



Brain Health Fitness and Dementia Prevention Paper

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Overview

Brain health fitness refers to the ability to maintain or optimize mental functions across the lifespan to improve quality of life at any age. Research and medical care have made significant progress in increasing the life span. In the past century, the human lifespan has doubled; one in three infants born today is predicted to live to 100 years. The older age groups within the population are growing disproportionately compared to the younger age groups, in Texas as in much of the world. The downside of these longer life years is that little has been done to extend robust cognition into late life. The majority of healthy adults experience declines in brain systems and cognitive functions that can begin as early as the fifth or sixth decade of life. With aging, the brain size decreases, connections between brain cells are reduced and interactions between brain regions are diminished.

Age-related cognitive decline can lead to slower mental processing and difficulty multi-tasking as well as difficulty with coming up with words, particularly names. When brain aging is accelerated by abnormal conditions, such as Alzheimer's disease or other dementias, cognitive decline includes the loss of recent memory, ability to track time, loss of abstract reasoning and other symptoms that can hinder one's ability to continue to live independently. In the same manner that the body is maintained through healthier lifestyle choices, such as being physically active, evidence generally shows that the same preventive measures can help to maintain brain health fitness. These approaches could diminish the effects of normal aging and help us to resist pathological brain conditions as well. Adults must take ownership for making lifestyle changes to keep their brains healthy throughout life. It is not likely that any pill or "quick fix" alone will make a lasting difference in cognitive performance.

Dementia is an example of abnormal brain disease that results in decline of both memory and normal daily life function and skills. Alzheimer's disease is the most common type of dementia and is rapidly increasing in Texas and throughout the United States. Alzheimer's disease affects approximately 10% of individuals age 65 and older and up to 50% of individuals over age 85. Today, more than 330,000 Texans are living with Alzheimer's disease, and Texas ranks second in the nation for the number of deaths due to this devastating illness. Whereas cancer and heart disease may claim more lives annually, a 2013 study by the Rand Corporation showed that Alzheimer's disease is *the most costly* illness to our society. Unfortunately, despite significant research advances, there is no treatment that can stop or reverse the disease process. Thus, it is exceedingly important for individuals and their healthcare providers to be aware of health and behavioral factors that may decrease the risk of developing Alzheimer's disease and other dementias.

Current Preventive Strategies

Although genetic and developmental factors play a role in how the brain ages, there appear to be healthy lifestyle choices that may promote optimal brain health fitness. Research now suggests that certain activities,

including mentally challenging or physical activity, may improve brain function. There is not definitive proof that following preventive measures will decrease the risk of cognitive decline in healthy aging and decline due to Alzheimer's disease and other dementias, but for the items below there is evidence to support further study:

- 1. Protecting the brain from Injury:** Major head injury with loss of consciousness, repeated head injuries, chronic use of alcohol in more than mild to moderate amounts, and smoking may increase the risk of cognitive decline and dementia, so measures should be taken to avoid these brain injuries.
- 2. Healthy hearts support healthy brains:** Growing evidence suggests that one may be able to slow cognitive decline in healthy aging and lower the risk of Alzheimer's disease and other dementias by reducing factors leading to heart and vascular disease. Vascular disease (i.e. atherosclerosis or "hardening of the arteries") can begin early in life. This can lead to stroke, but may also result in undetectable changes in the brain, which, over time, can affect memory and thinking. Avoiding or controlling risk factors for heart and vascular disease (high blood pressure, high cholesterol, diabetes, metabolic syndrome, elevated blood homocysteine levels), obesity, and physical inactivity helps to keep the brain healthy. A recent review by Alzheimer's Disease International emphasizes this approach to possibly reduce the risk of Alzheimer's disease and other dementias.
- 3. Diet:** Heart-healthy diets are believed to help protect the brain. Growing evidence suggests that following a Mediterranean-type diet and other diets that are low in saturated fats, high in omega-3 fatty acids (from fish), high in colorful vegetables and fruits, low in foods with added sugars, and with only moderate wine consumption, may offer protection against cognitive decline and dementia. Healthy and well-balanced diets will also help to protect against obesity, diabetes, and heart disease.
- 4. Brain engagement and mental activity:** There appears to be cognitive benefit to being a life-long learner and keeping one's brain active. Data suggest that the greatest protective effect of brain stimulation comes from early-life education, during the period of most active brain development. For adults, activities that are intellectually challenging have been associated with mitigating cognitive decline in healthy aging individuals, and possibly with delaying cognitive decline in those with brain diseases that affect cognition. Further, it appears that those who are most cognitively active are able to function better even in the presence of brain disease and may be able to remain independent longer.
- 5. Socialization:** People who are socially active may be more likely to maintain cognitive robustness. Strong social networks and active social lives (i.e. interacting with others, volunteering, etc.) may be protective against preventable cognitive decline and may help people who have Alzheimer's disease or another form of dementia to function at a better level. Although the mechanism of protection is not understood, social interaction stimulates the brain, provides changing situations that require adaptation, and helps keep us mentally sharp.
- 6. Stress:** Stress alone has not been shown to cause cognitive loss or dementia, although high levels of chronic stress can affect mental and physical functioning in some individuals. Stressful mental activities that may hinder optimum cognitive brain performance include: too much multitasking, working constantly without taking time to reflect, and avoiding new learning opportunities and mentally challenging activities. Good stress management throughout life will help to prevent the brain from overexposure to stress hormones, which can have an adverse effect on memory and thinking.
- 7. Sleep:** In order to have a healthy brain, regular and restful sleep must occur. In the short term, inadequate sleep may affect one's ability to think efficiently, problem-solve, process, store, and recall information. Deep sleep is believed to be necessary for good memory formulation and retention.

Experts recommend 6-8 hours of sleep per night for optimal function. Research also suggests that brain protection may be particularly related to sleep quality.

- 8. Physical activity:** Regular physical activity was identified by the 2010 National Institutes of Health (NIH) State-of-the-Science panel as a potential means to help prevent cognitive decline in healthy adults and those with dementia. Recent studies have shown that individuals who are physically fit tend to have less brain tissue loss with aging and enhanced brain blood flow. Actively exercising muscles can produce chemicals that stimulate the growth of brain cells. Collectively, there is evidence suggesting that being physically active actually enhances brain health. Current recommendations include that able-bodied Americans should participate in at least 150 minutes of moderate to vigorous aerobic activity each week.

Additional Considerations

- 1. Depression:** In some older individuals, there is a relationship between depression and cognitive decline. Those with a history of depression developing late in life may be more likely to develop Alzheimer's disease. On the other hand, depression alone can reduce cognitive abilities, and patients with dementia can become depressed. Thus, it is important for anyone with memory loss to be evaluated for depression and treated as indicated. The co-existence of depression and dementia can also further decrease everyday functional abilities.
- 2. Supplements:** While there is a large industry that advertises the brain health benefits of various supplements, it is important to realize that supplements and their advertising are not subject to Food and Drug Administration approval. Manufacturers can talk about theoretical benefits but are not required to prove these benefits, as they are with FDA approved drugs. Supplement companies cannot claim that their supplement treats any specific disease (e.g. Alzheimer's disease) but they can talk about improving cognition or memory, even if there are no studies to prove these claims. When there are specific nutritional deficiencies, such as B12 deficiency or Vitamin D deficiency, supplements can be indicated to correct the abnormality, and there is some evidence that correction of abnormal levels can improve cognition. In general, supplements are usually not necessary if a heart-healthy diet is followed and there is no demonstrated deficiency.
- 3. Clinical Trials:** In the absence of clear guidance to the public regarding what should be done to prevent Alzheimer's disease, there is a need for formal studies. It should be noted that a number of clinical trials are underway to examine whether interventions, such as diet and exercise, or medications, such as anti-diabetes drugs or antibodies that bind to brain amyloid can be used in normal older individuals to prevent or delay the onset of AD. In general, these studies target healthy people age 65 and older. There are a number of registries in the state as well as national registries where people who might be interested in such studies can sign up for further information.

Consensus Panel Statement

In 2010, the NIH convened a State-of-the-Science consensus panel that rigorously reviewed the available scientific evidence and found that "firm conclusions" could not be drawn about the association of any modifiable risk factor with prevention of cognitive decline or Alzheimer's disease. This conclusion was in large part due to a lack of studies with sufficient sample size, duration, and/or consistent diagnostic criteria (NIH State-of-the-Science Conference Statement: Preventing Alzheimer's Disease and Cognitive Decline¹). Furthermore, the generalization of research findings to individual cases can be challenging, since we do not yet know which modifiable risk factors (or combination of factors) are most important for whom, and this is

further complicated by a complex array of genetic factors. This statement is an important caution about adopting any approaches to brain health, or to slowing cognitive decline in aging or dementia if they are risky or costly, as there is not definite evidence for any such approach.

Texas' Response to Consensus Panel Statement

While Texas supports the work and conclusions of the NIH consensus panel, we assert that we must promote measures that show promise for maintaining brain health or *could* play a role in Alzheimer's disease risk reduction as we seek to improve the health of all Texans. We want to make the public aware that an emerging body of evidence shows that brain protection strategies, risk factor reduction, and lifestyle modifications, as discussed in this document, may also provide neuro-protection. Lifestyle measures in particular are low-cost, safe, and potentially effective in promoting both physical and brain health. These measures are supported by Texas in its prevention efforts as outlined in the *2010-2015 Texas State Plan on Alzheimer's Disease*.

Conclusion

Thanks to scientific advances, many individuals will now live to be 100 or even older, yet peak brain performance may not be maintained throughout the lifespan. Public health awareness and policies are needed to educate and promote brain health fitness and decrease the risks and effects of dementias, such as Alzheimer's disease. Both public policy and individual efforts should focus on maintaining and optimizing brain health fitness to protect our greatest asset and natural resource – our brain – for the rest of our lives.

Just as we cannot ignore our body's health until late life, we have to attend to our brain's health early, often and consistently. The number of older Texans grows larger each year, and we should take advantage of the many opportunities for modifying declining brain performance. The window for action is not restricted to early life, but extends throughout life.

1. NIH Consensus and State of the Science Statements. 2010 Apr 26-28;27(4):1-27.
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2. Alzheimer's Disease International. (2014). *World Alzheimer Report 2014: Dementia and Risk Reduction*.
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