

Lifestyle Influences **Brain Health**

By **Catherine O'Brien, PhD**, and **Roscoe Nicholson, MA**

Brain health, or brain fitness, has become a hot topic among professionals working with older adults. Recent research seems to support the idea that brain fitness programs can benefit us—but how effective are the available programs, and can they work among the older adult population? This article provides insight on the topic along with findings from a study of one brain fitness program designed for older adults.

According to the Alzheimer's Association, approximately 5 million Americans over the age of 65, or one in 8.5 older adults, have Alzheimer's disease (AD) or other dementias. AD is the fifth leading cause of death in Americans aged 65 and older. As the baby boomer generation ages, the number of older adults with AD and other dementias is expected to increase substantially. Medical advances and improved social and environmental conditions have resulted in a greater number of Americans living into their 80s and 90s. This greater longevity is likely to result in significant increases in the number of individuals with the disease since the risk of AD increases with age; the number of people with AD doubles for every 5.5-year interval after the age of 65.¹

Focus on Prevention

The lack of effective pharmacological treatments to prevent the onset of AD and the looming consequences for the public health system have prompted greater attention to prevention and delayed onset of disease as a strategy to address this crisis. In 2006, the Centers for Disease Control and Prevention (CDC) embarked on a new initiative called the Road Map, guided by a steering committee of representatives from federal agencies, universities, nonprofit organizations, and state health departments. The overarching goal of the CDC Road Map was to set forth a vision for maintaining or improving the cognitive performance of all adults.

As part of the CDC initiative, the committee developed 10 priority actions for improving cognitive health. Two of the priority areas demonstrated increasing attention to lifestyle

changes in order to reduce the risk of cognitive decline. Specifically, they included "help[ing] people understand the connection between risk and protective factors and cognitive health," and "conduct[ing] controlled clinical trials to determine the effect of reducing vascular risk factors on lowering the risk of cognitive decline and improving cognitive factors."

Neuroplasticity

The CDC priorities reflect expansive literature focused on modifiable lifestyle and behavioral factors potentially associated with cognitive decline. A key concept underlying these efforts is the idea of neuroplasticity, or the capacity of the brain to reorganize, change its neural structure, and form new neural connections throughout life. The discovery of the brain's ability to grow new neurons at any age represents a major departure from the previous understanding of the brain as fully formed early in life. Researchers now believe that the brain changes throughout life, growing new cells and altering neural structures in response to certain environmental input.

Brain injury is one such catalyst for new cell growth and restructuring. Numerous studies have explicated the brain's ability to change to compensate for injury, sometimes involving substantial rewiring of the brain's circuitry. Other nongenetic factors such as exercise can stimulate changes in the brain. For example, studies have demonstrated that exercise can increase the level of brain-derived neurotrophic factor (BDNF), a hormone that promotes growth of new brain cells. BDNF levels have also been associated with larger hippocampal volumes and better cognitive function in older age.²

Cognitive Reserve

The concept of cognitive reserve is useful in understanding potential relationships between lifestyle factors and the onset of AD symptomology. The theory of cognitive reserve seeks to explain differences in individuals' abilities to cope with AD pathology.³ In an oft-cited study, researchers found that a subset of patients identified as having advanced AD pathology upon autopsy remained clinically intact cognitively throughout their

Older adults who adopt brain-healthy behaviors can build cognitive reserve and delay the onset of Alzheimer's symptoms.



lives, showing no cognitive symptoms of the disease that was present in their brains.⁴ Researchers have speculated that innate intelligence or lifestyle factors such as a high level of education may provide skills that enable some individuals to compensate for AD pathology and delay the experience of AD symptoms.

The theory of cognitive reserve may help to explain why engagement in social and intellectual activities during leisure time is associated with a reduced rate of cognitive decline in cognitively normal older adults and possibly with a reduced risk of incident dementia. Functional imaging studies suggest that individuals participating in more leisure activities are not as susceptible to the onset of symptoms that typically coincide with AD pathology in the brain.⁵ Researchers have speculated that engagement in leisure activities may result in more efficient cognitive networks, providing a cognitive reserve that translates into a delay in the appearance of symptoms.

Focus on Brain-Healthy Lifestyles

Although better medications for AD may be on the horizon, the magnitude of the problem and the absence of effective treatment options suggest the use of a multipronged approach including both pharmacological research and behavioral strategies that can promote cognitive reserve and delay the onset of AD symptomatology. At the 2012 Alzheimer's Disease Research Summit, one of the key recommendations called for combining behavioral, lifestyle, and environmental interventions with pharmacological treatments to maximize the potential for benefit. Even a modest reduction in disease progression would have a significant personal and societal impact. Helping older adults maintain cognitive health could reduce the rate of institutionalization, as well as the physical and emotional burden shouldered by those caring for individuals with AD. Each of these outcomes would contribute to mitigating the financial impact of the disease on the health care system and the workplace. Although evidence supporting behavioral interventions is preliminary, the promoted behaviors, such as increasing physical activity, eating healthy foods, maintaining a high level of social and cognitive engagement, and reducing stress for emotional/spiritual health, are recommended health behaviors with numerous benefits far exceeding the risk of participation. Moreover, identifying behavioral interventions that delay the onset of AD symptoms would make a significant contribution toward addressing the problem.

Online Games' Benefits

The new focus on prevention has inspired a proliferation of commercial products designed to promote brain health through online training. In light of the increasing popularity of brain training, or brain games, and the claims being made about them, the Stanford Center on Longevity and Berlin's Max Planck Institute for Human Development commissioned a consensus report on the current state of research on brain training from nearly 70 scientists. The scientists were asked to evaluate the claims and promises being made regarding brain games and to recommend effective ways to improve cognition in healthy older adults.

The group's conclusion was that "claims promoting brain

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games are frequently exaggerated and at times misleading," and that "exaggerated and misleading claims exploit the anxiety of adults facing old age for commercial purposes." In the absence of the additional research the scientists deem necessary, the group recommends that "individuals lead physically active, intellectually challenging, and socially engaged lives, in ways that work for them." The researchers warn about brain games being viewed as a magic pill that comes with an opportunity cost, taking time and attention away from other preventive efforts that could be made. This message about the importance of lifestyle factors for brain health must not be lost among the many advertisements from groups wanting to sell brain games.

Boosting Brain and Memory

In 2012, Mather LifeWays Institute on Aging developed an educational program for promoting brain health among older adults called Boost Your Brain & Memory, which was later tested in two different studies.⁶ The project development team included researchers from Mather LifeWays Institute on Aging, along with external experts in the fields of clinical neuropsychology, epidemiology, public health, and mindfulness-based practices. The program consists of eight one-hour educational sessions: an introductory session, six sessions focused on lifestyle factors, and a concluding session. The introductory session introduces foundational concepts (eg, dementia, brain plasticity, cognitive reserve) and provides an overview of the structure of the course and specific topics covered. With the exception of the introductory session, the instructor begins each session by asking participants to report progress and engages in a brief discussion about overcoming any barriers or obstacles the participants may have encountered in trying to increase their participation in a given area.

Next, the instructor plays a series of two or three short videos describing the benefits of a specific area related to brain health. These videos not only present recommendations for lifestyle change based on current research, but also present specific research studies and their findings, demonstrating the reasons supporting these recommendations. Following the presentation, the instructor leads participants in a discussion and brief activity related to the topic area, such as an in-class set of exercises in the physical activity session. Participants are also asked to set short-term goals related to increasing their activity in the area addressed.

Although the main focus of Boost Your Brain & Memory lies in the promotion of long-term cognitive health through lifestyle modifications, the program also provides a set of memory

techniques that participants can use to increase their ability to remember tasks and lists. Such techniques are useful aides in recalling names, grocery lists, or the location of one's car in a parking lot. In addition to discussing lifestyle behaviors, the instructor presents information on each of the accompanying memory training techniques at the end of each of the lifestyle sessions. For example, one of the memory strategies is called Get Organized, or categorization, which involves grouping together similar items so that the conceptual group serves as a cue. The instructor discusses each of the strategies with the participants and encourages them to practice the strategy at home before the next class.

Evaluating the Program

During development of Boost Your Brain & Memory, Mather LifeWays Institute on Aging conducted a rigorous evaluation of the program among older adults. The population consisted of older adults derived from three Mather LifeWays senior living residences, two of which were in the Chicagoland area and one of which was in Arizona. In addition, older adults were enrolled from three Mather's—More Than a Café locations (restaurants with lifelong learning opportunities for those aged 50 and older). The study was designed to assess the feasibility of a multiweek brain health program focused on healthful lifestyles and explore outcomes related to the program, including cognitive performance and an increase in brain-healthy behaviors. In addition to examining the data for improvement in key outcomes, course evaluations were used to identify needed program modifications relating to appropriateness of content level, teaching methods, train-the-trainer procedures, integration of the Dakim BrainFitness system, and other program elements.

This study used a randomized controlled trial design in which participants were assigned to either an intervention group or a wait-listed control group. The intervention consisted of three components: an eight-week educational initiative to promote cognitive health through adoption of behaviors thought to be associated with reduced cognitive decline, AD, or mild cognitive impairment; practice of memory training techniques; and use of the brain fitness system, an online cognitive training program. Results indicated positive trends in memory performance and behavior change; however, the sample size was not large enough to demonstrate statistical significance. The study provided both quantitative and qualitative data, which informed substantial program revisions, including a greater focus on principles of behavior change.

A second study was conducted to evaluate the revised program among continuing care retirement community residents. Thirteen communities from different regions of the country participated in the study and implemented the program for older adults at their locations. Similar to the first study, residents were randomized into intervention and wait-listed control groups. Dakim was not included as a component of the second study for several reasons, including cost, feasibility of implementation with a geographically dispersed sample, an interest in separating any effect due to lifestyle education from the possible effect of cognitive training, and recognition of the

stronger evidence for lifestyle changes vs online training for long-term brain health. Pre- and postassessment surveys focused largely on changes in brain-healthy behaviors in three areas: physical activity, intellectual activity, and stress reduction. The intervention group reported greater behavior change than the control group on all items. These results were statistically significant on all except stress reduction. In addition, participants who had completed the course were more optimistic about maintaining memory compared with the control group. Taken together, these studies demonstrated the promise of educational interventions that present scientific research to motivate individuals to adopt lifestyle changes related to cognitive health.

Focus on Preserving Cognition

The growing older adult demographic and the reality of AD ensure continued interest in programs to promote cognitive health. In the senior living sector, organizations are directing greater focus on residents' brain fitness, as described by Terry Currier, fitness manager at Brookhaven at Lexington in Massachusetts. "A lot of people in my area are focusing on cognitive stimulation, but I'm a really big proponent of the wellness components to brain health. We have a very intellectual group [of residents] here—they take classes and read—but I want to make the case that brain health incorporates every aspect of health. Staying active and staying engaged is crucial," he says.

Currier continues, "Residents' two biggest fears are falling—and of course we have classes for that—and cognitive decline. We're a CCRC [continuing care retirement community], so [residents] see people with cognitive impairment all the time."

Laura Beyer, community relations coordinator at Clark-Lindsey in Urbana, Illinois, likewise sees increasing resident interest in strengthening cognitive skills. "Our residents are always pretty anxious about brain health—that is, about losing their brain health," she says. "So brain fitness is always one of our priorities."

As previously noted, there is substantial research to suggest that brain health is malleable, influenced by myriad factors, many of which can be controlled. Although the jury is still out on online cognitive training and brain fitness games, research into programs such as Boost Your Brain & Memory suggests that it is worthwhile to make concerted efforts to adopt and promote a brain-healthy lifestyle.

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For references, view this article on our website at www.TodaysGeriatricMedicine.com.