

Exercise Your Mental Health Risk Away:

Can Physical Activity Delay Dementia?

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Brain and brawn might not be as separate as we think. Recent studies have suggested that physical activity, even a small amount, can help prevent the decline of brain function in old age. This new research suggests that physical exercise encourages healthy brains to function at their optimum levels. Fitness induces nerve cells to multiply, strengthens their connections, and protects them from harm. Benefits seem to extend to brains and nerves that are diseased or damaged. So next time you hop on that treadmill or put on those walking shoes, be proud of yourself not only for helping your heart, but also your head.

Promising Results

Both clinical trials and animal studies have reached similar results correlating exercise to the maintenance of brain function. Human studies utilize surveys and various standardized mental strength tests to determine how well the brain functions. In studies with rats, scientists analyze brain fortitude with qualitative tests such as mazes. Most importantly, tests on rats give scientists information about brain function at the molecular level. Several proteins have been linked to cognitive decline, giving scientists a quantitative approach to studying dementia.

These proteins include brain derived neurotrophic factor (BDNF) and beta-amyloid. Researchers have found that BDNF regulates the production of synapses, which are the connections between brain cells that allow messages to be passed on. During exercise, the production of this protein increases and more synapses are formed. The brain also makes beta-amyloid -- a harmful protein that forms plaques in the brain that lead to Alzheimer's disease. Exercising decreases the accumulation of beta-amyloid by 50% in old mice.



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Exercise Recommendations

There are numerous factors that one must consider when creating an exercise routine. First, the earlier the routine is established, the more significant the results. One study found that men and women who exercised at least twice a week in their midlives decreased the chance of developing dementia by 50%. So the best time to start is now.

The type of exercise makes a difference, too. Aerobic exercise seems to be more beneficial than anaerobic exercise. This means that running, brisk walking, swimming, or any other exercise that gets increases heart rate is beneficial for the brain. Low impact sports, such as rowing, might be more suitable for the elderly and anyone else with fragile bones. Exercises such as lifting weights and yoga do not appear to improve brain function.

The best way to improve brain function is to practice a variety of exercises. Studies in both humans and animals have shown that an exercise regime consisting of various activities helps preserve brain function better than doing the same exercise over and over again. Thus, the most effective brain-preserving regime seems to be semiweekly aerobic work-outs consisting of a variety of activities.

Alzheimer's and Exercise

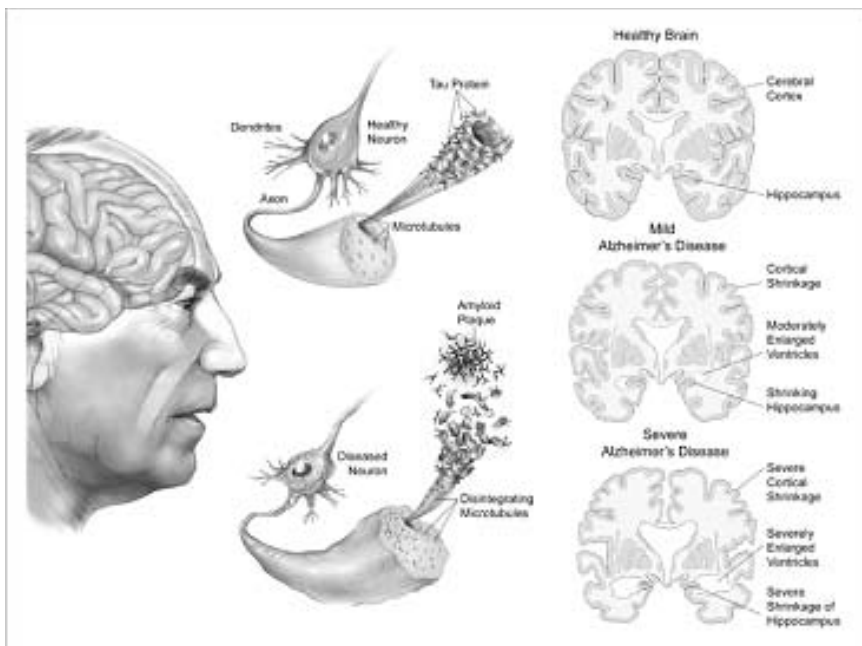
Alzheimer's disease (AD) is the most common cause of dementia affecting 15 million people worldwide, mostly over the age of 65. By the middle of this century, up to 14 million Americans may be diagnosed with the disease. Current treatments and medications are not very effective, and cost the country billions of dollars.

The cause of Alzheimer's disease is rooted in the brain. Specifically, damage in brain synapses is believed to cause the dementia that characterizes Alzheimer's disease. Synapses are specialized junctions through which cells of the nervous system signal to one another and they allow the neurons of the central nervous system to form interconnected neural circuits. Thus, they are crucial to the biological computations that underlie perception and thought. They also provide the means through which the nervous system connects to and controls the other systems of the body. Alzheimer's symptoms include steady impairment of memory, language, recognition, and daily tasks such as future-planning and decision-making.

Recent research on Alzheimer's disease is looking at the benefits that regular exercise might have on either ameliorating or delaying its symptoms. Studies with rats have shown that increased exercise leads to an increase in activity in the hippocampus, the region of the brain associated with AD, and improved synaptic function. These effects counteract the adverse symptoms of AD in rats and are thought to do the same in humans.

In one clinical study, 1,449 people aged 65-79 were questioned about their leisure time across their midlife in 1972, 1977, 1982 and 1987. After being surveyed once more in 1998, it was discovered that those who participated in some form of physical activity at least twice a week had a 60% less chance of developing Alzheimer's in comparison to those who did not. This suggests that an active lifestyle in youth and at midlife may increase the probability of enjoying both physical and cognitive health in later life.

Animal studies have linked AD to several proteins such as brain-derived neurotrophic factor (BDNF) and beta-amyloid. BDNF affects the survival and function of central nervous system neurons. Research suggests that during exercise, the

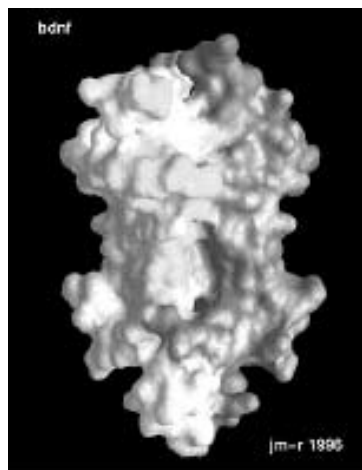


http://www.ahaf.org/alzdis/about/Brain_Neurons_AD_Normal.htm

brain increases BDNF levels, which increases the number of synapses in the hippocampus. Beta-amyloid, on the other hand, is harmful to the brain. In people with Alzheimer's, this protein surges to form the thick plaques that are one of the disease's hallmarks. In one study, mice that ran daily on a wheel for 5 months fared better on a memory test than mice that did not run. Moreover, the runners had half as much buildup of beta amyloid. All of these studies suggest that exercise is an easy and cost-effective method to reduce the risk of developing Alzheimer's disease.

Brain-Derived Neurotrophic Factor

Researchers in various neurological fields have increasingly focused their attention on brain-derived neurotrophic



<http://people.cryst.bbk.ac.uk/~ubcg09j/neurotrophins/esn11/esn11.html>

factor (BDNF). BDNF has been shown to affect the survival and function of neurons in the central nervous system, par-

ticularly in the hippocampus, the location of the brain associated with dementia. In addition, many experiments have found parallels between physical activity, brain function, and concentrations of this biomolecule.

For example, one study of rats showed that via BDNF, exercise significantly increases the expression of certain compounds that expedite the transfer of messages through brain synapses. Moreover, the more exercise is performed, the more BDNF expresses these compounds.

Other studies have shown that BDNF concentrations increase with fitness training in animals. In one experiment, rats were trained to swim and their BDNF levels were compared to those in sedentary rats. The trained rats had higher levels of BDNF than sedentary rats.

The trained rats were then detrained to see the effect of discontinued exercise on BDNF levels. In these rats, the BDNF levels were relatively low. Qualitative tests showed that trained rats had better memories than sedentary or detrained rats. This study emphasizes the importance of prolonged physical training.

Conclusion

While evidence for the benefits of exercise on the brain is soaring, physical fitness in the United States is plummeting. According to a report issued recently by the Centers for Disease Control and Prevention, nearly one-fifth of people 18 and over exercise for less than 10 minutes a week. Only 46 percent of adults performed the recommended 30 minutes or more of brisk walking or other moderate exercise 5 days a week. The obesity epidemic is affecting us in more ways than we previously thought, and is it now more important than ever to encourage each other to exercise.



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