



# Maintaining Brain Health:

## *Understanding Determinants, Neurological Disorders, Innovative Treatments, and Preventive Strategies*

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### Introduction

The human brain, a remarkable product of evolution, controls our thoughts, memories, movements, and emotions. With an ageing population and the rising prevalence of neurological disorders, prioritizing brain health is crucial for enhancing individual well-being and advancing society. This article will examine the impact of major neurological disorders on brain health, their innovative treatments, and preventive measures, highlighting the need for greater attention to brain health and its determinants is emphasized, - which remain largely unexplored compared to cardiovascular health.

### What is brain health?

Many existing definitions of brain health which are essentially age-appropriate, are either too broad or too narrow, reflecting a lack of consensus. According to the US Centers for Disease Control and Prevention, brain health involves the ability to perform cognitive functions like learning, judgment, language, and memory.<sup>1</sup> Ultimately, brain health is characterized by normal brain integrity and cognitive function without observable neurological disorders, encompassing essential tasks such as emotional regulation, movement control, sensory

processing, and social interactions.<sup>1</sup>

Despite growing risks such as the ageing population, mental health issues environmental toxins, and lifestyle factors, very few global initiatives address brain health.<sup>[1]</sup> The resources are inadequate and the policies are lacking to assist people dealing with problems related to brain health. Certain neurological conditions such as dementia are the main focus of many definitions of brain health, whereas other definitions concentrate on specific aspects of brain functioning. Certain definitions take into account different domains and stages of development, recognizing the complexity of brain health and its determinants in a range of disorders, which are shown in Figure 1 defined by WHO.

The brain grows and changes a lot during the early years of life. This is when we learn many new things, like how to talk, walk, and understand the world around us. The experiences we have and the things we see and hear help shape our brains and keep changing due to interactions between our environment, genetic makeup, and physiological processes.<sup>[1]</sup> Previously believed to occur sequentially, this development involves stages such as neuroplasticity in early childhood, pruning during

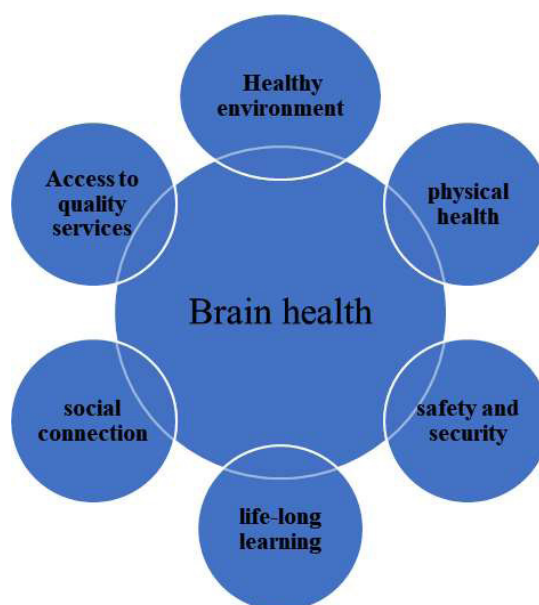


Figure 1: Six Key Factors Affecting Brain Health

adolescence, and senescence in adulthood.

Current research, however, indicates that protective factors that support neuroplasticity can be strengthened and risk factors reduced, allowing the ageing brain to continue changing and improving.<sup>[1]</sup>

## 2. Why is it important to address brain health?

Improving brain health has advantages for society on a social and economic level and benefits for an individual's mental and physical health. We can lower rates of substance misuse and mental health problems, enhance cognitive and emotional functioning, and lessen disorders affecting the central nervous system by addressing the determinants of brain health through promotion and prevention. Additionally, boosting brain health has a good effect on the cardiovascular and immunological systems, which may reduce healthcare expenses and improve educational outcomes for at-risk children.<sup>1</sup>

## 3. What are the neurological disorders which affect brain health?

Neurological disorders that affect brain function can be categorized into three main groups: those causing visible damage to brain structures, such

as cerebrovascular diseases and traumatic brain injury; functional disorders with detectable damage to brain connections, including neurodegenerative and mental disorders; and other conditions like migraines and insomnia that lack obvious anatomical or functional impairments.<sup>[2]</sup> Each group presents unique challenges in understanding and treating brain health.<sup>[2]</sup>

It takes scientific analysis to define and promote optimal brain health, but the complexity of the brain makes it hard to assess completely with a single parameter. There is no universally acceptable test which can be administered across populations and cultures.

There are several questionnaires available for self-assessments or by family members. Diagnosing cardiovascular diseases involves various biochemical tests and biomarkers, while neurological and neurodegenerative diseases currently lack ethical biochemical assessments and markers for early, effective diagnosis. This gap in culturally accepted methods highlights the need for future development in this area.

The Mini-Mental State Examination and the Montreal Cognitive Assessment, for instance, are simple-to-use instruments for general cognitive screening. Other tests, such as the Stroop Task,

Digit Span, and Rey-Osterrieth Complex Figure Test, however, concentrate on particular domains, such as language and memory<sup>1</sup>. Neuroimaging methods can also be used to evaluate brain integrity, but they have drawbacks too. In addition, the measuring of brain health is complicated by the effects of age, culture, and individual perception, underscoring the need for multidimensional, internationally accepted assessment instruments.

#### 4. What are the Innovative Treatments, and Preventive Strategies for common neurological disorders?

Common neurological disorders, such as Alzheimer's and cerebrovascular diseases, have intricate etiologies that involve both environmental and hereditary components. Monogenic neurological illnesses, on the other hand, frequently result from a single genetic cause. Crossspecies models facilitate easier study of these illnesses, boosting our comprehension of their causes and facilitating the testing of novel therapeutics.<sup>[1]</sup> Due to the irreversible nature of brain malfunction and the non-renewable nature of neurons, there are limit-

ed viable treatments and prevention strategies for serious neurological illnesses like dementia<sup>[1]</sup>. Recent studies that attempted to reduce tau protein aggregation and remove amyloid did not enhance cognition or delay the course of the disease in individuals with mild Alzheimer's<sup>[1]</sup>. Other therapeutic targets that are currently being investigated include inflammation, vascular dysfunction, and the gut microbiome<sup>[1]</sup>.

Innovative therapeutic approaches should take into account the biochemical and genetic components that contribute to diseases like Parkinson's and Alzheimer's. This emphasizes the benefits of precision medicine, which uses patient-specific treatment plans. For example, immunotherapies use the immune system to combat a variety of illnesses, while gene therapy presents a hopeful alternative for diseases that were previously incurable<sup>[3]</sup>.

There are key preventive strategies that promote brain health, along with associated factors shown in Figure 2. Each of these factors plays an important role in maintaining cognitive function and overall brain health.

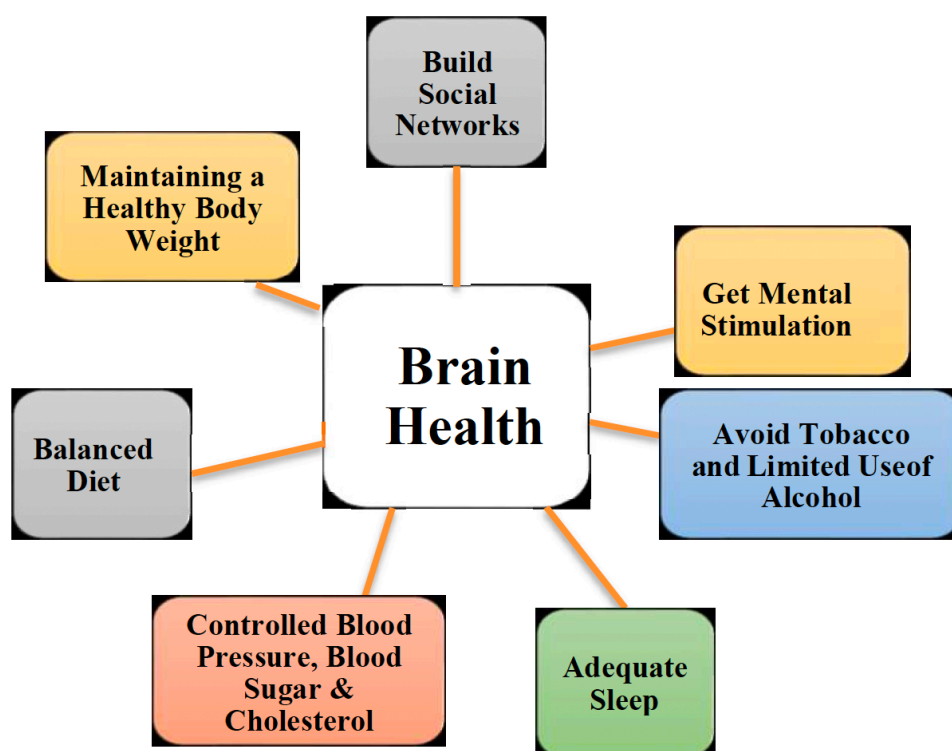


Figure 2: Factors That Improve Brain Health<sup>4</sup>

## Conclusion

In conclusion, improving individual well-being and promoting a healthier society require putting brain health first. We can enhance cognitive function and emotional resilience by comprehending the intricacies of brain illnesses and allocating resources towards creative therapies and preventative measures. By working together to address the factors that influence brain health, we can lessen the impact of neurological disorders and create a future in which everyone may live a healthy, psychologically and physically fulfilling life.

## References

- [1] Wang Y, Pan Y, Li H. What Is Brain Health and Why Is It Important? *BMJ*. 2020 Oct 9;m3683. Available from: <https://www.bmj.com/content/371/bmj.m3683>
- [2] Optimizing Brain Health across the Life-course: WHO Position Paper. [www.who.int](http://www.who.int). Available from: <https://www.who.int/publications/item/9789240054561>
- [3] Gadhave DG, Sugandhi VV, Saurav Kumar Jha, Nangare SN, Gupta G, Sachin Kumar Singh, et al. Neurodegenerative Disorders: Mechanisms of Degeneration and Therapeutic Approaches with Their Clinical Relevance. *Ageing Research Reviews*. 2024 Jun 1;99:102357–7. Available from: <https://www.sciencedirect.com/science/article/pii/S1568163724001752#fig0020>
- [4] Harvard Health Publishing. 12 ways to keep your brain young – Harvard Health. Harvard Health. Harvard Health; 2018. Available from: <https://www.health.harvard.edu/mind-and-mood/12-ways-to-keep-your-brain-young>

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