diagnosis. Though to achieve such goal one should be physically active across the lifespan to reduce the risk of various neurological diseases and protect the brain from the detrimental effects of aging, apart from improving cognition in children and healthy adults.

References

1. Basso, J.C., Suzuki, W.A. The Effects of Acute Exercise on Mood, Cognition, Neurophysiology, and Neurochemical Pathways: A Review (2017) // Basso, J.C., Suzuki, W.A. // *Brain Plasticity* 2 (2016/2017), – p. 127–152.

2. Fuss J., Steinle J., Bindila L., et al. A runner's high depends on cannabinoid receptors in mice. Electronic resource. Mode of access: <http://www.pnas.org/content/112/42/13105.full>

3. Godman H. Regular exercise changes the brain to improve memory, thinking skills Electronic resource. Mode of access: <https://www.health.harvard.edu/blog/regular-exercise-changes-brain-improve-memory-thinking-skills-201404097110>

4. Martynoga B. How physical exercise makes your brain work better. Electronic resource. Mode of access: <https://www.theguardian.com/education/2016/jun/18/how-physical-exercise-makes-your-brain-work-better>

5. Sample I. Taking your brain for a walk: the secret to delaying dementia Electronic resource. Mode of access: <https://www.theguardian.com/society/2014/feb/17/brain-walk-delaying-dementia-memory>

6. Shang A., Elman M., Karmouta R., DaSilva S. et al. The effects of acute aerobic exercise on memory and cognition in healthy young adults. Electronic resource. Mode of access: <http://www.wendysuzuki.com/exercise-publications>