

Alzheimer's Disease and its Effect on Humans

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ABSTRACT

Many individuals worldwide face ongoing suffering from the neurodegenerative disorder called Alzheimer's Disease (AD). It is an extremely progressive and degenerative neurological disorder that not only affects one's memory but also affects their overall response to the environment and daily living habits. Because of amyloid beta plaques and neurofibrillary tangles building up in the brain, this disease causes major cognitive decline and memory loss, to the point where people are not able to remember their own identity. More so, it is not just the individual diagnosed with Alzheimer's who is affected by the disease; it also affects their family members and their caregivers. The modern treatments that are currently provided for AD are mainly for symptomatic relief. Despite the many studies made by scientists and doctors, it is still uncertain what exactly can terminate this disease. This paper provides a comprehensive review of the current, up-to-date research on the treatments for this disease and the external and environmental factors that may have a role in causing AD. It also examines the overall impact of AD on the quality of life for individuals with this specific disease and how it not only affects the individuals but, more often, the caregivers have to face depression, rejection, and severe PTSD when dealing with family members that suffer from this disease. As a result, the progression of Alzheimer's disease has a significant impact on the overall health of society and wellbeing, creating a negative correlation with many negative factors existing, including the average life capacity of a human. Thus, finding a cure is deemed crucial (Alzheimer's disease facts and figures, 2020).

Keywords: Alzheimer's disease, neurodegenerative, cognitive decline, memory loss.

Subject: Neuroscience

INTRODUCTION

Alzheimer's Disease (AD) is a complex neurodegenerative disorder that has far-reaching implications not only for the individuals diagnosed but also for their caregivers and society at large (National Institute of Neurological Disorders and Stroke, 2023). This paper aims to provide a comprehensive overview of the current state of research on Alzheimer's Disease, including its symptoms, causes, and treatments, with a specific focus on the brain's neural and cognitive systems. Furthermore, it delves into the idea of a long-term impact of this progressive disorder on individuals and their families, emphasizing the emotional, psychological, and physical toll it takes (Saling, 2023). We also explore a pivotal hypothesis that posits the role of external and environmental factors, such as physical exercise, in potentially mitigating the effects of Alzheimer's Disease. This study incorporates a longitudinal experiment that compares the outcomes of regular physical activity versus a sedentary lifestyle in AD patients. Through this multi-faceted lens, this paper aims to contribute to the existing body of knowledge about Alzheimer's Disease, offering insights that could be invaluable for future research aimed at finding a definitive cure for this debilitating condition.

Hypothesis: External and environmental factors such as exercise can make a huge impact on the overall rate of Alzheimer's disease and are possibly some of the main factors that determine if a person with Alzheimer's disease can be cured with exercise and serotonin.

Research Question: How does the progression of Alzheimer's disease ultimately impact the brain system, and what are the long-term cognitive and physical effects on individuals and their families?

Experiment

To test this hypothesis, a longitudinal study was conducted.

Participants were divided into two groups: an experimental group where the AD patients are told to exercise and be active people as well as integrate themselves with the environment, and a control group where they continue what they used to be doing, which is sitting in their rooms all day getting treated. The study would assess whether environmental and external factors as well as personal benefits really affect the result of people with Alzheimer's really being more likely to be cured with exercising and doing activities that potentially benefit their mental health and happiness.

The study will ultimately also be able to go over the different impacts on how physical therapy and the idea of "nurturing by nature" can really establish a great effect on individuals that possess Alzheimer's disease. Patients or participants could potentially be asked about their performances and cognitive developments, if any, from the study each day, and the results can be listed down on a data table and seen as improvements over time with the experimental group and the controlled group (National Institute of Neurological Disorders and Stroke, 2023). The study could assess whether individuals with stronger physical exercise experience better outcomes in terms of cognitive function, emotional well-being, and physical health. Overall, this study could provide very valuable insights into the long-term effects of Alzheimer's disease ..on external and environmental factors, as well as the potential benefits of cognitive and physical therapy.

Limitations

One of the potential shortcomings of this study is the generalizability of the results to all Alzheimer's patients across the world. The sample in the potential research is limited to a specific demographic and geographic location, which may not fully represent the global population of individuals with Alzheimer's disease (AD). Additionally, cultural and environmental factors can play a significant role in the progression and management of Alzheimer's disease, and these factors may vary widely across different regions and populations. Therefore, it is important to interpret the results of this study within the context of its limitations, and further research is needed to assess the applicability of our findings to Alzheimer's patients worldwide. Once this experiment has the potential to traverse globally and amass more data, the results will be more generalizable and accurate to the potential causes and effects.

Causes of Alzheimer's Disease

The ultimate factor(s) causing AD remain unknown. However, there is much research on how it can be both genetic and environmental due to the factors that have previously been shown to affect the outcome of which individuals get AD. Family history of AD has been linked to an increased risk; for example, if one parent has this recessive trait, it would increase the offspring's chances of adopting this trait by 50%, indicating that AD might be a genetic component. Certain gene mutations, such as those affecting APP, PSEN1, and PSEN2, have also been associated with higher susceptibility to AD (Breijyeh & Karaman, n.d.; Gupta, n.d.; Wenk, n.d.).

Environmental factors are taken into account in a more physical way. For example, head injuries, chronic stress, and a lot of exposure to harmful substances have all been identified as potential contributors to Alzheimer's disease. Additionally, it is scientifically proven that lifestyle choices, including exercise patterns and even diet, may impact the risk of developing the disease. This is the principal inspiration for this research. However, more research is necessary to fully comprehend the precise role that environmental factors played in the onset of AD.

Overall, both factors, whether nature or nurture, are still unknown to this day. However, over time, there will be more progress, and the scientific community will officially declare the main cause of AD and, potentially, how to minimize the risk of developing this disease.

Here is how a brain affected by Alzheimer's Disease compared to a normal brain:

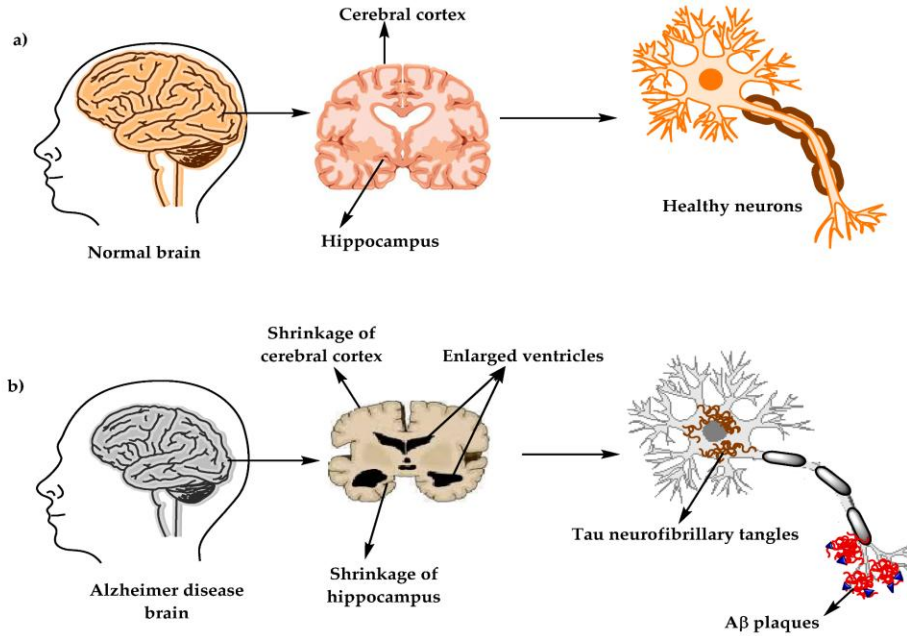


Figure 1: The physiological structure of the brain and neurons in (a) healthy brain and (b) Alzheimer’s disease (AD) brain.

Symptoms of Alzheimer's Disease

The symptoms of AD vary depending on the stages of the disease, but they typically include factors such as memory loss, difficulty with language and communicating, and changes in mood and cognitive behaviors. As the disease progresses, individuals with AD may also experience difficulty with motor skills and coordination in the brain, specifically in the limbic system, where the amygdala is located. Some common symptoms of Alzheimer’s include the following:

- Memory loss: Individuals with AD may have difficulty remembering past and even recent events
- Difficulty with Language: Individuals may have trouble finding the words to express their emotions, which often causes confusion and frustration with their caregivers.
- Changes in Mood and Behavior: Individuals with AD can experience changes in mood, such as depression or anxiety, and may exhibit behavioral changes such as agitation or aggression.

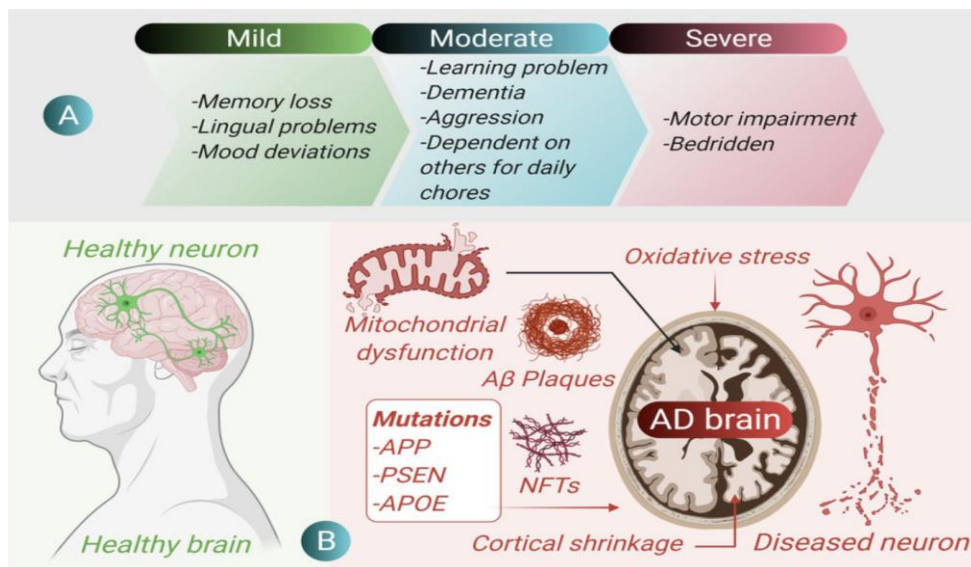


Figure 2: Diagram of Symptoms from Mild to Severe – Alzheimer’s disease and its pathogenesis. (A) Characteristic symptoms at various stages of AD. (B) The hallmarks and causatives of Alzheimer disease.

Diagnosis of Alzheimer's Disease

As stated above in the causes section, there is no definite diagnosis, meaning no standard is available for AD because the causes vary for individuals depending on environmental and genetic factors. However, if one starts to experience the symptoms, they will receive a suggestion from their doctors to take tests such as MRI and PET scans, which are used to detect changes in brain structure and function associated with AD. Thus, they can be diagnosed only with machines that are advanced and possess more accuracy. This disease, without these scans, can easily be misinterpreted as depression or other mental health issues.

Treatment of Alzheimer's Disease

Current treatments for AD focus on managing symptoms and providing support for affected individuals and their caregivers. Cholinesterase inhibitors and memantine are commonly prescribed medications that can help improve cognitive function and slow the progression of the disease. Non-pharmacological treatments such as cognitive training and physical exercise may also be beneficial. However, there is currently no cure for AD, and existing treatments provide only limited symptomatic relief.

Impact on the Brain and Nervous System

Alzheimer's disease affects the brain and nervous system in a number of ways. The presence of beta-amyloid plaques and tau tangles disrupts the normal functioning of neurons, leading to their degeneration and death. This process begins in the hippocampus, the area of the brain responsible for memory and learning, and spreads to other areas of the brain as the disease progresses.

As neurons die, the brain becomes smaller and lighter, with noticeable shrinkage in areas such as the hippocampus and cerebral cortex. This can be seen on brain scans, which show significant changes in brain structure and function in individuals with Alzheimer's disease.

The loss of neurons in the brain also disrupts the communication between different parts of the brain, leading to a decline in cognitive function. Individuals with Alzheimer's disease may experience difficulty with memory, language, problem-solving, and decision-making. They may also have difficulty with spatial awareness, navigation, and coordination.

In addition to these cognitive effects, Alzheimer's disease can also impact the emotional and physical health of individuals. Changes in the brain can lead to alterations in mood and behavior, with individuals becoming more withdrawn, irritable, or agitated. They may also experience depression, anxiety, and sleep disturbances.

Long-term Effects on Individuals and Families

Alzheimer's disease is a chronic and progressive condition that can have significant long-term effects on individuals and their families. As the disease progresses, individuals may become increasingly dependent on others for assistance with daily activities such as dressing, eating, and toileting. This can be a significant burden on family members, who may have to take on caregiving responsibilities.

Caregiving can be emotionally and physically demanding, with many caregivers experiencing high levels of stress, depression, and anxiety. They may also experience financial strain, as the costs of care can be significant. This can lead to a decrease in the quality of life for both the individual with Alzheimer's disease and their family members.

In addition to the practical challenges of caregiving, there are also emotional challenges that come with the progression of Alzheimer's disease. Family members may experience feelings of guilt, grief, and loss as they watch their loved one decline. They may also experience a sense of frustration and helplessness as they struggle to provide care and support.

As individuals with Alzheimer's disease progress through the stages of the disease, they may become increasingly isolated from their social networks. This can lead to a decrease in social support and an increase in feelings of loneliness and depression. It is important for family members and caregivers to provide emotional support and social engagement for individuals with Alzheimer's disease in order to improve their quality of life and overall well-being.

Mental Health Impacts to Caregivers

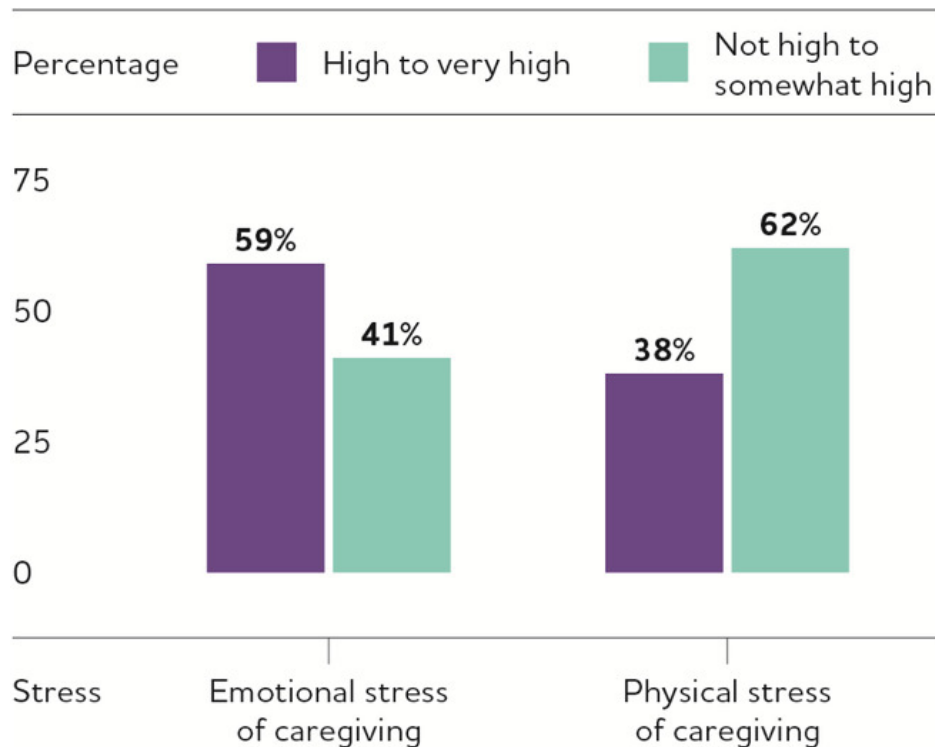


Figure 3. Proportion of caregivers of people with Alzheimer's or other dementias who report high to very high emotional and physical stress due to caregiving.

Source: Alzheimer's Association (2023)

CONCLUSION

Alzheimer's disease is a progressive and degenerative brain disorder that has significant impacts on the brain and nervous system, as well as on the cognitive, emotional, and physical well-being of individuals and their families. The loss of neurons in the brain disrupts the communication between different parts of the brain, leading to a decline in cognitive function and memory. As the disease progresses, individuals may become increasingly dependent on others for assistance with daily activities, which can later cause a loss of freedom for the caretakers.

This topic could benefit from further research to understand the underlying mechanisms of Alzheimer's disease and develop more effective treatments. In addition, more research is needed to explore the long-term impacts of physical and cognitive therapy on individuals with Alzheimer's, as well as the effects of different environmental and external factors on the progression of the disease. By continuing to study Alzheimer's disease from multiple angles, we can gain a more comprehensive understanding of the condition and work towards better interventions and support for those affected.

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