Let’s Split: How the Effects of a Hemispherectomy of the Left Side of the Brain Compares to Removal of the Right Side

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Abstract

The “let’s split” project explores how a hemispherectomy of the left side of the brain affects personality and development, compared to removal of the right side of the brain. As a secondary research project, the project will explain the importance of each side of the brain and the common results of a hemispherectomy on either side. A hemispherectomy is a rare treatment in which a cerebral hemisphere of the brain is removed as a result of frequent seizures or epilepsy. While the prognosis of this treatment is good, it remains a last resort. Young patients are able to improve dramatically after the treatment, however there are some complications. Primarily, as a result of the hemispherectomy, patients always suffer from paralysis on the side of the body opposite from the removed hemisphere. Furthermore, the older the patient is, the less likely the brain can transfer over the information from one side of the brain to the other effectively. By studying these issues, however, this project can discover how the issues correlate with the right or left side of the brain respectively. With this information, neurologists and other healthcare professionals may be able to increase the quality of healthcare delivery for these patients.

Keywords: [hemispherectomy, correlate, cerebral, paralysis, epilepsy]
A hemispherectomy is a surgery that is defined to be the removal of part or all of a hemisphere of the brain. It has been used to treat patients with severe epileptic seizures. There are two types of hemispherectomy: functional and anatomic. The functional hemispherectomy is where only the small sections causing seizures are removed, and the remaining brain tissue is disconnected. The blood loss is less therefore most neurosurgeons prefer this method. The anatomic hemispherectomy is where the full hemisphere of the brain is removed, resulting in a risk of high blood loss. Though both procedures are extreme, the outcomes of the two hemispherectomies are similar and effective. These two different types of hemispherectomies affect the variables of what we researched. Different types of removals of the brain will affect the overall analysis we are comparing from the right side of the brain, to the left.

Another major variable of the outcomes of the procedure is the age of the patient. In younger patients, the effects of a hemispherectomy are less exaggerated as opposed to mature a brain. Regardless of the hemisphere removed, there is little to no variance in general cognitive abilities such as verbal and nonverbal communication. While it is true that getting a hemispherectomy as an adult can increase intelligence post-procedure more than having it earlier in life, an early hemispherectomy has a higher possibility to decrease the frequency of seizures in epileptic patients. An early hemispherectomy is easier to heal from, as well, due to brain plasticity. This is the ability of the brain to heal itself after injury or damage due to surgery.

Before beginning, we must understand the difference between the two sides and the cognitive development that happens within either side. The left side of the brain is what controls language, verbal memory, and core studies, such as reading, writing, and math. The right side of
the brain, on the other hand, is considered to be the very creative side of the brain is because it recognizes colors and images. It is associated with visual perceptions, understanding music, and recognizing faces.

A common theory when it comes down to the left and right brain is that very artistic people are usually left handed, and use more of the right side of their brains. That is, shockingly to most, a myth. While we may use each side at different times, we all use both sides of our brain equally. This would make sense, in theory, because the hemispheres of our brain control the muscles of our body in symmetry. For instance, our left brain would control our right hand, arm, leg, and so on, while our right brain would control the left side of our body.

This procedure has always been a study for the psychological world. Researchers in the past studied hemispherectomies of the brain used to study it by performing a surgery splitting it by the corpus callosum, which connects the two sides of the brain to each other. They studied these “split-brain patients” and watched their progress and cognitive ability from there. One thing that this study showed the researchers came from a test where these split brain patients had to conjure up names for different objects. They had a difficult time thinking of names for things processed by the right side of the brain, but could complete this easily with words processed on the left side of the brain. This is how it came to be theorized that the left side of the brain controls language. Although each side is especially good at recognizing something in particular, or completing a certain function, it has also been discovered that people are even more successful when the two halves work together. Alone, they can do the same things, but not as efficiently.

As previously hypothesized, the left and right hemispherectomies have an effect on the brain as well as the entirety of the body. Primarily, when the left hemisphere is surgically removed, the performance of general cognitive abilities diminished such as verbal
communication and the use of one's memory. Moreover, the patient would also lose the ability to maneuver the right side of the body, including the hand, arm, leg, and foot, due to the loss of the influence of the left brain. On the other hand, if the right hemisphere of the brain were removed, it is believed that there are no permanent effects other than the paralysis of the left side of the body. Specifically, this is the reason why right hemispherectomies are more common as compared to the left. There are a few cognitive effects such as a deficit of nonverbal communication and poor identification skills.
References

Primary Resources


Gainotti, Guido. "Unconscious processing of emotions and the right hemisphere."


Secondary Resources


Let’s Split

Appendix A

Participation Agreement

Date: _02/06/17__  

**Due: February 3, 2017 @ 11:59 p.m.**

Name: Jourdan Lawrence, Brylea Huit, and Thomas Woodall (Student Mentor)

Classes participating in the URHSS project include students from the Central Park Campus (CPC) Human Anatomy and Physiology II Classes taught by Professors R. Brown & R. Cravo along with students from the Health Sciences Academy (HSA) classes taught by Professors K. Newby & T. Sanchez

Human Biological Organ(s) interested in: Brain

Interest in medicine or research: How a hemispherectomy of the left side of the brain affects personality and development, compared to removal of the right side of the brain.

Additional information: N/A

Style of communication/presentation preferred: Trifold Poster and an animated video presentation

Agreement to participate with assigned partner in the Premier Workshop: Undergraduate Research Health Sciences Symposium.

I attest I will meet all requirement of the assignment and present on March 31, 2017.
I, Jourdan Lawrence, give my permission for Brylea Huit and Thomas Woodall to use the “let’s split” Symposium (URHSS) workshop project for educational purposes only. Each of the three named individuals have permission to utilize this intellectual material insofar as they each provide proper attribution to all parties involved.
Appendix C

Let’s Split

Proposal Outline

Topic:

- How a hemispherectomy of the left side of the brain affects personality and development, compared to removal of the right side of the brain.

Mode of Delivery:

- Poster board

Role Division:

- Brylea: Right side of brain, characteristics, and results of hemispherectomy.
- Jourdan: Left side of brain, characteristics, and results of hemispherectomy.
- Thomas: Mentor us; help us strengthen project ideas and work.

Health Care Delivery:

- With this information, neurologists and other healthcare professionals may be able to increase the quality of healthcare delivery for these patients.
Let’s Split

Appendix D

Proposal

The Let’s Split project is a secondary research project that explains the difference between the effects of a left or right hemispherectomy. A hemispherectomy is a rare treatment in which a cerebral hemisphere of the brain is removed as a result of frequent seizures or epilepsy.

There are two types of hemispherectomy: Functional and anatomic. The functional hemispherectomy is where only the small sections causing seizures are removed, and the remaining brain tissue is disconnected. The blood loss is less therefore most neurosurgeons prefer this method. The anatomic hemispherectomy is where the full hemisphere of the brain is removed, resulting in a risk of high blood loss. Though both procedures are extreme, the outcomes of the two hemispherectomies are similar and effective.

The role division is as follows. Jourdan is responsible for research on the characteristics and procedure effects of the left side of the brain. Brylea is responsible for this of the right side of the brain, and gathering supplies. Both researchers will be gathering separate information and assisting with the essay and poster board. Our mentor, Thomas, is responsible for making sure our sources are scholarly, information accurate, and all papers strong. Together, we are responsible for effective communication to succeed in this undergraduate research project. The purpose of the “Let's Split!” project and other studies done by neurosurgeons is to study the effects of each type of hemispherectomy to deliver more effective care to patients in need of a procedure like this. This project will be presented through the use of a trifold poster board as well as video animation.
Primary Resources


The source explains the long term results of a hemispherectomy. Unlike the other sources, it claims that those requiring hemispherectomies in their adult years had a higher postsurgical intelligence as opposed to those requiring a hemispherectomy in their childhood years. However, early hemispherectomies have a higher possibility to decrease the frequency of seizures in epileptic patients.


'Remarkably, few other impacts are seen. If the left side of the brain is taken out, "most people have problems with their speech, but it used to be thought that if you took that side out after age two, you'd never talk again, and we've proven that untrue," Freeman says. "The younger a person is when they undergo hemispherectomy, the less disability you have in talking. Where on the right side of the brain speech is transferred to and what it displaces is something nobody has really worked out."(Choi, 2007)'. In the both a right and left hemispherectomy, the patient loses use of the hand opposite the side on the removed hemisphere as well as vision on that side is lost.

This reference shows us a lot about the left brain and the right brain. It is one of the few resources that talks a lot about the specific effects of taking out the left side of the brain. It explains common theories and studies that support our research, such as split brain patients who have a damaged or removed corpus callosum, and the effects of this.


In four experiments tested, they discovered that the left hemisphere was stronger than the right when it comes to simple calculation. It discovered that with addition and subtraction, the right hemisphere could approximate the answer even if it doesn't know how to do it mentally.

Gainotti, Guido. "Unconscious processing of emotions and the right hemisphere."


In order to learn what would happen to take out the right hemisphere, we have to find out a more specific description of its functions. This source researched the unconscious emotions due to the right hemisphere of the brain. After lots of studies and surveys, they found out that the unconscious emotions come from the right side of the brain. The studies include surveying the different parts of emotion and how people feel them.

Lettori, D., Battaglia, D., Sacco, A., Veredice, C., Chieffo, D., Massimi, L., ... & Di Rocco, C.

This resource explains the follow up results of nineteen children after early hemispherectomies. After 2-11 years of observation, the percentage of a seizure-free outcome was about 73.7%. Furthermore, there was also a lack of developmental deterioration as a result of the treatment.


This source provides information over the results of hemispherectomies in young patients. When the left hemisphere of the brain was removed, the results suggest “substantial language deficits” as well as “limitations in short-term memory in verbal intelligence.”


This source gives us critical insight on the myths that we are raised to believe, when it comes down to the brain. These include theories, or myths, such as the “smarter people use more left brain” and “artists use more right brain” and that one side controls something all on its own, while in reality it gets help from its other half to perform efficiently.

This source gives us more about functional hemispherectomies and when it could be needed for a patient with epileptic seizures. Parts of the brain that were causing these seizures have been removed in order to let the patient improve. Although no research had been done on the long term effects of this procedure, it does reduce the risk of mortality.


The left hemisphere of the brain is associated with language, verbal memory, reading, writing and arithmetic. It also controls the sensation and movement of the right side of the body. The right side, however, deals mainly with interpreting what was seen and touched as well as non-verbal
Let’s Split

Appendix E-2

Secondary Resources


The source explains the noticeable changes in ability after a left and right hemispherectomy respectively. This information will aid in the distinction between the left and right hemispheres and their functions as a result of the procedure. It also explains that age is a major factor in the transference of certain skills designated to each hemisphere.


While antiepileptic drugs have been used to help epileptic seizures for this almost 15 year old patient for 10 years, its effects have deteriorated and the use of a hemispherectomy is required. After 5 years of recovery and monitoring of this patient, neurosurgeons have discovered a great improvement in cognitive development and ability to do many skills. This study shows us that brain plasticity is not only prominent in young children. Brain Plasticity is the ability to recover and brain tissue and nerves to regenerate and heal.

Elger, Christian E., Christoph Helmstaedter, and Martin Kurthen. "Chronic epilepsy and
A functional hemispherectomy is mainly for anyone who is severely epileptic and maybe the medications don’t work for them. This can be a last case solution for some people. Some of the more serious side effects include weakness of the muscles of the affected side, loss of words and ability to remember them.


This source is an article about a split brain patient. Split brain is a procedure used to study the left and right side of the brain, connected by the corpus callosum. The corpus callosum connects the two hemispheres. When this is damages, or absent, it is considered “split brain”. This helps us to understand what parts of the hemispheres are connected to each other, because when one side is missing, problems with these connected parts are sure to arise.


The hemispheres of the brain relates symmetrically with the sides of the body. The right hemisphere controls the left side of the body, and the left hemisphere controls the right side of the body. Right hemisphere. While it is a myth that more creative people use more of the right brain than the left brain, the right hemisphere is responsible for creativity and artistic skills. Both hemispheres are connected by the Corpus Callosum, but have very different functions.

This source explains the effects of a hemispherectomy on the dominant and the non-dominant hemispheres. In adults, especially, it is more common as well as preferable to remove the non-dominant hemisphere of the brain as supposed to the dominant. The dominant hemisphere of the brain, usually the left side, allows the person to use higher mental functions to communicate orally and through written texts.


This source provides an explanation of the intellectual effects of a hemispherectomy in both adult patients as well as in children. Through this study, it is seen that adult patients have trouble adjusting to the removal of left hemisphere and as a result have a decreased intellect with speech disturbance. When the right hemisphere is removed, however, the effects seen portrayed ‘defects in judgment’.
Let’s Split

Appendix F

Change Log

<table>
<thead>
<tr>
<th>Date</th>
<th>Changes Made</th>
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<tr>
<td>2/15/17</td>
<td>&gt; (Proposal) The Let’s Split project is a secondary research project that explains the difference between the effects of a left or right hemispherectomy. A hemispherectomy is a rare treatment in which a cerebral hemisphere of the brain is removed as a result of frequent seizures or epilepsy. There are two types of hemispherectomy: Functional and anatomic. The functional hemispherectomy is where only the small sections causing seizures are removed, and the remaining brain tissue is disconnected. The blood loss is less therefore most neurosurgeons prefer this method. The anatomic hemispherectomy is where the full hemisphere of the brain is removed, resulting in a risk of high blood loss. Though both procedures are extreme, the outcomes of the two hemispherectomies are similar and effective. The role division is as follows. Jourdan is responsible for research on the characteristics and procedure effects of the left side of the brain. <strong>Brylea is responsible for this of the right side of the brain, and gathering supplies.</strong> (I would rephrase “responsible for this” or don’t abbreviate at all… does not read well. IE “As Brylea is for the right-side as well as gathering supplies… OR And Brylea is responsible for research on the characteristics and procedure effects of the right...</td>
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side of the brain as well as gathering supplies…”) Both researchers will be gathering separate information and assisting with the essay and poster board. Our mentor, Thomas, is responsible for making sure our sources are scholarly, information accurate, and all papers strong. Together, we are responsible for effective communication to succeed in this undergraduate research project. The purpose of the (I do not this these words are needed, I would remove. Its implied with the purpose is, so you do not need the purpose and the purpose. ;-) ) “Let's Split!” project and other studies done by neurosurgeons is to study the effects of each type of hemispherectomy to deliver more effective care to patients in need of a procedure like this. (I would rephrase to keep from ending the sentence with “this” IE “In need of such procedures…”) This project will be presented through the use of a trifold poster board as well as video animation.

>(Annotated Bibliography) Annotated Bibliography


The source explains the long term (a “-“ needs to be added between long tem.) results of a hemispherectomy. Unlike the other sources, it claims that those requiring hemispherectomies in their adult years had a higher postsurgical intelligence as opposed to those requiring a hemispherectomy in their childhood years. However, early hemispherectomies have a higher possibility to decrease
the frequency of seizures in epileptic patients.


‘Remarkably, few other impacts are seen. If the left side of the brain is taken out, "most people have problems with their speech, but it used to be thought that if you took that side out after age two, you'd never talk again, and we've proven that untrue," Freeman says. "The younger a person is when they undergo hemispherectomy, the less disability you have in talking. Where on the right side of the brain speech is transferred to and what it displaces is something nobody has really worked out."(Choi, 2007)’. (The period should go before the quotation marks and parentheses. “.”) In the both a right and left hemispherectomy, the patient loses use of the hand opposite the side on the removed hemisphere as well as vision on that side is lost. (I would rephrase, it does not read well.)


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would remove, you do not need to say left and right each time you refer to a hemispherectomy. Or change the “and” between left and right to “or”)
hemispherectomy respectively. This information will aid in the distinction between the left and right hemispheres and their functions as a result of the procedure. It also explains that age is a major factor in the transference of certain skills designated to each hemisphere.


While antiepileptic drugs have been used to help epileptic seizures for this almost 15 year old (hyphens need to be added between 15-year-old.) patient for 10 years, its effects have deteriorated and the use of a hemispherectomy is required. After 5 years of recovery and monitoring of this patient, neurosurgeons have discovered a great improvement in cognitive development and ability to do (replace with “in” or rephrase. Ability implies doing) many skills. This study shows us that brain plasticity is not only prominent in young children. Brain Plasticity is the ability to recover and brain tissue and nerves to regenerate and heal. (I would rephrase or remove, its abrupt and not necessarily needed. If the reader does not know what brain plasticity is they can Google, your research is on Hemispherectomys not specifically brain plasticity.)

A functional hemispherectomy is mainly for anyone who is severely epileptic and maybe the medications don’t work for them. This can be a last case solution for some people. Some of the more serious side effects include weakness of the muscles of the affected side, loss of words and ability to remember them. (use a stronger word like vocabulary, and maybe rephrase the last part IE “and the ability to recall.


This source is an article about a split brain (hyphen needed) patient. Split brain is a procedure used to study the left and right side of the brain, connected by the corpus callosum. (Rephrase/clarification, is the procedure a study or a treatment or both?) The corpus callosum connects the two hemispheres. When this is damages, or absent, it is considered “split brain”. (I think this would read better if combined into one sentence. And add a hyphen to split-brain.) This helps us to understand what parts of the hemispheres are connected to each other, because when one side is missing, problems with these connected parts are sure to arise.
| (rephrase, I think this could read better and make more sense if rephrased. IE “
| This helps us understand the correlation between the left and right side of the brain the key roll the corpus callosum plays, with its many complicated connections… I know you can do better than this example, I’m just writing examples to help you better understand where I am coming from”
| The left hemisphere of the brain is associated with language, verbal (needs a space between these words) memory, reading, writing and arithmetic. It also controls the sensation and movement of the right side of the body. The right side, however, deals mainly with interpreting what was seen and touched as well as non-verbal
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Let's Split

Written Research

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development that happens within either side. The left side of the brain is what controls language, verbal memory, and core studies, such as reading, writing, and math. The left side of the brain can be remembered this way: "Left Logic." The right side of the brain, on the other hand, is considered to be the creative side of the brain because it is the side that recognizes colors and images. It is associated with visual perceptions, understanding music, and recognizing faces.

A common theory when it comes down to the left and right brain is that very artistic people are usually left handed, and use more of the right side of their brains. That is, shockingly to most, a myth. While we may use each side at different times, we all use both sides of our brain equally. This would make sense, in theory, because the hemispheres of our brain control the muscles of our body in symmetry. For instance, our left brain would control our right hand, arm, leg, and so on. Our right brain would control the left side of our body.

This has always been a study for the psychological world. They used to study it by performing a surgery splitting the brain by the corpus callosum, which connects the two sides of the brain to each other. They studied these "split-brain patients" and watched their progress and cognitive ability from there. One thing that this study showed the researchers came from a test where these split brain patients had to conjure up names for different objects. They had a difficult time thinking of names for things processed by the right side of the brain, but could complete this easily with words processed on the left side of the brain. This is how it came to be theorized that the left side of the brain controls language. Although each side is especially good at recognizing something in particular, or completing a certain function, it has also been discovered that people are even more successful when the two halves work together. Alone, they can do the same things, but not as efficiently.