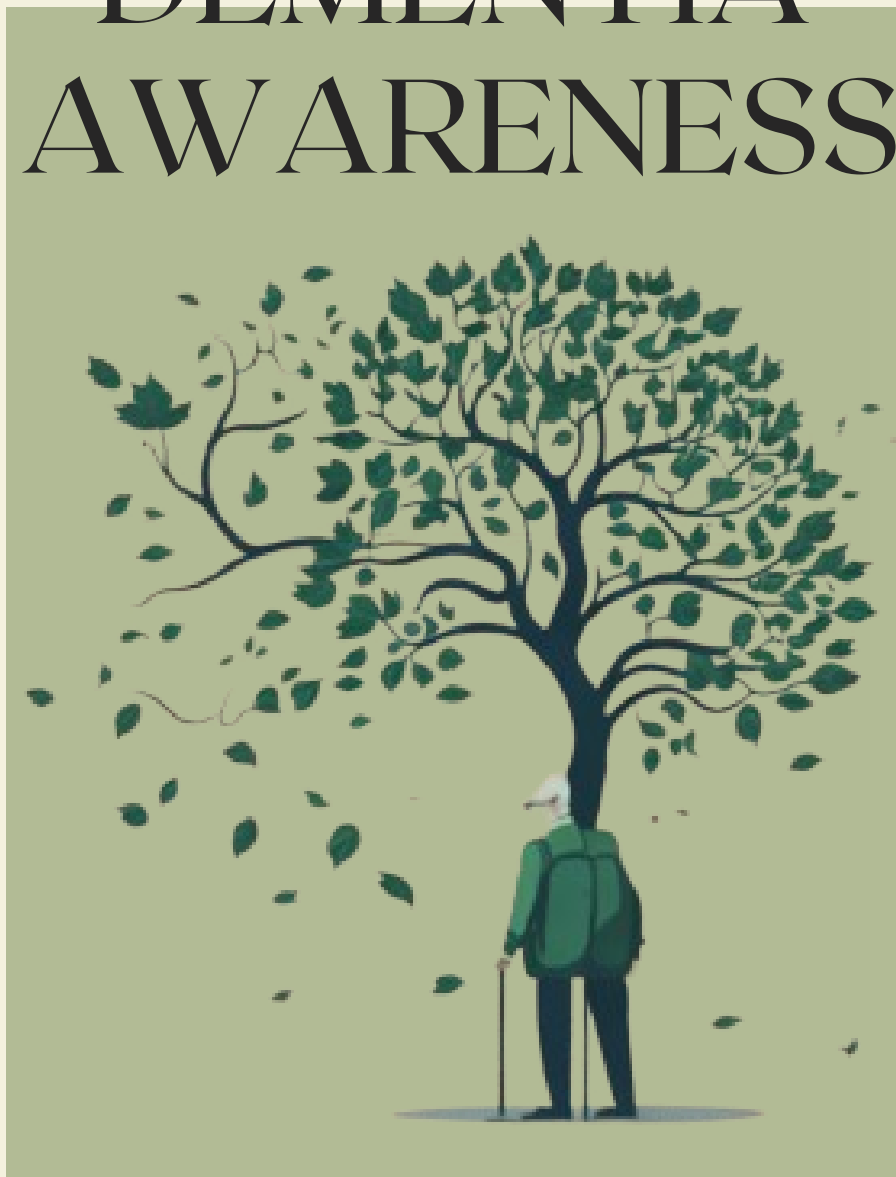


DEMENTIA AWARENESS



Supervised by Dr. Amir Jahanian Najafabadi

Introduction

Welcome to this booklet on Dementia Awareness. In the chapters that follow, we aim to shed light on an important topic that touches the lives of millions of people around the world. The main idea of this booklet is to purely raise awareness in an easy language for layman people. This booklet is designed by a group of passionate students under my supervision for the course of Community Impact Project at Constructor University in Bremen, Germany. In this project, we aimed to provide valuable insights into dementia in a layman language, offering a comprehensive understanding of its symptoms, impact, and ways to support individuals affected by it. This booklet is offered in five languages including German, English, Albanian, Portuguese and Russian.

Dementia is not just a single disease but a collective term for a range of conditions that affect memory, thinking abilities, and daily functioning. Whether you're a caregiver, a family member, a friend, or someone seeking information, we invite you on a short journey to explore the complexities of dementia. Our goal is to equip you with knowledge and resources to foster greater understanding, empathy, and practical strategies for navigating the challenges associated with this condition.

(1) awareness-cip.de



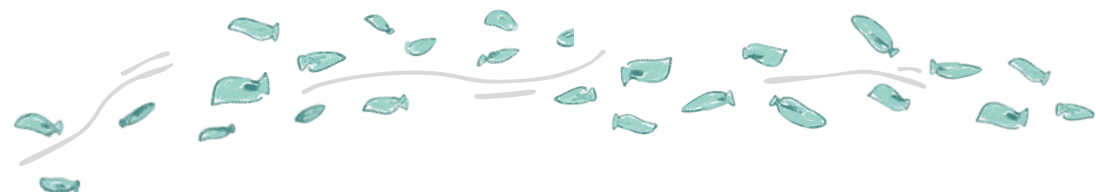
Throughout these chapters, we'll explore various aspects of dementia, including its types, common signs and symptoms, potential causes, available treatments, and most importantly, the best practices for offering support and care to those affected. Additionally, further information on these topics and much more can be found on our website (<https://awareness-cip.de>), which delves deeper into the causes, progression, and treatment of dementia.

Dementia not only affects the individuals diagnosed but also significantly impacts their families and communities. By fostering awareness and understanding, we can create more inclusive and supportive environments for everyone affected by dementia. The reader will develop strategies to cope with dementia patients around them—which can be a daunting task without any training—, and more efficiently care and live with patients.

We hope this booklet serves as a valuable resource, enabling readers to better comprehend dementia and empowering them to make a positive difference in the lives of those impacted by this condition.

As a supervisor and head of this team, I would like to acknowledge the extensive efforts, hard work and creativity of my students in production of this booklet. Names are listed in alphabetic order:

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With the best regards,

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Stages of Dementia, subsequent symptoms, and treatments

1 Doctor's visit for early detection

2 Disease-modifying therapies

Early stage

Middle stage

Memory loss

> multiple causes; solely does not imply dementia

Examples:

- forgetting names after fresh introduction
- loss/misplacement of valuable objects

Forgetfulness of one's past and present

- > past, like one's old school
- > present, like what day it is

Tendency to get lost

Troubles with bladder and bowel control

Changes in sleep pattern

Difficulty with planning and organizing

Requiring help choosing proper clothing for the occasion or season

3 Symptomatic therapies

More information on the different treatments can be found on these pages:

- 1 page 24
- 2 page 25
- 3 page 25
- 4 page 26

Late stage

Requiring around-the-clock assistance

> daily personal care

Vulnerability to infections

> like pneumonia

Loss of awareness of recent experiences/surroundings

Difficulty with communication

Changes in physical abilities

> walking, sitting, and eventually, swallowing

4

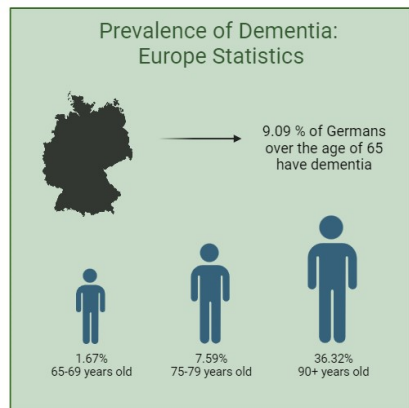
Targeted therapies

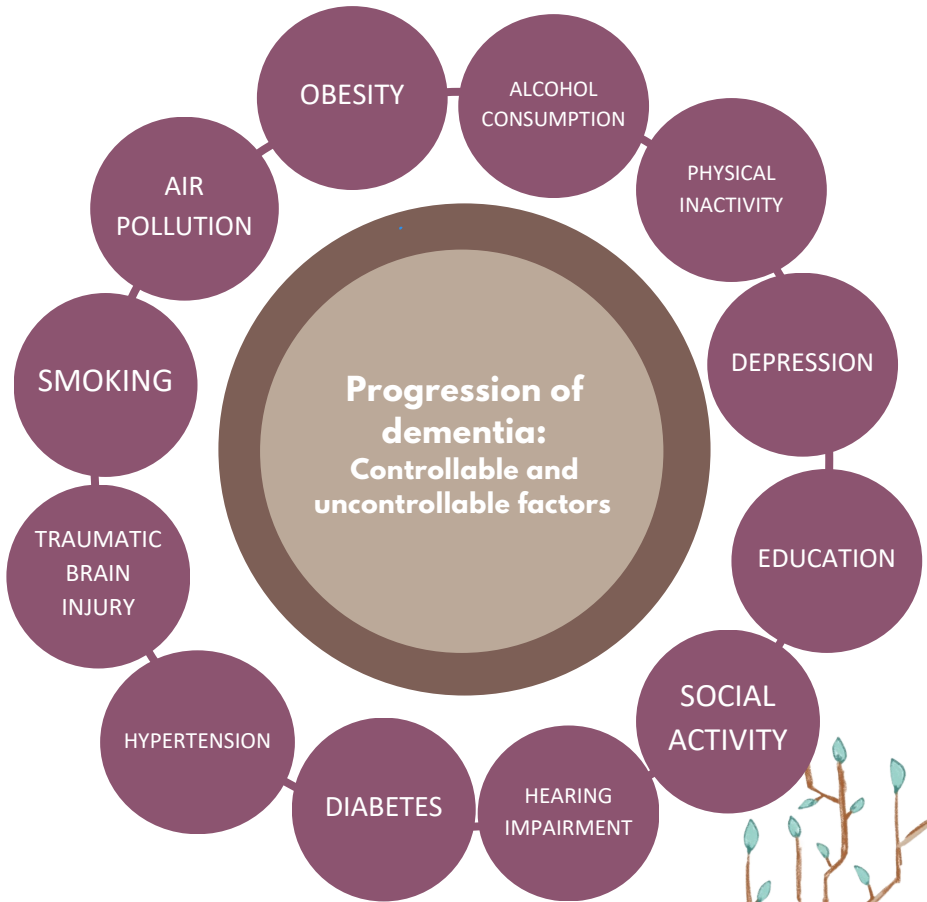
Chapter 1. What is dementia?

Dementia is a neurodegenerative condition that makes it difficult for patients to complete everyday life tasks such as remember and think. “Condition” is not to be confused with disease; as dementia itself is not a disease, rather it is a combination of symptoms that make daily life more challenging. In fact, there are some diseases that can lead to different types of dementia, depending on what kind of damage they cause to the brain. The most common type of dementia comes from Alzheimer’s disease, and other types include dementia with Lewy bodies, frontotemporal dementia, and vascular dementia.

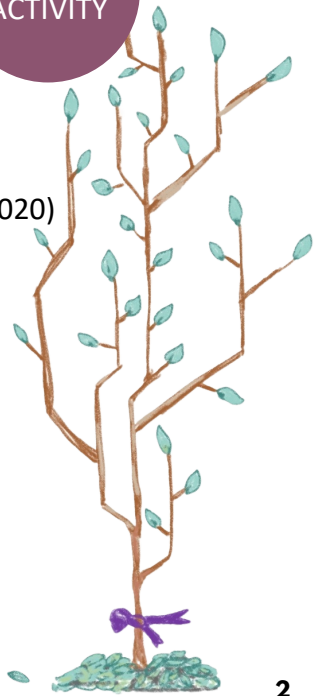
The incidence of dementia cases rises dramatically with age. According to one study, 9,09% of Germans over the age of 65 have dementia. In Europe, the prevalence of dementia at 65-69 years is 1,85%, rising to 7,59% at 75-79 years, and 36,32% at 90+ years[1]. Although dementia onset is positively correlated with aging, it does not mean that it is part of normal aging. Many older adults will live their lives to the full extent without ever developing any related symptoms. While the **neuropathological damage** seen in the brains of dementia patients tends to resemble that of normal aging adults, the difference tends to be the extent of the damage (Wahl et al., 2019).

Treating dementia is, as of right now, a challenging task. There is no cure for the disease; however, science has been able to provide us with knowledge on how to reduce the chances of dementia occurring in the first place.





(Lancet Commission, 2020)



Chapter 2

How can you prevent dementia and help the patients suffering from it?

All the factors listed in the previous page account for approximately 40% of dementia cases, and some of them are modifiable.

Thus, based on the scientific studies making a few lifestyle changes can reduce the risk of suffering from dementia by a lot. A few examples of such changes would be:

1. Being physically healthy:

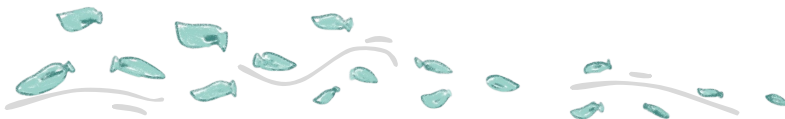
- Choose an activity you like!
- It doesn't make sense to force yourself to run 10 kilometers daily or lift weights if that's not something you enjoy. If you need to become more experienced in sports, you can start slow by joining yoga classes or even trying speed walking.
- Use a wearable gadget!
- If you like dissociating when exercising, consider buying high-quality headphones. You can listen to music or even podcasts and thus enjoy the process more. Remember to invest in headphones that won't fall out throughout your workout routine!
- Another helpful gadget could be a smartwatch. Seeing your progress - such as the steps made throughout one day or calories burned - "on paper" can motivate you to improve in the future!
- Watch workout videos!
- You could still stay active at home if you want to avoid exercising outdoors or in public places! There are many free workout videos on the internet; you can even go as far as finding a personal trainer online who will create a personalized workout plan and support you throughout the process!

(1)[Deutsche Alzheimer Gesellschaft](#)

- Consider group activities!
- Even if you see yourself as introverted, trying to exercise with others might be worth a shot. This would improve your physical activity and help you find people who also want to live a healthier lifestyle!

2. Having a healthy and balanced diet:

- Include wholegrain starchy foods!
- Starchy foods, like potatoes, bread, pasta, and rice, are a good source of carbohydrates and an important part of a healthy diet. They help fill your body, so you are less likely to go for little and unhealthy snacks throughout the day!
- Eat more fruits and vegetables!
- Fruits and vegetables are a great source of vitamins. Adding vegetables to the main dishes will make them much more tasty, and replacing sugary snacks with fruits will make you feel much better!
- Swap red meat with fish!
- It is not advised to eat only fish or red meat but to change it up! According to research, you should only consume red meat three times a week (not more than 700g per week!), and on other days, try different foods such as fish (but also chicken and legumes).
- Choose lower-fat dairy foods!
- Instead of buying milk, cheese, or yoghurt with a higher percentage of fat, try to go for the ones with lower levels. You could also try other options, such as lactose-free or fortified soy milk!
- Limit salt!
- It's not just a myth that too much salt is bad for your body. Cutting down on salt is not easy, but considering that, according to the WHO, 1.89 million deaths yearly are associated with consuming too much sodium, it's worth trying! A good start would be to use more alternatives to salt when preparing dishes, such as garlic, citrus juice, salt-free seasoning, or spices.

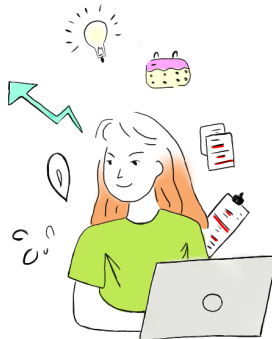


- Reduce sugary foods!
- These days, there is a lot of sugar in most of the products we eat, such as ketchup, fruit juices, iced teas, etc. Thus, it's extremely difficult to eliminate sugar from our diets entirely. However, there are small steps which you can take, such as:
 - Drinking diet Coke instead of a normal one
 - Replacing sugary cereals with plain wholegrain cereals
 - Not adding sugar to tea and coffee.
 - Lower alcohol consumption!

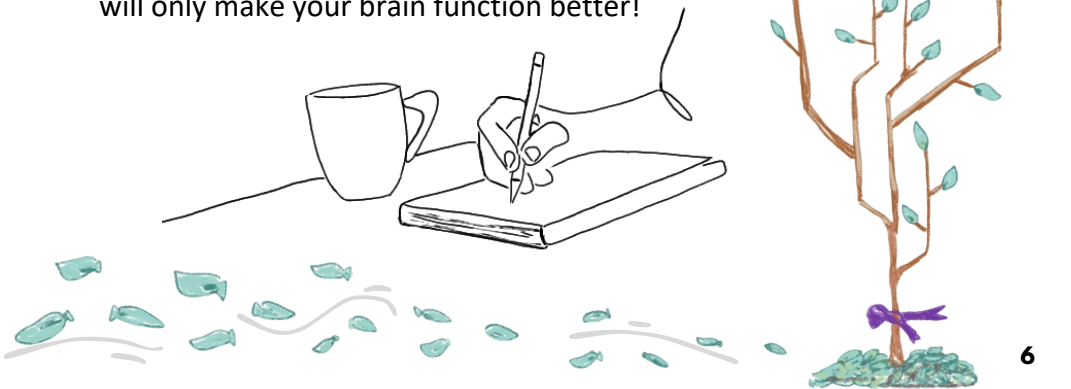
For some people, lowering their alcohol consumption might be more challenging than for others - depending on their friends, groups, place of work, culture, etc. You don't have to stop drinking (even though many scientists recommend it) but instead focus on drinking less. Make sure to have alcohol-free days each week, always count your drinks, and try swapping alcoholic drinks for low or non-alcoholic ones!

3. Attend interesting courses!

- Even if you have already finished your education, you should still take courses/seminars that interest you! It is a fantastic way to acquire new skills and meet new fascinating people you most likely would not have been able to meet otherwise!
- There are plenty of classes to take in real life, such as cooking classes, but attending online courses has also gained much popularity.



- Participate in creative activities!
- Creative activities include painting, drawing, printmaking, clay modeling, etc. This is a great stress reliever, even for people who don't consider themselves creative!
- Help the society!
- Many organizations are constantly looking for volunteers for their social projects. You don't have to go to a third-world country and save turtles to do something good for society! You could volunteer at an animal shelter or work with children and youth.
- Play challenging games!
- By this, we are not saying you should play GTA V in the hardest mode but rather games that challenge your brain. Try solving a crossword from time to time or do puzzles (you can then frame the done picture and show it off to all your friends and family)!
- Read books!
- Reading books has so many benefits for your life! It will help you reduce stress, enhance your memory, improve sleep, and expand your vocabulary.
- If you have little experience with reading books, try reading articles online or even short stories. What matters is that you read about something you are actually interested in!
- Keep a diary!
- Keeping a diary is not only reserved for teenagers! This activity can only do good for you and your mental health. Every therapist will tell you to keep a journal to reflect on your behavior and build awareness. Even if you're not struggling with mental health, keeping a diary won't do you any harm and will only make your brain function better!



- Learn a new language!
- The older we get, the more challenging it is to learn a new language - but that shouldn't stop us from trying! It is an excellent exercise for your brain, and if you don't feel like investing too much of your time, you should look into mobile applications that offer language courses. With even a few minutes per day, you could learn a lot!

After discussing possible activities that reduce the chance of suffering from dementia, we will discuss how to support the person who has dementia, their family, and yourself. This part is dedicated to everyone who has been affected by the disease to any degree:

1. In terms of everyday care:

- Try to create a routine for the patient in their life. You can start by serving meals at the same time each day.
 - Make to-do lists! Completing a task will give you and your patient the feeling of accomplishment.
 - Write appointments and events in a calendar to see in advance what is coming your way.
 - Invest in loose-fitting, comfortable, easy-to-use clothes to make it easier for your patient to put them on.
 - Buy a sturdy shower chair for more comfort when taking a shower.
- Even in difficult moments, try to be gentle and respectful!



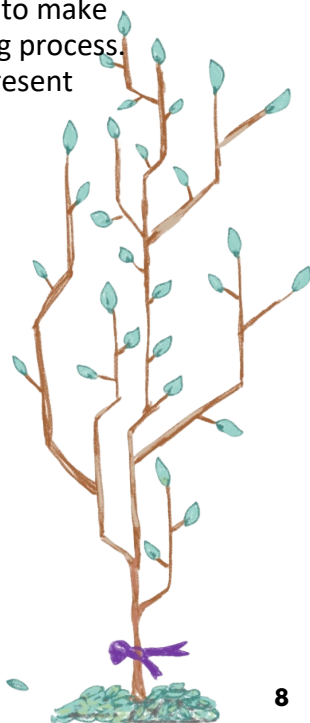
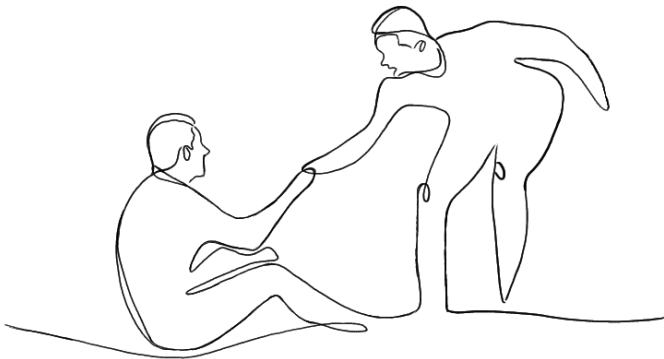
(1)Deutsche Alzheimer Gesellschaft

2. Be mindful of communication and behavior!

- Be prepared to reassure your patient whenever they feel lost.
- Stay calm even when you find yourself in a stressful situation.
- Respect the patient's personal space and allow them to be as independent as they can be.
- Keep well-loved objects and photographs around the house to make the place warmer.
- Avoid using the phrase "Don't you remember?" and instead try to gently remind them of what they seem to be forgetting.
- Encourage a two-way conversation for as long as it is possible

3. Help them lead an active and healthy lifestyle

- a. Include your patient in doing the household chores such as cooking or gardening.
- b. Join in on the activities – it is way more fun to work on something together than alone!
- c. Play music in the background to have more fun and help motivate your patient.
- d. Go on daily walks together! It is a healthy exercise for both the patient and the caregiver.
- e. Buy a variety of healthy and easy to prepare food to make it easier for your patient to participate in the cooking process.
- f. Ask them what they would like to eat and try to present them with choices - "Would you prefer to have a banana or an orange?"



4. Home safety

- In a household with stairs make sure to:
- Have at least one handrail.
- Put carpet and safety grips on stairs.
- Mark the edges of steps.
- Insert safety plugs in unused electronic outlets.
- Get rid of unused items, such as small rugs that the person might trip over.
- Provide good lighting all around the house to make the environment seem more safe.
- Remove curtains and rugs with busy patterns that might confuse the patient.
- Lock up cleaning and household products such as detergents or paint.

5. Taking care of yourself as a caregiver:

- Don't be ashamed to ask for help if you're feeling overwhelmed!
- Eat nutritious foods so that you can also stay healthy for long.
- Join a support group! Sharing your experiences with other caregivers is a great way of improving your mental health.
- Take breaks whenever you're feeling overwhelmed. Try calling a friend, and remember that you're not alone!
- Try to spend time with friends in real life as well!
- Get exercise to keep your body healthy.
- Try meditation or yoga. These activities can help you relax after stressful days.
- Consider mental health professionals to learn how to cope with stress and anxiety.



6. Planning for the Future

- Start important discussions early!
- Get your patient's consent and permission in advance to be able to access any needed information regarding their insurance, bills etc.
- Try to discuss as soon as possible:
 - 1) Legal and financial matters.
 - 2) Options for in-home care.
 - 3) Options for long-term care.
 - 4) Funeral and burial arrangements.



Chapter 3 An interactive activity

Nowadays, numerous research efforts have provided compelling evidence for the effectiveness of non-pharmacological interventions in improving the well-being of dementia patients. And, now it can be said that the development of treatment improving the cognitive system, sensory skills, and physical state can contribute to the positive influence on patients' quality of life.

Cognitive therapies have demonstrated positive outcomes in enhancing cognitive function and slowing down cognitive decline. These therapies involve engaging patients in mental exercises and activities that challenge their cognitive abilities, such as memory games, puzzles, and storytelling.

Sensory skills development is an essential component of dementia care. Aromatherapy, for instance, can have a calming and soothing effect on dementia patients. Additionally, tea tasting is an enjoyable sensory activity that can engage multiple senses - smell, taste, and touch. Exploring different tea flavors and textures can be a stimulating and pleasurable experience for dementia patients, promoting a sense of well-being and relaxation.

Physical activity is crucial for individuals with dementia, as it not only benefits their physical health but also their cognitive and emotional well-being. Engaging in regular physical activities, such as walking, chair exercises, or dancing, can help improve balance, muscle strength, and coordination.

Furthermore, physical activity promotes the release of endorphins, which can enhance mood and reduce feelings of depression and anxiety commonly associated with dementia.

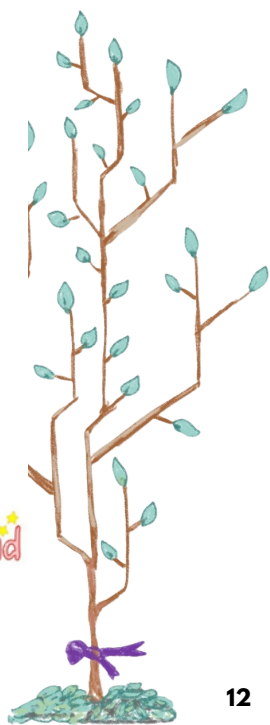
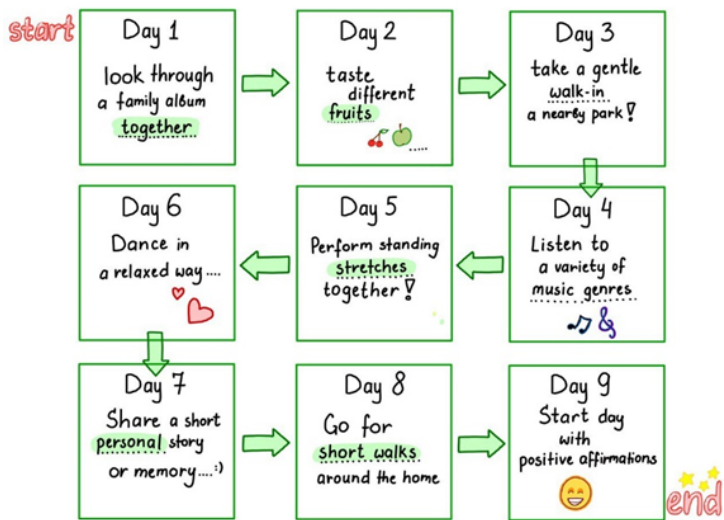


Now, how about taking a challenge with patients by knowing the significance of the development of cognitive, sensory and physical states? Below we offer you an example of how to spend time that is not only useful, but also enjoyable!

The activities of the challenge are all about getting your brain in the game! We want patients to jump in, think actively, and have a blast with the tasks. Instead of just going through the motions, we aim to keep your mind fully engaged.

Why? Because that's the secret for successful learning, problem-solving, and becoming a critical thinking superstar! Some activities refer to the sensory skills, which can have a positive effect on the patient's mood. The other part of the challenge is dedicated to the physical activity of patients!

Please note that when performing such mini-fitness training, it is important to monitor the patient's general well-being. Complete the task to the minimum possible and then show improvement in the patient's general state! And, always please remember, caregivers' support during the whole challenge is key to see good results 😊



Chapter 4

Where does the caregivers' stress come from?

Transitions into caring roles can increase one's levels of distress, health issues, and health-risk behaviors. This could be explained by different stressors that appear (Sörensen et al., 2006; Shahidi, 2023).

<p>Primary Stressors</p> <ul style="list-style-type: none">• Caring tasks• Exposure to patients' medical conditions, behavior, and impairment (e.g. emotional outbursts)• Unmet needs (e.g. lack of hospital support)	<p>Secondary stressors</p> <ul style="list-style-type: none">• Work• Financial situations• Family responsibilities• Shortage of time and sleep• Current health issues
<p>Appraisal</p> <p>Perceived capacities to deal with caring conditions (e.g. how much do caregivers think they can handle)</p>	<p>Exacerbating and mitigating factors</p> <p>Knowledge about carers' direct responsibilities and available resources (E.g. for Bremen caregivers, Family Caregiver Support Group x Bremen University)</p>

1) Primary stressors:

Primary stressors arise from the tasks of caring for the patient, including the exposure to patients' medical conditions, behavior, and impairment. Particularly, patients' changed behaviors, such as emotional outbursts, intensify stress levels. In addition to patients' conditions, unmet needs such as lack of hospital support make caregivers feel more burdened.

2) Secondary stressors:

Secondary stressors come from other aspects of caregivers' lives that are indirectly affected by caring responsibilities, including work, financial situations, and family responsibilities. Shortage of time is a common problem faced by caregivers. They don't have time to take care of themselves physically and mentally, leading to common issues like sleep deprivation and fatigue.

3) Appraisal involves personal evaluations of caregivers' roles.

The assessment of their capacities to deal with the changing situations can influence the level of suffering from distress. Hence, some caregivers feel more stressed and burdened than others, irrespective of their actual level of caring responsibilities and tasks, but rather, the perceived level.

4) Exacerbating and mitigating factors:

Mitigating factors help to relieve caregivers' stress, including knowledge and understanding about carers' direct responsibilities and resources available externally, e.g. from the society, healthcare systems, relationships, and communities. If caregivers are aware of local resources, they would be better prepared to deal with the difficulties of caring tasks. In the following paragraph there is an example of a local source in Bremen where caregivers could turn to.



**Suggested resource in case for Bremen caregivers:
Family Caregiver Support Group x Bremen University**

On the other hand, exacerbating factors are the pre-existent factors in caregivers' lives, e.g. financial instability, mental and physical health issues. For example, if caregivers suffer from anxiety, it would be even harder for them to cope with daily stress from caring responsibilities.

Why is it important to know about the causes of stress?

Understanding the reasons why caregivers become stressed and depressed can help in managing the patients better. If you're a caregiver yourself, you can learn more about the causes of your stress and make a tailored plan to deal with it. If you have a friend who plays the role of a caregiver, you can also help them by developing empathy towards their situation, hopefully relieving mental burdens to some extent.



Chapter 5

Interventions to help caregivers

Psychotherapy: Psychotherapy sessions could be either individual or group-based. Cognitive-Behavior Therapy and Acceptance and Commitment Therapy are known for their effectiveness in helping caregivers adapt to new mindsets and behaviours, to meet the high demands of actively caring for another person.

Psychoeducation: While psychotherapy is more oriented towards dealing with emotions emerging from new responsibilities, psychoeducation addresses information and knowledge about dementia, tasks relating to caring about another, and possibly mental caring approaches.

Respite: Similar to vacation leaves offered to employees, respite gives carers space and time to recover from stressful responsibilities. These could come in as many forms such as institutional respite or group day care.

Support groups: Support groups could offer a safe space for carers to vent and share their feelings and struggles to deal with their loneliness.

Training for patients: While other interventions engage directly with carers' distress, training for patients can help relieve caregivers' stress by reducing burdens of caring tasks. These training aims at improving social and cognitive abilities of patients themselves in their daily life.

Pharmacotherapy: This approach aims at specific problems faced by carers such as depression, insomnia, or anxiety by medical treatments.

Other interventions: yoga, mobile applications, life-review, etc.



Crawling into life of a caregiver: An interview with Vijaya, a caregiver for her father, a dementia patient

(Late-Stage Care, Heartbreaks and Tender Moments, Hospitals, Dilemmas, Decisions, 2011)

"All housework and caregiving was shared between us sisters and we maintained a very sterile environment to keep him in good health. I had suspended my career and returned to India so that I could stay at home all day."

"One common problem we faced was that the nursing staff had no idea how to deal with someone who could not understand and would not co-operate, but even then they would not allow caregivers to be present."

"Had we not been proactive in our supervision of the treatment given, our father may not have received the treatment as prescribed."

"One point that I wish to emphasise here is that in all our experiences with doctors over the years we were able to 'discuss' on equal footing (i.e. without being cursorily brushed off as laypersons) only when we had done our homework (with knowledge garnered from the Internet) that showed we could understand medical issues and treatments."

"Sometimes I would lean over and place my cheek close to his mouth so he would give me a small peck on my cheek, and then I would show him the other cheek, he would give me a peck again..."

Chapter 6 The biology of aging and dementia

As mentioned in the first pages of this booklet, dementia is a condition encapsulating the diseases leading to specific symptoms, but not a disease in itself.

Alzheimer's disease:

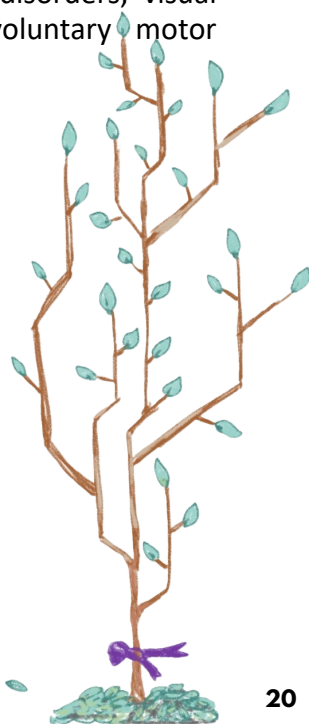
Alzheimer's disease causes dementia due to the accumulation of **tau proteins** and **amyloid-beta proteins**, leading to tangles and plaques, which leads to the death of neurons (Sengoku, 2019). Clinically, it can be difficult to diagnose, as the formation of these plaques can occur before symptoms appear (Morrison and Hof, 1997).

Dementia with Lewy Bodies:

Dementia with Lewy bodies tends to manifest as a result of the accumulation of alpha-synuclein in various regions of the brain. This protein has a tendency to form clusters, called Lewy Bodies, which lead to disease onset. This type of dementia is typically accompanied by other symptoms such as sleep disorders, visual hallucinations, rapid eye movements, and involuntary motor movements (Outeiro et al., 2019).

Protein aggregation:

Proteins are integral to keep cells functioning. Sometimes, however, proteins can malfunction and clump up together, forming what we call protein aggregates. Once in this form, the proteins lose their original (beneficial) function and become toxic to the cells. This is a common occurrence in neurodegenerative diseases such as Alzheimer's disease and dementia with Lewy bodies.



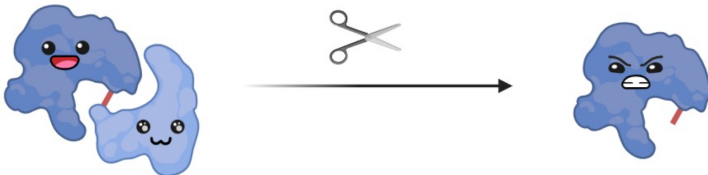
Tau protein:

Our neurons form the meshwork of information flow in the brain. The tau protein is responsible for maintaining the structural integrity of these neurons. A defect in tau proteins can cause them to become unstable. Much like a building without pillars, the neurons collapse and die, forming tangles that obstruct information transfer between neurons. The buildup of such neuronal tangles in the brain is largely responsible for neurodegeneration, and, as a result, dementia.



β -amyloid:

Another possible pathway involved in dementia progression is due to β -amyloid build-up. β -amyloid is a protein fragment—a protein cut in the wrong place—commonly found in the brain of patients that suffer from dementia with Lewy bodies. β -amyloid accumulates outside of neurons, ultimately leading to their death.



Each of these changes define three different types of frontotemporal disorders **connected to its respective brain impairments** :

1. Progressive behavior/personality decline

— Characterized by changes in personality, behavior, emotions, and judgment (called behavioral variant of frontotemporal dementia)

2. Progressive language decline

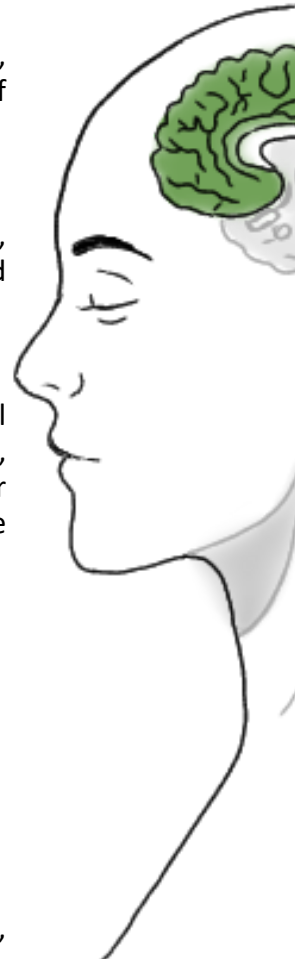
— Marked by early changes in language ability, including speaking, understanding, reading, and writing (called primary progressive aphasia).

3. Progressive motor decline

— Characterized by various difficulties with physical movement, including the use of one or more limbs, shaking, difficulty walking, frequent falls, and poor coordination (corticobasal degeneration as one of the examples).

In most cases, the cause of the frontotemporal disorder remains unknown. However, in up to 40% of people, this type of dementia can be defined by genetic mutations with familial history causing faulty protein function. Another reason could be as well acquired or genetic lysosomal dysfunctioning.

Now that we know some of the causes of dementia, let's take a look of what has been done in the field, to treat this condition.





Vascular dementia:

It is a neurocognitive disorder caused by reduced blood flow to the brain. Neurocognitive – one that is related to neuronal cells communication mechanisms that are involved in learning, knowing and understanding processes. Drastic changes in the brain blood supplies could be results of major strokes or cerebral (referring to location in brain) small vessel diseases. The consequence of such are changes in brain functionality and structure that cause dementia.

Some risk factors include hypertension, obesity, and diabetes, leading to neurovascular (meaning both concerning neurons and vascular systems) impairments. Environmental impacts, such as air pollution, adds up to such impaired functions of the brain vasculature vascular, causing brain inflammation and oxidative stress (Lecordier et al., 2021).

Frontotemporal disorders:

They are a form of dementia caused by loss of functions in frontal and temporal lobes of the brain. Scientists estimate that such disorders may cause up to 1/10 of all dementia cases, around as common as Alzheimer's among people younger than age 65.

More than half of people with these disorders are 45 to 64 years old. Frontotemporal disorders exclusively affect the frontal and temporal lobes of the brain, and the region affected defines which symptoms would appear first (Frontotemporal Disorders, n.d.).



Chapter 7 Research into dementia treatments

Research into dementia treatments is a dynamic and evolving field, with ongoing clinical trials, scientific discoveries and new drug discovery methods. As of now, there is no single definitive cure, but the outlook for future remedies looks promising. Scientists seek for drugs that can modify the course of dementia, addressing the underlying causes of the condition mentioned before, such as the aggregations of amyloid and tau proteins in Alzheimer's disease. So what are the current strategies for tackling dementia?

1) Early Detection: The first step to prevention of the progression of the diseases is to be aware of the stage where it is currently in. Intuitively, this is not something we can detect ourselves. However, what we can do is pay attention to symptoms and go to the doctor when potential signs of disease appear. Doctors could then run multiple tests --usually imaging your brain, in the search of specific protein aggregations -- to run a diagnosis.

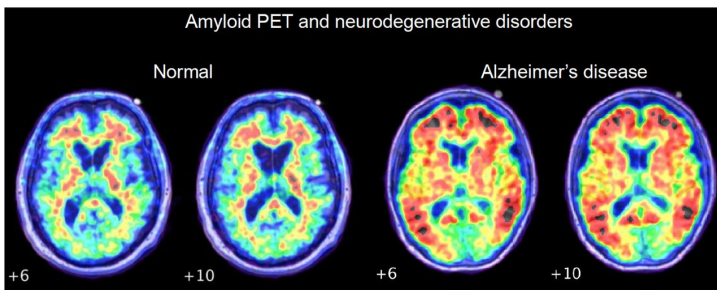
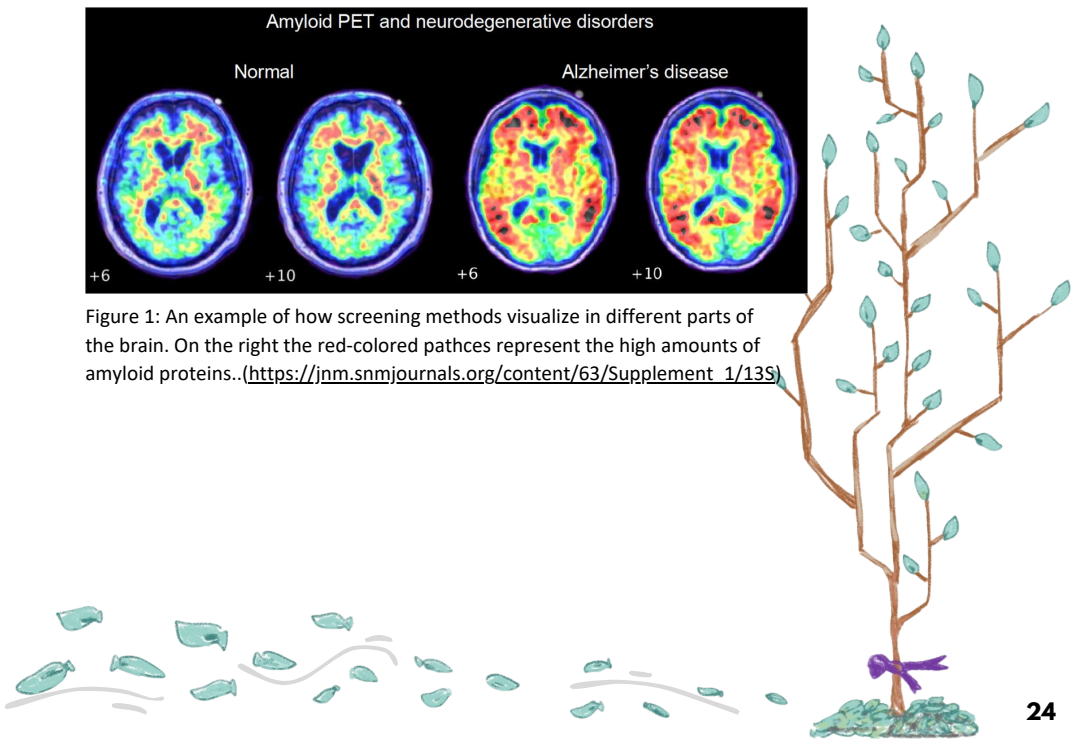


Figure 1: An example of how screening methods visualize in different parts of the brain. On the right the red-colored pathces represent the high amounts of amyloid proteins..(https://jnm.snmjournals.org/content/63/Supplement_1/135)



2) Disease-Modifying Therapies: they are medications or therapies aimed at slowing down the progression of the condition. The difference between a medication and a therapy is that the former is typically administered for short periods of time and has a strong effect, while the latter takes longer to make an impact but its benefits are long-lasting.

How do these therapies work?

A typical workflow looks like this: researchers identify biomarkers of the condition they want to treat, e.g. the protein aggregation of beta-amyloid and tau. Different biomarkers, or the abundance of one biomarker in someone’s brain, can usually reflect how progressed the condition is, in that patient.

Researchers would then seek for ways to reduce or eliminate these biomarkers by designing drugs or therapies. After years of clinical research and trials (on various animals and eventually, humans), the regulatory system of the country will decide whether the therapy meets the criteria for safety and efficacy. Then, you can benefit from these treatments. However, the earlier you diagnose the condition and take action, the more chances you have of ameliorating any symptoms and biological causes.

3. Targeted Therapies: Targets of the disease are difficult to identify as they are a byproduct of complex signalling which can be difficult to trace back to a single molecule. Future treatments may focus on the following targets within the brain to relieve adverse effects such as:



- **Neuroinflammation** (brain swelling),
- **Oxidative stress** (accumulative damage from waste products of oxygen consumption in the brain)
- **Synaptic dysfunction** (communication problems between cells in the brain)

It is important to note that, even though certain biomarkers can change after treatment, it doesn't automatically mean that the treatment is changing the course of the disease. For example, treatments can reduce the buildup of certain proteins in the brain in research studies, but they don't improve people's severe symptoms that are irreversible such as memory loss.

This happens because conditions are rather complex and cannot be reduced to one biomarker, or even a few of them. In addition, there are things we cannot change at all, that correlate to the progression of the disease.

For example, in certain types of dementia, e.g. frontotemporal dementia, genetic factors such as family history, genetics and age need to be taken into consideration (Belder et al., 2023).

3) Symptomatic therapies are mainly drugs that help to manage and reduce the effects of a condition's symptoms without necessarily treating the cause itself. They aim to improve the individual's comfort, functionality, and quality of life, while researchers continue working hard towards finding more effective treatments or cures.



In the case of dementia cholinesterase inhibitors are identified. Cholinesterases are a class of enzymes, and cholinesterase inhibitors, intuitively, are proteins that block the function of these enzymes. Since these blockers don't modify the actual disease processes of dementia, any benefits they provide tend to disappear when the treatment is stopped (Belder et al., 2023).

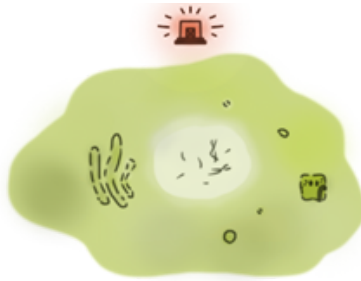
As mentioned earlier, dementia is a progressive neurodegenerative condition. The severity of the symptoms depend on the stages when the brain worsens quicker over time. This means that what's happening inside the brain is always changing, which makes it tough for scientists to keep up with thier research. There is a significant demand for specialized therapies and drugs since current drugs such as donepezil and rivastigmine ones don't commodify the patients' specific stages and are costly. The latter needs to be paired up with understanding and managing risk factors such as hypertension, diabetes and high cholesterol (Belder et al., 2023).



Glossary

1. **Biomarker** = chemical or biological compound in (parts of) your body that, in certain conditions, indicates the presence of a disease.

2. **Cellular senescence** = the state of a cell in which it loses the ability to divide and function as it normally would, similar to a “retirement” of the cell. Commonly, this happens when a cell ages and has divided for long enough not to be able to do it again without compromising its integrity. Senescence can also be induced by damage happening at any time point inside the cell, e.g., when DNA breaks.



3. **Chronic** = (In the context of conditions,) that persists over long periods of time.

4. **Comorbidity** = a disease that occurs at the same time as another (“co” = along with, “morbidity” = the state of suffering from a disease).

5. **Protein** = “worker” of the cell. Proteins are made of different types of smaller building blocks, called amino-acids. In order to give rise to the three-dimensional structures that the proteins have, the amino-acids are put together like beads on a string. The shape of a protein tends to define its function: some proteins are responsible for maintaining the structure of cells, others can deliver information across different places, and some can even “patrol” the cell to look for malfunctioning proteins.

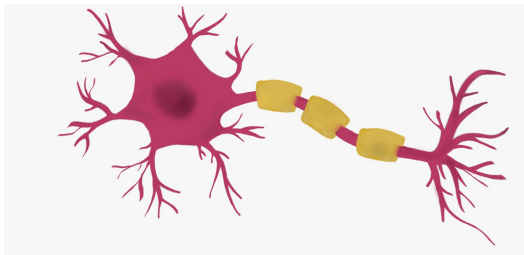


Most proteins, however, are **enzymes**: proteins that help speed up the chemical reactions taking place inside a cell.

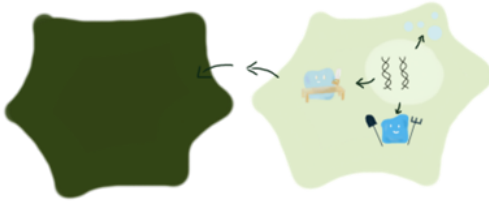
Multiple proteins, when physically coupled together, form **complexes**. However, when the proteins lose their shape and clump together inside the cell, they form **aggregates**.



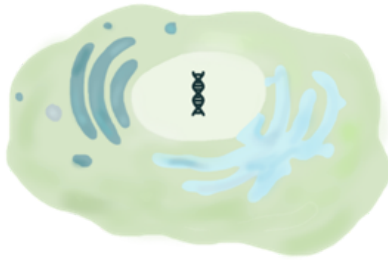
6. **Neuron** = type of cell inside the brain and the body. Neurons send each other signals, much like a communication. On a large scale, these communications allow our brain to think and our body, to perform actions. Biologically, neurons have distinct, characteristic shapes, their most prominent structure being a long wire-like axon in the middle. At one end of the axon there is a “body”, containing the nucleus and the organelles, and equipped with branch-like extensions (“dendrites”) able to receive incoming signals from other neurons. At the other end, there is a “synapse”: a free space through which the neuron transmits signals to the neighbouring neuron(s).



7. **Nucleus** = a small, round structure in the center of most cells. It contains the DNA, encoding the genetic information which dictates how the cell should work and behave. Therefore, the action taking place within the nucleus defines what happens within the cell, as well as how the cell interacts with its environment and neighbors.



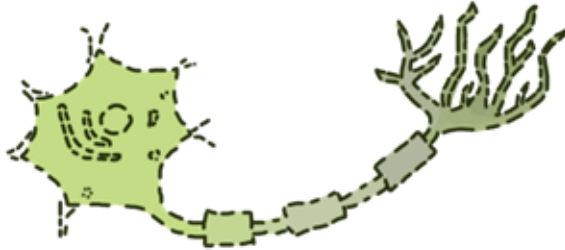
8. **Organelle** = small structure inside a cell with specific functions, like an “organ” of a cell. For instance, the nucleus itself is an organelle. The nucleus is itself an organelle.



9. **Phenotype** = the observable traits of an organism (here, we mostly talk about humans), including for example their appearance and behavior.



10. Progressive neuron death = ongoing and gradual loss or degeneration of nerve cells, or neurons, in the nervous system.



11. **Neuroinflammation** = Inflammation is a protective response of the body against potentially dangerous or harmful things in the body (e.g. viruses, damaged cells). Intuitively, neuroinflammation is an inflammation that happens in the brain and nervous system and affects how the brain works.



12. **Neurodegenerative disease** = a chronic condition, often characterized by damage and loss of neurons over time, particularly in the brain but overall in the nervous system.

13. **Neuropathological damage** = pathology is the study of diseases, and neuropathology deals with the study of neurological diseases (i.e., diseases of the nervous system). Thus, the term “neuropathological damage” encapsulates any damage that is being done within the nervous system, in the context of a disease.



References



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**Die Sparkasse
Bremen**