Preventing Dementia in Older Adulthood: Is It Possible?

By Maha Younes, PhD

"You have dementia." At the beginning of my career as a neuropsychologist, having to say those words during a feedback session after a cognitive evaluation was one of the most painful professional experiences. There was nothing I could offer to patients and families other than empathy and support, as well as practical suggestions about end-of-life planning and establishing daily routines. Recent research on aging, cognition, and dementia, though, has changed the landscape of the field and there are findings that offer a lot more to patients than just empathy; they offer concrete recommendations that can enhance cognition, or at least minimize cognitive decline over time.

While research was originally focused on the concept of "cognitive reserve" (Stern, 2009), the idea that our brains are primarily reinforced against the effects of aging and dementia by innate intelligence and educational experiences, research is now focused on a myriad of factors that seem to be protective. The National Academy of Neuropsychology has recently released a paper in which they discuss four key lifestyle factors that science has shown to have implications for brain and cognitive health: 1) physical activity and exercise, 2) social engagement, 3) cognitively stimulating activity, and 4) diet (specifically Mediterranean-style diets) (J. J. Randolph et al., 2024). In addition, the paper also discusses how sleep and stress are implicated as modifiable factors that contribute to our ability to retain our cognitive functions as we age.

Physical Activity and Exercise

Physical activity has long been touted as important for cardiovascular health (Shiroma & Lee, 2010). Research then found associations between a person's level of exercise in midlife to a reduced risk of neurodegenerative disease as far as two decades later (Spartano et al., 2016), indicating that physical activity was just as important for brain health. Even more interesting was the research showing that, in addition to having better functional outcomes in later adulthood, people who exercised in their middle adulthood actually showed greater integrity of the white matter tracts in the brain and had thicker primary motor and somatosensory cortices (Tarumi et al., 2021). Therefore, it seems that the amount of exercise during one's earlier and middle adulthood years has a direct effect on the preservation of brain networks. While some of this effect seems to be from reducing cerebrovascular risk, which can contribute to small vessel disease that leads to dementia, there is also evidence from animal studies suggesting physical activity may actually facilitate neuroplasticity (Ahlskog et al., 2011), the ability of the brain to form and reorganize synaptic connections.

Some of the most exciting research on this topic, though, has to do with how the brain can actually grow and retain new neurons in response to exercise. It was once believed that the brain stopped making neurons at or shortly after birth. Since the 1960s, however, research has slowly been demonstrating the fallacy of this earlier belief. More recent research has shown that the brain can produce new neurons throughout life, and in fact, some brain regions may make thousands of new neurons a day, but most tend to die within just weeks (Shors, 2014). Physical exercise may be one way to actually increase the number of neurons in key areas of the brain, such as the hippocampus, which is responsible for memory.

One of the most compelling studies conducted had older adults, who had been inactive, walk for 40 minutes per session, 3 days per week, for a year (Erickson et al., 2011). After the first few weeks of walking at any rate, they were asked to walk at a moderate rate (defined as 60-75% of their maximum heart rate) for the remainder of the study. After the year, during which the study was conducted was over, they compared this group to a control group that was prescribed stretching and toning exercises. The results showed increased hippocampal volume and improvement in spatial memory in the group of seniors who had engaged in moderate-intensity exercise regularly. In contrast, there was a loss of hippocampal volume in the control group, presumably the "typical" decline associated with "normal" aging. Interestingly, even within this control group, those older adults who had higher fitness levels prior to this study had less hippocampal volume loss than those who did not. The results of this research supported findings by previous

research suggesting that physical activity is protective and may even augment cognitive functioning regardless of when it begins.

Social Engagement

Human beings are social creatures. At no time in our history did this become so apparent as it was during the COVID-19 pandemic when the world was on lockdown. The effects of that prolonged period of isolation have been discussed regarding its impact on mental health and mood both within the general population (Kupcova et al., 2023) and within the older adult population, specifically (Lau et al., 2023). While lack of social engagement can cause cognitive issues indirectly because of its detrimental effects on mental health (Bauermeister & Bunce, 2015) and physical health (Yang et al., 2016), lack of social engagement can also have a more direct detrimental effect on cognition (Prommas et al., 2023).

Just as lack of social interaction can have a negative effect on cognition, increasing the frequency of social interaction and the size of our social network, including our sense of social support, can positively impact our cognitive functioning as we age. While this positive impact may be partly due to the indirect effects of improved mental health (Kawachi & Berkman, 2001) and improved physical health (Cohen & Janicki-Deverts, 2009), it also has a direct effect on our cognition, especially as we age, because social interactions give the brain a workout. Social interaction involves paying close attention, comprehending language, interpretation of body language, and recollection of recent or distant experiences for context. Then the brain needs to process all of this information and formulate a response within an appropriate timeframe (J. Randolph, 2020). In fact, research suggests that the effect of social activity on cognitive functioning can be found even after controlling for factors such as mental health, physical health, cognitive activity, and physical activity (James et al., 2011). Just as with physical activity, the effects from social engagement, even those much earlier in life, are related to the preservation of cognitive functioning as we age. But, it is never too late to take advantage of this benefit; starting to socialize later in life has been linked to a reduction in cognitive decline in older adults (Park et al., 2017).

Cognitively Stimulating Activity

When thinking about ways of preserving cognitive functioning, cognitive stimulating activities may be the most obvious. In the past, some of these activities were contained within the concept of "cognitive reserve" and included advanced educational pursuits and cognitively stimulating jobs; these activities were found to be associated with less cognitive decline with time (Scarmeas & Stern, 2003). However, research has shown that educational and occupational activities are not the only way to be cognitively stimulated. Studies indicate that engaging in challenging leisure activities can also reduce the risk of developing dementia (Yates et al., 2016) and that engaging in such activities can moderate the influence of education on dementia risk (Lachman et al., 2010).

People often wonder about what types of activities, frequency of activities, and level of difficulty are needed to reap the benefits. Reading, in particular, seems to be very powerful in reducing the risk of dementia (Lopes et al., 2012), but computer-based activities, playing games, and crafting activities (such as knitting or quilting) also have all been found to reduce dementia risk (Geda et al., 2011). Ultimately, anything that requires cognitive effort seems to be beneficial. As a rule of thumb, a task should be challenging, but achievable: having a task be too challenging will lead to frustration, and having it be too simple will not result in the "cognitive work" needed for the effect. The research supports the colloquialism of "use it or lose it." To see the most significant impact on functioning, studies indicate that one must engage in a cognitively challenging task at least one hour a day (Hughes et al., 2010).

Diet

The importance of a healthy diet, along with images of food pyramids, is drilled into our minds from elementary school. However, we are rarely taught about how nutrition directly affects the brain. Research in the past two decades has shown that there are both neuroprotective and neurorestorative mechanisms related to our intake of certain nutrients, such as antioxidant micronutrients (like vitamins C and E) and anti-inflammatory macronutrients (like omega-3 polyunsaturated fatty acids) (Whalley et al., 2004). As a result, a diet was developed that provides individuals with guidelines on the best foods to eat and to avoid in order to reduce the risk of developing dementia called the MIND diet (Mediterranean-DASH diet intervention for neurodegenerative delay) (Morris et al., 2015). Since its introduction in 2015, many studies have evaluated the effectiveness of the MIND diet and have frequently found it to be superior to other diets in improving cognitive functioning in older adults, though it may not have an equal impact on all aspects of cognition (Kheirouri & Alizadeh, 2022; Berendsen et al., 2018). In fact, some studies have shown this diet to slow cognitive decline by as much as 7.5 years (Balakrishnan, 2022). Though some controversy about its effectiveness exists, following the MIND diet can have a positive and significant impact on health and mortality, more generally (Corley, 2022), so it is a healthy choice to make. Further, it is not a formal diet but rather a set of guidelines, making it easy to introduce gradually; even making little changes can make a big difference in health.

Sleep

In our busy, hectic world, people often undervalue the importance of a good night's sleep; as a result, there is a high prevalence of individuals in our society who get insufficient sleep (defined as less than 6 hours per night). Studies have linked poor sleep to many medical diseases including

rcardiovascular disease and diabetes, as well as an increased incidence of accidents and injuries, stress, pain, and mortality (Grandner, 2022). But the effects of lack of sleep on cognition are more than just from being fatigued. Sleep is the primary time when the brain's glymphatic system, the neuronal equivalent of a "janitorial crew", can flush out the neuronal waste that is produced during the day by our brain's activities (Jessen et al., 2015). One of those waste products is called beta-amyloid (Xie et al., 2013) and it contributes to Alzheimer's disease when it accumulates, causing brain plaques and inflammation; so the less sleep one gets, the more the buildup of beta-amyloid (Sprecher et al., 2017).

Research suggests that individuals should routinely get 7-8 hours of sleep (Grandner et al., 2010); sleeping less than this amount for even a couple of days has been found to negatively impact cognitive performance (Van Dongen et al., 2003), and ultimately, chronic poor sleep is related to a higher risk of developing cognitive impairment (Bubu et al., 2017). Paradoxically, too much sleep is also not a good thing (Léger et al., 2014). Regularly sleeping more than 10 hours per night can have a negative impact on cognition, as well, though the mechanism is not as well-understood (Ma et al., 2020); it is possible that this relationship is mediated by psychiatric issues, such as depression (Léger et al., 2014).

Stress

To a certain extent, stress is unavoidable in life and some stress may actually be helpful, increasing motivation especially when it is perceived as goal-related and manageable (Travis et al., 2020). However, when we talk about the negative effects of stress, we are usually talking about the "other" kind of stress; those perceived as unmanageable. This type of stress directly affects our brain and can cause a disconnect between the amygdala, the brain's threat warning system, and other parts of the brain including parts of the frontal lobe and hippocampus (Jovanovic et al., 2011). These effects can limit our ability to use our working memory, remember information, problem-solve, and regulate our emotions. In addition, during these high-stress times, the amygdala activates a fight-or-flight type of response with a release of stress hormones (such as adrenaline and cortisol), which can also affect cognition (Franz et al., 2011).

Chronic stress has been linked to damage in specific brain areas, such as the hippocampus and parts of the frontal lobe (Papagni et al., 2011), because of the toxic effects of cortisol (Lupien et al., 2018). Mindfulness and meditation strategies are some of the most effective means of managing stress; they have also been found to have a positive impact on brain structure (Fox et al., 2014), but any self-care strategies can be helpful (Perera & Agboola, 2019). Exercise has also been touted as a stress-management strategy (Churchill et al., 2022) that also improves mood, in general (Yao et al., 2021); therefore, exercise gives double the brain-promoting effect by increasing your physical activity and reducing your stress!

Conclusions

Forgetting is a part of life. We are never going to remember every moment of our lives or every detail, but the kind of cognitive decline that we were once told to accept as a "natural" part of aging, or which is more severe and debilitating, might not have to happen. Research into "SuperAgers," older adults who cognitively function at the level of individuals up to 30 years younger, indicates that it is possible to age very well (Sun et al., 2016); it also may provide additional insights into those factors which affect our cognitive performance as we age. We are continuing to expand our knowledge of just how much of what we do throughout our lives can set us up for a healthier future. Even if you have not had the best habits thus far in your life, it is not too late to start. Changes that you make today can significantly improve your tomorrow.

Resources

If you are interested in learning more about the research in this area and/or interested in more specific guidance about how to implement them, there are several books written by respected practitioners in this field. Here are a few:

1) *The Brain Health Book: Using the Power of Neuroscience to Improve Your Life*, by John Randolph, PhD

2) *High-Octane Brain: 5 Science-Based Steps to Sharpen Your Memory and Reduce Your Risk of Alzheimer's*, by Michelle Braun, PhD

3) *Keep Your Wits About You*, by Vonetta M. Dotson, PhD

About the Author

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References Furnished Upon Request