

Nutrition and Cognitive Function in Adults

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Key points:

- Introduction
- Nutritional Factors Supporting Cognitive Health
- Biological Reactions Associated with Aging
- Role of Nutrition and Lifestyle in maintaining Cognitive Health
- Conclusion

Introduction

Dementia, particularly Alzheimer's disease, poses a significant public health challenge. Despite recent advancements, effective treatments to prevent or delay its progression remain elusive. Therefore, identifying strategies to prevent dementia is crucial. Research suggests that lifestyle choices, such as healthy dietary management, may be effective in preventing cognitive impairment. Diets rich in antioxidant and anti-inflammatory properties, like the Mediterranean diet, have shown promise in reducing cognitive decline. Certain food groups, including fruits, vegetables, and nuts, as well as specific nutrients like unsaturated fatty acids and antioxidants, have also been linked to improved cognitive functioning. However, existing evidence from clinical trials is inconsistent, highlighting the need for further research to establish effective nutritional strategies for managing cognitive impairment.¹

Nutritional Factors Supporting Cognitive Health

Phospholipids, particularly glycerophospholipids (GPLs), are crucial components of cell membranes and play a vital role in brain function. The main

GPLs in cell membranes are phosphatidylcholine (PC), phosphatidylethanolamine (PE), phosphatidylserine (PS), and phosphatidylinositol (PI). Research has shown that these phospholipids, especially PS, are essential for neural function and cognitive health. Aging affects the composition and synthesis of phospholipids in the brain, leading to decreased cognitive function. Supplementing with exogenous phospholipids, such as PS, has been shown to improve cognitive function and neural health in animal studies.

Carotenoids, such as lutein and astaxanthin, have antioxidant properties and may play a role in preventing cognitive impairment. Lutein, in particular, has been shown to improve cognitive function in older adults, especially when combined with DHA. Low levels of lutein have been linked to Alzheimer's disease, and dietary intake of lutein-rich foods, such as *Chlorella pyrenoidosa*, may help increase blood concentrations.

Vitamins C, E, and A are essential antioxidants that help protect against cognitive decline. Research has linked low levels of these vitamins to impaired cognitive function, while high levels have been associated with longevity and healthy brain function. Additionally, vitamins B, D, and K have been found to play important roles in cognitive health, particularly in older adults.²

Biological Reactions Associated with Aging

Reactive oxygen species (ROS) and reactive nitrogen species (RNS) can cause oxidative stress, leading to cellular damage and cognitive decline. Antioxidants can help mitigate this damage. Lipid peroxidation, a process in which ROS damages lipids, is also implicated in cognitive impairment. Research has shown that lipid peroxidation is increased in Alzheimer's disease (AD) and Parkinson's disease (PD). Dietary interventions, such as consuming foods rich in antioxidants, may help reduce lipid peroxidation and cognitive decline. New analytical methods, such as LC-MS/MS, are being developed to study lipid peroxidation in vivo. Recently, ferroptosis, a form of cell death linked to lipid peroxidation, has been implicated in neurodegenerative diseases, highlighting the importance of understanding the relationship between lipid peroxidation and cognitive impairment.³

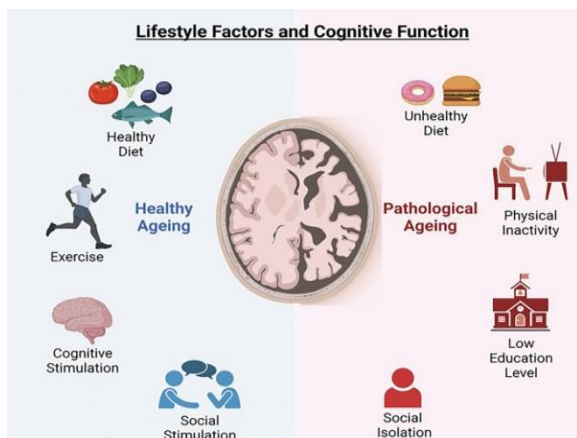


Figure 1: *Lifestyle and Cognitive function.*⁶

Role of Nutrition and Lifestyle in maintaining Cognitive Health

As we age, our cognitive abilities naturally decline. However, this process can be accelerated by factors like oxidative stress, inflammation, and vascular dysfunction. These same factors contribute to neurological diseases, but can be worsened by genetics or environment. Preserving cognitive

function is crucial for older adults' autonomy and well-being. While age and genetics play a role in dementia, modifiable factors like depression, diabetes, hypertension, obesity, smoking, and physical inactivity can increase risk. On the other hand, a healthy diet rich in vegetables, a Mediterranean diet, and engaging in cognitive activities may help reduce dementia risk. Even life events like childhood trauma or chronic sleep disturbances can impact cognitive health later in life.

Conclusion

Maintaining optimal cognitive health requires a

balanced diet rich in essential nutrients. Deficiencies in micronutrients like B vitamins and iron can impact cognitive function. A whole-diet approach, focusing on overall dietary quality, is key to promoting cognitive well-being. The Mediterranean, Nordic, DASH, and MIND diets have been linked to a lower risk of cognitive decline and dementia. A healthy lifestyle, including regular physical activity and balanced eating habits, should be encouraged from early adulthood. More research is needed to understand the relationship between nutrition, lifestyle, and cognitive function. Longitudinal studies and large-scale surveys can provide valuable insights into cognitive health and impairment.³

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