

NR 546 Exam Study Guide

Midterm Exam

Functional neuroanatomy- brain anatomy and physiology covered in both the course Explore section and readings. If a particular area of the brain is affected, what is the expected response? What symptoms would you expect to see? Link the assessment to the affected brain area. For example, if a client comes to your office with complaints of (fill in physical complaint) what are of the brain is affected? Focus on those specific examples within the Explore section and your readings. A client cannot copy a written word or drawing, what area of the brain is affected?

Frontal lobes

The frontal lobes are associated with movement, intelligence, abstract thinking, the ability to organize, personality, behavior, and emotional control. Traumatic brain injuries can result in personality changes, difficulty controlling emotions, and other cognitive functions.

Parietal lobe

The middle part of the brain, responsible for proprioception, is the home of the somatic senses. This part of the brain helps a person to identify spatial relationships, interpret pain and touch in the body, and identify and give meaning to objects. Damage to the anterior portion of the parietal lobe may cause **astereogenesis, the loss of the ability to recognize objects via the sense of touch**. This may be experienced by patients with post cerebral vascular accidents.

Temporal lobe

The temporal lobe is located on the side of the brain and is involved in short-term memory, speech, auditory signals, and smell recognition. It identifies “what” things are – object identification. **It contains the limbic system, amygdala, and hippocampus**. There are multiple pathways within the temporal lobe which affect object identification and language comprehension, including the ability to understand semantics. **A dominant temporal lobe lesion can present as Wernicke’s aphasia. Temporal lobe disorders include dementia, affective disorders, and attention deficit hyperactivity disorders (ADHD).**

Occipital lobe

This is the back part of the brain and controls visual processing. Damage to this lobe results in the inability to form visual memories. Bilateral lobe damage results in

the inability to recognize items by sight even though vision is normal. Occipital lobe seizures can cause hallucinations, such as lines of color.

Central sulcus

This separates the frontal lobe from the parietal lobe.

Corpus callosum

This controls the communication between the two brain hemispheres. The corpus callosum is involved in attention, impulse control, and emotion regulation. It integrates impulses from both sides of the brain. It is said that Albert Einstein had a very large corpus callosum. **Persons with an underdeveloped or missing corpus callosum may have intellectual impairment.**

Hippocampus

This is located deep in the temporal lobes and is **involved in anxiety and memory shifting short-term to long-term memory.** Hippocampal function is impaired in schizophrenia and dementia. There is ongoing research into the role the hippocampus plays in anxiety and decision making.

Amygdala

This is located deep in the temporal lobes and involved in **emotional regulation and perception of odors.** All smells travel directly to the amygdala. Cooking smells can elicit memories of childhood events and holidays. **A traumatic event can result in the formation of the fear response, causing the fight or flight reflex within the autonomic nervous system and affects the hypothalamic-pituitary-adrenal (HPA) axis causing the release of stress hormones (e.g. cortisol).** The amygdala also is involved in the interpretation of facial expressions and sexual stimuli.

Thalamus

This is an egg-shaped structure involved in sensory organ and motor command processing. **All sensory systems except for the olfaction process through the thalamus,** which is responsible for processing all external information. The thalamus has been associated with symptoms related to schizophrenia and post-traumatic stress disorder (PTSD).

Basal ganglia

A group of structures involved in voluntary motor movements, cognition, and emotion. Basal ganglia movement disorders include Parkinson's disease, **obsessive-compulsive disorder (OCD), and Tourette syndrome.** The striatum is a group of structures that includes the caudate, putamen, and nucleus accumbens. The dorsal striatum contains the caudate nucleus and the putamen. The ventral

striatum contains the nucleus accumbens. Both are involved in facilitating voluntary movement.

Dorsal striatum

This is involved in complex motor actions and linkage of cognition to motor actions. It is the main input area for the basal ganglia and is activated when anticipating or engaging in pleasure.

Nucleus accumbens

This is involved in the reward circuit and reinforces addictive behaviors.

Limbic system

This is associated with pleasure, reward, and reinforcing behavior. Emotion and learning* Drug abuse affects the limbic system, disrupting emotions and feelings associated with normal behavior.

Central sulcus	Separates the frontal lobe from the parietal lobe
Frontal lobe	Associated with movement, intelligence, abstract thinking. etc.
Broca's area	Speech
Temporal lobe	Involves object identification and auditory signals
Cerebellum	Coordination
Wernicke's area	Speech comprehension
Occipital lobe	Primary visual area
Parietal lobe	Keeps us alert to what is going on around us
Sensory Cortex	Pain, heat, and other sensations
Motor cortex	Movement
Hippocampus	Involved in both memory and anxiety
Nucleus accumbens	Involved in the reward process

Thalamus	Involved in sensory organ and motor command processing
Striatum	Involved in complex motor actions, also links cognition to motor actions
Limbic system	This includes circuits that are associated with pleasure and reward, emotion and learning
Basal ganglia	A group of structures involved in voluntary motor movements
Amygdala	Involved in emotional regulation and perception of odors
Corpus callosum	Controls the communication between the two brain hemispheres
White matter	Contains nerve fibers that connect neurons from different regions into functional circuits
Grey matter	Contains nerve cells and dendrites
Brain tissue	Made up of grey matter and white matter

- The primary auditory processing areas are in the superior temporal gyrus bilaterally
- The meaning of verbs and grammar are found in **Broca's area**.
- Reading nouns aloud activates the primary motor area, but Broca's area is not strongly activated until the person actively uses grammar. A person who suffers a lesion in Broca's area also known as Broca's aphasia comprehends most aspects of language but have pronounced articulation deficits.
- They cannot name a wide variety of objects because the motor programs that activate the sequence of lip tongue and mouth movements to produce the word are lost. Patients with Broca's aphasia also suffer agrammatic ISM. Verbs are most likely to be left out.
- If a patient with **Broca's aphasia** is asked to describe a picture that shows a

car crashing into a wall he or she will say something like the car... car... there... the car and... the wall. The patient is unable to produce the verb crash at all and each word is pronounced very haltingly. Broca's area appears key to understanding the Germanic construction of more complex sentences.

Wernicke's aphasia have a lesion in the left superior temporal lobe. These patients are completely fluent in their speech but their speech makes no sense at all.

- They cannot comprehend speech and therefore cannot follow commands unless nonverbal cues attend them. Curiously the patient is unaware that anything is wrong.
- Each time the examiner asks a question the patient responds with gibberish. In Wernicke's aphasia not only is Wernicke's area itself damaged but so are the connections to the ventral stream in the temporal lobe. When the patient hears words Wernicke's area no longer recognizes those words as words.
- If the damage is less severe and Wernicke's area is intact the patients also do not comprehend what is said to them yet they will repeat what they hear said around them this is called conduction aphasia the patient comprehends language and is fluent but cannot repeat things on command.
- Patients with **damage in the right hemisphere** or more likely to exhibit agnosia which is lack of knowing about many objects whereas patients with left sided damage tend to exhibit anomia the inability to name the object
- A patient with **agnosia** when shown a hammer may state that he or she does not know what it is when asked to demonstrate how to use it he or she will fail to do so accurately (right sided damage) in contrast a patient with and anomia will make pounding motions with his or her hands but is unable to access the correct word for the item(left sided damage)

Anomia- cant say the word of what's right in front of them- ate an apple would be stated as "I ate a red round fruit" (left sided damage)

Right side of damage also can cause prosopagnosia, the inability to recognize faces

Patients with **right parietal damage** develop interesting deficits. They often lose their sense of geography and are no longer able to navigate around their home or city. And in severe cases they may develop hemineglect (a failure to recognize the left side of their own body or the left side of their world). If asked to draw a clock they will only draw a semicircle and not the whole clock they may fail to wash their

hands on their left side or comb their hair on the left side.

Patients with right sided damage sometimes take on speech that has a flat non emotional tone

The left hemisphere concerns itself with details of stimuli in the world and the right side interprets the global pattern. For example when drawing an image patients with right hemisphere damage lose the overall pattern and patients with left hemisphere damage lose sight of the detail

- The left dorsal lateral prefrontal cortex controls verbal working memory. The right dorsal lateral prefrontal cortex contains the visual spatial sketchpad which manipulates objects in space.
- Patients with damage in the dorsolateral prefrontal cortex (DLPFC) rarely exhibit overt language problems, they recognize objects easily, in the initial conversation they may appear quite normal period when tested however subtle impairments are detected. If given the problem described previously they confuse the number of blocks with the number of apples.
- The patient with dorsal lateral prefrontal cortex (DLPFC) damage when given a maze will voice understanding eagerly grab the pencil and plow through the maze taking the first path instead of taking time to consider routes that might be more successful when at the dead end in the maze he or she will simply keep drawing ignoring the rule to stay within the walls. **DLPFC (dorsolateral prefrontal cortex) is concerned with executive functions, VLPFC (ventrolateral prefrontal cortex) is involved with motor INHIBITION

The occipital frontal cortex (OFC) plays a key role in decision making and social behavior.

- The occipital frontal cortex can both inhibit and activate the amygdala. Patients with occipital frontal cortex damage have difficulty assessing risk and continue to take excessive risks even when they are losing.
- This is not due to lack of awareness that they are doing poorly but to an inability to assess risk on the next trial even though they lost on the prior trial period such patients are described as impulsive but it is not due to an inability to withhold the response but rather to assess the risk and appropriateness of the response

the posterior occipital frontal cortex(POFC) plays a role in rewards and punishments that are inborn or instinctive such as sugar sex pain and social humiliation while the anterior frontal occipital frontal cortex (OFC) is engaged for higher level learned

rewards such as money awards and fame. The occipital frontal cortex also plays a pronounced role in aggression and anger.

Frontal Lobe Damage

damage to the frontal lobes causes loss of the ability to solve problems and to plan and initiate actions, such as crossing the street or answering a complex question (sometimes called executive functions).

- back part of the frontal lobe (which controls voluntary movements) is damaged, weakness or paralysis can result.

- middle part of the frontal lobe is damaged, people may become apathetic, inattentive, and unmotivated.

- middle back part of the left frontal lobe (Broca area) is damaged, people may have difficulty expressing themselves in words—an impairment called **Broca (expressive) aphasia**

People who lose their inhibitions may be inappropriately elated (euphoric) or depressed, excessively argumentative or passive, and vulgar. They may show no regard for the consequences of their behavior. They may also repeat what they say. Some people develop similar symptoms when they get older or if dementia develops. These symptoms may result from degeneration of the frontal lobe

Parietal Lobe Damage

Certain functions tend to be controlled more by one of the parietal lobes (usually the left). It is considered the dominant lobe when it controls language. The other lobe (nondominant) has other functions, such as enabling people to be aware of how the body relates to the space around it.

front part of the parietal lobe on one side causes numbness and impairs sensation on the opposite side of the body. Affected people have difficulty identifying a sensation's location and type (pain, heat, cold, or vibration). People may have difficulty recognizing objects by touch (that is, by their texture and shape).

middle part is damaged, people cannot tell the right from the left side (called right-left disorientation) and have problems with calculations and writing. They may have problems sensing where parts of their body are (a sense called proprioception).

Because different areas of the brain control specific functions, the location of brain damage determines the type of dysfunction that results.

Which side of the brain is affected is also important because the functions of the two

halves of the cerebrum (cerebral hemispheres) are not identical. Some functions of the brain are performed exclusively by one hemisphere. For example, movement and sensation on one side of the body are controlled by the hemisphere on the opposite side. Other functions are performed mainly by one hemisphere, which is said to be dominant for that function, and the other hemisphere is said to be nondominant. For example, the left hemisphere mainly controls language in most people. This characteristic is called left-hemisphere language dominance. Damage to only one hemisphere of the brain may cause complete loss of such functions.

However, most functions (such as memory) require coordination of several areas in both hemispheres. For such functions to be completely lost, both hemispheres must be damaged.

Temporal Lobe damage

part of the left temporal lobe controls language comprehension. If that part is damaged, memory for words can be drastically impaired, as can the ability to understand language—an impairment called [Wernicke \(receptive\) aphasia](#) (see table [Testing a Person With Aphasia](#)).

If certain areas of the right temporal lobe are damaged, memory for sounds and music may be impaired. As a result, people may have trouble singing.

Occipital Lobe Damage

-main center for processing visual information

-If both sides of the occipital lobe are damaged, people cannot recognize objects by sight, even though the eyes themselves are functioning normally. This disorder is called cortical blindness. Some people with cortical blindness are unaware that they cannot see. Instead, they often make up descriptions of what they see (called confabulation). This disorder is called Anton syndrome.

Seizures that involve the occipital lobe can cause hallucinations involving vision. For example, people may see lines of color when they look in a certain direction.

OFC (occipital frontal cortex) inhibits and activates the amygdala and is activated when a risk assessment is required. Some behaviors associated with the OFC include sex, sugar, pain, social humiliation, money, rewards, fame, and aggression. The amygdala will identify a threat and then the OFC will determine the risk or benefit of an action based on past experience.

Limbic Lobe Damage

Damage that affects the limbic lobe usually results in a variety of problems.