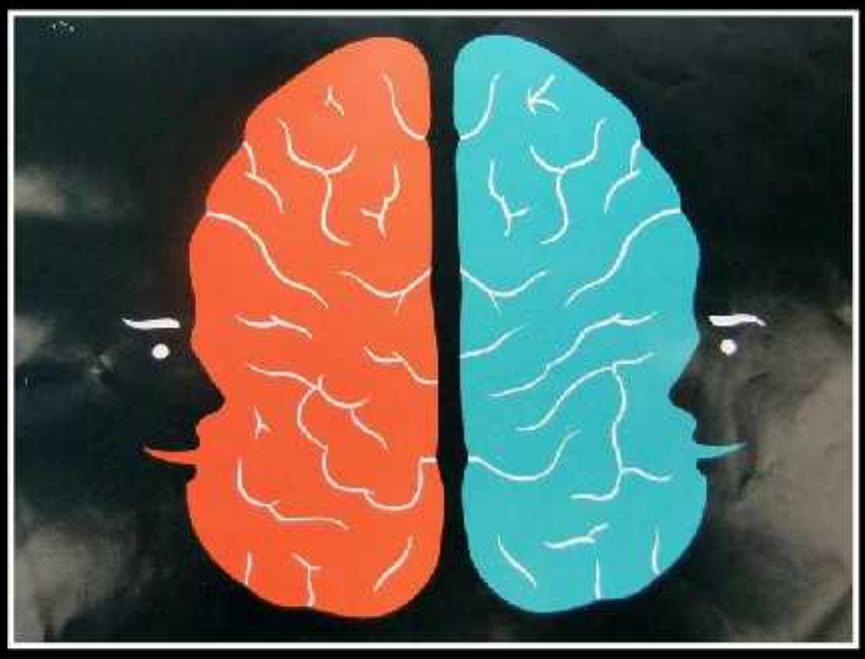
LANGUAGE CENTERS ON BOTH SIDES OF THE BRAIN



"I can recall written words but my auditory memory is limited to rehearsed phrases. The word piles are different."

~ Meaghan Buckley

Kim Peek was born on November 11, 1951 with an enlarged head, a malformed cerebellum and the absence of a corpus callosum in his brain. 32 That's what he didn't have.

What he did have was a computer-like mind, which allowed him to have word-for-word memory of over 9000 books - including the Bible, note-for-note recall of classical music, encyclopedic knowledge of all US zip codes, all roads in the US and Canada, world and American history, sports, movies, geography, church history, the space program and more. 32

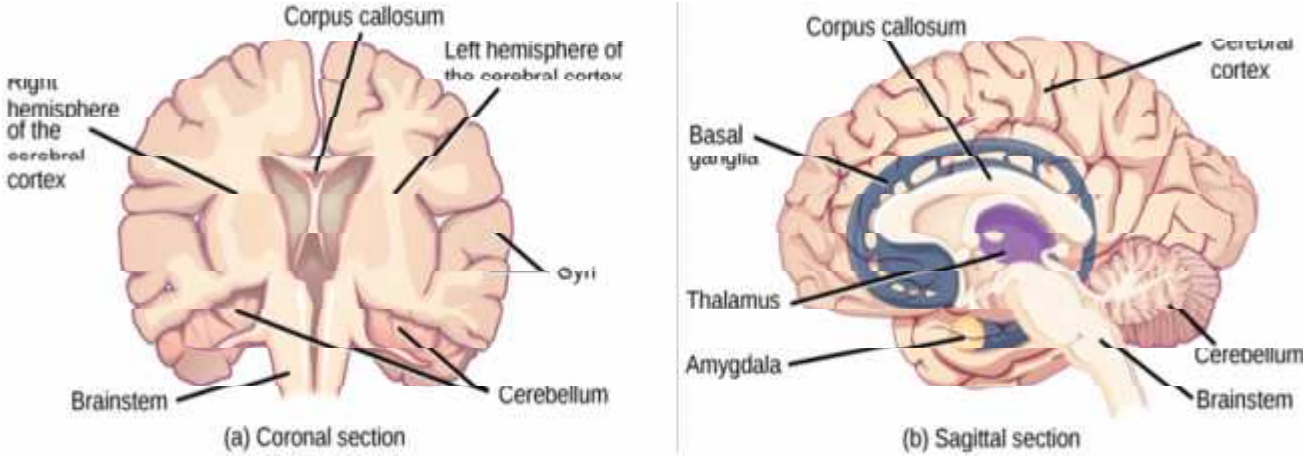
Peek could read the pages of a book in 8-10 seconds and retain the information. He was able to split his vision, so that each eye scanned its corresponding page in a book, allowing him to process both pages at once. The reason Peek could read so much information so fast was because he had developed language areas in both hemispheres of his brain. 33

Reading typically involves a side to side, back and forth transfer of information before the brain can process what is being read. In Peek's case, since there was

no corpus callosum, there was no transfer ability. This led to the development of dual language centers and his extremely fast reading capabilities. 34

> Meaghan also has this instant reading and comprehension ability. All she has to do is look at a written page for a few seconds to absorb its contents and she has perfect recall of everything she's read. So I assume she too is bypassing the traditional right brain-left brain transfer process.

Despite all these abilities, however, Peek was unable to button his shirt, and he had difficulties performing routine, everyday tasks. If someone just observed him and was unaware of his amazing savant abilities, they might have assumed he was mentally disabled, rather than just differently abled.



individuals born without a corpus callosum, like Peek, have a congenital disorder known as *agenesis*, and many of them have trouble looking at faces and looking at others in the eyes. They also tend to have difficulty in social situations. This makes sense since, without an integrating corpus callosum, they would struggle with self awareness, making social judgments and participating in social interactions difficult. 35

Sounds like people with autism, doesn't it? And there is good reason for this because studies have shown that the corpus callosum in people with autism is atypical. It is either reduced or increased in size. Reduction in size could indicate fewer integrating connections; increase in size could mean more complicated, inefficient connections.

"If efficiency is the goal, you can have efficiency being diminished by the absence of connections, but you can also have efficiency being interrupted by too many overloaded connections," neurologist and founder of the Brain Research Program, Dr. Elliot Sherr says. 36

This lack of exchange of integrating information between the two sides of the brain could easily explain the left brain tendency of people with autism to get more bogged down by detail and have more difficulty separating out the forest from the trees.

> I have an amazing memory for details. I remember all of my toys and all of my educational games in minute detail. You would be surprised at how much information I absorb just existing. Tiny itty bitty details. Every time mom read to us I envisioned the words.

But what about the right side of their brains? If the left side is acting as an independent agent, might not the right side be doing the same? In the past few years, imaging studies have shown that the right hemisphere is heavily involved in the processing of others' emotions, intentions and beliefs — what many scientists have come to understand as the 'theory of mind'. 37

In 2009, researchers presented two split-brain patients with a series of stories, each of which involved either accidental or intentional harm. The aim was to find out whether the patients felt that someone who intends to poison his boss but fails because he mistakes sugar for rat poison, is on equal moral ground with someone who accidentally kills his boss by mistaking rat poison for sugar. (Most people conclude that the former is more morally reprehensible.) 38

The researchers read the stories aloud, which meant that the input was directed to the left language processing hemisphere, and they asked for verbal responses, so that the left hemisphere, guided by the interpreter mechanism, would also create and deliver the response.

So could the split-brain patients make a conventional moral judgment using just one side of the brain? 39

It turns out they couldn't. They thought both scenarios were morally equal, which suggest that both sides of the brain working together are necessary for this type of reasoning task. And that if there is a problem in the connection between the two sides of the brain, then theory of mind might not be happening.

We know it isn't happening in people with autism, so we might assume that the **two sides of the autistic brain are not communicating as they should AND quite possibly each side is operating as an independent entity.**

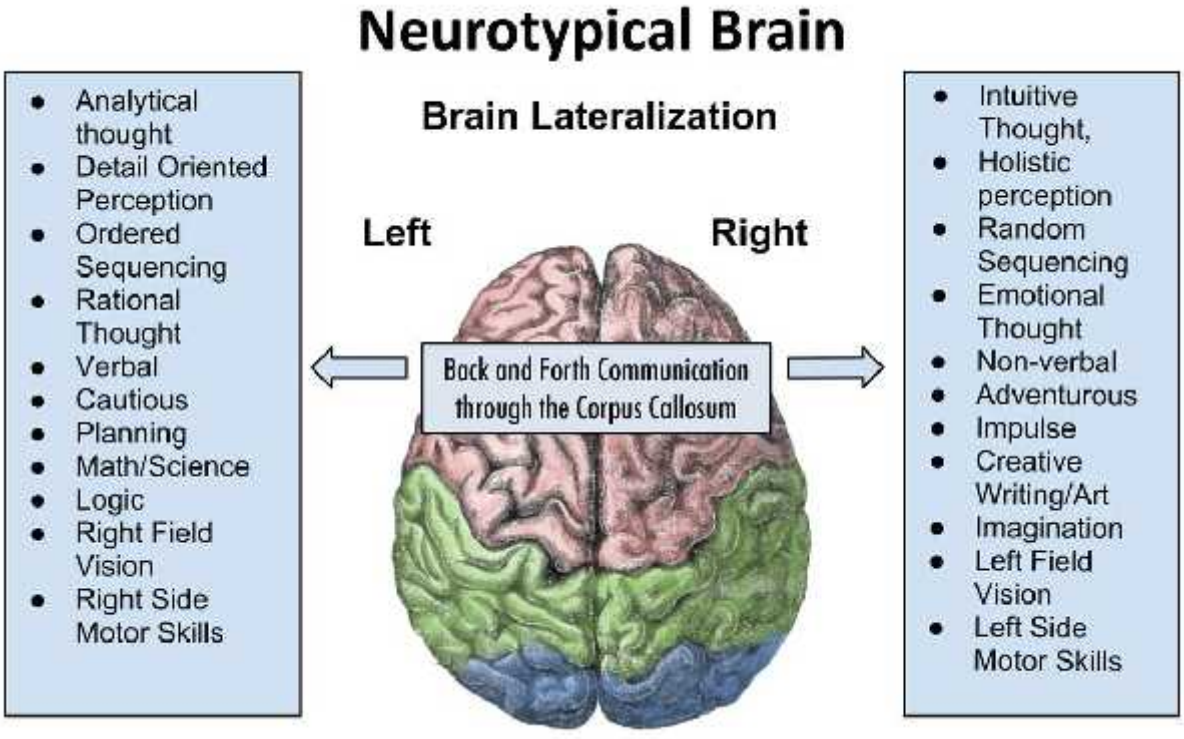
Let's explore this further. Postmortem studies have shown that autistic brains tend to be nice and symmetrical, with both the left and right sides being of equal size, while neurotypical brains tend to be asymmetrical or lopsided. 40

The reason for this could be because, in autism, the two sides of the brain are operating as independent systems, or because the functionality of each side is better balanced (i.e. there are language regions in both sides).

Functional MRI (fMRI) testing with young children with ASD found that when they listened to a bedtime story they displayed more (receptive language) activity on the right side of the cerebrum (in their frontal and temporal lobes) than neurotypical controls, who displayed more activity on the left side.

The 2007 study concluded that toddlers with autism might be on a deviant developmental trajectory characterized by a greater recruitment of right hemisphere regions during speech perception. 41

We now know that the stereotype of "right brained" and "left brained" people is false. Our understanding of the brain's complexity has shown us that there are just too many discordant variables. But still, most of us tend have dominant sides. Sides that react faster, with smoother, more coordinated sensorimotor control. 42



For most of us righties, our left hemisphere typically has a greater cell-packing density and its neural links are more tightly connected, primarily due to the fact that the language speaking and processing capabilities that we use all the time are hardwired on the left.

This isn't true for left-handers, however. Their brains tend to be much more symmetrical and balanced than those of right-handers, and the size differences between the hemispheres less pronounced. Almost like autistic brains. 43

What I am getting at here is that perhaps some people with autism are mentally ambidextrous and their brains exhibit what British psychologist Chris McManus calls "random cerebral variation." He says, even in doing everyday tasks left-handers and mixed-handers tend to exhibit more varied, unpredictable and diffuse cerebral activity than right-handers. 44

Turns out, there really is not a hard and fast rule for brain wiring, especially when it comes to language.

Remember Dr. Gazzaniga's amazement at his split-brain patient Vicky's ability to write what she couldn't speak. "It's just astounding. Here is the executive writing system acting outside the system that can actually speak, with all the usual phonological mechanisms."45

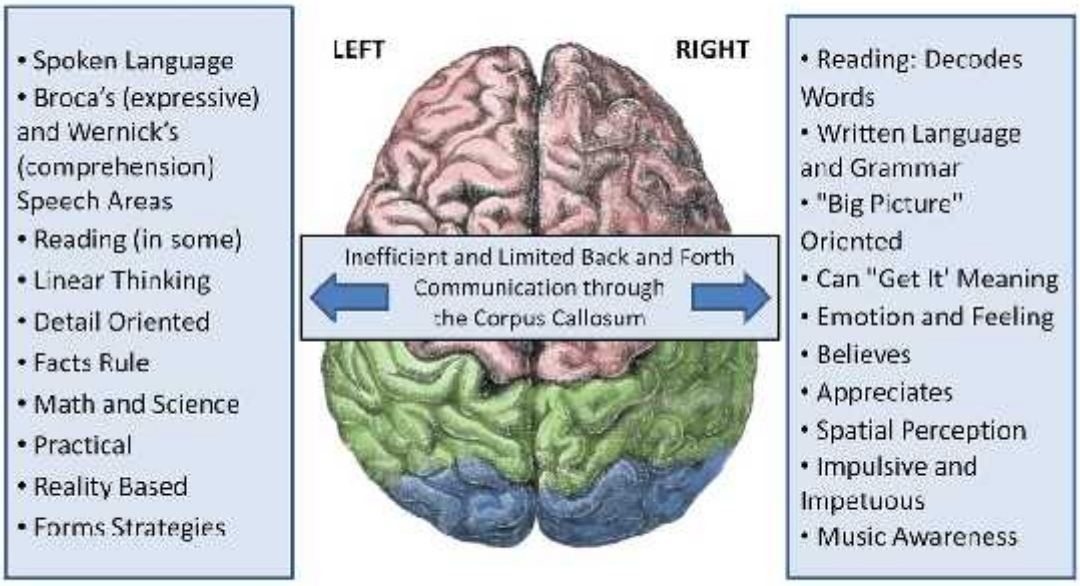
"That talking is in the left and writing in the right side of the brain in this woman is "really fascinating," said Dr. Steven Pinker, a linguist at MIT. "It suggests that reading and writing arose separately from spoken language and may be wired up in the brain wherever there are "spare areas."46

In point of fact, spoken language began about 100,000 years ago, whereas reading and writing evolved only a few thousand years ago so they are relatively new on the evolutionary timeline. Unlike speech, they are not hardwired into the brain as yet.

This means that while oral speech has been wired into established regions in the left hemispheres of our brains, reading and writing functions could be located anywhere. Theoretically, they could "hop around in your brain and even go from one side of the brain to another." 47

Children with autism, with their symmetrical and deviant brain structure, might well develop language functions in both hemispheres. Or, as Meaghan puts it, two separate piles. The left brain pile for spoken words and the right brain pile for written words. This would explain how she can use language so easily on the one hand and have such difficulty with it on the other.

Autistic Brain Lateralization



Functions More Like a "Split Brain"

Words have always had a special appeal to me. Early in my life I taught myself to read words and to understand them. When I hear words they appear in my brain as spelled out language.

I can hear all the conversations in a room all at once. Everything I hear feels like fat noise bubbles that are sitting at the top of my brain. I can read them and type them but I can not add them to my speech.

My brain is full of piles and piles of words piled up on each other. Written words.

I can recall written words but my auditory memory is limited to rehearsed phrases. The word piles are different. I think in your language but I verbalize in rote responses.

You see my brain has no problem with words and grammar. If language processing stopped at the thought level, I would get an A plus. The breakdown happens when it comes to combining words with sound, motor with sensory.