

[Editorial]

Keep on Walking

As clinicians who evaluate and treat musculoskeletal conditions on a daily basis, we are well aware of the positive effects of regular exercise. Weight control, aerobic fitness, and muscle strength maintenance are all benefits of daily workouts. The cardiovascular system also gains from regular exercise with blood pressure control and high-density lipoprotein (HDL) enhancement, with the commensurate decline in cardiovascular risk depending on the control of other comorbidities, such as smoking and diabetes. However, not nearly as obvious are the positive effects of exercise on brain function, especially as we age.

Decades ago, our brains were compared to machines, with parts that wore out or computer hard drives that went bad, indicating a defined and limited capacity and longevity. Fortunately, neuroscience research has demonstrated that the machine and computer analogy is not accurate and our brains are more “plastic” in function. Back in the 1970s, researchers Mark Rosenzweig and Michael Merzenich showed that the brain’s circuitry changes microscopically with experience and activity.⁷ These researchers showed that with environmental stimulation, the brains of animals grew in size in key areas. In other words, our brain circuits are changing constantly depending on what we are doing in the world, both positive and negative. This is where the old adage of “use it or lose it” probably is applicable. It appears that our brains are more prone to waste away from underuse than overuse.

Most of us “baby boomers” fear the all-too-common onset of dementia in our friends and relatives, robbing us of a loved one or friend.² Alzheimer’s disease, the most common form of dementia, appears to be hitting everywhere. It has affected so many in my local vicinity that I have thought about moving, fearing some environmental cause. If it is not already an epidemic, it soon will be as baby boomers advance in age. It is a scary disease process, robbing many of the enjoyment of life.

A useful way to view dementia is the loss of the brain’s elasticity; it loses its interconnections and begins to shrink. Once brain interconnectivity is lost, confusion and often frustration ensues. Valiant efforts have and are being made to arrest the process in its early stages. Exciting research appears to show that exercise—both mental and physical—not pills or potions can help decrease the risk of this dreaded feature of adult life.¹ Peter

Elwood of the Cochrane Institute at Cardiff University in the United Kingdom studied 2235 men with ages ranging from 45 to 59 years for 30 years.³ Not surprising were that eating a healthy diet, controlling weight to a body mass index of between 18 and 25 kg/m², not smoking, and limiting alcohol consumption reduced their risk of cognitive decline by a whopping 60%. But, better than all those known traditional healthy habits was exercise! Biking 10 miles a day, walking 2 miles a day, or other vigorous exercise produced the best results. Sadly, less than 1% of the men studied adopted all 5 healthy lifestyle parameters tested, with less than 5% following 4 parameters.

Many people do not have the discipline to pursue such a rigorous lifestyle and argue that degenerative diseases such as Alzheimer’s are “in your genes” and therefore cannot be avoided. But it is quite clear that our genes interact with our environment and we can control our environment to a certain extent. Pursuing a healthy lifestyle, including daily exercise, may very well help determine how our genes are expressed.

Take, for instance, a classic simple study by Kirk Erickson, a psychologist at the University of Pittsburgh. Monitoring 299 dementia-free people, aged 70 to 90 years, starting in 1989, Erickson found that walking at least 1 mile a day significantly enhanced the volume of several brain areas, including the frontal lobe, which is involved with problem solving and reasoning^{4,5}; 169 people of those 299 who started the study were free of cognitive impairment at the completion of the study. By walking at least 1 mile a day, they had reduced their risk of cognitive impairment by approximately 50%. This represents a classic example of how the environment of the brain influences genetic factors.^{4,5} Clearly, brain development is controlled by the genetic makeup, but it appears that exercise in this group influenced cognitive function in a very positive fashion.

There are other dramatic examples of how effective exercise is on brain development and maintenance. Take the hippocampus, for instance. It is part of the limbic system, is located beneath our cerebral cortex, and has a right and left half. It is responsible for consolidating information from short-term to long-term memory and for spatial navigation.⁸ This region deteriorates in the elderly with and without dementia. A study of 165 nondemented individuals, aged 59 to 81 years, used the region of interest analysis on magnetic resonance imaging to

find a triple association between higher aerobic fitness levels associated with larger right and left hippocampi after controlling for age, sex, and years of education.⁶ The larger hippocampi and fitness levels were associated with better spatial memory performance. These results suggest that higher aerobic fitness levels are associated with increased hippocampal volume in older humans, resulting in better memory formation.

Since it is clear that in most civilized societies today life expectancy is increasing, an effort should be made to prevent the well-recognized decline in cognitive function so common in the elderly. Daily physical exercise deserves to be part of everyone's daily schedule. As musculoskeletal clinicians, we need to do our part to keep the elderly exercising and walking as much as possible. The benefits go far beyond our muscles and bones! Keep walking!

—Edward M. Wojtys, MD
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