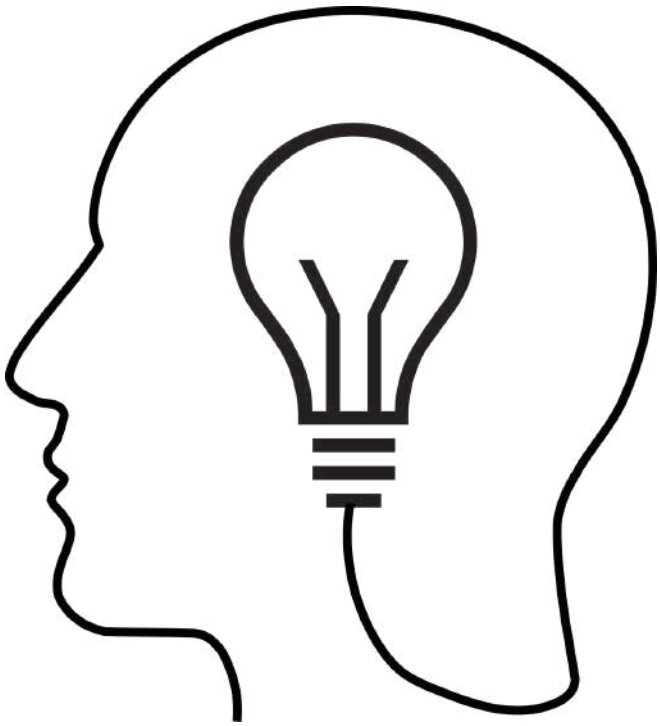
Mindful
Continuing Education

Fostering Brain Health Throughout the Lifespan



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Introduction

Health is a state of well-being that is not limited to the body but includes mental and social wellness (World Health Organization, 2021). Brain functioning is essential to overall health and is often overlooked by those who have maintained theirs or by people who have maintained their cognitive abilities and intact neurological system. Brain health can be fostered over the lifespan in a variety of ways, including preventative strategies and ongoing medical support. Mental health professionals must have an understanding of brain health and its importance because it is responsible for the most complex of human functioning including memory, thoughts, movement, and emotions management (BMJ, 2020). By being informed about brain health, mental health professionals can best support the whole health of their patients and develop appropriate treatment plans for optimal wellness and recovery.

Section 1: Brain health overview

Introduction

Health is not simply defined as the absence of disorders or conditions that impact functioning (World Health Organization, 2021). It is far more intricate and robust as a concept and is impacted by various external stimuli such as environment, family history, and access to resources and education. Brain health is not exempt from this. Individuals with the healthiest brains have access to resources to promote brain health. They have an understanding of what brain health is and why it matters. Brain health matters because of its responsibility for cognitive, mental, and emotional functioning (BMJ, 2020).

What is brain health?

There is no definition for brain health that is so defined it has been accepted across all systems (BMJ, 2020). Current definitions for brain health offer a generalized understanding of what it is: “an ability to perform the mental functions of cognition, including the ability to learn, use language, and remember information” (BMJ, 2020). Another definition states “brain health is the preservation of optimal brain integrity and mental and cognitive function and the absence of overt neurological disorders” (BMJ, 2020).

The consensus is that the healthiest brains are those that perform the highest levels of cognition. This does not mean, however, that individuals with lower levels of cognition

do not have established brain health. It is important to understand that all brains receive, store, and communicate information differently. Life experiences greatly impact brain health. This course will review in-depth a variety of experiences that impact brain development and health.

Brain health is important to achieve and maintain because it supports the longevity of life and ensures the highest level of performance where attention, problem-solving, communication, and other essential functions are concerned (American Heart Association, 2021). The health of the brain impacts all aspects of overall wellness including interpretation of senses and the ability to control movement; the maintenance of cognitive, mental, and emotional processes; and the ability to behave appropriately socially (BMJ, 2020).

To understand brain health, one must understand brain development.

What is typical brain development?

Brain development occurs in utero and does not stop for many years after a child is born (Centers for Disease Control and Prevention, 2021). The human brain does not generally stop developing until age 25 (University of Rochester Medical Center, 2021). The brain develops based on appropriate nutrition provided during pregnancy, if children are or are not exposed to toxins or infections, and children's experience with the world and those around them. (Centers for Disease Control and Prevention, 2021).

Care recommended for brain development

Because brain development occurs across the lifespan, the Centers for Disease Control and Prevention (2021) recommends the following acts at various times:

1. Before pregnancy, it is recommended that individuals meet with their doctors to develop the best preconception health possible. This includes developing healthy lifestyles free from alcohol, drugs, and smoking (Centers for Disease Control and Prevention, 2020). It includes developing healthy environments and taking pre-pregnancy medications to ensure the highest level of nutrition possible. It also includes ensuring vaccinations are up to date and toxic chemicals are avoided. Finally, this can include processing family trauma or addressing other mental health conditions (Centers for Disease Control and Prevention, 2020).

2. During pregnancy, it is recommended that individuals maintain all the healthy activities they did pre-pregnancy and work with their medical teams to address

any health needs that arise. Folic Acid is an essential vitamin to take during pregnancy for brain health because it can help prevent birth defects, ensuring the body and brain are healthily developed.

3. At birth, it is recommended that individuals engage in assessment and newborn screening activities to ensure that the brain was appropriately developed in utero and any complications that could impact brain functioning are identified (Centers for Disease Control and Prevention, 2020). This includes screening for any health conditions that impact the survival of the baby as well as genetic conditions, endocrine conditions, metabolic disorders, and heart defects (Centers for Disease Control and Prevention, 2020).

4. During infancy (ages 0-3) it is recommended that parents engage in effective practices to promote attachment and development such as responding to children in predictable ways, being warm and sensitive, developing predictable routines, talking with children, providing a safe environment, and disciplining without being harsh (Centers for Disease Control and Prevention, 2021). Children should receive ongoing developmental screening at ages 9 months, 18 months, 24 months, and 30 months (Centers for Disease Control and Prevention, 2021).

5. During early childhood (ages 4-11) it is recommended that parents be prepared for the significant changes that will occur with their children (Centers for Disease Control and Prevention, 2020). Parents should notice any potential disorders in their children that impact the brain such as Attention-Deficit/Hyperactivity Disorder, Asthma, Chickenpox, Covid-19, Developmental Disabilities, the flu, and obesity (Centers for Disease Control and Prevention, 2020). Children need access to educational materials, resources, and schooling. They must have opportunities to socialize and make friends, and they need access to movement and play. These years are essential for development and experience.

Developmental milestones

One of the ways to determine if the brain was healthily developed in utero and childhood is assessing for developmental milestones. Developmental milestones indicate healthy or typical development and should be monitored very closely until age 5 (Centers for Disease Control and Prevention, n.d). Developmental milestones suggest behavior or functional abilities that should be achieved based on what most babies do by a certain age. While not all babies will develop on the same timeline, it is important to suggest to parents that they know their children best, and as such they should serve

as advocates and partner with medical teams if they notice their children are not achieving developmental milestones as typical (Centers for Disease Control and Prevention, n.d).

The Centers for Disease Control and Prevention (n.d) indicates the following milestones as healthy development:

1. By two months most babies will smile, look at parents, make sounds, turn their head at sounds, pay attention to faces, track individuals, become bored, hold their head up, and push up when spending time on their tummy

2. By four months most babies will smile spontaneously, play with others and cry when it stops, babble, cry differently depending on their needs, respond to affection, reach for items, recognize familiar people, hold their head up unsupported, hold toys, and bring their hands to their mouths

3. By six months most babies will know if someone is a stranger, look at themselves in the mirror, respond to their name, begin to say vowels when babbling, show curiosity about things outside of their reach, pass items between their hands, roll over, begin to sit without support, and rock back and forth

4. By nine months most babies will be afraid of strangers and cling to familiar adults, have toys they prefer over others, understand the word “no”, copy sounds and behaviors of others, point at things, stand up by holding onto objects, sit without support, pull self up to stand, and crawl

5. By one year most babies will show fear, cry when their parent leaves, put out their arms or legs to help with getting dressed, respond to simple requests, change their tone when babbling, shake or throw items, find things easily, put things in and take things out of containers, begin to drink from a cup, and try to copy words

6. By eighteen months most babies will have “temper tantrums”, show affection to familiar people, cling to caregivers in new situations, play pretend, explore alone if a parent is close by, use the word “no,” know what typical objects are, follow 1-step directions, scribble, walk alone, walk up steps, pull toys, help with undressing, and use a spoon

7. By two years most children will copy others, be excited when around other children, show defiant behavior, know the names of others, follow instructions, use two to four-word sentences, find hidden things, can sort shapes and colors,

can play make-believe, name items, stand on their tiptoes, kick balls, and are beginning to run

8. By three years most children are showing affection without prompting, show concern and become upset with changes in their routines, can dress and undress, talk well enough to be understood by strangers, use toys with buttons and moving parts, can do puzzles with three to four pieces, turn book pages, and screw and unscrew lids and can turn door handles

9. By four years most children are finding joy in new activities, are becoming more and more creative in their play, would rather play with others than alone, knows basic grammar, tells stories, can say their first and last name, can name colors and some numbers, understand the idea of counting, use scissors, play board games or card games, and can hop or stand on one foot

10. By five years old most children are wanting to please others and become like their friends, agree with rules, are aware of gender, can speak, can count up to ten things, can print some letters or numbers, know about everyday items such as money, can do somersaults, can use the toilet on their own, and can swing and climb (Centers for Disease Control and Prevention, n.d)

The Centers for Disease Control and Prevention (n.d) recommends parents and teachers do the following to promote typical brain development to ensure that children hit their developmental milestones as appropriate:

1. For two-month-old children, parents should cuddle and talk during feedings, help babies learn to calm themselves through using a pacifier or sucking on their fingers, develop routines with their children, act excited when their babies make noises, encourage their babies to lift their heads, hold their babies upright, and ensure that their babies have tummy time

2. For four-month-old children, parents should have steady routines for eating and sleeping, copy their babies sounds and become excited when they make sounds, ensure babies have age-appropriate toys to play with, and ensure that babies have safe opportunities to reach for items and toys through exploration of their environment

3. For six-month-old children, parents should play on the floor with their babies every day, learn to read their babies moods and respond as needed to support the baby, play reciprocally, read books to their children every day, read colorful

picture books to their children, point out new things to their babies and name them, hold their babies up so they can look around, and encourage their babies to roll over when on the floor for tummy time

4. For nine-month-old children, parents should do things that make their babies feel comfortable, continue with their routines, describe items to their babies, ask for behaviors from their babies that they want, teach their babies cause and effect, play peek-a-boo with their babies, and provide plenty of space for their babies to move and explore

5. For one-year-old children, parents should give time for their children to adjust to new caregivers, say "no" firmly to their children, give a lot of praise and encouragement to their children, read to their children every day, build sentences on top of words that their children use, let their children draw freely, encourage play with blocks and toys, and encourage children to make noise

6. For eighteen-month-old children, parents should ensure environments are safe for children, praise positive behavior, promote children describing their emotions, encourage pretend play, use descriptive words with children, ask their children simple questions, name pictures in books when reading, provide balls for kicking, and throwing, and encourage children to blow bubbles and pop them

7. For two-year-old children, parents should encourage their help with chores and basic tasks, arrange playdates, give attention and praise for behavior that follows directions, teach children to identify body parts and animals, encourage children to say words instead of pointing, help children play with puzzles, ask children to complete tasks, and take children to parks and nature trails and encourage their exploration

8. For three-year-old children, parents should arrange playgroups, work with their children to solve problems, talk to their children about emotions, set rules and limits for their children, give children instructions, read to their children every day, play counting games and matching games, and play outside with their children

9. For four-year-old children, parents should play make-believe with their children, give their children choices whenever they can, allow their children to solve their problems when they can, encourage their children to use words, use grammatically correct language when speaking to their children, teach their children to play outdoor games, and play their children's favorite music or movies

10. For five-year-old children, parents should give their children more freedom to make choices, not give a lot of attention to when children talk back or say “no,” talk to their children about safe touch, ask children their predictions when reading stories, encourage their children to read, encourage their children to draw, help their children climb on play structures, and promote children learning to ride a bike (Centers for Disease Control and Prevention, n.d)

Brain anatomy

Mental health professionals should have an understanding of how the brain functions anatomically as it is what controls the functions of the body. The brain consists of three parts: the cerebrum, cerebellum, and brainstem (Mayfield Brain and Spine, 2018).

The cerebrum makes up a large portion of the brain (Mayfield Brain and Spine, 2018). It holds the left and right hemispheres of the brain and is responsible for functions such as hearing, seeing, understanding and interpreting touch, speaking, reasoning, learning, understanding emotions, and controlling movement. The left hemisphere of the brain is responsible for controlling speaking, writing, comprehending, and mathematics. The right hemisphere of the brain is responsible for spatial awareness and understanding, creativity, musical skills, and artistic abilities. Each hemisphere of the brain has lobes: frontal, temporal, parietal, and occipital lobes. These lobes have specific functions they are responsible for. The frontal lobe is responsible for personality, judgment, speech, body movement, and concentration. The parietal lobe is responsible for interpreting language and words, understanding and sensing touch and temperature, receiving information via vision or hearing, and understanding space. The occipital lobe interprets light and vision. The temporal lobe is responsible for understanding language, memory, hearing, and organizing or sequencing information it receives (Mayfield Brain and Spine, 2018).

The cerebellum is responsible for movement and coordination, balancing, and maintaining posture (Mayfield Brain and Spine, 2018). It is located just under the cerebrum and behind the brainstem (Mayfield Brain and Spine, 2018).

Finally, the brainstem is what connects the cerebrum and cerebellum to the spinal cord of the body (Mayfield Brain and Spine, 2018). It is responsible for regulating body temperature, breathing, heart rates, digestion, sleep cycles, swallowing, coughing, and other physical health tasks (Mayfield Brain and Spine, 2018).

Summary

Because the brain is responsible for all functioning, mental health professionals must understand the way that brain health impacts overall health and behavior. While a consensus for what brain health means is still being developed across systems, it is fair to suggest that the healthiest brains are those that are functioning independently and are free of disorders.

Section 2: Current research on brain health

Introduction

Neuroscience research, or research on the brain, is highly prioritized in the healthcare system and has been for most of history. The Greeks in ancient times first began studying the brain to understand neural disorders (Brazier, 2018). In the 1800s, a French surgeon, Pierra Broca, began researching the impact of damage to the brain and its specific functioning. By the 1950s, brain research became so modern that stroke, cardiovascular disease, and multiple sclerosis began being treated and prevented in healthcare (Brazier, 2018). The science of the brain has become so essential that in 2018 the National Institute of Health committed 1.5 billion dollars over ten years to advancing brain research through over one hundred research projects (SharpBrains, 2018). Brain research focuses on the nervous system and the biological understanding of learning, memory, behavior, perception, and consciousness (Emotiv, 2021). Such research is essential because it helps to label disordered behavior and develop preventative strategies. It also helps medical teams to develop treatment processes and medications for physical and mental health disorders (Emotiv, 2021).

Different types of brain research

There are many varieties of brain research that explore the functions and genetic makeup of the brain differently (Emotiv, 2021). For example, some researchers prefer to focus on the cellular makeup of the brain, others prefer to focus on the nervous system as a whole, and some research the impact of culture on learning and behavior. Early childhood development is an important area of brain research. Another important area of brain research in neurological disorders and aging (Emotiv, 2021).

Researchers are studying the brain in various ways (Emotiv, 2021). This includes observing behavior and scanning the brain via electrical, chemical, and magnetic stimulation. This can be done via electroencephalography (EEG) and other brain scans

that show both the structure and function of the brain. This kind of imaging has greatly improved the healthcare and medical system's understanding of brain functioning and disorders (Emotiv, 2021).

The major branches of neuroscience are as follows (Brazier, 2018):

1. Affective neuroscience - this is the science of the relationship between neurons and emotions
2. Behavioral neuroscience - studies the impact of the brain on behavior
3. Clinical neuroscience - focuses on the disorders of the nervous system and how to prevent them. Clinical neuroscientists refer to mental health disorders as brain disorders
4. Computational neuroscience - the study of how brains compute and function
5. Developmental neuroscience - focuses on the way the brain grows and changes throughout the lifespan. This helps to understand disorders of development
6. Molecular neuroscience - researches the role of molecules, genes, and proteins concerning the functioning of the nervous system
7. Neuroinformatics - computer scientists and neuroscientists collaborate to understand ways to collect, analyze, and publish data on the brain
8. Neurolinguistics - research on the brain where speech is concerned. This evaluates how humans acquire, store, understand and express language
9. Neurophysiology - seeks to understand the relationship between the brain and the body functions

How is brain research being used?

Brain research is being used in various fields and studies. It is used in education for understanding brain activity and for analyzing the best environments for learning (Emotiv, 2021). For example, neurological imaging offers information about how ideal learning occurs in specific types of settings. Brain research in mental health is seeking to find causes for specific disorders as well as understand the genetic component of mental illness (Preidt, 2018). For example, researchers are labeling the genes that specifically increase the potential for specific mental illness symptoms (Preidt, 2018). Brain research in aging works to understand dementia and Alzheimer’s disease, and serves as a means

for developing appropriate caregiving strategies and potential treatment programs or programs to delay the symptoms when possible (The Picower Institute, 2021).

What recent research on the brain indicates

Research from the last few years, published in 2019, found the following most recent updates on the brain (Saplakoglu, 2020):

1. People experience emotions while sleeping - asymmetrical activity in the frontal lobes indicates anger during dreaming
2. Loneliness is difficult on the brain. Too much time alone literally shrinks the brain volume
3. The human brain naturally shields itself from thinking too intimately about death because this will prevent individuals from procreation
4. Cerebrospinal fluid is essential for sleeping. It flows in and out of the brain when a person is sleeping
5. Individuals who have just one brain hemisphere (some people have had half of their brain removed to prevent seizures) were able to function well and independently because the other half of the brain strengthened to support the functioning
6. The average English-speaking person must learn 12.5 million pieces of information related to language, however, in a single day they will only recall 1,000-2,000 pieces of language-related information, therefore indicating the significant amount of storage of language-related data that the brain holds
7. Brain cells do not immediately die upon individual death, but rather over time

Research on aging brains have found the following recent trends and information about brain health (National Institute on Aging, 2020):

1. Older adults are still able to learn new skills, form new memories, and improve their vocabulary and language skills
2. Certain parts of the brain do shrink over time - especially those related to learning mental activities
3. Communication between nerves over time is not as effective

4. Blood flow in the brain decreases with time
5. Inflammation increases over time

The future of neuroscience

Brain research and neuroscience have given humans a much better understanding of health, disorders, and prevention. Without this research, many people would have had shorter lives with less quality of life than they have had because of modern neuroscience research and treatment. Brain research is not stopping. It is only getting stronger and more important. The future of neuroscience should focus on, but not be limited to, the following over the next fifty years (Altimus, Marlin, Charalambakis, Colon-Rodriguez, Glover, Izbicki, Johnson, Lourenco, Makinson, McQuail, Obeso, Padilla-Coreano, & Wells, 2020):

1. **Inclusivity** - much of the past brain research has been done on white men or people of European descent, which has caused systemic barriers to understanding human behavior for all people. There is poor understanding in the field across the sexes and nonwhite populations
2. **Implementation into the classroom** - the field acknowledges that despite a strong understanding of how information is learned, it hasn't been broadly implemented across educational systems for teachers in primary and higher education. Future research will focus on how to implement strategies into the classroom and make it accessible for all students to learn consistently with their circadian rhythms
3. **Implementation in the courtroom** - neuroscience is learning more about how criminal behavior is explained and how decisions are made. In the future, the field hopes to explain the culpability and likelihood of recidivism for individuals who have committed crimes (Altimus, et al., 2020)
4. **How to influence brain activity** - future research will continue to focus on ways to change brain activity to prevent brain disorders, such as Parkinson's disease

Summary

Brain research has been and will continue to be a major focus of research globally where healthcare is concerned. Because the brain is responsible for most of the bodily functioning and experience, it is essential to understand how it works. Additionally,

healthcare costs associated with brain disorders are extremely high. Therefore, if researchers can understand treatment and prevention, the cost of healthcare can be reduced and individual longevity and quality of life can be enhanced. Future research will continue to focus on aging, disorders, and prevention. Additionally, future research will likely continue to expand and understand the relationship between technology and health.

Section 3: Facts and myths about the brain

Introduction

Most people have experienced the rabbit hole that a WebMD or Google search will bring when they notice a symptom or hear of a diagnosis or disorder that they do not recognize. It is important to understand that the anxiety that can occur when this happens is incredibly triggering and significant for many people. Because of that, individuals must be able to recognize what is real and what is false where brain health is concerned. This section of the course offers common facts versus myths about the brain and brain health.

Brain facts

The following brain facts offer an interesting perspective to the human brain (DENT Neurological Institute, 2019):

1. The brain weighs on average 3 pounds. The largest brained weighed 4.43 pounds and the smallest human brain weighed 2.41 pounds
2. The cerebrum makes up 85% of the brain
3. The human brain makes up about 2% of the weight of the body
4. The texture of the brain is referred to as a “firm jelly”
5. 75% of the brain is comprised of water
6. Dehydration negatively impacts the functioning of the brain - especially where memory and attention are concerned
7. The human brain grows three times the size it was when it was born in the first year of life

8. 80% of the brain is grown by 2 years of age and will continue to grow in size until age 18
9. The brain does not fully stop maturing until about age 25
10. There are approximately 100 billion neurons in the human brain
11. There are approximately trillions of connections or synapses in the human brain
12. The brain has the highest cholesterol content of any organ in the body - 25% of the cholesterol of the body is living in the brain
13. Short term memory lasts 20-30 seconds
14. The brain does not feel pain - the scalp and coverings around the brain and bones are what have all the pain receptors
15. The brain begins to shrink around 40 years of age
16. Alcohol can have irreversible effects on the brain
17. The average human has 12,000-60,000 thoughts per day and 95% of those thoughts are the same as the day before
18. Every minute 750-1,000 milliliters of blood flows into the brain
19. The brain requires exercise for best functioning
20. When awake, the brain powers 12-25 watts of electricity - this is enough to power a lightbulb
21. The brain is the fattiest organ in the body, containing 60% fat
22. The brain requires sleep to properly function and when the brain hasn't had enough sleep it gets hotter. Yawning cools down the brain (DENT Neurological Institute, 2019)
23. Brain information can travel up to 268 miles per hour between cells (Northwestern Medicine, 2021)
24. The spinal cord stops growing at around four years of age (Northwestern Medicine, 2021)

Myths about the brain

The following myths have been debunked about the human brain (Northwestern Medicine, 2021):

1. **10% of the brain is the only part that is used** - the brain is actually always active, even during sleep, and is firing neurons constantly
2. **Brain size causes higher intelligence** - the size of the brain has nothing to do with how intelligent a person is. This is determined by the number of connections between brain cells, which are called synapses
3. **Alcohol kills the brain** - moderate alcohol use does not kill brain cells. Binge drinking, however, does damage neurons
4. **Babies listening to classical music will have benefits** - there is no evidence supporting this idea that babies are smarter because they listen to classical music. They might, however, be calmer or feel soothed by the music when they listen to it
5. **Left-brained people are more analytical and right-brained people are more creative** - the University of Utah researched this and found that there is no predominant brain use in people
6. **IQ never changes** - IQ scores can fluctuate as individuals age
7. **The brain works better under pressure** - while a deadline might prompt someone to work harder where concentration is concerned, brain performance is not enhanced and actually, stress can reduce brain functioning (Northwestern Medicine, 2021)
8. **We only have five senses** - while the most common are smell, hearing, sight, taste, and touch, there are more than five ways to experience stimuli (Kulmo, 2019). Nociception, for example, is the pain sensation. Proprioception is the sense of positioning of the body. There are others as well
9. **The brain can be trained to be smarter** - while puzzles, crosswords, and other activities do stimulate the brain, they don't facilitate enhanced intelligence (Kulmo, 2019)

Summary

Understanding myths and facts about the brain is essential because it shows how wildly misunderstood brain health is. Despite ongoing research and developments in

neuroscience, more information is being learned and uncovered about the brain every day. While it is difficult to disseminate this information to the masses immediately, mental health professionals should work to provide psychoeducation and education on brain health to their patients when necessary.

Section 4: The impact of aging on the brain

Introduction

The current average lifespan in the United States is 78.7 years (Centers for Disease Control and Prevention, 2018). As one can imagine, the brain and body change significantly over those years. This is especially true for people with adverse experiences. The body and brain change so much just inherently, but individuals who are exposed to trauma in the brain or body will experience even more changes.

How aging alters the brain is being more widely studied and understood, because of the degree to which the aging population is impacting healthcare-related services. This becomes increasingly significant, since, by 2050, the elderly population is predicted to grow faster than the working-age population. (Leatherby, 2016). Furthermore, aging individuals take up more medical resources and attention than any other group of individuals in the United States. In 2014, Medicare spending (mostly reserved for individuals over the age of 65) was over 618 billion dollars (Leatherby, 2016). While not all medical costs are related to the aging brain, it is important to understand that healthcare is expensive and the impact of aging on the human brain does drive the cost of healthcare up as well as reduce the quality of individuals' lives.

The brain-changing

As we age, the human brain changes more than any other muscle, organ, or body part (Han, 2020). Its structures change, its functions change, and the impact it has on behavior changes. The brain-changing over time is normal. Normal aging looks like the following (Han, 2020):

1. **Difficulty learning new things** - learning new things and making memories can take longer as individuals age
2. **Multitasking** - completing multiple things at once, or compartmentalizing, takes longer and is more difficult as individuals age

3. **Recalling information** - recalling information, often referred to as strategic memory, begins to decline after age 20
4. **Remembering specific appointments** - most people find that without cues, such as a calendar or alert, remembering specific dates and appointments is more difficult

Normal aging can be attributed to the following changes in the brain over time (Han, 2020):

1. **Reduction in brain mass** - the frontal lobe and hippocampus begin to shrink around age 60-70 years old
2. **Cortical density** - the surface of the brain thins over time and therefore cognitive processing is slower than when individuals are young
3. **White matter** - the myelin nerve fibers in white matter shrink over time and therefore reduce cognitive functioning
4. **Neurotransmitters** - fewer chemical messengers are developed over the lifespan and therefore cognition and memory are reduced as well as the development of dopamine, serotonin, norepinephrine, and acetylcholine - resulting in a likelihood for depression over the lifespan

What normal aging looks like

Normal aging occurs starting at 30 years old and sometimes even earlier (Centers for Disease Control and Prevention, 2021). Normal aging generally generally encompasses the following (Centers for Disease Control and Prevention, 2021):

1. Arteries and blood vessels stiffen and therefore must work harder to function
2. Bones shrink and become less dense with time - this often causes pain and stiffness
3. Muscles lose strength, become less flexible, and have less endurance overtime
4. Bowel and bladder functioning may require more frequent support and trips to the bathroom
5. Skin loses elasticity over time, resulting in wrinkles and being more easily bruised and cut

6. Vision changes over time by becoming blurry and often developing cataracts
7. Many people report feeling less fulfillment and joy in their lives over time
8. Slower cognition is normal as individuals age

What normal aging does not look like

It is often difficult to differentiate between what normal and abnormal aging looks like, especially where brain health is concerned. Dementia is often experienced by the aging brain and it is not considered normal aging of the brain (Centers for Disease Control and Prevention, 2021). Non-normal aging of the brain looks like this (Centers for Disease Control and Prevention, 2021):

1. Inability to complete tasks independently
2. Difficulty recalling names of friends and family members
3. Forgetting the purpose and function of items
4. Repeating questions because individuals forgot the answers to the questions they previously asked
5. Taking much longer than normal to complete easy tasks or common tasks
6. Misplacing items commonly
7. Inability to remember steps and getting lost

Dementia and the brain

Dementia is often thought of as a normal part of aging, but it is in fact not a characteristic of routine aging, and thinking of it as normal is damaging to individuals and communities. By disregarding memory loss as an essential part of aging, older individuals might have less support because they lack an accurate diagnosis or understanding of their health.

Dementia is the term we use when referring to memory loss, language loss, inability to problem-solve, and a reduction in other thinking functions that is so significant that it impacts daily life (Alzheimer's Association, 2021). Dementia is a result of abnormal brain changes that alter behavior, feelings, functioning, and relationships. Alzheimer's disease makes up about 60-80% of dementia. Dementia is diagnosed by observation of behavior, a review of medical history, and ruling out other causes. It cannot be easily tested for

and it is not definitively diagnosed until post-mortem brain reviewing (Alzheimer's Association, 2021).

There are a variety of types of dementia with different causes. They are as follows (Mayo Clinic, 2021):

1. **Alzheimer's disease** - this is the most common cause of dementia, but experts in the field of neuroscience have not definitively identified its cause. There is the knowledge that the mutation of three specific genes is associated with this disease and that individuals with Alzheimer's disease have plaques and tangles in their brains. These are likely contributing factors, but it is still not decisively understood what causes Alzheimer's disease

2. **Vascular dementia** - this is the second most common type of dementia that results from damage to the vessels that supply blood to the brain

3. **Lewy body dementia** - this is a form of dementia caused by proteins that are found in the brain. This is a progressive form of dementia

4. **Frontotemporal dementia** - this is caused by the degeneration or breakdown of nerves and connections in the frontal and temporal lobes of the brain

Risk factors for dementia include the following (Mayo Clinic, 2021):

1. **Age** - the risk rises as individuals age, especially after age 65. While it is not a normal part of aging, it is more likely to occur in older individuals

2. **Family history** - individuals who have family members with dementia are more likely to develop it themselves

3. **Down syndrome** - individuals with Down Syndrome are more likely to develop early-onset dementia

Dementia can result in the breakdown of other systems. It often results in the following negative health impacts (Mayo Clinic, 2021):

1. **Poor nutrition** - individuals might forget how to eat or stop eating altogether, which impacts their nutrition and often can cause death

2. **Pneumonia** - because individuals with dementia may forget how to swallow they are at a higher risk for aspiration, which could send food into their lungs and cause pneumonia

3. **Hygiene** - because individuals with dementia may struggle to perform essential tasks such as bathing, dressing, and toileting they face struggles related to hygiene and skin breakdown

4. **Safety challenges** - individuals who have dementia have a higher risk of safety issues such as leaving home and getting lost or falling while ambulating

5. **Death** - dementia often results in infection, comas, and eventually death

As one can easily see, damage to the brain results in not just memory issues or cognitive issues, but major health complications as well.

Treatment of dementia

Dementia cannot be cured, unfortunately, however, future research hopes to find opportunities to cure dementia symptoms (Mayo Clinic, 2021). Currently, treatment related to dementia focuses on delaying symptoms and treating quality of life needs. There are a few medications that can help improve symptoms of dementia (Mayo Clinic, 2021):

1. **Cholinesterase inhibitors** - these medications improve the levels of messaging that chemically occur in the brain, therefore positively impacting memory and judgment

2. **Memantine** - these medications regulate glutamate activity to improve brain functions such as learning and memory

Other therapies can be helpful where dementia is concerned such as (Mayo Clinic, 2021):

1. **Occupational therapy** - this supports developing systems to prevent significant incidents related to dementia such as teaching safe ambulation and adding safety precautions into the home that support safe functioning and reduce falls

2. **Physical therapy** - this supports the continuous movement of muscles and body parts that might be less often used as individuals age, therefore becoming weak

Most individuals who have dementia will require caregiving as their dementia progresses. Caregivers can try the following practices to support the safe progression of dementia (Mayo Clinic, 2021):

1. **Enhanced communication** - speaking slowly and using simple sentences and words is essential for individuals with dementia. It is important to use one task prompts and not overwhelm individuals who have a difficult time with cognitive processing
2. **Exercise** - physical movement is incredibly helpful for restlessness that is often a common symptom for people with dementia. Exercise is also thought of by neuroscientists as a protective factor for developing dementia
3. **Activities** - caregivers supporting individuals with dementia should attempt to engage them in preferred activities as much as possible
4. **Routines** - individuals who have dementia generally feel more comfortable, safe, and respond better to care when it is a routine that they are used to. Caregivers establishing routines that are generally predictable, even if the individual is unable to remember them, is helpful to the progression of the disease. Examples of this include waking up at the same time every day and going to bed at the same time every night, ensuring the house/room looks the same every day, engaging in activities around similar times, preventing late-night caffeine use, and maintaining a calendar of events
5. **Planning for future care** - because individuals who have memory loss may require support as they age, it is important to plan with them early about what they want that care to look like. Individuals should receive person-centered care based on their values and cultural needs and requests

Summary

Bodily and brain changes are natural over the lifespan. Individuals should be prepared for slower cognition and occasional difficulty with attention and the processing or recalling of information. Dementia and Alzheimer's disease, however, are not a normal part of aging and should not be referred to as inevitable with age. Individuals who present with severe memory loss or difficulty recalling information should be seen by their doctor and additional specialists as soon as possible to receive support for such symptoms that are not consistent with the natural progression of aging.

Section 5: The impact of injuries on the brain

Introduction

Most people have heard of traumatic brain injuries or even known of a celebrity or community member who has had such an injury. They are common in sporting communities, especially football, rugby, car racing, and other activities that have the potential for bodily collisions or crashes. Unfortunately, brain injuries are not uncommon. Traumatic brain injuries (TBIs) are a leading cause of both death and disability in the United States (Centers for Disease Control and Prevention, 2019). In fact, in 2014, 155 individuals died every day from a traumatic brain injury. Individuals who experience and live through an injury to the brain often require a significant amount of rehabilitation to recover and/or care for the rest of their lives (Centers for Disease Control and Prevention, 2019).

What is a traumatic brain injury?

According to the Centers for Disease Control and Prevention (2019), a traumatic brain injury is an injury to the brain prompted by a "bump, blow, or jolt" that disrupts normal functioning. Traumatic brain injuries can range from mild to severe, where mild TBIs may cause only a brief change in functioning and severe TBIs can result in an extended, or even permanent, change in brain functioning. Mild TBIs are referred to as concussions (Centers for Disease Control and Prevention, 2019).

How common are traumatic brain injuries?

The following statistics show how significant traumatic brain injuries are in communities in the United States (Centers for Disease Control and Prevention, 2019):

1. In 2014 56,800 people died as a result of a TBI. 2,529 of these deaths were in children
2. In 2014, 812,000 children were treated for a TBI
3. In 2014, 2.87 million TBI emergency room visits occurred
4. Between 2006 and 2014, there was a 54% increase in emergency room visits related to TBIs

What causes brain injuries?

There are a variety of common traumatic brain injuries. Almost half of the traumatic brain injuries have been a direct result of falling (Centers for Disease Control and Prevention, 2019). This statistic is important because aging individuals have a higher likelihood to fall. Mental health professionals who help facilitate care for aging people

should be prepared to build preventative measures for falling as a way to reduce potential damaging brain injuries. Other causes of brain injuries include the following (Centers for Disease Control and Prevention, 2019):

1. Being struck against an object
2. Motor vehicle accidents
3. Intentional self-harm

Individuals who are at risk for traumatic brain injuries include the following (Centers for Disease Control and Prevention, 2019):

1. Older adults
2. Individuals with mental illnesses who engage in self-harm
3. Children engaging in play

What is the impact of a traumatic brain injury?

Traumatic brain injuries have an often devastating impact on the person's life who has experienced them. These effects are generally wide-reaching and are not limited to just physical or cognitive impacts, but rather have negative results in all aspects of a person's life (Headway, 2021). Effects of brain injuries include behavioral consequences, cognitive consequences, communication consequences, emotional consequences, and more (Headway, 2021).

Negative behavioral effects of brain injuries include the following (Headway, 2021):

1. **Impulsiveness that was not present before the injury** - can lead to dangerous and reckless behaviors such as sexual promiscuity, substance use, and other dangerous activities
2. **Disinhibition or lack of interest in doing things as well as lack of control in behavior while doing things** - this often results in highly inappropriate social behavior
3. **Obsessive behavior** - fixation or rumination of thought and behavior is common after a TBI
4. **Irritability** - this is considered one of the most common changes after a TBI

5. **Aggressive behavior** - verbal aggression is very common after a TBI
6. **Loss of initiative or apathy** - many people will appear as though they do not have concern for others. This is especially true shortly after the TBI occurs and generally reduces over time
7. **Self-centeredness** - it is common for people with a TBI to focus on themselves after the accident occurs and some people may struggle to appreciate others

Negative cognitive effects include the following (Headway, 2021):

1. **Memory problems** - short term and working memory are often reduced after a TBI occurs. Most people will struggle with names and faces as well as recalling information just said to them
2. **Loss of linguistic skills** - some people may have a hard time talking after a TBI and will require patience from others when communicating
3. **Impairments in perception and visual skills** - it is common after a TBI to have a difficult time making sense of pictures or shapes that once appeared "normal" or easy to recognize
4. **Reduced motivation** - starting tasks is often difficult and some people might refer to this as "lazy" when in fact it is not
5. **Reduced concentration** - completing tasks often becomes difficult because people have a shorter concentration span as a result of a TBI
6. **Slower processing time and reduced processing ability** - organizing facts is often difficult for people who have had a TBI. They may easily become overloaded by information and may need additional time to process
7. **Repetition or perseveration** - some people may return to the same topic or idea over and over with a difficult time breaking that cycle
8. **Reduced reasoning** - logic, rule-following, and engaging in appropriate discussions often becomes difficult after a TBI
9. **Impaired insight** - impaired insight often results in a difficult time understanding the impact of one's behavior and it can cause individuals to have less compassion
10. **Impaired empathy** - this is a difficult symptom for the family and friends of people with a TBI because it can seem as if the person is intending to lack

empathy, however, brain injuries impact the frontal lobe, which is responsible for empathy and support for others. Because of this, it is common that individuals struggle to have empathy for others

Negative communication effects from traumatic brain injuries include the following (Headway, 2021):

1. Impairing the physical ability to speak - this makes it difficult for individuals to be understood, which often results in frustrations and behavioral outbursts
2. Receiving information - individuals who are receiving information from others in communication may have a difficult time understanding the information and therefore struggle to be appropriate in interpersonal interactions

Negative emotional effects from traumatic brain injuries include the following (Headway, 2021):

1. **Personality changes** - many individuals who have experienced TBI are perceived by their family and friends to be different people after their accident than they were before. This is traumatic and scary for many people who might feel as if they cannot remember who they once were. This is especially difficult for people with a traumatic brain injury who are parents because their children feel they are different
2. **Mood changes** - mood swings, especially rapidly changing moods, are common for people with TBIs. This is often difficult for caregivers to address and support
3. **Depression** - because many people with TBIs may feel a loss of normalcy in their lives and require support they once did not need, it is common for them to have feelings of depression during the adjustment period to life after the injury. This is true even for people who have mild symptoms
4. **Anxiety** - most people with TBIs find that their anxiety is worse immediately after the injury than it is later on in their recovery process. Those who are experiencing anxiety for the first time in their lives while also transitioning into being a person with a brain injury are likely to be more distressed from the anxiety than those who had experienced it (and have learned coping skills) before the injury
5. **Frustration and anger** - individuals with brain injuries might feel anger at the situation that prompted the injury and /or themselves if they feel they caused

their injury. For example, a person might be angry with themselves for getting in the car with a friend who they knew was driving drunk

6. **Post-traumatic stress disorder (PTSD)** - this is a very common experience for people who received a brain injury because, with whatever caused the injury, there was a painful blow to the head of some kind. Individuals might re-experience that trauma via flashbacks or dreams. They may experience enhanced arousal, numbing, inability to remember the event, or other symptoms consistent with PTSD

Individuals who present with any emotional or mental health symptoms should access services for those symptoms. Professionals supporting patients with brain injuries must refer them to appropriate mental health services and work collaboratively to ensure they are recovering.

Negative physical effects from brain injuries include the following (Headway, 2021):

1. **Mobility issues** - because the brain is responsible for sending signals to the body to move, these signals may be reduced or may not occur automatically. Individuals might have poor balance or feel as though they can no longer control their bodily movements and functions after a brain injury occurs. They may require physical assistance in the form of hands-on caregiving support or a mobility device to safely walk or move from place to place

2. **Spasticity** - many individuals will find that they have a limited range of movement and their limbs might feel weak. This often results in muscle spasms that can be both uncomfortable and painful

3. **Weakness** - individuals with weakness may find that they have paralysis in some parts of the body. This is referred to as hemiplegia

4. **Ataxia** - this is an uncontrolled movement that is irregular and impacts the ability to coordinate movement. This can cause poor handwriting or impaired hand-eye coordination

5. **Sensory issues** - many people find that they no longer respond to touch the same way that they did before their brain injury. They might have reduced eyesight functioning or strange walking patterns after the injury

6. **Fatigue** - some people may feel tired in ways they never had before. They might think they can perform more tasks than they can before they become tired. This is

often a difficult part of the rehabilitation process and many people find that transitioning back to work after a brain injury is difficult because what they used to be able to do in a workday now takes much longer or requires more effort and energy to complete

7. **Speech difficulties** - because the brain is responsible for telling the mouth to move to talk, speech is often impacted. Some people may be hard to understand and other people may completely lose the ability to speak

8. **Epilepsy** - some brain injuries result in people having seizures

How brain injuries are treated

Brain injuries are treated differently based on the severity of the injury (Mayo Clinic, 2021). Mild injuries are often treatable with over-the-counter pain medications that support the reduction of headaches. This, in combination with close monitoring, will generally suffice. Individuals should be monitored by friends or family for worsening of symptoms or new symptoms altogether. They should partner with their physicians to determine when it is appropriate to return to work and other life activities such as exercise or recreational activities that they enjoy (Mayo Clinic, 2021).

Moderate brain injuries may require more intense care than home monitoring can provide (Mayo Clinic, 2021). This could include emergency room visits to measure oxygen levels, blood levels, blood pressure, and to prevent any further injury to the head and neck. Often individuals might require anti-seizure medication to prevent seizures from occurring or diuretics and/or intravenous fluids. In extreme cases, patients may be placed in an induced coma to ensure that the brain has enough oxygen and nutrients (Mayo Clinic, 2021).

Severe brain injuries may require emergency surgery to remove blood clots, fix fractures, stop bleeding in the brain, and relieve pressure in the skull (Mayo Clinic, 2021).

Most people, regardless of the severity of the brain injury, will require rehabilitation after the injury occurs (Mayo Clinic, 2021). They can expect to need to relearn some skills, such as walking or dressing. They may receive rehabilitation services in an outpatient therapy center or an inpatient skilled nursing or acute care facility. Rehabilitation teams working with patients with brain injuries often consist of a physiatrist, occupational therapist, social worker, physical therapist, speech therapist, neurologist, nurse, trauma specialist, vocational counselor, and a recreational therapist. These experts should work in collaboration with one another and with the injured

individuals to ensure that their person-centered treatment goals are met (Mayo Clinic, 2021).

Summary

Regardless of the type of injury or the severity of the injury to the brain, individuals with brain injuries should expect, at minimum, some mild symptoms that require time and care as they recover . Depending on their severity, brain injuries can have lifelong negative consequences in all aspects of life. Brain injuries can result in poor physical, emotional, cognitive, and social functioning. Individuals with brain injuries must have access to appropriate treatment services to ensure they recover as much brain function as possible after the injury occurs.

Section 6: The impact of trauma on the brain

Introduction

Most mental health professionals have heard the term “trauma biologically rewires the brain” over and over again in their studies. This is because it is true: trauma does change the brain. It is important to understand that brain functioning is greatly altered by trauma and that trauma is very common. How individuals label or define their trauma is just that: individual. However, collectively, most people have experienced a trauma, if not multiple traumas. Those who are of the age to recall the Covid-19 pandemic will likely be able to look back at it and label it as traumatic. Trauma is so common it is the number one cause of death from ages 1-45 years old (Coalition for National Trauma Research, 2020). Additionally, the annual cost of trauma is 671 billion dollars in healthcare and the loss of productivity in employment (Coalition for National Trauma Research, 2020). Understanding and preventing trauma helps to ensure that brain health is optimized.

How common is trauma?

Exposure to multiple types of victimization and trauma is very common across the lifespan. The following statistics demonstrate how trauma impacts individuals (Substance Abuse and Mental Health Services Administration, 2020):

1. Two-thirds of children have experienced at least one traumatic event before the age of 16 years old. This includes psychological, physical, or sexual abuse; community or school violence; witnessing domestic violence; experiencing a

natural disaster or terrorism; experiencing the sudden death of a loved one; being a victim of war or a refugee; experiencing military-related family stress; neglect; and having a life-threatening illness

2. Each year nine stadiums for sporting events can have every seat filled by the number of youth who require hospitalization for physical-assault related injuries
3. 25% of students have been in at least one fight
4. 20% of students have been bullied at school
5. 1 in 6 students have been bullied online
6. 19% of students have Post-traumatic Stress Disorder
7. 54% of United States families have experienced a natural disaster

Children who have experienced trauma are at risk for the following (Substance Abuse and Mental Health Services Administration, 2020):

1. Learning problems
2. Lower grades
3. More suspensions and expulsions from school
4. Higher need for mental health services
5. Higher likelihood of being in the child welfare system and criminal justice system
6. Long-term health problems
7. Substance use behaviors and disorders

Trauma can be detected in children by the following behaviors (Substance Abuse and Mental Health Services Administration, 2020):

1. Preschool children are more likely to cry or scream; eat poorly; have nightmares during naptime, and have a difficult time being separated from their parents
2. Elementary children are more likely to have anxiety; experience fear; feel guilt or shame; struggle to concentrate, and have a difficult time sleeping

3. Middle and high school children are more likely to feel depressed and alone; have eating disorders; have self-harming behavior; use substances; and engage in inappropriate and risky sexual behavior

How is trauma connected to the brain?

Trauma impacts brain health and development in many ways. It is especially important to understand how childhood trauma and traumatic stress impacts development (Stress and Development Lab, 2018). Trauma in childhood has the following negative consequences on the brain (Stress and Development Lab, 2018):

1. It causes the amygdala to be hyperactive, which results in children sensing threat when it isn't there, being hypervigilant in their environments, monitoring people closely, and making it hard for them to pay attention in school

2. The medial prefrontal cortex has weakened signals to the amygdala after trauma, resulting in persistent fear and anxiety as well as reminders about the trauma that the child experienced

3. It is unknown how, but the hippocampus functions less appropriately after trauma, resulting in a reduced ability to learn and recall information. This makes it difficult for children to determine what is safe versus what is dangerous when they are interacting with the world

The following strategies are recommended for children after they have experienced trauma to ensure that their brain functions as appropriately as possible (Stress and Development Lab, 2018):

1. Ensure they feel safe in their environment - this can be done by reducing any fighting or arguing so that there is less violence, locking doors, and reviewing what to do in the event of a stranger coming to the door

2. Write a safety plan with the child for when they encounter a danger - this will ensure that the child knows the plan and who to contact in the event there is an emergency

3. Provide the child more support as a caregiver

4. Ensure children are in non-dangerous situations so they learn that there are safe and secure places for them - this will help them learn the difference between danger versus safety

5. Help children to develop coping skills such as deep breathing, relaxation, distraction, and asking for help
6. Help children access resources for trauma such as therapy or medication management

Changes in the brain do not have to be permanent after a trauma occurs. Therapeutic services specific to trauma can help to reduce the impact of trauma on the brain. The most common treatments for trauma include the following (American Psychological Association, 2021):

1. **Cognitive Behavioral Therapy** - this focuses on the relationship between thoughts and behaviors. For people with trauma, it hopes to change the pattern of thinking related to the traumatic event or events to help individuals have more positive outcomes with behavior and functioning
2. **Cognitive Processing Therapy** - this focuses on helping patients challenge beliefs they hold about their trauma that are not helpful. For example, they might reframe a belief such as "my trauma is my fault" or "this should have happened to me"
3. **Eye Movement Desensitization and Reprocessing Therapy** - this utilizes bilateral stimulation to reduce the severity of the experience and to reframe the traumatic memories
4. **Narrative Exposure Therapy** - this helps individuals establish a coherent life narrative in which to contextualize traumatic experiences
5. **Prolonged Exposure Therapy** - this exposes patients to memories related to their trauma over time in a gradual way and offers them the chance to face the memories they have been avoiding

Summary

Trauma is both incredibly common and dangerous for brain development. While the brain is more likely to experience significant changes in development during childhood and the formative years, even adults struggle with trauma. Individuals who experience trauma must have access to appropriate trauma-informed mental health services as soon as possible after their traumatic experience. This ensures the least likelihood for significant impacts of trauma and/or a diagnosis of Post-Traumatic Stress Disorder.

Section 7: Strategies for optimizing brain health

Introduction

It has become abundantly clear how brain health is essential for functioning. The brain communicates to the body what, when, and how it should move. It communicates to individuals when they are safe and unsafe so that they can plan for how to maintain their safety. It helps ensure that relationships are appropriate and individuals can learn and care for themselves. However, it is not always perfect. Brain disorders, such as Alzheimer's disease or other neurological conditions, do occur. Individuals must have an understanding of how to promote their brain health. Mental health professionals and individuals working with patients, especially as they age and become at risk for more abnormal brain functioning, can provide strategies to optimize brain health.

Individuals with the healthiest brains and best cognitive functioning

Research has found that those individuals who have the highest functioning brains tend to do the following:

1. Engage in consistent physical exercise
2. Engage in activities that stimulate their intellectual capabilities
3. Are active socially
4. Have coping strategies to manage their stress
5. Eat a colorful, healthy diet
6. Sleep well and often (Han, 2020)
7. Manage their blood pressure well
8. Manage their blood sugar well
9. Manage their cholesterol well
10. Take a low dose of aspirin regularly
11. Avoid tobacco use
12. Avoid excessive alcohol use
13. Manage their emotions

14. Protect their head from injury (for example, wearing a helmet)
15. Have strong social networks and social supports (Harvard Health Publishing, 2021)

Why sleep is essential

Maintaining a healthy sleep routine is one of the best ways to ensure a healthy brain (Miller, 2019). Sleep is a critical and revitalizing process for brain functioning. While individuals are sleeping, their energy decreases, and the brain can restore itself. It does so by removing waste and replacing energy used during the day. This helps to promote immune functioning and endocrine system functioning. Most people find that five to ten hours of sleep per day is essential to complete these processes. During the sleep cycle, the brain also helps to process the information it received that day. The hippocampus stores information during the day and then transfers necessary information to the cerebral cortex at night during sleep (Miller, 2019).

Mental health professionals should be prepared to assess how well their clients are sleeping and help them to develop healthier routines that promote sleep when necessary. Unfortunately, although good sleep is necessary for optimal health, not everyone is sleeping well. One-third of the United States population reports symptoms of sleep disturbances (Miller, 2019). Sleep issues are often caused by genetics, environment, stress, medical or health issues, parenting, substance use, ruminating thoughts, and pain. Because sleep has such negative health impacts and brain functioning impacts, sleep disorders must be treated seriously and effectively (Miller, 2019).

Exercise and the brain

The physical movement of the body is very good for brain health. Exercise positively impacts the brain by increasing the blood flowing in and out of the brain (Miller, 2019). It helps to increase the oxygen that is delivered to the brain as well as to remove waste products. This helps to improve cognitive functioning, reduce atrophy in the brain in aging individuals, improve mental health, and improve energy (Miller, 2019).

Engaging both hemispheres of the brain

As discussed earlier, the brain consists of a left and a right hemisphere (Miller, 2019). One hemisphere is responsible for creativity and the other is responsible for more analytical activities. Engaging in activities that activate different parts of the brain is

important. This is why learning another language, learning to play an instrument, or learning to drive a car may be time-consuming initially but eventually becomes easier with time and is very valuable. These activities challenge those parts of the brain, and as individuals challenge their brains with more complex actions and tasks, their brains become healthier and healthier (Miller, 2019).

Avoiding substances

The brain is negatively impacted by substance misuse and excessive substance use should be avoided as much as possible to optimize brain health. Addiction works by stimulating the brain's reward system and offering feelings of euphoria when a drug or alcohol enters the body/brain (Addiction Center, 2021). This prompts individuals to want to continue using the drug more and more, eventually requiring more of the drug, both in frequency and quantity, to feel that euphoria. This causes an addiction (Addiction Center, 2021).

Substance use can damage the brain by reducing the brain and body's ability to regulate temperature, emotion, decision-making, breathing, and coordination (Addiction Center, 2021). Substances disrupt proper limbic system functioning and encourage continued use of the drug, despite its devastating consequences. For example, loss of employment, relationships, or housing may occur as a result of drug use. Oftentimes, these negative consequences are difficult to reverse and long-term damage may occur (Addiction Center, 2021).

To optimize brain health, individuals should avoid excessive use of substances or engage in rehabilitation services to stop misusing substances if such use is causing significant problems in functioning or relationships (Addiction Center, 2021). Such services include (Addiction Center, 2021):

1. Accessing an inpatient treatment facility for safe detoxification and ongoing mental health services to ensure sobriety
2. Medically assisted treatment
3. Cognitive Behavioral Therapy
4. Dialectical Behavioral Therapy

Summary

Brain health can be optimized by engaging in stimulating activities and appropriately caring for one's body. This includes healthy lifestyle routines such as exercise, staying hydrated, eating a well-rounded diet, and avoiding substance misuse..

Section 8: How mental health professionals can support brain health

Introduction

Mental health professionals play an important role in brain health. Because they work with individuals across the lifespan and in various states of health, they can intervene, notice symptoms, and send referrals as needed. They might be the first individuals to ask about or recognize indicators of brain-related struggles. Mental health professionals should be well-versed in brain health, disorders, injuries, and treatment services to ensure the highest quality of care is offered to patients.

Psychoeducation

When mental health professionals work with individuals with brain disorders such as Alzheimer's disorder, a traumatic brain injury, Autism, or other issues, they can provide helpful psychoeducation to normalize the experience for the patient. Helping patients to understand their health empowers them to participate more fully in their well-being.

Cross-systems collaboration

When mental health professionals work with individuals who have poor brain health, they can help facilitate referrals to other professionals or work across systems with professionals to ensure their needs are being met. Cross-systems collaboration is an essential service for all people, but especially individuals who struggle cognitively. Without cross-systems collaboration, the patient is responsible for communicating to one provider what another provider said. For example, telling their primary care physician what their neurologist says or vice versa. When mental health professionals facilitate cross-systems teams for collaboration, the professionals meet together with the patient to ensure that everyone is receiving pertinent and accurate information as needed. This takes the burden off the patient and helps ensure that appropriate information is shared, which positively benefits the patient as well as the providers.

Case management

Mental health professionals can also support brain health by referring the client to a case manager who will ensure that the individual has access to appropriate services. For example, caregiving hours, primary care, social interactions, and behavioral health services may be coordinated by the case manager. This is especially helpful when working with patients with traumatic brain injuries who might require extensive physical and mental support for functioning.

Summary

Mental health professionals have an ethical responsibility for supporting the whole health of the patient. This is not limited to mental health. Understanding brain health over the lifespan ensures that patients are treated on a biological level as well as an emotional and cognitive level. By working across systems, providing psychoeducation, and referring to necessary services, mental health professionals provide care that supports and optimizes brain functioning and health.

Section 9: Case studies

Case study 1: Arthur

Arthur is an 85-year-old man who lives independently in a one-bedroom apartment in downtown Seattle. He recently stopped driving because he was noticing that his response time was slowing down and in the city, this felt dangerous for him. For example, he would be at a stoplight and it would turn green but it might take him 15-20 seconds to notice and he might miss the green light. He also realized that he was having a harder time slowing down and he worried about getting in an accident. Arthur lives near his adult children and grandchildren and was able to talk with them about the best decisions for how to get around. His children helped him facilitate medical transit to get to and from appointments and they are willing to transport him to other community activities and shopping trips. For example, he likes to attend a weekly church service, book club and likes to visit his neighborhood community garden regularly. Arthur is very integrated into his community and his children understand the importance of maintaining these social connections.

Outside of slower cognitive reactions that makes driving more problematic for Arthur, he appears to be cognitively intact and requires little additional supports. While he might occasionally forget an item on his grocery list while at Safeway, he recalls historical and recent information well, has strong relationships with his neighbors and is able to meet his physical health needs. He self manages his medications for blood pressure, engages

in regular walks and swimming, and likes to prepare most of his own meals. He can complete all his activities of daily living independently. Both he and his children agree that he is safe living at home alone at this time.

Arthur's case is an example of normal aging.

Case study 2: Charlene

Charlene is an 81-year-old woman who lives with her adult son in his home. Prior to moving in with him, she was independent and lived alone in a two story home that she has owned for over 50 years. She recently moved in with her son when she fell and broke her hip. Charlene required surgery for a hip replacement and has been living with her son and his family since for rehabilitation purposes. He has been helping her with physical health activities such as bathing and dressing. It was intended to be a short-term living situation and Charlene was planning to move back to her house, although it has two floors so "that might be difficult" she said to him. It has been a challenging transition, and Charlene's son has noticed some things that she has been intentionally hiding, including that she often forgets to turn off the stove or oven and sometimes is up wandering in the middle of the night feeling lost. Charlene's son feels that it is unsafe for her to move back into her home.

Despite knowing that things have been different for her, Charlene has been unable to name her confusion or advocate for herself to others because of the fear of losing her independence. She loves the home she has lived in and does not want to lose it. Charlene's son is trying to convince her to talk with her doctor about the obvious confusion and memory loss that she is experiencing but Charlene is hesitant and fears what will happen as a result. Recently she decided, however, it might be a good idea to assess her health and seek additional support as needed. Charlene was diagnosed with early-stage Alzheimer's disease. She and her son agree that for now residing in his family home is a good step for her, but they agree that long-term solutions might need to be identified to best support her.

Charlene and her son are currently in the process of planning for her future care. This case illustrates that conditions such as Alzheimer's disease, which are not inevitable as the result of aging, require hands-on assistance.

Case study 3: Marshall

Marshall is a 32-year-old man who recently experienced a traumatic brain injury in a head-on collision. Marshall was hit by a drunk driver who was killed in the accident.

Marshall previously lived independently, was a finance manager at his local county health office, and was planning to propose to his long-term girlfriend. The accident resulted in paraplegic status and slowed cognitive functioning. He has been engaged in a variety of therapies to improve his physical functioning and cognitive functioning. He is now using a wheelchair for mobility.

Marshall's cognitive functioning is most interrupted where memory is concerned. He has a hard time recalling recent information he receives but can retain long-term information. His girlfriend finds this to be the most difficult part of their relationship now because he will forget things in the middle of a conversation. This has resulted in tense interactions and frustration for Marshall as he believes he is no longer a good partner and has considered leaving his girlfriend as a result. Marshall is incredibly depressed and recently began drinking alcohol to cope with this depression. His girlfriend is finding that the stress resulting from the combination of therapeutic interventions he needs for his injury as well as his ongoing alcohol use is extremely detrimental to their relationship. She recently approached him and said that he must stop drinking if there were to be any hope to continue their partnership. Marshall agreed and decided to attend therapy to cope with the trauma from the accident. He was diagnosed with Post-Traumatic Stress Disorder and decided to engage in therapeutic services.

After a few years of completing therapy on a regular basis, Marshall's memory and cognitive abilities have improved and he has stayed sober. He and his girlfriend developed systems for him to be more independent at home and he was able to return to work. Marshall and his girlfriend got married and now have two children. He continues to use a wheelchair for mobility but requires little other support. Marshall's case demonstrates the severity of traumatic brain injury and how devastating it can be to a person's life. His case is also a good example of how multiple services can be combined to ensure that the best recovery is possible.

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