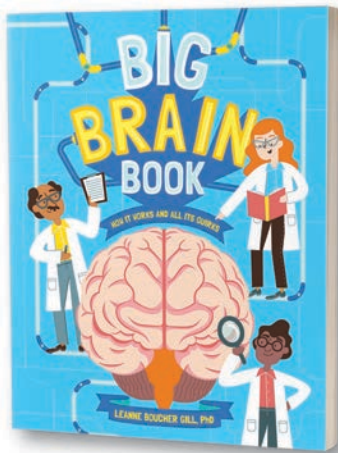




Answers to All Questions Brainy: *Big Brain Book!*



Have you ever wondered why your heart races when you are scared or why you need sleep? Your child might. *Big Brain Book: How It Works and All Its Quirks* by Leanne Boucher Gill, PhD, is a book for kids who are interested in how the brain works!

Read *The Big Brain Book* in order or jump around. Either way, your child will be in awe of the squishy organ between their ears.

Here's a sample of some of the questions answered in *Big Brain Book: How It Works and All Its Quirks*.

Brain Anatomy:

How is my brain different from the brains of other animals?

Most mammals, including humans, and birds have nervous systems set up with the brain located inside the head and the spinal cord in the back that acts as an information highway between the brain and body. In animals other than mammals and birds, nervous systems are a little different. For example, take the giant squid. This cephalopod not only has three hearts, but has a brain shaped like a donut! What is even stranger is that its esophagus goes right through the middle of its donut brain. If the giant squid swallows something really giant, it could potentially damage its brain as the food travels down its esophagus to its stomach.

On land, there are some spiderlings (baby spiders) and very tiny adult spiders whose brains are so large relative to their body size that some of the brains end up in their legs. They're walking brains! On the other hand, cockroaches don't even need a brain to keep walking. If their heads get cut off, the neck seals itself and the cockroach keeps on living, walking around, until it starves to death! Ew!

...In the ocean, when a sea squirt finally latches onto an object, be it a coral, the ocean floor, or a boat, they eat the part of their nervous system that controls their movement, their cerebral ganglia. Ganglia is the scientific term for a bunch of neurons that work together in one area. The sea squirt won't be able to move anymore, but it's a small price to pay for the delicious meal they just ate!

The answer also contains information about differences between humans and other animals in brain structure, brain size and intelligence.

Brain and Body:

Why can't we tickle ourselves?

Skin is the way we get information about the world—how cold or hot it is, how windy the day is, and whether or not something (or someone) is touching us...Throughout your skin, there are specialized receptors for touch called mechanoreceptors.

Different mechanoreceptors respond to different kinds of touch information, including tickling sensations. When these mechanoreceptors are activated by tickling, they send a message to the somatosensory cortex (Chapter 11) that something (or someone) has touched you. Notice that the message sent to the brain is that "you've been touched", not "you've been tickled." In order for you to feel tickled, a lot more needs to happen.

Scientists have discovered that the cerebellum (Chapter 1) may be the part of the brain that prevents us from tickling ourselves. The cerebellum is located at the base of your brain, and one of its many functions is to monitor our movements. It can tell the difference between touches that are expected and those that are unexpected. So, when you reach down to touch your knee, your cerebellum tells you that it was you touching you. You're not surprised because you knew your knee was going to be touched. When someone else touches your knee, your cerebellum did not know that was going to happen, so it's unexpected, and you might laugh because it felt ticklish to you. But it takes more than an unexpected touch to make you feel ticklish.

In order for the unexpected touch to be felt as a tickle, you have to find the situation you are in fun. The brain encodes messages in context! The area of the brain that processes all kinds of pleasant information is called the anterior cingulate cortex (ACC). It is located in the front of the brain and is involved in all sorts of higher order cognitive functions like feeling empathy, making decisions, and controlling one's impulses. The ACC is also the brain area that becomes activated whenever you smell something pleasant, eat something pleasant, touch something pleasant, or if you're in a pleasant situation. It's one of the brain areas that lets you know when things are good or bad.

When Things Go Wrong:

Why do I have to wear a helmet when I play sports?

Your brain is very delicate and has the consistency of Jell-O. Think of carrying a bowl full of Jell-O— it jiggles back and forth against the bowl whenever you move it. Your brain does the same thing. As you are walking and breathing, your brain moves ever so slightly in your skull. This is why your brain is protected by a thick skull (bone) and a thin layer of membranes (meninges) and fluid (blood and cerebral spinal fluid, layered between the meninges) that cushion your brain as it sloshes about. The meninges cover your entire brain and spinal cord. There are three layers of the meninges. The pia mater lies closest to the brain and is Latin for "tender mother." The middle layer is called the arachnoid mater and the layer closest to the skull is called the dura mater. Medical students remember the order of the layers using the acronym PAD (Chapter 4), which is appropriate because the meninges are used to pad the brain.

Most of the time, your skull, PAD, and fluid do a great job of protecting your fragile Jell-O-brain. But if you get hit hard on the head, your brain will strike one side of your head with great force, causing it to bounce back on the other side of your head. It's like a tennis match in there with your brain as the ball. When the brain hits the inner walls of your skull, it can cause injury to your brain tissue, and can even cause bleeding of the brain. This type of traumatic brain injury (TBI) is called a concussion and it can have both immediate and long-term effects. People can sustain a concussion any time they get hit in the head, including when playing contact sports like football or soccer, being in a car accident, or even falling down and hitting their head on the ground.

Athletes wear helmets to protect their head from being crushed, bruised, or scraped. You have to protect your skull so that it can help protect your brain. Many people are working on creating helmets that better protect the brain and head, but the existing helmets can only protect people if they wear them. So, it's always wise to wear a helmet when playing a sport and riding your bike. You only have one head with one brain, so you need to do everything you can to keep it healthy.

The answer also includes information about concussion.

For a tour of the lobes of the brain and what they do, check out Dr. Gill's book, [*Lobe Your Brain: What Matters About Your Grey Matter*](#).

This Article's Author

Leanne Boucher Gill, PhD, is a professor of psychology at Nova Southeastern University, where she received the Faculty Excellence in Teaching Award and was named the NSU STUEY Professor of the Year. She maintains an active research program studying how exercise affects the way we think. She lives in South Florida. [Visit her on Twitter](#).