Meet Your Master: Getting to Know Your Brain - Crash Course Psychology #4

Crash Course: Psychology
https://youtube.com/watch?v=vHrmiy4W9C0
https://nerdfighteria.info/v/vHrmiy4W9C0

In the early 1800's, German physician, Franz Joseph Gall spent a lot of time running his fingers over the scalps of strangers. He wasn't a hairdresser, he wasn't a masseuse, he wasn't just like a big fan of heads. He was a phrenologist, he was the first phrenologist. Gall believed that a persons personality was linked to their skull morphology, that its bumps and ridges indicated aspects of their character. Amazingly this "science" actually caught on, was widely practiced for decades, and Gall became something of a celebrity. Well, with a head like his, one can see how he might have been a little bit fixated with skull shape. Eventually, phrenology was dismissed as a cult pseudoscience because it turns out your cranial contours tell us exactly nothing about what's happening inside the brain. And yet! Gall was actually on to something big, something that we knew nothing about. Remember, at this point we were just starting to get consensus that the brain was the source of self and not like the soul or the heart or whatever. His lasting and correct proposition was that different parts of the brain control specific aspects of our behavior. Like we talked about last time, there is a strong link between biological activity and psychological events. But in addition to the interplay of chemicals like neurotransmitters and hormones, a lot of this has to do with that localized parts of the brain have specific functions, like vision, movement, memory, speech, and even facial recognition. Function, in other words, is localized. If you could stimulate different parts of my brain in any way you wanted to– and if you ask me nicely, I just might let you– you could control my movements, my memories, and even my personality. Poke my brain over here and my arm would twitch, poke here and I'd remember my first kiss, do it up her and suddenly I'd be filled with a tremendous Hulk-like rage! This is the link between the brain, that physical hunk of gunk between the ears, and the mind, the thing that is us, our consciousness, our behavior, our decisions, our memories, our selves. Some neuroscientists like to say that the mind is what the brain does, so one of the driving questions of psychology and, like, the human experiment is "How do our brains' functions tie to the behavior of the mind?" And you can't even ask the right questions, let alone get at some of the answers, until you get to know the brain. [Intro] You might have a passing familiarity with your nervous system, like, "The brain bone is connected to the spinal cord bone, and the spinal cord bone is connected to the motoneuron bone." That's your central nervous system, and there aren't actually any bones. Your central nervous system, or just CNS, is what makes your bodies big decisions. This system is the command center, and if you mess with it, things are gonna get weird. There's also the peripheral nervous system, which is composed of scout-like sensory neurons that gather information and report it back to the central nervous system. To get a handle on just how physical the roots of your mind and personality are, how concretely your nervous system makes you you, let me tell you a story. The curious case of Phineas Gage. In 1848, a genial chap named Phineas Gage was working on the railroad, tamping gunpowder into a blasting hole with an iron rod, but the gunpowder ignited.The resulting explosion caused the rod to shoot like a bullet up through his left cheek and out of the top of his head. There's brain in between those two places, by the way. Amazingly, he stood up after the accident, and walked over to a cart, described what had happened, and then they drove him back to his house, all while he was conscious. So the doctor came to examine him, and refused to believe that a rod had in fact passed through his head, understandably. Until Phineas started coughing and an amount of brain that the doctor described as a teacup-ful fell out of his head, and the doctor had to accept indeed what had happened. After a few months of convalescing, he was pretty much healed up and moving around like he used to. But his friends were saying that Phineas was no longer like himself. Yes he had his memories and his mental abilities, and he walked and talked and looked the same, minus an eyeball, whereas the old Phineas was mild-mannered and soft-spoken, the post-spike-to-the-brain Phineas was surly and mean-spirited and vulgar. People started to describe him as "no longer Gage." Phineas moved away from America, the scientific establishment lost contact with him and 12 years later, after a series of seizures he died at the age of 36. Phineas is a great, if extreme, example of how function is localized in the brain and how physical and biological factors can be reflected in psychological ways. Of course he is also an excellent example of how individual studies are not particularly useful, especially since we have very little data on what Phineas was actually like before or even after his accident. Most accounts are from the months directly after the accident, and many of them conflict. It's completely possible that he continued to heal and lived his remaining years as a happy and productive citizen. Intro-psychology texts often paint the simple picture of Phineas just so we can have a clear example of the moment when physicians realized that messing with the brain was messing with the mind, but it is of course all much more complicated and Phineas was an actual, real life person, I feel that we should give him the nuance and mystery that he deserves. Now you might have heard that we only used about 10 percent of our brains, and oh if that were true, Phineas would lose a quarter of his and he'd be just fine. And if we could just harness the rest of that gray mush, we'd be able to mind read and levitate and get all Professor X. It's an exciting thought, as exciting as the idea that I can tell what kind of tea you like by feeling the bumps on your head. It is also exactly as wrong. After watching an hour or so of reality TV, you'd be forgiven for thinking that some people are only working at 10 percent brain capacity. But in actual reality, brain scans show that nearly every region of the brain lights up during even simple tasks like walking and talking. Not only that, but the brain itself requires 20 percent of all the body's energy, and it would make little evolutionary sense to throw much energy away at something that is only minimally active. As animals, our capabilities have developed in part from our brain structures. We're actually able to trace our evolutionary history as we come to understand these structures. Less complex animals have simpler brains designed for basic functioning and survival: rest, breathe, eat. Whereas more complex animals like many mammals possess brains that feel, remember, reason, and predict. These animals don't have all new systems. They have new brain systems built upon old brain systems. The brain is kind of like a set of Russian nesting dolls. The outermost wooden doll is the newest, most detailed and most complex, but as you go deeper, the dolls become older and smaller, and simpler, and more generic. The innermost wooden doll is the oldest, most basic. It's like a fossil in your head. This inner core of the brain, sometimes called the "old brain" still performs for us much as it did for our early evolutionary ancestors. It's anchored by the brainstem, the most ancient and central core of the brain where the spinal brain enters the skull. Above it, at the base of the skull, is the medulla. Here, old brain functions happen automatically without any conscious effort: the beating of hearts, the breathing of lungs, that sort of thing. The pons is perched on the medulla, and it helps coordinate movement. Above the pons, at the top of the brainstem, is the thalamus, a pair of egg-shaped structures that take in sensory information related to seeing, hearing, touching, and tasting. The reticular formation is a finger-shaped nerve network inside the brain stem that's essential for arousal, which isn't necessarily what you feel upon seeing a particularly nice-looking human, but instead refers to things like sleeping and walking and pain perception; other important functions. The baseball-sized cerebellum, or "little brain", swells from the bottom of the brain stem and is responsible for non-verbal learning and memory, the perception of time, and modulating motions, it controls voluntary movement like your sweet dance moves, but it also gets impaired easily under the influence of alcohol, hence the term "tipsy". So the old brain systems keep our body's basic functions running smoothly; the sort of stuff any animal might need. This is pretty much where the brain stops for reptiles. For higher functions, we look to the limbic system. This includes the amygdala, hypothalamus, and hippocampus. Sort of a border region of the brain separating the old brain and the newer, higher cerebral areas. The amygdala consists of two lima bean-sized clusters of neurons and is responsible for memory consolidation as

well as both our greatest fear and hottest aggression. Stimulate one area of the amygdala, and a docile family dog suddenly morphs into a blood thirsty Cujo. Shift that electrode over just a tiny bit and that dog will be cowering at butterfly shadow puppets. The hypothalamus keeps your whole body steady, regulating body temperatures, circadian rhythms, and hunger, also helps govern the endocrine system, especially the pituitary gland. You should also thank your hypothalamus for allowing you to feel pleasure and reward. Rats implanted with electrodes in the reward center of their hypothalamuses and given ways to self stimulate those areas will essentially reward themselves until they collapse or die. So, use with caution. The final part of the limbic system is the hippocampus, central to learning and memory, and if it's damaged, a person may lose their ability to retain new facts and memories. Now above all of this is the most advanced stuff - the stuff that you think of when you think of the brain - the grey matter. The two hemispheres of your cerebrum make up about eighty-five percent of your brain weight, and oversee your ability to think, speak, and perceive. The left and right hemispheres govern and regulate different functions, giving us a split brain, connected by a structure called the corpus callosum. So, for instance, language production is controlled largely by the left hemisphere, while certain creative functions are controlled by the right. Though this has nothing to do with handedness or people having dominant sides of their brain being more analytical or creative or whatever - that's part of what we call pop psychology: a behavioral disorder in which journalists and arm chair psychologists use research showing beautiful, detailed, intimately connected complexities of your brain to sell newspapers or reinforce previously held beliefs. Yes, some tasks are distributed to one side, but the sides are deeply and constantly connected; a statement as general as "artistic people use their right brains" is as useless as saying "artistic people have particularly bumpy heads". Finally, covering the left and right hemispheres, we have the cerebral cortex, a thin layer of over twenty billion interconnected neurons. But let's not forget the unsung heroes of your nervous system: the billions of non-neuron glial cells, which provide a spider web of support that surround, insulate, and nourish the cerebral neurons. You've probably seen enough brain diagrams to know that the cerebral cortex's left and right sides are subdivided into four lobes: the frontal, parietal, occipital, and temporal, all separated by especially prominent folds, or fissures. Each lobe does indeed have its own set of duties, and would have made Franz Gall proud. The frontal lobes, just behind your forehead, are involved in speaking, planning, judging, abstract thinking, and as the tale of Phineas Gage reminds us, aspects of personality. The parietal lobes receive and process your sense of touch and body position. At the back of your head, the occipital lobes receive information related to sight. And the temporal lobes just above your ears process sound, including speech comprehension. Remember that each hemisphere controls the opposite side of the body, so my left temporal lobe processes sounds heard through my right ear. And within these lobes there are still more regions that have specialized functions. Your motor cortex at the rear of your frontal lobes, for example, controls voluntary movements and sends messages from the brain out to the body like "pet that dog!" or "pick up that mug", while your somatosensory cortex right behind it processes incoming sensations like "Ooooh, that doggie is soft!" or "Gah, the mug is hot!" The rest of your grey matter is made up of association areas that are related to higher mental functions like remembering, thinking, learning, and speaking. But the thing about association areas is that unlike your sensory or motor cortex, you couldn't just poke one and create a neat response. Association areas are more subtle; they deal with things like interpreting and integrating sensory input and linking up with memories. And they prevail throughout all four lobes, so brain damage to different areas will cause very different results. A lesion on a specific part of the temporal lobe may destroy a person's ability to recognize faces; traumatic memories or overactive hormones can profoundly affect our behavior and emotions - all of which remind us how fundamentally biology and psychology are intertwined. And there are few more fascinating examples of this than how we sense and perceive the world around us, so that's where we're gonna pick up next week. For now, if you were paying attention, you learned the basics of the central nervous system, specifically the brain, which can be understood in terms of old or of more evolutionary ancestral structures, along with the limbic system, and new structures, which include lobes, cortices, and association areas. Thanks for watching this lesson in Crash Course Psychology, which was brought to you by The Air Show, Midnight House Elves on Etsy, and Daniel Vasey, thank you so much to all of you. If you would like to sponsor an episode and give your own shout-out, you can learn about that and other perks available at Subbable.com. This episode was written by Kathleen Yale, edited by Blake de Pastino and myself, and our consultant is Dr. Ranjit Bhagwat. Our editor and director is Nicholas Jenkins, Michael Aranda is our sound designer and our graphic team is Thought Cafe.