Cerbral Hemispheres

The human brain is divided into two distinct hemispheres: the left and right cerebral hemispheres. These two hemispheres are connected by a thick band of nerve fibers known as the corpus callosum, which allows communication between the two. Although both hemispheres are involved in most cognitive processes, there are several differences between them in terms of structure and function.

- **Structure**: The left and right hemispheres have different morphological characteristics, with the left hemisphere typically being slightly larger in size. This difference in size is believed to be related to the greater demands placed on the left hemisphere for language processing. In terms of neural connectivity, the left hemisphere is more densely connected within itself and less connected with the right hemisphere, whereas the right hemisphere is more widely connected with the rest of the brain.
- **Function**: The two hemispheres have distinct and complementary functions, which often lead to lateralization of cognitive processes. The left hemisphere is typically associated with language processing, analytical thinking, and sequential processing, while the right hemisphere is associated with spatial reasoning, artistic ability, and holistic processing.
- **Language**: The left hemisphere is considered the dominant hemisphere for language processing, including the production and comprehension of speech. The left hemisphere contains Broca's area, which is responsible for the production of speech, and Wernicke's area, which is responsible for the comprehension of speech. In most people, language processing is lateralized to the left hemisphere, although there are some individuals with a degree of bilateral language representation.
- **Analytical Thinking**: The left hemisphere is also specialized in analytical thinking, which involves breaking down information into smaller parts and examining them in detail. This includes mathematical reasoning, logical problem-solving, and scientific thinking.
- **Spatial Reasoning**: The right hemisphere, on the other hand, is specialized in spatial reasoning and perception, which involves understanding and manipulating objects in three-dimensional space. This includes tasks such as visual-spatial reasoning, map reading, and art appreciation.
- **Artistic Ability**: The right hemisphere is also associated with artistic ability, including the ability to appreciate beauty and form. This includes skills such as music appreciation, creativity, and the ability to understand and create visual art.
- **Holistic Processing**: The right hemisphere is also specialized in holistic processing, which involves the integration of information from multiple sources to form a complete picture. This includes tasks such as pattern recognition, facial recognition, and understanding the emotional content of speech.

Overall Functioning

In addition to the differences in structure and function between the left and right cerebral hemispheres, here are a few more things to know:

- **Hemispheric Dominance**: In most people, one hemisphere is dominant over the other. The

dominant hemisphere controls language and most cognitive processes, while the non-dominant hemisphere helps support these processes. It is believed that hemispheric dominance is determined by genetics and is established early in life.

- **Interhemispheric Cooperation**: Despite the differences between the hemispheres, they work together in a coordinated manner to carry out many complex cognitive processes. This is facilitated by the corpus callosum, which allows information to be transferred between the hemispheres.
- **Brain Plasticity**: Often over-rated and exaggerated, the human brain has a remarkable ability to adapt and change in response to experience, known as brain plasticity. This means that if one hemisphere is damaged, the other hemisphere can compensate for some of the lost functions.
- **Handedness**: Handedness is strongly correlated with hemispheric dominance. The majority of right-handed individuals have a dominant left hemisphere, while the majority of left-handed individuals have a more balanced distribution of function between the two hemispheres.
- **Split-Brain Patients**: In rare cases, individuals with severe epilepsy may undergo a surgical procedure known as a corpus callosotomy, in which the corpus callosum is cut to prevent seizures from spreading between the hemispheres. Split-brain patients provide unique insights into the function of the two hemispheres, as they are able to perform certain tasks with one hand that they cannot perform with the other.
- **Right Hemisphere Syndrome**: In some cases, damage to the right hemisphere can result in a set of symptoms known as Right Hemisphere Syndrome. This can include difficulty with spatial orientation, visual-spatial skills, and facial recognition, as well as changes in emotional regulation and social behavior.

Roger Wolcott Sperry

Roger Wolcott Sperry was an American neuropsychologist and neurobiologist who was awarded the Nobel Prize in Physiology or Medicine in 1981 for his groundbreaking work on the specialization of the cerebral hemispheres. He was born in 1913 in Hartford, Connecticut and received his PhD in Zoology from the University of Chicago in 1941.

Sperry's work focused on the study of brain function and the specialization of the two hemispheres of the brain. He was particularly interested in understanding the role of the corpus callosum, a large bundle of nerve fibers that connects the two hemispheres. In the 1950s and 1960s, he conducted a series of experiments in which he studied patients who had undergone surgical severance of the corpus callosum in order to treat epilepsy.

Sperry found that after this surgical procedure, the two hemispheres of the brain were no longer able to communicate with each other, and instead operated as separate entities. He discovered that the two hemispheres had different specializations, with the left hemisphere being specialized for language and logical processes, and the right hemisphere being specialized for visual-spatial processing, music, and artistic abilities. This discovery of hemispheric specialization was a major contribution to the field of neuroscience and helped to establish the concept of lateralization of brain function.

In addition to his research on the corpus callosum and hemispheric specialization, Sperry also made important contributions to the understanding of the brain and its ability to reorganize and recover

from injury. His work has had a lasting impact on the field of neuroscience and has led to new perspectives on the nature of brain function and the potential for recovery from brain injury.

Left-Hemispatial Neglect

Left Hemispatial Neglect, also known as left neglect or hemispatial neglect, is a condition that occurs after damage to the right hemisphere of the brain, particularly in the parietal lobe. It is characterized by a failure to attend to, or process information from, the left side of space.

Individuals with left neglect may ignore or fail to respond to stimuli on the left side of their visual field. This can result in difficulties with tasks such as reading, writing, and orienting themselves in space. They may also have difficulty with personal hygiene, grooming, and dressing, as they may overlook the left side of their body.

The exact mechanism of left neglect is not well understood, but it is thought to involve damage to attentional and perceptual systems that are involved in orienting to and processing information from the left side of space. This can result in a reduction in the processing of sensory input from the left side and a failure to direct attention to that side of space.

Left neglect is typically assessed through a variety of tests, including line bisection, copying figures, and reading tasks. Treatment for left neglect may include physical therapy, occupational therapy, and cognitive rehabilitation, which aim to improve the patient's ability to attend to and process information from the left side of space.

A patient with Left Hemispatial Neglect (also known as hemispatial neglect or left neglect) may experience the following symptoms:

1. **Inattention to the left side of space**: The primary symptom of left neglect is a failure to attend to or process information from the left side of space. This may result in a patient ignoring or failing to respond to stimuli on the left side of their visual field.
2. **Difficulty with personal hygiene and grooming**: Patients with left neglect may overlook the left side of their body and have difficulty with tasks such as brushing their teeth, grooming their hair, or dressing themselves.
3. **Difficulty with reading and writing**: Patients with left neglect may ignore or miss letters, words, or entire lines on the left side of a page when reading or writing.
4. **Difficulty with spatial orientation**: Patients with left neglect may have difficulty orienting themselves in space, such as getting lost in familiar surroundings or having difficulty reaching for objects on their left side.
5. **Neglecting the left side of objects**: Patients with left neglect may only attend to the right side of objects, such as a table or a chair, and ignore the left side.

A clinician may observe the symptoms of left neglect during a clinical evaluation, which may involve the following tests:

Line Bisection Test: A test in which the patient is asked to bisect a line with a mark or a ruler, while ignoring distractions on either side of the line. This test assesses the patient's ability to attend to the left side of space.

Copying Figures Test: A test in which the patient is asked to copy a figure, such as a star or a triangle, while ignoring distractions on the left side of the page. This test assesses the patient's ability

to attend to the left side of space when performing a motor task.

Reading Test: A test in which the patient is asked to read a passage while ignoring distractions on the left side of the page. This test assesses the patient's ability to attend to the left side of space when processing linguistic information.

These tests, along with a thorough clinical evaluation and a review of the patient's medical history, can help a clinician diagnose left neglect and determine the severity of the condition.

Hyper-emotionalism

Hyper-emotionalism is a phenomenon that can occur following damage to the left hemisphere of the brain. The left hemisphere is responsible for language processing and logical, analytical thinking, and damage to this region can result in changes in emotional regulation and expression.

The exact cause of hyper-emotionalism following left-sided brain damage is not well understood, but it is thought to be related to a disruption in the normal functioning of the brain's emotional processing system. The left hemisphere is known to play a role in regulating and modulating emotional expression, and damage to this region can result in an overproduction or underproduction of emotions.

Hyper-emotionalism is characterized by an excessive and intense emotional response to stimuli, often in the absence of an appropriate emotional response. Individuals with hyper-emotionalism may experience sudden, intense emotional outbursts, such as crying, laughing, or anger, in response to relatively minor stimuli. They may also have difficulty controlling their emotions and regulating their emotional expressions.

In addition to hyper-emotionalism, individuals with left-sided brain damage may also experience a range of other emotional and behavioral symptoms, including:

- **Emotional lability**: This refers to rapid and sudden changes in mood, such as quickly transitioning from happiness to sadness or anger.
- **Impulsivity**: This refers to acting on an impulse without considering the consequences, and may include impulsive behavior, such as excessive spending or reckless driving.
- **Aggression**: This refers to behavior that is intended to cause harm or damage, and may include physical or verbal aggression.
- **Apathy**: This refers to a lack of emotional response or interest in the environment, and may include a lack of motivation and emotional expression.

Diagnosis of hyper-emotionalism following left-sided brain damage typically involves a thorough medical evaluation, including a review of the patient's medical history and a physical and neurological examination. Imaging studies, such as a CT scan or MRI, may also be performed to confirm the location and extent of brain damage.

Treatment for hyper-emotionalism may involve a combination of medications, such as anticonvulsants or mood stabilizers, and behavioral or cognitive therapies, such as cognitive-behavioral therapy or psychotherapy. In some cases, rehabilitation or physical therapy may also be recommended to help improve overall function and quality of life.