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The Effect of Physical Activity on Cognition and the Brain in the Process of Aging

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Abstract

In this article, we investigate the effects of physical activity and fitness on brain health and cognitive functions, as well as the prevention of possible cognitive impairments in people who are in late adulthood and early age and maybe without impairment or with some degree of cognitive impairment. According to studies, high fitness and more physical activity lead to increased hippocampal volume, periphrontal cortex, and basal nuclei.

Also, regular physical activity causes more functional brain connections, greater integrity of white matter, more efficient brain activity, and a higher level of executive and memory functions. On the other hand, most epidemiological studies and clinical trials have investigated aerobic training. However, some studies have investigated the effect of resistance training. Despite these promising results, more randomized trials are needed to clarify the heterogeneity in response to different physical activity in different people.

Keywords: Aging; Biomarker; Cognition; Old age; Physical activity

Introduction

The human brain is inherently flexible and constantly takes on a new format in the face of new experiences. However, many factors affect the capacity and range of brain flexibility throughout life, where kinesiology merges with psychology and neuroscience. In this article, we point to some evidence that a balanced level of moderate-intensity physical activity is essential for utilizing the normal capacity of brain flexibility, improving cognitive functions, maintaining health, and reducing the risks of old age. Also, in recent years, many researchers have been interested in studying the effects of aerobic and strength physical activity on improving cognitive functions of elderly people with a mild type of dementia, which we will briefly mention their results [1].

Discussion

Effects of physical activity on brain and cognition in old age

In recent years, the effects of physical activity on the brain and cognition in the elderly have been studied more extensively than other age groups. Although the results of many preliminary studies are ambiguous and dual, new studies based on meta-analyses and neural photography show more convincing patterns according to which physical activity is an effective method of improving brain function and cognition skills at the beginning and continuation of the old aging process [2].

The effect of physical activity on cognitive function

Cross-sectional, observational, and randomized clinical studies on the effect of physical activity on aging show that continuous physical activity can maintain and even improve a person's cognitive functions throughout life. This is also true in those with cognitive impairments. For example, the results of a randomized study of 18 people show that moderate-intensity physical activity improves cognitive function in all cognitive skills. However, its effect on executive performance indicators was much higher. Another longitudinal study shows that physical activity based on the self-report method is associated with a 40 percent lower risk of experiencing a cognitive decline over several years [3].

These researches, and similar studies, have a convincing discussion in this area that both continuing physical activity and initiating it at an early age has a profound effect on maintaining cognitive health, improving performance, and reducing the risk of advanced cognitive impairment

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in individuals. Also, according to clinical studies, aerobic training can lead to both the prevention of cognitive disorders and improvement in the early stages by improving cardiovascular function. Few studies have been conducted on resistance training that shows that increased strength and burning and chemical mechanisms associated with muscles can positively affect the function of neurons in different parts of the brain [4].

The effect of physical activity on brain structure

So far, more than 30 studies have been conducted on the effect of physical activity or fitness on the brain structure of people over 60 years of age, with the vast majority of them showing that they are defending its positive effect. These effects are considered important because we know that aging is associated with brain atrophy and loss of volume, which is considered as a presumed cause of dementia. High aerobic fitness levels are correlated with a greater volume of gray matter in the elderly brain in different regions such as the hippocampus of the frontal lobe, and the nucleus of codite. Also, some studies have shown that this increase in the volume of gray matter as a result of physical activity is associated with a lower risk of cognitive impairment [5].

These cross-sectional and observational studies on the elderly are in line with clinical trials showing that six months to a year of regular physical activity leads to an increase in the volume of gray matter in both the frontal lobe of the cortex and the hippocampus. Such effects on the volume of gray matter are associated with observed differences in the integrity of white matter. For example, several studies have reported that high levels of cardiopulmonary fitness and physical activity are associated with greater integrity of white matter in different pathways linking the frontal lobe to sub-cortical regions. Overall, there is convincing evidence that physical activity and fitness affect the brain structure of people at an older age, both by increasing the volume of gray matter and by increasing the integrity of white matter [6].

The effect of physical activity on brain function

Studies show that high levels of fitness, high physical activity, and randomized trials are associated with increased nervous system performance during cognitive activity. Also, high fitness levels and random interventions are correlated with increased connections and connections between the hippocampus, frontal lobe, and singulitis. The important point is that the changes observed in the fMRI paradigms focused on activity and rest are associated with improved cognitive function, which shows that these changes are not side effects without the meaning of physical activity, but have a behavioral correlation [7].

Conclusion

Overall, there is considerable evidence that higher physical activity and higher fitness levels are correlated with the cognitive and brain health of older people. However, some important questions remain. For example, there is a lot of growing evidence that the benefits of physical activity may vary depending on the function of genetic factors and diet. According to several genetic studies, physical activity can reduce the potentially destructive effects of APOE e4 allele on brain pathology recognition and biomarkers [8].

However, most studies tend to have relatively small samples and focus on a specific gene. Also, according to clinical studies, aerobic training can lead to both the prevention of cognitive disorders and improvement in the early stages by improving cardiovascular function. Few studies have been conducted on resistance training that shows that increased strength and burning and chemical mechanisms associated with muscles can positively affect the function of neurons in different parts of the brain [8].

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