

Are You Left or Right?: Studies of the Two Hemispheres of the Brain From Infancy to Adolescence

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Ever since the beginning of the human race, the brain has been the organ to resolve all of our conceptual troubles. Each of these troubles has required two ways of resolution: understanding and analyzing the problem “in the box” and creating solutions and ideas “out of the box.” Luckily for us, we were born with both capabilities. The brain functions higher thinking in two types of segments, the left brain and the right brain. According to the left brain vs. right brain dominance theory, the left brain works best at logic, language, and analytical thinking. The right brain works best at expressive and creative tasks. The cycle of the human species through its lifespan offers many experiences as milestones in every stage. In these milestones, the development of the left brain vs. right brain dominance theory is very unique. In my research, I became really interested in how the information outside of the brain is processed and how the brain, in response, organizes the knowledge and sends out the response. I will first start my discussion off from pregnancy and the prenatal environment and end at the adolescent phase of life.

The first signs a woman feels in being pregnant is in missing her period. However, because it may be too soon to take a pregnancy test, a woman can look at a few signs to indicate a positive pregnancy test. She may at first feel “tender breasts, darkening areolas, nausea, fatigue, frequent urination, and bloating (1).” It is much better for a woman to wait two weeks after missing her period until taking the pregnancy test because fetal development will have reached one month in time by then. Brain development has already occurred during the second and third weeks of this month. According to Murkoff (1984), by week thirty the “brain starts to look like one, taking on those characteristic grooves and indentations.” (p. 1). No other organ takes as long to develop as the brain which keeps developing well into early adulthood.

The basic structural unit of the brain is called a neuron. At birth, the child’s brain consists of one hundred billion neurons. Each neuron sends, processes, and responds to information by releasing chemicals in the brain called neurotransmitters. So how can two different people end up with different brains? This is where genetics comes into play. As genes are passed on from parents to offspring, they control which type of neuron is produced, its location, and its function. However, the most important aspect in this process is how genes determine which type of neurotransmitters each neuron will respond to. The rest of the development of neurons is influenced from stimulation from the outside environment. As Kenneth Dodge (2011) states, “all

human thinking is *multifactorial*, meaning its causation involves multiple genes and multiple environmental factors” (p. 3). Stimuli also determine whether a particular neuron will develop further and reach its potential or go unused and die.

The brain is lateralized into two sections. The left brain utilizes in language, logic, critical thinking, numbers, and reasoning. The right brain is utilized in recognizing faces, expressing emotions, music, reading emotions, color, images, intuition, and creativity. Turgeon (1993) sums up the difference:

We all have these two sides to ourselves: a logical, rational side, associated with the left hemisphere of the brain, which enjoys clarity and can formulate explicit thoughts; and a more mysterious side, the right hemisphere, which is at home in complexity and ambiguity, darkness and subtlety, and can intuitively grasp truths that the left brain does not recognize. (p. 2).

The corpus callosum, a bundle of neural fibers connects the two hemispheres together.

With the child developing as a fetus in the eleventh week of pregnancy (ninth week after fertilization), there are many prenatal effects that can occur to affect the child’s left brain-right brain development. We will first look at prenatal effects on right brain development. A mother’s low blood sugar levels can hinder creativity while also causing the child to have a lower adrenaline development range. Recreational drugs, most importantly marijuana, can hinder intuition by fastening to neurons and impeding in normal communication between the neurons. Autism is still a study in progress but scientists for the most part have agreed that autism has more effects on the development of right brain thinking as it is linked to reading emotions and recognizing faces. One of the greatest propositions of the theory on autism growth is the mother’s exposure to valproic acid and/or thalidomide and her history with gestational diabetes.

The left brain is more easily affected during fetal development than the right brain. Depression and anxiety by the mother can affect the child’s overall logic as can consumption of anti depressants with ingredients such as mianserin and methiothepin. These drugs affect critical thinking processing by inhibiting the release of the neurotransmitter serotonin. If the mother suffers from pneumonia (bacterium *Streptococcus pneumoniae*), the child can suffer from slower language development by a slow maturity of the Eustachian tube in the child’s ear.

There are many helpful tips in encouraging the child to employ his critical and creative thinking skills. Playing with legos allow children to associate shapes and colors together in literally a constructive way. Most children have a tendency of creating a structure where parts of the same color remain together in parts of the building, a clear sign of organizational creative thinking. Helping the child imitate basic facial movements such as sticking out one's tongue, is an early sign of its advancement in problem solving skills by establishing relationships among concepts. Harris (2002) explains Jean Piaget's theory on this:

Piaget considered that the imitation of facial movements was a much more advanced achievement, possible only from the age of about one year. This is because, on his view, the ability to imitate facial movements required mental representation (a mental model) of the appearance of the face. Piaget describes a baby from about eight months touching her mother's face and then touching her own, as if to establish the correspondence between invisible parts of her imitation of her own body and visible parts of the mother's face. On these traditional theories, imitation of facial expressions develops late because the infant must first establish, through inference, the relationship between another person's visible movements and their own invisible movements. (p. 127).

Sing along songs help child learn rhythms and some research suggests that learning the rhythms of music is analogous to learning mathematical concepts. Flash card training allows child to develop his reasoning through cause/effect and question/answer associations. The ideal home environment for early improvement of higher thinking skills has been described as containing brightness of space, light colors on walls, lengthy and tall furniture, and visual exposure to paintings and objects.

The preschool and elementary years (ages 4-11) are a period of critical thinking growth and finding one's creative endeavors. To further clarify, we must look at the left and right side of the brain in further detail than we have before. The left, or analytical, brain is devoted primarily to managing logical cognition in a sequential cause and effect manner. It looks at the parts of a concept making up the whole. The right side, however, processes ideas through association to produce intuitive conclusions. It focuses on the concept as a whole instead of the parts. Decosterd (2010) differentiates the purposes of the two sides in analyzing the current president of the United States, Barack Obama:

The left brain reasons from part to whole and communicates in names and labels. It is concerned with facts, discrete parts, verbal expression, careful scrutiny, and closure. Obama is adept at left brain logic, expression, order, and analysis. He is very much attuned to the realities of the present. The right hemisphere or right brain is our strategist, innovator, and visionary. It controls intuitive and emotional thought. The right hemisphere is imaginative, nonverbal, and holistic. It reasons from whole to parts, is reflective, and thinks of the world as it could be. It is concerned with future possibilities, with creativity, with change, and with our interpersonal connections. Obama leads from right brain vision, from a transformational perspective and from interpersonal connections. (p. 34).

We will first look at the right side in the elementary years starting off with one of the basic learning areas, spelling. Most top spellers use visualization to recall the arrangement of letters in a word. Strong spellers tend to break words in chunks, think about small words in big words, and visualize whether or not the word looks right. The best way to help the child apply right brain thinking in spelling is to actually make the word look visually like what it represents. For instance, taking the word "cat," if you make the C the A and the T look like a cat (with paws, a face, whiskers, and ears), the child will visualize the word as a whole. So next time you ask the child to spell the word "cat," all the letters will appear at once in its head rather than one at a time. It leads to faster intuitive connection building. The same concept can be applied to mathematics. If you put the correct number of dots inside of a number the dots are representing, the child will be less likely to count on his fingers and be able to recognize the number as a whole all at once. In reading, it is best encouraged to teach the points and main ideas in the passage visually. Once the connections to the plot are drawn visually, the parent/teacher can pull out one of the connections and ask the child how it is relevant to the beginning and end points of the plot. If they have been paying attention, they will arrive at a different conclusion with the absence of the connection that was taken out.

Now we will take a look at the left brain during the elementary years. In mathematics, the child is more likely to note down patterns in each number's quality. For instance, all multiples of five end with a zero or a five or all multiples of four are even numbers. Left brain thinkers are much more skilled in mixed numbers and fractions than right brain thinkers. Left brain development during these years involves a concept called deliberate practice. In deliberate practice, a child will create a variable based on experience (trial and error) and advance that variable, through many repetitions, to an advanced abstraction. This idea is seen mostly in

sports. For instance, suppose a child is learning how to do a basic handstand. At first the variable they may come up with is weight balance. On the first week they will focus on keeping their arms straight to allow a better supporting base. The next week they will couple this idea with sucking in their gut allowing for even weight distribution between the upper and lower body. By the third week, they will try to extend their feet straight up and kick in an upward direction to loosen the weight on the arms. At the end, they will have advanced the variable of weight balance to a much higher perception than what they started from as a result, succeeding at doing a handstand.

Cheri Fuller, a teacher at the Frisco Independent School District in Frisco, Texas, studied the best learning applications for elementary students when they are at home, away from school. Fuller (2004) says:

Successful students have at least one adult who interacted with them about their writing; took time to let them read their stories, poems, or whatever they'd written aloud; and encouraged them to express themselves on paper. They suggested real reason to do practical writing like making lists (of friends to invite to a party or foods they'd like to eat in the coming week). For math, experiences at home with measuring, learning to set up a simple budget, and counting toys while putting them away on shelves; and for reading, avid young readers tend to come from homes where there's a lot of reading aloud, parents are engaged in their own reading, and interesting books and magazine are available. (p. 45).

The major change in the middle school/high school years is the advent of puberty. Puberty not only changes your body parts and emotions but also thought processes. You start to feel more sensitive and more self conscious and are less inclined to tolerate teasing and criticism. There are much more intense emotions at this phase. Instead of just disliking something, you began to hate it and instead of just liking something, you began to love it. Jealousy turns into super jealousy and sadness becomes total complete depression. Mood swings are also much more present at this lifestage. There are quick switches back and forth between two polar emotions.

Biologically, myelination peaks in adolescence. Myelination is the process where myelin, a dielectric material, forms around the axon part of a neuron allowing higher cognitive functioning of the nervous system. Myelination occurs in the respective brain parts where an individual is strongest. The cells that you don't use die out whereas the ones you do use form stronger neural pathways. At this stage, there is also the existence of a still very immature

frontal cortex which allows for teenagers to engage in risk taking and immature, irrational decision making. This includes engaging in activities such as skateboarding/extreme sports, raves, ecstasy, drugs, alcohol, dating/sex, and car accidents. While we all use both hemispheres of our brain, the decrease in the size of the corpus callosum in the teenage years allows one myelination of a hemisphere to be stronger than the other.

Due to this high peak in neural biological development, the brain is very vulnerable. Drugs and alcohol consumption might not just be affecting them for that night but rather for the next eighty years or so. Corbin (2007) explains why it is easier to get addicted to drugs at this age:

Rapid changes are also noted in the levels of certain other neurotransmitter chemicals such as serotonin and dopamine, which control and regulate the pleasure response in the brain. Alcohol, nicotine, and many other such drugs appear to trigger much of the same response in the brain as these natural neurotransmitters. Consequently, using such drugs during a time period when there are frequent and significant fluctuations in the levels of these neurotransmitter chemicals appears to make teenagers more susceptible and vulnerable to addictions of all types. Addictions that begin in the adolescent years are also significantly more difficult to overcome. (p. 28).

One of the rites of passage in the teenage years is the acquisition of a driver's license at the usual age of sixteen. When this happens, the teenager has to learn directions of the road really fast and adjust accordingly. Left brain thinkers tend to remember directions best by being given a list of where to turn as well as how long each road will be. To them the concept is simple: follow the directions and you'll reach your destination. Right brain thinkers, on the other hand, prefer to remember the roadmap visually in their heads. They will remember streets to turn on by associating common landscapes on those roads such as supermarkets or restaurants. For instance, they would prefer you to say something like "turn right on the street in front of Wal-Mart" rather than "turn right on Las Positas Road." This allows right brain thinkers one advantage: they can memorize directions on a map much faster than left brain thinkers in terms of short term memory. Left brained individuals, however, are less prone to get lost on the road and are much better at memorizing directions for long term memory.

Another critical moment in most teenagers' is their testing of the dating scene's waters. According to Feinstein (2009), teenagers date for a variety of reasons but the main reason is that it gives them an escape:

Dating serves a number of purposes for a teenager. It provides a form of recreation, serves as a source of status and achievement, shows independence from the family, and offers the opportunity to begin experimenting sexually. When we are in love, dopamine is released and the person in love is often more creative, has more endurance, more energy and is more focused and less interested in the broad problems of society. (p. 52).

It is interesting to note however that the hemispheres react differently in a relationship. The left brain is viewed as “the truth” and the right brain is viewed as “what we want to hear.” When faced with a difficult relationship situation, more teenagers tend to lean on the right brain view and say the things that are not necessarily the truth but things that make them feel better or more morally superior than their partner. While many would view this as the wrong thing to do, sometimes in a relationship it can be what the other person is expecting and wanting to hear. Lester (2012) explains the dilemma:

My friends and I are often frustrated by the catch-22 that is associated with telling the truth when we meet some women. You would think telling the truth to a woman would be commended (and expected), but I cannot count the number of times men have been looked upon with scorn because the actual truth was not the “expected truth.” (p. 1).

The world around us is understood by the way we comprehend it. Each stage of life offers us two general ways of comprehension. Which one we choose shows not just who we are at that moment but who we are to become. We will analyze the problem “in the box” and conjure up solutions and ideas “outside of the box.” From infancy to adolescence, the challenges of life are not just controlled mentally but also biologically and physically as well. The nervous system compensates what we need and what we do not need throughout the lifespan. It is important to note that we are never completely left brained and never completely right brained. No matter how much we try to survive the world by running away to just one side, we always return back to where we started...the middle. Both sides are necessary for our survival.

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