

RIGHT BRAIN LEFT BRAIN

It happened on a Sunday morning in the mid 1970s. I was very anxious to get to work to see Tom. He was an 18 year old who, on the night of his graduation from high school, went with some friends to swim in a pool. He dove into the shallow end and became a quadriplegic. I was the Assistant Head Nurse in the ICU at Lutheran Hospital at that time so I assigned the patients to the staff. I also assigned a patient to myself and knew I could take care of Tom that day. Tom had been on the ventilator for several weeks because he had no spontaneous respirations. I had a dream about him Saturday night and was anxious to share it with him.

In 1836, Marc Dax, a country doctor observed many patients who suffered from loss of speech, known as aphasia, following damage to the brain. B5. In the 1940s a Canadian neurosurgeon named Wilder Penfield used local anesthesia to reduce side effects of surgery in patients with epilepsy. He would stimulate parts of the brain until a patient could relate a sign that occurred prior to a seizure. He studied one patient who said he smelled burned toast before having a seizure, so Penfield would stimulate areas of the brain until the patient smelled burned toast and that area would be excised. B6. In the 1950s neurosurgeons went through a period of cutting into the corpus callosum of the brains of patients with severe seizures. The corpus callosum is the communication pathway between the R & L hemispheres of the brain. They then observed how the brains changed when the two hemispheres were separated from each other. B6. In the 19th and early 20th Century it was believed that the left hemisphere corresponded to masculinity and that the right hemisphere dealt with femininity and that each hemisphere could function independently from each other. The right side of the brain was also

seen as inferior and thought to be exhibited in women, children, criminals, and the insane. B9.

The right brain-left brain theory originated in the work of Roger W. Sperry, who was awarded the Nobel Prize for Physiology and Medicine in 1981 for his work in split-brain research. He studied the functions of the brain in patients who underwent surgery to cut the corpus callosum to treat refractory epilepsy. B2. He discovered that these patients experienced inability to name objects that had been previously processed by the right side of the brain, but were able to name objects that had been processed by the left side of the brain. B2.

In the past few decades positron emission tomography, known as PET scans, have been used to view parts of the brain that are used when people carry out certain activities. These scans measure the level of glucose in the brain to show where neurons are active. B6.

An MRI scan is used for locating problems such as brain tumors. Most of the body is made up of water molecules which consist of hydrogen and oxygen atoms. At the center of a hydrogen atom is a particle called a proton. Protons are like tiny magnets. Magnets in an MRI scanner turn all the protons to face one way. Radio waves then knock the protons out of alignment and when the radio waves are turned off, the protons realign. This sends out radio signals which are used to build a 3D image. B6 The magnetoencephalography, abbreviated as a MEG scanner measures the electrical currents that pass through the brain as the nerves send signals to one another. Dr. Michael Gazzaniga tested how the brain processes words it reads. He scanned a volunteer who read words only in their left field of vision. The information was seen as an electrical current moving first from the right hemisphere, through the corpus callosum to the left hemisphere where it was processed. B6.

ANATOMY OF THE BRAIN. (Diagrams on Tables)

Probably most people in today's world know that the right side of the brain controls the left side of the body and vice versa. Our brain is the most complex organ in the human body and weighs approximately 3 pounds or 2% of our body weight, and is about 6 inches long. It is the size of 2 fists placed next to each other. The brain consists of over 100 billion neurons (or nerve cells) and 100 trillion connections. The outer layer of the brain, the cerebral cortex, is approximately 1 - 4.5 mm thick. It is often called the grey matter because it consists mostly of neurons and it lacks the insulation that makes other parts of the brain appear white. The white matter consists of nerve fibers which transfer the electrical signals from the neurons to the corpus callosum. There are four lobes of the cerebral cortex: the frontal lobe, which is for reasoning and planning; the parietal lobe, which processes sensory information, handles movement, and recognizes objects; the temporal lobe, which includes memory, recognition of sounds, as well as speech; and the occipital lobe which is the center for vision. B6. The activities of the cerebral cortex and the cerebrum are divided between the right and left hemisphere (which makes up about 2/3 of the total brain). The hemispheres are not the same but extremely similar in that most processes are found on both sides. In 1908 the corpus callosum was identified and neurologists began to understand its function in the 1950s. It has been referred to as a conduit since it transmits electrical signals back and forth between the right and left hemispheres. Its use is not fully understood to this day! It is believed that besides connecting the two hemispheres of the brain, it cuts communications between the right and left side of the brain when necessary. An example would be if a person has to react to a situation quickly as in a fight or flight situation.

The body needs information quickly so the corpus callosum restricts traffic between the frontal lobes and allows the more automatic brain stem and cerebellum to respond. Musicians and people who are left handed and ambidextrous are said to have a larger corpus callosum. It is recorded that the brains of men are larger than those of women, thus the bigger ego—just kidding.

The cerebellum, which is located underneath the occipital lobe of the cerebrum, has also been referred to as the hindbrain. The functions of the cerebellum are coordination of voluntary movements or motor control such as posture, balance, coordination, and speech. The brain stem is the posterior part of the brain and continues on as the spinal column. It consists of the midbrain, the pons which controls sleep, respiration, swallowing, bladder control, hearing, equilibrium, taste, eye movement, facial expression, as well as posture, and the medulla oblongata which controls digestion, sneezing, swallowing, respiration, and circulation. The brain stem controls all the functions of our body that are needed to survive including breathing, circulation and heartbeat, as well as digestion.

The corpus callosum is divided into four parts: the rostrum, genu, body, and splenium. The Rostrum and genu connect the frontal lobes of both hemispheres. The body and splenium connect the temporal and occipital lobes. So this means that the body and splenium are coordinating what the right and left ear hear as well as what is seen in the right and left fields of vision. The splenium connects the two parietal lobes which allows the brain to tell us where something has touched us. The corpus callosum coordinates the left hemisphere, which understands words, with the right hemisphere which understands context. B6

R & L brain

According to Anne Stiles, a professor of English at St. Louis University, Robert Louis Stevenson's novella "The Strange case of Dr Jekyll and Mr. Hyde" helped promote the idea of "left and right brains". B1. As we all are aware—the left side of the brain controls the right side of the body and the right side of the brain controls the left side of the body. Evidence of this is seen in people who have had a stroke. Bruno Dubuc, a Neuroscientist at McGill University in Montreal states that vision is different: nerves from the left side of the eyes are connected to the left side of the brain and nerves from the right side of the eyes are connected to the right side of the brain. B1. Left and Right handed people use the brain differently from each other. Handedness is determined while the fetus is developing. Scientists have found that by 24 months of age 97% of toddlers had a hand preference. Scientists believe that whether you are right-handed or left-handed is genetic although they have not been able to find a single gene that determines handedness. They theorize that handedness is controlled by a range of genes working together. If both parents are left-handed there is about a 26% chance of being left-handed while if neither parent is left-handed there is about a 10% chance of being left-handed. Left handed people primarily use the right brain for manual tasks while right handed people use the left brain, so this means that the side of the brain that is used for certain activities is different from person to person, so—hemispheric dominance varies from person to person. A 2014 study shows that up to 99% of right handed persons have the language centers in the left hemisphere, but so do 70% of left handed people. B3, B6

The human brain is constantly reorganizing itself. It is very adaptable to change and is tailor-made for learning. As scientists continue to map the brain they gain more insight into which parts control which functions. This information is vital to advanced research into brain diseases and injuries and how the brain can recover from them. B8.

LATERALIZATION

Lateralization is the theory of functions or abilities to be specialized to either the left or right side of the brain. The theory is that people are either left-brained or right-brained, meaning that one side of their brain is dominant. If a person is mostly analytical and methodical he is said to be left brained and if a person tends to be more creative or artistic that person is thought to be right-brained. B8. An article in *The Journal of Neuroscience* states that even though the two hemispheres appear to be nearly identical, different neuronal networks allow for specialized function that is different in each hemisphere. Each individual's brain develops differently which leads to unique lateralization in each person. B9.

Right Brain Attributes

Recognizing faces	Imagination	Ability to see the big picture
Expressing emotions	Intuition	
Music and rhythm	Creativity	Reading emotions
Being a free Spirit	Risk taking	Impulsive
Recognizing Color	Free thinking	Artistic skills
Being more subjective	Being thoughtful	Comprehension
Concerned with holistic aspects of life		Perceptive

Depression has been linked to a hyperactive right side of the brain because it is more emotional than the left hemisphere. “There is evidence of processing negative emotions, pessimistic thoughts and unconstructive thinking, as well as vigilance, arousal and self-reflection...”. B9. As James Bow relates in his book “Left Brain vs. Right Brain”, “unusual activity in the right brain has been observed in people dealing with depression, and it may be caused by the right hemisphere’s tendency to second-guess decisions made by the left hemisphere.” He says that the right frontal lobe is more active when people feel sad, but the left frontal lobe is active when people are happy. B6. Careers for right brained people are: Graphic Design, Counselor or Psychologist, Interior Designer, Painter, Musician, Manager. B10.

Left Brain Attributes include

Analytical	Math and Science	Likely to think in words rather than being visual
Detail and fact oriented	Reasoning	
Language	(grammar, vocabulary and literal meaning)	Quantitative
Logical	Speech production	Reality based
Critical thinking	Sign language used by deaf	Avoids risk
Factual	Tends to reduce matters of ethics to measures and rules	
Programming	Controls right side of the body	

Paul Broca, a physician, discovered that the front left of the brain is used for speaking while the back left is used for understanding speech. As Bow relates, when we are focusing on something specific or trying to figure out something or to make decisions we are heavily using our left brains.

Careers for the left-brained person: Scientist, Network Administrator, Business Analyst, Mathematician, Reporter, Programmer. B10.

What side of the brain do you think was being used in the story of Tom, the 18 year old who dove into the swimming pool resulting in quadriplegia? We might think that since I was anxious to get to work I was using the right brain while expressing emotions. Maybe I was using the left side of the brain and exhibiting critical thinking while I was getting ready to talk to Tom about my dream. What side of the brain was Tom using when he decided to dive into a pool? Was he using the right side of his brain taking a risk? Was he just being a free spirit? Some may say he was not using his brain at all! Let's explore this in more detail...

We use both sides of the brain simultaneously in such activities as:

Writing music

Writing poetry

Writing fiction

Architecture

Scientific illustration

The left hemisphere helps us speak words in the proper order while the right hemisphere helps us understand the meaning of the words. B10

During most activities both sides of the brain work together. Math is thought of as a left-brain activity, but the right brain is used to figure out math problems. An artist uses the right brain to be creative while using the right hand or left brain to paint. People who are left-handed are not using their right brain more than the left because both hemispheres are working together.

Bow explains that using both hemispheres allows us to be both focused and alert, as well as being able to react to problems and plan ahead. The corpus callosum promotes cooperation of the two hemispheres by coordinating activities in both sides of the brain and thus avoiding

conflict between the two sides. It also is reported to be larger in musicians than in non musicians.

People who are left handed and ambidextrous also have a larger corpus callosum that may be up to 11% larger than the norm. B6

Research into the left brain and right brain theories can be shown by the use of an MRI scanner. 3D pictures reveal that the right and left brains are used simultaneously rather than revealing a dominant side. It does depend, however on the activity of the person as to which side of the brain is being used more.

Ann Pietrangelo of Healthline, states scientific research reveals that there is not right or left brain dominance, but that there are right and left hemispheres which are similar but not exactly alike. (They both perform similar functions.). The networks on one side are not stronger than the other side. We don't use one side or the other but both simultaneously. General personality traits, individual preferences, or learning style do not translate into the notion that you are left-brained or right-brained. Still, it is a fact that the two sides of your brain are different and certain areas of your brain do have specialities. The exact areas of some functions can vary from person to person. B8.

SURGICAL SEPARATION OF HEMISPHERES

Dr. Paul Brand, a physician, and Philip Yancey, who is an author, wrote in the book entitled, *In His Image*, "In all of medicine, there is no more shocking procedure than brain surgery. It seems a violation, as terrifyingly sacrilegious as bursting into the Holy of Holies. No

one who opens a human skull escapes this grim sense of defilement. For centuries the human brain remained undrawn, or sketched only in rough caricature—the mysterious organ daunted even the brave pioneer Leonardo da Vinci, as shown by his hesitant and inexact studies.” B 12

Surgical separation of hemispheres causing a split brain, was performed to reduce seizures in epileptics and it was discovered that the brain still functioned normally. Areas of the brain were mapped by stimulating parts of the brain. Stimulation in one area caused a response in the opposite hemisphere. Hemispherectomies or separation of hemispheres, have been done in the past for severe cases of epilepsy and the rest of the brain was able to adapt. Rafi Letzler in “Live Science” says that according to the Cleveland Clinic a baby can grow up with normal memories and a normal personality after undergoing a hemispherectomy B1.

A number of patients who had this surgery found that half of their body acted independently from the other half. One patient for the first months after surgery had difficulty coordinating the activities of her hands which was infuriating to her. They acted independently of each other. She would go grocery shopping and when she would reach out to take something off a shelf the other hand would interfere with that activity. (Alien hand syndrome) Her hands not only had difficulty with coordination but they disagreed on what she should pick up!

One patient’s left hand acted aggressively striking out at his wife for no reason. The right hand had to grab the left hand to stop it. Another patient who had the same surgery was tested mathematically by physicians who would show the patients simple questions on one side of his field of vision and the left hemisphere would answer the questions

correctly 90% of the time while the right hemisphere would only answer correctly by chance.
B6.

James Bow relates that perhaps the most famous split-brained person was Kim Peek. Kim was known as a "megasant", as he had an exceptional memory, but he also experienced social difficulties, possibly resulting from a developmental disability related to congenital brain abnormalities. The dictionary defines savant syndrome as a condition in which someone with significant mental disabilities has certain abilities that exceed those of the average person. These people usually have a neurodevelopmental disorder such as autism. The dictionary defines rain-man as an autistic or mentally or socially impaired person. Kim's life was the inspiration of the Oscar-winning 1988 movie *Rain Man*. Kim did not have surgery to cut his corpus callosum. Instead, he was born with a malformed cerebellum and no corpus callosum. This anomaly presented Kim with inability to perform everyday tasks such as buttoning up his shirt. However, he was able to memorize over 9,000 books. Since he had a split brain he was able to split his vision and read two separate pages at once! Kim allowed scientists in 2004 to scan his brain to make a 3D map to help neurologists better understand what the corpus callosum does and how the two sides of our brain communicate. B6.

What happens when the brain is damaged?

Damage to specific areas in the left brain can cause language processing difficulties, but these people can relearn speech using the right hemisphere. The brain is remarkably resilient and adaptable. (Plasticity). It can recover from injury depending on what the injury is or where it is. For example, if an area is injured, the surrounding brain or even the complimentary brain of the

opposite hemisphere can take over the functions of the damaged brain. A concussion may temporarily impede certain brain functions, but they eventually recover. Strokes on the other hand can permanently damage parts of the brain. Other areas of the brain can compensate for some of the loss through training and therapy. New synapses or connections can be formed to help the brain regain certain functions. Damage to either side of the brain has led scientists and neurologists to discover which brain functions are involved with specific areas. Scientists who also studied cadaver brains have been able to discover where the nerves travel and which functions are affected. These studies led to the discovery of the different anatomic areas of the brain as well as the functions. People with left hemisphere damage may have impaired perception of high resolution or detailed aspects of an image. Those with right hemisphere damage may have impaired perception of low resolution, or big picture aspects of an image. B 9.

Paul Broca and Karl Wernicke have named areas in the brain where expressive aphasia occurs if the areas are damaged, thus damage to the brain causing aphasia may be referred to as Broca's aphasia, which is concerned with pronunciation and Wernicke's aphasia in which the person's language is nonsensical to the listener.

Susan Blackmore explains what happens when we dream: Our brain is constantly active during REM sleep, from the brain stem to the cortex, whether we are dreaming or having nightmares. She states that the limbic system, which is in the mid-brain, deals with emotions and includes the amygdala, which is mostly associated with fear. She relates that the cortex is responsible for the content of dreams, including the monsters we flee from, the people we meet, or the experience of flying. B4.

**As Paul Harvey always said,” and now the rest of the story”. I shared my dream with Tom. I told him that I dreamed that I disconnected him from the ventilator and he was able to breathe. I asked him if he wanted to try this and he indicated that he did! I told him to signal to me when he was ready. The time came and I removed him from the ventilator— and guess what? Tom took his first breath! His rehabilitation began that very day.

Now we will explore MYTHS ABOUT THE BRAIN

“According to the theory of left-brain or right-brain dominance, each side of the brain controls different types of thinking. As we have learned , left-brained persons are often said to be more logical, analytical, and objective, while right-brained persons are said to be more intuitive, thoughtful, and subjective. B 2. In a two year study in 2013, in the journal *Public Library of Science*, researchers found no evidence for significant differences in right vs left side dominance in 1000 people when looking at their brains. B1. Researchers have demonstrated that right-brain/left brain theory is a myth, yet its popularity persists. Why? Unfortunately many people are likely unaware that the theory is outdated. The ideas seem to have taken on a mind of its own within popular culture—from magazines to books to online quizzes. B7

Christian Jarrett believes the right-brain, left-brain myth will probably never die because it has become a powerful metaphor for different ways of thinking: logical, focused, and

analytical versus broad-minded and creative. He also relates that the seductive idea of the right brain and its untapped creative potential also has a long history of being targeted by self-help gurus peddling pseudo-psychology. Today the same idea is also used by the makers of self-improvement video games and apps. The latest version of the app, Faces Make Right Brain Creativity boasts that it is an extraordinary tool for developing right brain creative capabilities. B11. As Dr. Robert Schmerling of Harvard Health Publishing states, “According to a 2013 study from the University of Utah, brain scans demonstrate that activity is similar on both sides of the brain regardless of one’s personality.” They also looked at the brain scans of more than 1,000 young people dividing the brain into 7,000 regions and found no evidence of “sidedness”. B12

TIPS AND TRICKS TO KEEP YOUR BRAIN SHARP

Ann Pietrangelo notes that the Alzheimer’s Association has a few tips to keep your brain stimulated:

Spend some time each day reading or writing, or both

Never stop learning. Take a class, go to a lecture, or try to acquire a new skill.

Tackle challenging puzzles

Play memory games, card games, board games

Take on a new hobby that requires you to focus.

Listen to music

In addition to thinking exercises your brain benefits from a good physical workout—120 minutes of aerobic exercise a week can improve learning and memory. B8

CONCLUSION

We have learned that there are specific functions in each hemisphere of the brain, and that both hemispheres work together to complete a task. Most of the information scientists have learned about the brain has come from studies on persons who have had brain damage or surgery to pinpoint specific areas of activity. The brain is able to take over functions of the opposite side in the case of injury so it is at times difficult to pinpoint where damage has occurred. Autopsies have also revealed brain lesions that were responsible for certain problems people may have experienced.

Currently neurosurgeons at the Mayo Clinic continue to map the brain as there is still much to be learned about the right and left hemisphere functions. They have this opportunity when they are performing brain surgery for tumors or seizures. The procedure involves sedating the patient then waking the patient while the neurosurgeon stimulates the brain. The patient cannot feel any pain and a 3D computer image is used during surgery as a guide.

The MEG scanners are getting more precise in making detailed images of our brains. New tools such as the gamma “knife” (which is really not a knife) uses focused beams of radiation to allow surgeons to make tiny incisions in the brain as small as the size of a cell. With this technology surgeons can fix these brain issues without opening the skull. B6.

The Declaration of Independence states, “We hold these truths to be self-evident, that all men are created equal, that they are endowed by their Creator with certain unalienable Rights, that among these these are Life, Liberty, and the pursuit of Happiness.” I firmly believe that our Creator has also endowed each one of us here with the most marvelous gifts to secure our full potential to use our Rights—the Right Brain and the Left Brain.

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