

Alzheimer's Disease

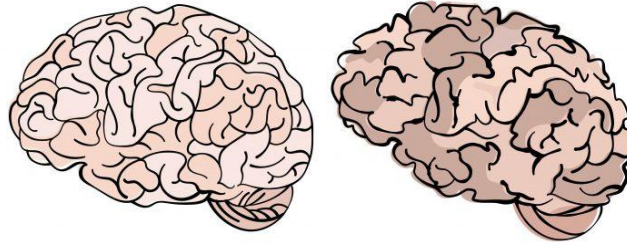
A look into one of America's most
prolific killers



What Is Alzheimer's?

Alzheimer's is a neurodegenerative disorder.

As it progresses, it wreaks havoc on vital cognitive functions like memory.



HEALTHY BRAIN

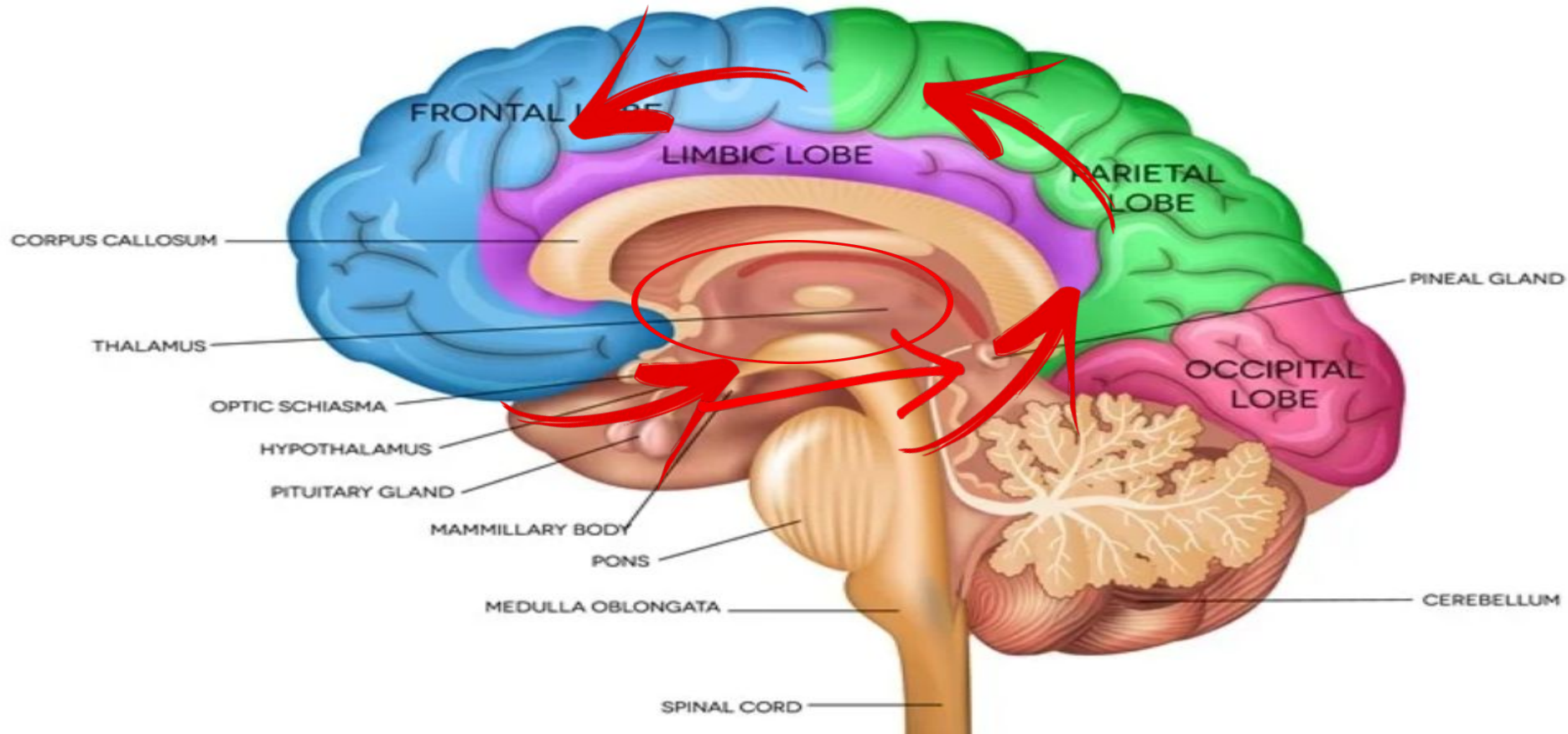
ALZHEIMER'S DISEASE

Neurodegenerative disorders are progressive disorders that entail cerebral atrophy over an extended period of time.

Not dementia!

Dementia is a term
not a disease!

ANATOMY OF THE BRAIN



Why Should Alzheimer's Be Important To You?

ALZHEIMER'S DISEASE BY THE NUMBERS

1/10

Number of
people over 65
who have
Alzheimer's

6th

Alzheimer's
disease is the
sixth leading
cause of death
in the U.S.

5.8M

Number of
Americans who
live with
Alzheimer's

20

Number of years
you could have
the disease
before symptoms
appear

2/3

Number of
Alzheimer's
patients who
are women

Why Should Alzheimer's Be Important To You?

Brain cells degenerate and die, destroying important cognitive functions.

No cure exists, only medications and management strategies

Alzheimer's requires a medical diagnosis, and the tests are expensive.

This information is brought to you by Mayo Clinic and Alzheimer's Association! :)

2020 Alzheimer's Disease Facts and Figures



Alzheimer's disease is the leading cause of death in the United States

50%

of primary care physicians believe the medical profession is not ready for the growing number of people with Alzheimer's or other dementias



More than **5 million** Americans are living with Alzheimer's



1 in 3 seniors dies with Alzheimer's or another dementia

It kills more than breast cancer and prostate cancer combined



16 million Americans provide unpaid care for people with Alzheimer's or other dementias

These caregivers provided an estimated 18.6 billion hours valued at nearly

\$244 billion



In 2020, Alzheimer's and other dementias will cost the nation **\$305 billion** — By 2050, these costs could rise as high as **\$1.1 trillion**

Between 2000 and 2018 deaths from heart disease have decreased

7.8%

while deaths from Alzheimer's disease have increased

146%

Alzheimer's Symptoms



**CONFUSION WITH
TIME AND LOCATION**



**WITHDRAWAL FROM
SOCIAL ACTIVITIES**



**DIFFICULTY
COMPLETING
FAMILIAR
TASKS**



**DIFFICULTY
SOLVING
PROBLEMS**



**POOR
JUDGEMENT**



**TROUBLE
WITH IMAGES
AND SPACES**



**MISPLACING
ITEMS**



**MEMORY
LOSS**



**UNFOUNDED
EMOTIONS**



**DIFFICULTY
WITH WORDS**



Cognitive: mental decline, difficulty thinking and understanding, confusion, delusion, forgetfulness, making things up, difficulty concentrating

Behavioral: aggression, difficulty with self care, irritability, repetition of words, personality changes, restlessness, wandering and getting lost

Mood: anger, apathy, loneliness, mood swings

Psychological: depression, hallucinations, paranoia

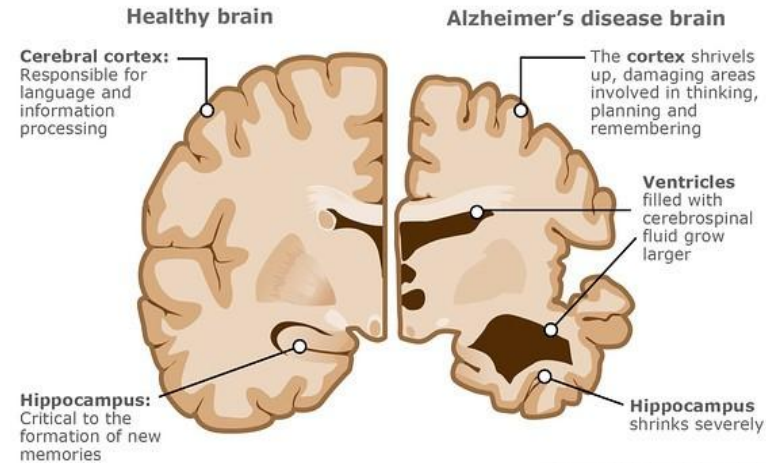


Potential Causes - Hereditary Causes

The genes that influence Alzheimer's

Gene	Chromosome	Onset	Percentage of Cases
APP	21	Age 45-66	0.1% of cases
Presenilin 1	14	Age 28-62	1-2% of cases
Presenilin 2	1	Age 40-85	0.1% of cases
ApoE4	19	Age 60+	50% of cases

Alzheimer's disease



Carrying one copy of the $\epsilon 4$ form of the ApoE gene increases your risk up to four times. But you can carry the risky form of this gene and still not develop dementia, and many people develop the disease without carrying the $\epsilon 4$ gene. **APA. (2012, June 20)**

Amyloid-beta(A β) Protein

Amyloid-beta(A β) is a piece of “Amyloid Precursor Protein” (APP). We have yet to determine its function, but we have an idea.

- ❖ APP may function as a regulator of synapse formation and/or as an antimicrobial agent.
- ❖ When APP is activated, it gets cut up by proteins. Those pieces either become intra- or extracellular. Sometimes, one of those pieces is A β . **Alzheimer’s Association (2020)**



- ❖ A β is chemically “sticky”.

❖ Oligomers, Fibrils, Beta-sheets, and Plaques

- ❖ These plaques interfere with communication between neurons. It also activates the immune response, causing inflammation. **Alzheimer’s Association (2020)**

Amount of A β plaques isn’t causation to the degree of cognitive impairment.

- About 25% of the elderly have plaques but suffer no dementia. **(textbook)**

These plaques destroy Acetylcholine-producing neurons in Alzheimer’s patients, blocking acetylcholine activity impairs learning in humans.

- ❖ A β plaques and tau tangles are normally seen as the cause of cell death, but there’s a lack of absolute evidence.
- ❖ Acetylcholine helps keep old information from interfering with our ability to learn and remember new information. **American Psychological Association. (2004, February 15)**

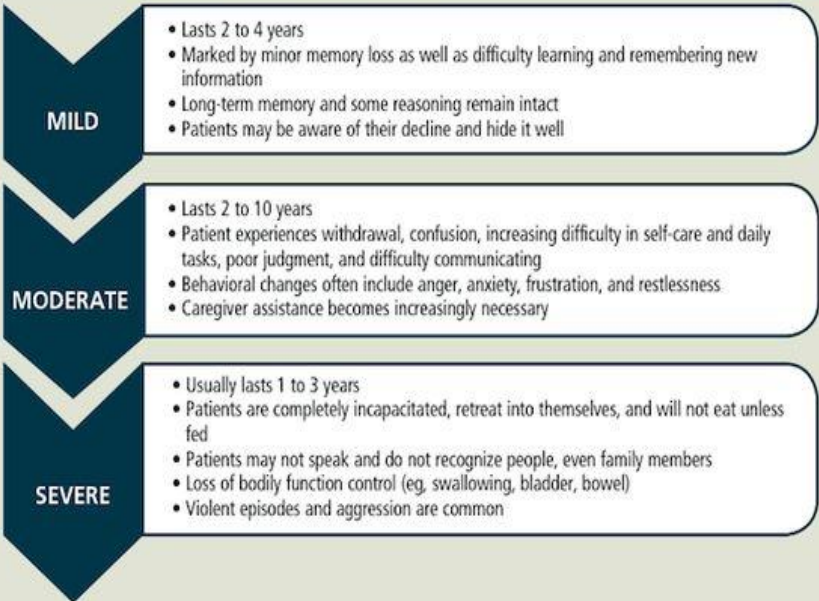
Potential Causes - Environmental Causes

Potential environmental triggers for dementia include;

- ❖ Exposure to things like pesticides and second-hand smoke, as well as diabetes. People in injury-heavy careers, like football players, see injuries like Traumatic Brain Injury(TBI), and there may be possible links between Alzheimer's and TBI **(textbook)**
 - However, most research evaluating the risk of AD following TBI has exclusively used clinical diagnostic criteria for AD, and findings have been mixed. **Schaffert, J. et al, (2018)**
- ❖ Infections can also increase the likelihood of Alzheimer's, like Chlamydomphila pneumoniae, which increases Alzheimer's by fivefold, and Spirochete, which increases Alzheimer's by tenfold.**(textbook)**
- ❖ **Reserve hypothesis;** individuals with greater cognitive capacity may be able to compensate for brain changes from things like aging and injury.
 - The risk of developing the symptoms of dementia decreases by 46% with higher educational and occupational levels and higher IQ and mental activity in earlier life.**(textbook)**
 - The delay may last for the rest of the individual's life, if not, decline occurs more rapidly than in other Alzheimer's patients.**(textbook)**

Stages Of Alzheimer's

FIGURE: STAGES OF ALZHEIMER'S DISEASE



Adapted from references 12, 13, and 15.

Early (Mild)

In this stage, people may:

- ❖ Forget things or misplace objects
- ❖ Ask the same question over and over
- ❖ Not remember names when meeting new people

Middle (Moderate)

In this stage, people may have:

- ❖ Increased memory loss and confusion
- ❖ Problems recognizing family and friends
- ❖ Continuously repeating stories, favorite wants, or motions

Late (Severe)

In this stage, there is almost total memory loss. The individual may:

- ❖ Mistake a person for someone else
- ❖ Delusions may set in
- ❖ Basic abilities such as eating, walking, and sitting up fade during this period

Available Treatments - Drugs

COMMON TREATMENTS FOR ALZHEIMER'S

CHOLINESTERASE INHIBITORS

These drugs are used in early Alzheimer's to boost levels of a neurotransmitter that plays a role in memory formation and sleep.



NAMZARIC

For people whose current treatment needs a boost, this combo drug contains a cholinesterase inhibitor and Namenda to help improve thinking.



NAMENDA

This drug blocks the neurotransmitter glutamate, helping to boost attention, mood and alertness in patients with moderate to severe cases.



FUTURE TREATMENT

Monoclonal antibodies are currently under investigation and may help immune cells learn to target and clean up the damaging proteins in the brain.



healthcentral

Memantine

Common brands: *Namenda*

Rivastigmine(CI)

Galantamine(CI)

Common brands: *Razadyne*

Donepezil(CI)

Common brands: *Aricept*

Available Treatments - Early Diagnosis

Two different studies for detecting AD; cognitive abilities and genetics.

- Neuropsychological testing looks for asymmetrical changes to the brain. These subtle cognitive changes can precede the onset by as many as 7-10 years..
- Genotype testing is a more consistent and accurate predictor, and looks for specific genes.
- Genotype testing is superior(for rate of occurrence), but Neuropsychological Symmetry testing superior(for evaluating onset in an individual)..
- Neuropsychological testing may help indicate when it is time to start medication.**American Psychological Association. (2002, April 7)**

Secondary prevention strategies seek to prevent or delay progression to full dementia.

- Behavioral treatments show promise as secondary prevention strategies.
- The Mayo Clinic has launched an intensive multicomponent behavioral treatment.
 - It produced short-term improvement and longer-term stabilization of a patient's ability to function.

American Psychological Association. (2012, June 20) - Glenn E. Smith, PhD

Researchers focus their efforts into finding a cure by looking into removing AB or blocking its formation, preventing tau tangles, and reducing inflammation.

- Early detection could allow doctors to intervene with drugs to protect against significant brain damage.

We can reliably diagnose mild cognitive impairment.

- Mild cognitive impairment (MCI) involves problems with memory and other mental functions.
- Unlike dementia, MCI does not interfere with the person's daily life.
- Individuals with MCI are at a greater risk of developing a dementia-related illness, but lifestyle changes can reduce and/or help slow the onset of dementia. **AFA**

Available Treatments - Physical Therapy

Nutritional problems are common in persons with dementia.

- Some may not want to eat and others may not be able to feed themselves.
- A good diet is vital to a person's health and well-being.
 - Flavonoids - good for better language, episodic memory, and slower cognitive decline in elderly.(many fruits, specially berries, vegetables)
 - Limited salt and sugar.
 - Fruits, vegetables, nuts and fish(antioxidants and Omega-3 fatty acids boost brain health).

Attempts to improve memory and general cognitive performance in the elderly through training have not met with much success.

- The Synapse Project(elderly show episodic memory capability gains after spending 16 hours a week for three months learning things like digital photography, quilting, and other tasks that are both interesting and cognitively demanding).(textbook)

People tend to do better when they have a history of mental and physical activity.

- Tapping strengths

In the case of Alzheimer's patients, "What are the abilities that remain? How can we connect with the person who is still here?"". Draws on people's backgrounds and strengths as well

- Nurturing community

The team infuses its techniques with relevant research on memory, social connections and other pertinent topics. Using a "naturally mapped" environment, is a great way to do this. For instance, Hearthstone facilities all have pleasant destinations at the end of every corridor, rather than closed doors.**Tori DeAngelis, December 2009,**



Physical exercise, Schallert explained, may stress the brain in the same way as a mild toxin, and thus protect it against a later, more extreme stress.**Winerman, L. (2005, November)**

Ways To Catch Alzheimer's

We used to have no way of definitively telling if a person had Alzheimer's until death.

- Now we can use PET scans, which are 75-90% accurate.**(textbook)**
 - PET scans can predict about $\frac{1}{3}$ of individuals who will develop Alzheimer's within the next several months.
- We can also measure AB and tau in the cerebrospinal fluid for an equally accurate diagnosis.
 - Biomarkers found in cerebrospinal fluid and blood have shown 90-100% accuracy in predicting progression to Alzheimer's over the next 5-6 years.**(textbook)**



Some tests look for loss of cognitive ability, but the amount they look for to determine if someone is "normal" can be too low for some individuals. Higher "normals", over the standard, can more accurately predict how many highly intelligent people will deteriorate over time.**American Psychological Association. (2004, January 4)**

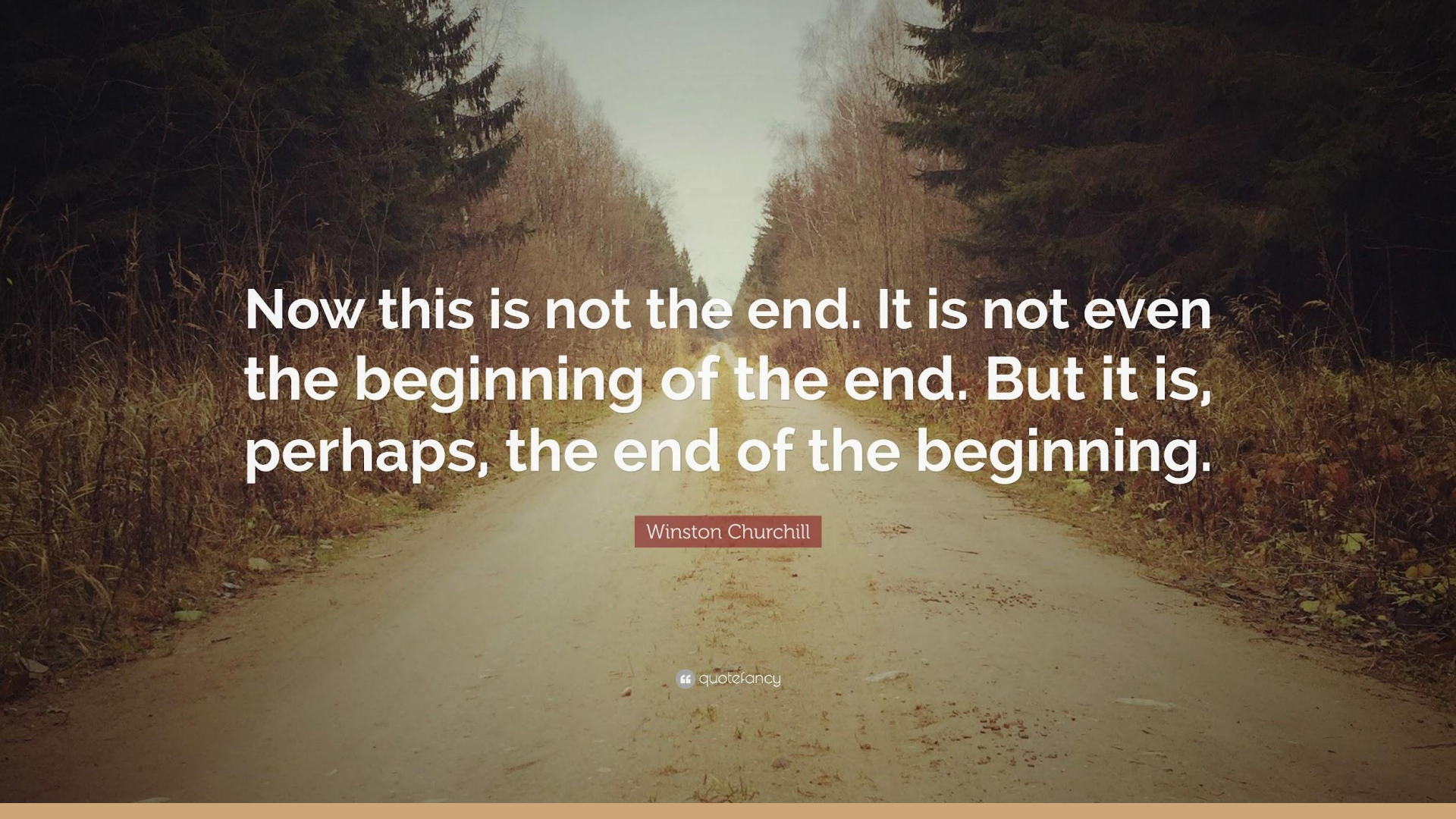
Ways To Catch Alzheimer's

To be effective, the medications currently available to treat Alzheimer's have to be used early on. Psychologists have identified several promising tests to help with that. **American Psychological Association. (2005)**

1. *Paired-associate learning test.*
2. *Perceptual identification task.*
3. *Visual association test.*
4. *Dichotic listening task.*

10 Early Signs and Symptoms of Alzheimer's (Alzheimer's Association (2020))

1. Memory loss that disrupts daily life
2. Challenges in planning or solving problems
3. Difficulty completing familiar tasks
4. Confusion with time or place
5. Trouble understanding visual images and spatial relationships
6. New problems with words in speaking or writing
7. Misplacing things and losing the ability to retrace steps
8. Decreased or poor judgment
9. Withdrawal from work or social activities
10. Changes in mood and personality



**Now this is not the end. It is not even
the beginning of the end. But it is,
perhaps, the end of the beginning.**

Winston Churchill