Reading

Aerobic Exercise and Brain Health

The disease-fighting, weight-controlling benefits of physical exercise, especially aerobic exercise, have long been known. Now, researchers have discovered another advantage: Physical exercise has a powerful effect on brain health, and the benefits go beyond the release of endorphins, the chemical in the brain that improves mood. Exercise affects the brain's plasticity—that is, its ability to reorganize[1] itself—and can reduce the age-associated loss of brain tissue that decreases cognition in the elderly and in those who have disorders such as Alzheimer's disease.

Recent studies have found that exercise activates a number of factors in the brain, including a protein known as *brain-derived neurotrophic factor* (BDNF), that stimulate the growth and development of brain cells. BDNF regulates the production of synapses, the connections between neurons that are essential for transmitting signals from one nerve cell to the next, and may also be involved in producing new nerve cells. Using rodent models, researchers found increased concentrations of BDNF in the hippocampus, an area of the brain involved in learning and memory and associated with dementia, after only one week of regular exercise. A study in older humans found a correlation between aerobic fitness, the size of the hippocampus, and performance on spatial memory tests. Other human studies noted that aerobic exercise increased the volume of gray[2] matter in some parts of the brain.

Regular exercise can help stave off some effects of normal aging and delay or diminish the gravity of conditions such as Alzheimer's disease, depression, and multiple sclerosis. Even over a relatively short time, exercise can repair some of the loss in brain capacity associated with aging. The greatest effects have been found in processes such as decision-making. Aerobic exercise can also improve short-term memory in the elderly. Exercise has been found to lower the risk of Alzheimer's disease in mice by decreasing the buildup of a protein known as beta-amyloid, which forms the brain plaques that precede Alzheimer's. The mice also outperformed nonexercising mice in a memory test. In a study of multiple sclerosis patients, those who exercised regularly fared better than those who exercised less. The exercise group scored better on tests of cognitive function, and their brain scans showed less deterioration and more gray matter.

In addition to increasing brainpower, exercise can help relieve depression. Although it is well known that endorphins help relieve stress and

[1]BrE: reorganise
[2]BrE: grey

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reduce anxiety and depression, BDNF plays a role as well. Human studies have shown that people who have received a diagnosis of major depression typically have lower concentrations of BDNF in their blood. Animal studies indicate that corticosteroids, which the body produces in response to stress, decrease the availability of BDNF in the hippocampus. Exercise can counteract this effect. Exercise also lessens depression by increasing blood flow to the brain.

The link between aerobic exercise and improved brain function in the elderly and in people with impaired cognition could lead to new ways to prevent and treat brain disorders. Meanwhile, people may have more control over their own brain health than was previously believed.

Answer the questions about **Aerobic Exercise and Brain Health.**

Questions 1–8

Complete the sentences below.
Choose ***NO MORE THAN ONE WORD*** *from the text for each answer.*

1. Exercise helps people feel good mentally because it releases endorphins, which put people in a better ..... .
2. BDNF improves the connections between nerve cells in the brain because it ..... how those connections, or synapses, are made.
3. Studies on rodents showed that there were larger ..... of BDNF in the brain after just one week of exercise.
4. Exercise may lessen the ..... of Alzheimer's disease and other disorders that affect the brain.
5. As people age, they may not function as well because they lose some brain ....., but exercise can repair some of this lost ability.
6. A study with multiple sclerosis patients showed that those who exercised more had less ..... of the brain.
7. Usually, smaller amounts of BDNF are found in the blood of people ..... with depression.
8. Exercise may lessen the effects of stress because it can ..... the effects of corticosteroids, which are produced by stress.

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My Words

Write the words that are new to you. Look them up in the dictionary and write their definitions.

Words	Definitions

Word Families

noun	diagnosis	The doctor asks the patient a series of questions to make a diagnosis.
noun	diagnostician	The doctor is an outstanding diagnostician.
verb	diagnose	It is not always easy to diagnose a disease.
adjective	diagnostic	Doctors use different diagnostic tests to identify diseases.

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noun	gravity	Because of the gravity of her condition, the patient was kept in the hospital.
adjective	grave	The patient arrived at the hospital in grave condition.
adverb	gravely	The patient was gravely ill.

noun	indication	Forgetfulness may be an indication of Alzheimer's disease, or it may just be a normal part of aging.
noun	indicator	There are several key indicators that doctors look for in their diagnoses.
verb	indicate	Studies indicate that exercise helps increase brainpower.
adjective	indicative	Memory loss may be indicative of a more serious condition.

noun	impairment	Multiple sclerosis patients suffer many physical impairments.
verb	impair	Aging can impair short-term memory.
adjective	impaired	Impaired memory can be improved by regular exercise.

noun	mood	People are often in a good mood after exercising.
noun	moodiness	A person who suffers from moodiness may be helped by regular exercise.
adjective	moody	If you are feeling moody, get some exercise.
adverb	moodily	The patient replied moodily when asked if he was feeling much pain.

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Word Family Practice

Choose the correct word family member from the list below to complete each blank.

If you are suffering from a bad **1**..... that won't go away, it is important to see a doctor. Mild depression may be a temporary response to the normal stresses of life, but ongoing depression could **2**..... a more serious condition. The doctor will ask you a series of questions and may recommend some tests to come up with a **3**..... . If your condition is **4**....., the doctor may give you medication. If, on the other hand, you are not suffering any serious disorder or **5**....., the doctor may recommend something as simple as regular exercise.

1.	mood	moodiness	moody
2.	indication	indicate	indicative
3.	diagnosis	diagnose	diagnostic
4.	gravity	grave	gravely
5.	impairment	impair	impaired

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Dictionary Skill

Different Meanings
Many words have more than one meaning.

Read the definitions below. Then read the sentences and write the letter of the correct definition for each sentence.

QUESTIONS 1–2

gra-vi-ty [GRA-vuh-tee]
A *noun.* seriousness
B *noun.* the force that holds objects on the Earth

_____ 1. *Gravity* makes it easier to walk downhill than uphill.

_____ 2. Because of the *gravity* of his injury, the doctor told him not to exercise for several months.

QUESTIONS 3–4

dis-or-der [dis-OR-der]
A *noun.* a disease or illness
B *noun.* confusion; lack of order

_____ 3. The doctor's office was in such *disorder* that she couldn't find the test results.

_____ 4. Depression is a serious *disorder*, but there are ways to treat it.

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Listening

CD 1 Track 15

Listen to the conversation. Complete the form below. Write ***NO MORE THAN ONE WORD*** *for each answer.*

Hospital Fitness Center[1]

New Patient Information

Patient Name: *Amanda* 1.....

Interests: 2 ..... *exercise classes*

Level: *beginner, but previously took* 3..... *classes*

Referral? *Yes, recommended by doctor in order to improve* 4..... *and stave off* 5 ..... *gain.*

[1]BrE: Centre

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