Are People Left-brained or Right-brained?

One of the most prevalent neuromyths out there is the idea that an individual's strong personality traits, like being very creative or highly analytical, are due to the brain preferring one hemisphere over the other. Right-brained people are said to be creative and artistic, while left-brained individuals are considered rational and logical. Of course, sometimes this is spoken with a light-hearted tone that isn't meant to be taken seriously, but the idea remains deeply ingrained in pop culture and among pseudoscientists looking to sell a course or book. But is there something to it? Can people really have a strong dependence on only one half of the brain? Well, let's find out!

At the beginning of the book, we described the anatomy of the brain and discussed the two brain hemispheres. We also talked about different brain lobes and individual regions within the brain, like the hippocampus or prefrontal cortex (PFC). But it's important to remember that most brain regions are actually part of a pair. For example, there is a left and right PFC, or the left amygdala and right amygdala, and so on.

Mostly, we tend not to describe them in terms of left or right and just name the region, assuming that both are involved in whatever task or behaviour we are interested in. But in reality, there are subtle differences between each hemisphere. Brain *lateralisation* refers to behaviours or processes that heavily rely on one hemisphere and not the other. While that does occur, for instance in language processing and a few other functions, a much more accurate way to describe the differences would be to speak in terms of asymmetry because no process in the brain is 100 percent lateralised, and no person is either left-brained or right-brained—spoiler alert!

Early signs of a lateralised brain

The idea of asymmetry in the brain goes back hundreds of years, probably longer. Scientists observed that parts of the cortex looked different or uneven, with subtle differences between each hemisphere. Naturally, questions began to arise about whether those physical differences would translate into differences of the mind.

It wasn't until the 19th century, when anatomists Pierre Broca and Carl Wernicke described a clearer picture of lateralised brain structures for language, that the idea of lateralisation really took off.

In 1861, in a Paris hospital, Broca assessed a patient who could understand speech perfectly well but had trouble speaking, only able to mutter a few words. When the patient died, Broca conducted an autopsy and discovered damage to a region within the inferior frontal gyrus of the left hemisphere. Broca presented his findings and continued to study other patients with similar language deficiencies. For years, he collected evidence and analysed brain injuries affecting speech. Broca's area is known as the region responsible for speech production. In right-handed people, it was always in the left hemisphere. A few years later, Wernicke's area, known to support language comprehension, was also identified in the left hemisphere. More than a century of further investigation has shown how language is predominantly controlled by left hemisphere regions.

Many people point to this lateralisation as evidence that the brain does, in fact, have preferred hemispheres for certain tasks and that personality or types of behaviours are no different. However, while language is heavily lateralised, it doesn't mean the other hemisphere just sits back with a margarita when it's time to talk.

The left hemisphere processes linguistic information that conveys the literal meaning of words and the structure of language, but the right hemisphere deals with metaphors and processes

prosody—the intonations that convey emotional information in speech.

But language is just one aspect of brain function. To find more answers about the myth of left- or right-brained personalities, we need to look further.

Sperry's split-brain experiments

The modern era of brain lateralisation research—and the neuromyths that accompany it—bounded forward due to Roger Sperry's groundbreaking split-brain research in the 1960s and 1970s. From that point on, the scientific world exploded with the possibilities of asymmetry in the brain and what it meant for our understanding of brain function.

Sperry's experiments answered a burning question in neuroscience, which sought to explore the influence and function of the corpus callosum—the bundle of 200 million white matter tracts travelling between the hemispheres and the most prominent highway of communication between brain hemispheres[47].

Even with the corpus callosum severed so that the hemispheres could not communicate, patients still exhibited the ability to perform calculations using the right hemisphere, going against the scientific wisdom of the time that the left hemisphere was solely responsible for arithmetic and logic. Sperry's experiments, using simple tasks to isolate the performance of each hemisphere, demonstrated that functions like arithmetic, reading, writing, spatial perception, and facial processing had some degree of lateralisation, and the search for further asymmetries took on a life of its own. But not before Sperry was awarded the 1981 Nobel Prize in Physiology or Medicine for his revolutionary studies. Before the jubilation had really ended, Sperry, while tremendously proud of his achievements, was quick to caution about overgeneralising their findings. In his 1982 paper he stated[48]:

"Speculations concerning "left-brain" versus "right-brain" functions call for a word of caution. The left–right dichotomy in cognitive mode is an idea with which it is very easy to run wild. Furthermore, in the normal state, the two hemispheres appear to work closely together as a unit, rather than one being turned on while the other idles. Much yet remains to be settled in all these matters"

Sperry maintained that while asymmetries exist within the brain, it functions as a whole unit. The simplistic view that one hemisphere does one thing and the other side does something completely different is not correct. Tasks can be divided within the brain, where they process complementary information, leading to a more integrated and efficient system.

Unfortunately, Sperry's warnings about oversimplifying the brain's division of processes were largely ignored. The idea that one hemisphere was creative and the other logical or analytical was based on some evidence but not enough to claim a fully lateralised division of processes. But it was too late. These ideas became mixed up in popular culture and became an exciting and lucrative way to discuss the brain. The problem, though, is that it just wasn't true.

If you would like to learn a more about Sperry's experiments, then scan the QR code below.

WHY IS THERE ASYMMETRY IN THE BRAIN AT ALL?

If the brain works as a whole unit, communicating through the connected brain circuits to form the connectome, then the next question might be why asymmetry exists in the first place.

Brain processing needs to happen quickly, and it takes a lot of energy. If we are to survive in harsh environments where resources might not be in abundance, the brain needs to be efficient. But if the brain were to perform the same processing of information twice—once for each hemisphere—this redundancy would consume more energy and take a few milliseconds longer. Multiply that by a few billion neurons involved, and the energy costs would become significant.

However, if the brain performed similar but complementary tasks in parallel that, when combined, created a seamless experience or function, then that would be more advantageous to us. In addition, this delegation of complimentary responsibilities may also serve as an insurance policy. If one region suffers damage, then some of the other functions may remain because the other hemisphere can compensate, and through neuroplasticity, full function may also return as the brain attempts to rewire itself.

There are hundreds of studies detailing subtle differences between brain hemispheres for almost everything our brain does, but they are complementary rather than a one-side-does-it-all sort of thing. We know that functions are not solely focused in one hemisphere because studies involving lesions, experiments, and damage have shown the involvement of both sides. Much more debate surrounds dozens more processes and almost every brain region, but they lack compelling and well-designed studies, and the data is often controversial.

Interestingly, the right hemisphere seems to have a larger number of neurons projecting into the left hemisphere, but when we look at the left, it sacrifices sending out lots of neurons to the right side. Instead, there is much more intra-connectivity in the left hemisphere. Of course, both sides have connections all over the brain, but the relative amounts differ between hemispheres. This

might seem odd at first, as we might expect both sides to be reasonably similar in where all their neurons project to, but when we think about language and how much brain real estate that takes up, the differences make sense. That's because, as far as repeatable and well-established differences between the brain hemispheres go, there are really only two processes that have broad agreement: language in the left hemisphere and visuospatial processing (orientation of objects in space) in the right.

However, there is asymmetry, as the right hemisphere seems to be better equipped to process smaller numbers, including zero, whereas the left hemisphere handles larger ones[49].

Some evidence suggests that the difference is due to the different levels of activation of the visual cortex, with larger numbers increasing the activation in the left occipital lobe[50].

But we should also note that the data can sometimes be inconsistent. Some authors argue for left hemisphere dominance with addition and multiplication, but equally, others contend that both hemispheres are required. The variability arises from differences in measurement techniques and tasks that participants are asked to undertake. In reality, while research can be found to support claims of each hemisphere's role in certain aspects of arithmetic, there appears to be an interaction between both hemispheres involving intricate networks, and it is a little too much to describe all of the nuances of each hemisphere here.

The same could be said about the right hemisphere and its inclination toward more creative behaviours. Pop culture references the right hemisphere for all types of musical or artistic personalities, but the reality is much more nuanced than that.

For instance, even when studies attempt to clarify the role of each hemisphere in creativity, they rarely, if ever, use professional artists. It also becomes surprisingly difficult to provide a universal definition of creativity that could be applied through rigorous scientific testing in various laboratory and research groups.

Some authors have suggested that the neuromyth of creativity in the right side of the brain could have been created for a number of reasons[51]. For instance, it may have started based on very real evidence, as the right hemisphere does play a larger role in visuospatial perception. Artists and creative types may lean on this type of ability more so than other cognitive skills, and particularly when drawing scenery or people, they would require a good sense of spatial awareness. But while creative endeavours may draw upon right hemisphere processing, no evidence suggests that artists or non-artists have innate differences in visual mental imagery.

There may also be other reasons why this idea is such a captivating myth. As we have seen, language is lateralised towards the left hemisphere, and with language comes structure, organisation, and logical interpretation of meaning. It may simply be a natural assumption that the opposite characteristics—no rules, imagination, and creative freedom away from strict language—would be in another part of the brain, such as the right hemisphere[51].

While it may be true that each hemisphere contributes unequally to tasks, including creative tasks, the current understanding is that both hemispheres are involved in the creative process. As far as the brain is concerned, creativity is just another aspect of cognition. Like many other processes in the brain, it is a human tendency to give creativity mystical or even divine meaning.

Final thought

The brain works as a whole, using networks that may differ in some respects, but the entire brain is involved in producing a behaviour. Our personalities are not right-brained or left-brained, and while

we may demonstrate asymmetry, it's our experiences and the entirety of our brain that make us who we are.

Humans have so much variation that there will always be subtle differences within the brain in how we process information and the resulting behaviours. Sometimes, these functions are slightly more active in the left hemisphere or the right, or we see no real difference. If you were to take a million artists, poets, and musicians and scan their brains, you would see just as much variation in the data as if you were to image one million mathematicians, political scientists, and Vulcans from *Star Trek Enterprise*. Both hemispheres would be working towards the task at hand, regardless of personality type.

That's not to say that we don't have different personalities or skills that we find easier to access or have an inclination for. Of course, we do. A person can be more creative than analytical or intuitive compared to methodical as we seem to have at least some innate predisposition for certain personality aspects, but in general, it has more to do with environment, lifestyle choices, and passion than it does with which side of your brain is working harder.

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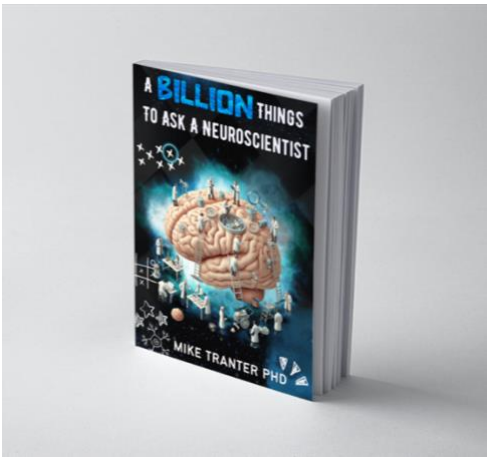

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This is just the beginning. Join me, and let's explore your brain in ways you've never imagined. Let's go!