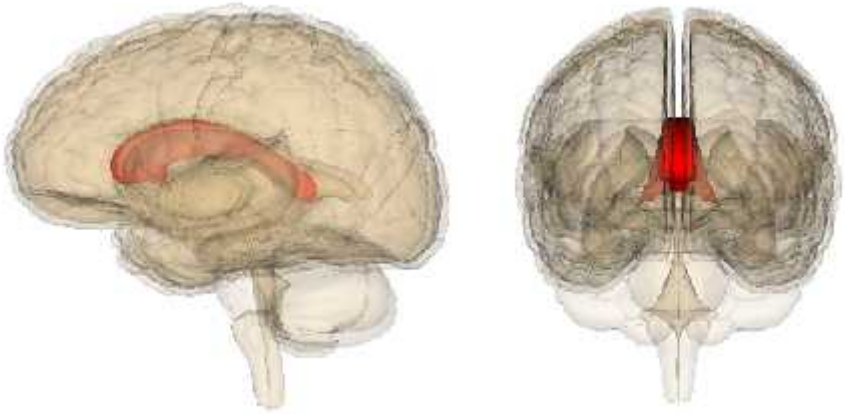
SPLIT BRAIN: TWO INDEPENDENT MINDS

"In my mind I am able to formulate thoughtful language, but what emerges from my mouth is often rote and repetitious."

~ Meaghan Buckley

Seven years after the publication of The Man with a Shattered World, in June 1979, a woman by the name of Vicky was undergoing brain surgery to split the two sides of her brain in half. The procedure, that lasted nearly 10 hours, was being performed in order to stop the terrible seizures that Vicky had suffered from since she was 16.



The doctors surgically sliced through the thick band of neural fibers that make up the corpus callosum, the structure that links the two hemispheres of her brain. This procedure may sound drastic nowadays, but at the time this split-brain operation, known as a corpus callostomy, was accepted practice. It was pioneered by Dr. Roger Sperry at the California Institute of Technology in the late 1950s.

Vicky's procedure was a success in that it stopped her epileptic seizures but, after she recovered, she discovered that she could no longer write. She could still speak and understand spoken language, but she could not write anything - not even her name.

This surprised her doctors because, up until that time they had assumed that all the language functions - speech, reading and writing - were all grouped together and located in the left brain.

Intrigued by this discovery, Dr. Michael Gazzaniga, head of the cognitive neuroscience program of Dartmouth College, tried an experiment.

Vicky or V.J (as she was referred to in the study) was put in front of a screen onto which words -- nouns, verbs and adjectives -- were flashed to each side of her brain independently. Her hands rested below the screen, shielded so that her eyes could not see them. Each hand held a pen over a tablet of paper. 21

When a word was shown to the left hemisphere -- the one with spoken language -- she could read the word and spell it out loud, but she could not write it down. Attempts at writing were illegible.

When words were shown to the right hemisphere, Vicky was stumped. She would look at the word and say, "Um, I think there's something there but I can't tell what it is." She could not read, speak or spell the words. But amazingly, she could write them down. 22

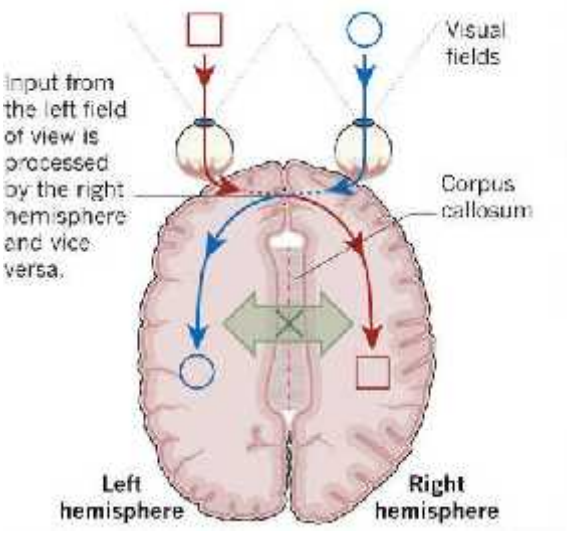
"She'd pick up the pencil and boom, write out the words, no problem," Dr. Gazzaniga said. "It's just astounding. Here is the executive writing system acting outside the system that can actually speak with all the usual phonological mechanisms." 23

The researchers concluded that Vicky's (V.J.s) left hemisphere controlled her speech and reading, but not writing. Similar tests suggested that her right hemisphere controlled writing, but not reading, speech, or the neural functions that allow people to find the right word for an object. 24

In effect, what they discovered when they severed Vicky's brain to control her seizures, was that she was left with two separate brains, each one having abilities of its own, but neither one able to connect with the other to offer a complete, comprehensive picture. (This makes sense since the integrating corpus callosum was severed.)

These corpus callostomy studies were groundbreaking, because they gave evidence of two independently operating brains! A left and a right.

To get how this would work you have to understand that the brain is basically cross-wired with the body, so that the right hemisphere controls the left side of the body and visa versa.



The split brain studies showed that if an object was placed in the left hand (processed by the right hemisphere) it could be used but not named; whereas an object placed in the right hand (processed by the left hemisphere) could be named and described immediately. [25] It was astounding!

Meaghan is a fascinating example of this right-left brain disconnect - even though her corpus callosum is not technically split. She will often tell us one thing verbally and respond quite differently in writing. Her verbal responses are quick and rote. If shown a picture of something familiar, she will have no difficulty naming it verbally. But when we go beyond the familiar, the differences become clear.

The other day I put on a pair of her sun glasses that were lying on the table in front of us, looked at her and asked: What do you see?

She promptly answered: "glasses."

I then asked her to type her response. She typed:

"Mommy wearing my sun glasses."

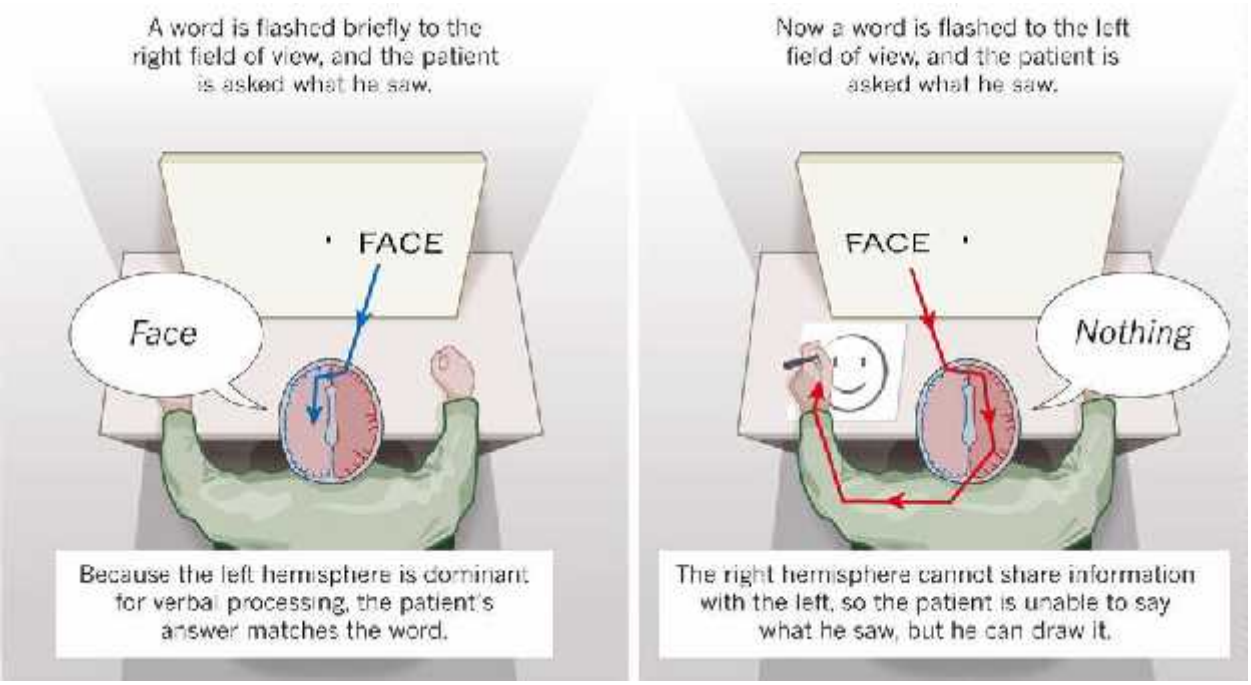
There was a blue and white decorative ceramic vase in the shape of a fish on the table. I asked her what it was.

She promptly answered: "milk."

When I asked her to type her response. She typed:

"A fish vase made out of clay."

It really is remarkable the difference in the two responses, and I could give hundreds more examples. The thing is, this dichotomy of answers does not faze her. She knows that her verbal answers are mostly "nonsense" (her term) and she says to ignore them. Unfortunately, many people don't. Many people think that they are all she is capable of. I'm sure she is not the only one caught in this trap.



Gazzaniga and Sperry found that several patients who had undergone a complete callostomy suffered from a disconnection syndrome. In patients with a disconnection syndrome the right hemisphere, which controls the left hand and foot, acts independently of the left hemisphere and the person's ability to make rational decisions. This can give rise to a kind of split personality, in which the left hemisphere give orders that reflect the person's rational goals, whereas the right hemisphere issues conflicting demands that reveal hidden desires. 26

One of Gazzaniga and Sperry's child participants, Paul S, had a fully functional language center in both hemispheres. This allowed the researchers to question each side of the brain. When they asked the right side what their patient wanted to be when he grew up, he replied "an automobile racer." When they posed the same question to the left, however, he responded "a draftsman." Another patient pulled down his pants with the left hand and back up with the right in a continuing struggle. On a different occasion, this same patient's left

hand made an attempt to strike his unsuspecting wife as his right hand grabbed the villainous limb to stop it. [27]

Through studies of this [split brain] group, neuroscientists now know that the healthy brain can look like two markedly different machines, cabled together and exchanging a torrent of data. But when the primary cable is severed, information — a word, an object, a picture — presented to one hemisphere goes unnoticed in the other. [28]

There are clearly, in some people, separate areas in the brain for oral language and written language and it is entirely possible to communicate one thing vocally and entirely different thing verbally.

> The implications of this are very important because, if there is a disconnect between the right and left brains in autism (a problem with the wiring of their corpus callosum) and visual information of forms and objects is processed on one side and writing on the other, this could result in selective aphasia. Meaning, they could look at a picture or object presented to them and know what it was, even be able to say what it was, but NOT be able to write or type what it was because the connecting network between the two sides of their brain that would enable the object recognition side to communicate with the writing side was not doing its job. This could work in reverse as well, where they would write what the object was but not speak it's name.
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> The shift in language processing from one side of the brain to the other has been proposed before for ASD children, but I think that Meaghan and others like her have language processing capabilities on both sides of their brain. This would help to explain the symmetry of their brains. It would also explain her two separate piles of words and why there is such a huge discrepancy in the language she writes and the language she speaks. She is using two completely different brains. Typically, these two sides of the brain would act together, but in autism, since the neural connecting wires of the corpus collosum are either jumbled or inefficient, the two sides of the brain operate essentially independently, much like the brains of split brain or severely brain injured persons.

Today, we can get a much better view of brain function by using imaging techniques, especially magnetic resonance imaging (MRI), a safe procedure that uses magnetic fields to take pictures of the brain. Using MRI to measure brain function is called functional MRI (fMRI), which detects signals from magnetic properties of blood in vessels supplying oxygen to brain cells. [29]

These sophisticated imaging tools can show us just about anything we want to see when it comes to brain activity. **But what imaging scans can't show us is the human story behind the technology.** They can't show us, for example, a person

who may not be able to read aloud a word when it's presented to the right hemisphere, but who has no difficulty in pointing to the appropriate drawing and either writing or typing the word.

"This gives you a sense of the right hemisphere's ability to read, even if it can't access the motor system to produce speech," Richard Ivry, director of the Institute of Cognitive and Brain Sciences at the University of California says. "Imaging is very good for telling you where something happens," he adds, "whereas patient work can tell you how something happens."[30]

In fact, it is possible to have no verbal language at all and still have the ability to write eloquently and intelligently. Why? Because we have two sides to our brain, each of which can work either together or independently, to a greater or lesser degree. I believe this is what is happening in some autistic brains.

"With split-brain patients, you can see the impact of disconnecting a huge portion of that network, but without damage to any particular modules," says Michael Miller, a psychologist at the University of California, Santa Barbara. [31]

I believe this separation of biology and ability is key if we are going to truly get to the bottom of what makes one human being different from another. It is all too easy to assume a disability if there is no understanding of exactly how each small idiosyncrasy in the brain alters a person's perception and ability.

> I have autism. I am also very intelligent. These two things are completely compatible. My autism has no bearing on my intelligence. Autism makes it difficult to control my body but my mind functions fine. The problem is the disconnect between my mind and my body.
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> My mind tells my body one thing, my body does what it wants. So in my mind I am able to formulate thoughtful language, but what emerges from my mouth is often rote and repetitious.