

# BRAIN BEHAVIOR SYSTEMS: THEIR FUNCTIONS, PROBLEMS, AND SOLUTIONS

## Lesson 5 Guided Notes



The corpus callosum connects the left and right hemispheres. The left hemisphere tends to be more detail-oriented and has more cells, while the right is more “big picture” oriented.

An extensive research study at Amen Clinics found some interesting differences between male and female brains.

**Women:** Strengths in female brains include empathy, intuition, collaboration, self-control, and appropriate worry. Vulnerabilities tend to include anxiety, depression, insomnia, eating disorders, pain, and difficulty “turning off their brains.” Women often have a more extensive limbic system.

**Men:** They have about 10% more neurons (grey matter) than women, but women have more dendritic connections (white matter). Men tend to be more left-sided in their processing and to have a larger inferior parietal lobe, which is involved with estimating time, speed, mathematics, and visualizing objects in 3-D.

## Six Brain Systems

- Prefrontal Cortex (PFC)
- Cingulate Gyrus
- Basal Ganglia/Insula
- Temporal Lobes (TL)
- Deep Limbic System (DLS)
- Cerebellum

## 1. PREFRONTAL CORTEX (PFC) - “THE BRAIN’S CEO.”

- **Functions:** Focus, forethought, impulse control, organization, planning, judgment, empathy, insight, and learning from mistakes.
- **Problems:** Short attention span, impulsivity, procrastination, disorganization, poor judgment, lack of empathy, and brutal honesty (having “no filter”).
- **Conditions related to low PFC functioning:** Engaging in bad habits (i.e., smoking and overeating), ADHD, schizophrenia, antisocial personality disorder, brain injury, frontal, temporal dementia, and certain forms of depression.



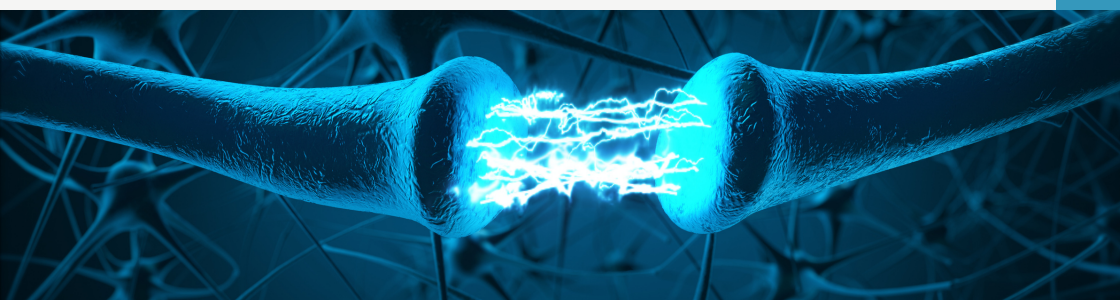
## 2. CINGULATE GYRUS – THE ANTERIOR PORTION (ACG) IS KNOWN AS THE BRAIN’S “GEAR SHIFTER.”

- **Functions:** Cognitive flexibility, attention-shifting, being able to go from idea to idea, seeing options, ability to “go with the flow,” cooperation, and error detection.
- **Problems related to overactivity in the ACG (often related to lower serotonin levels) can include:** Getting stuck, worrying, obsessiveness, holding grudges, compulsive behavior, certain types of addictions, oppositional and argumentative behavior, and seeing too many errors in self and others.
- **Conditions related to overactivity in the ACG:** Tendency to get “stuck,” anxiety disorders, PTSD, obsessive-compulsive spectrum disorders, some eating disorders, addictions, and oppositional defiant disorder.
- **Conditions related to underactivity in the ACG:** low motivation, mutism, and decreased movement.



### 3. BASAL GANGLIA/INSULA - MOVEMENT, ANXIETY, AND MOTIVATION

- **Basal Ganglia components:** Caudate (thoughts), putamen (motor movements), and nucleus accumbens (pleasure). The insula is involved with emotional processing, including visual and auditory processing.
- **Basal ganglia functions:** Blends feeling and movement, controls body's idle, helps with motivation, and helps control smooth motor movement (i.e., handwriting).
- **Insula Functions:** Sensing emotional and physical pain.
- **Problems related to overactivity in the basal ganglia/insula:** Too much anxiety and panic, conflict avoidance, predicting the worst, excess motivation, and pain.
- **Conditions related to overactivity in the basal ganglia/insula:** Panic disorder, generalized anxiety disorder, somatoform disorder, Tourette's disorder, and PTSD.
- **Problems related to underactivity in the basal ganglia/insula:** ADD-like symptoms, decreased motivation, and movement disorders.
- **Conditions related to underactivity in the basal ganglia/insula:** Parkinson's disease, Huntington's disease, extrapyramidal movements, low motivation, and apathy.



### 4. TEMPORAL LOBES (TL) – KNOWN AS THE “WHAT PATHWAY” BECAUSE THEY NAME THINGS

- **Functions:** Language and learning, memory, mood stability and temper control, listening/reading, social cues, rhythm/music, and spiritual experience.
- **Problems:** Emotional instability, memory problems, panic, aggression, headaches, learning problems, illusions, and déjà vu, mild paranoia, and unusual religious or sexual experiences.
- **Conditions when TL function is underactive:** Learning problems, memory problems, dementias, TL epilepsy, aggression, suicidality, and brain trauma.
- **Conditions when TL function is overactive:** Seizures, irritability, panic, mysticism, and spiritual or religious experiences.

## 5. DEEP LIMBIC SYSTEM (DLS) - EMOTIONAL CENTERS OF THE BRAIN

The limbic brain has several components, including the medial thalamus, amygdala, hippocampus, the hypothalamus, inferior orbital PFC, and the anterior cingulate.

- **Functions of the DLS/medial thalamus area:** Integration of and gateway for sensory information, setting an emotional tone, bonding, charged memories, sense of smell, and libido.
- **Conditions related to overactivity in the DLS/medial thalamus:** Sadness, moodiness, negative thoughts, low motivation, social isolation, loss of libido, and pain syndromes.
- **Conditions related to underactivity in the DLS/medial thalamus:** Depression, cyclic mood changes, pain, and sensory overload. Low activity in the thalamus can cause decreased reactivity.

## 6. CEREBELLUM

- **Functions of the cerebellum:** Processing and integration, coordination, impulse control, organization, and speed of thought.
- **Problems related to decreased cerebellar function:** Coordination problems slowed gait, slowed thinking, delayed speech, disorganization, impulsivity, and poor conditioned learning.
- **Conditions related to decreased cerebellar function:** Autism disorders, cerebellar tumors, and brain injury.

# The Cerebellum

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The cerebellum comprises 10% of the brain's volume yet has 50% of its neurons. Its left hemisphere is connected to the right frontal lobe, and the right hemisphere of the cerebellum is connected to the left frontal lobe.