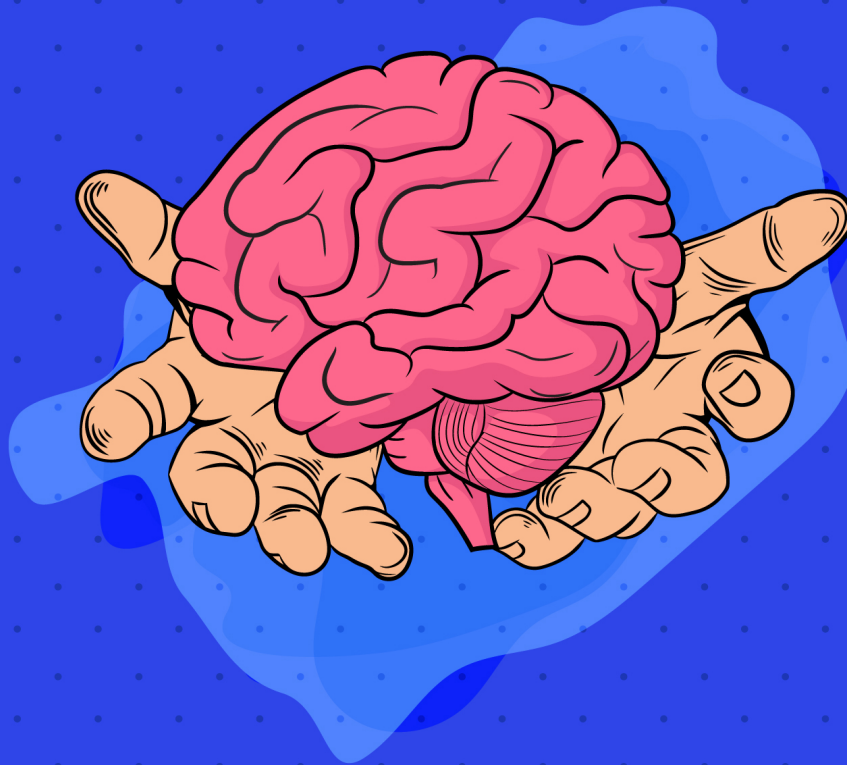


SUMMARY

THE

BRAIN

DAVID EAGLEMAN



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Summary of «The Brain» by David Eagleman

Written by Alyssa Burnette

The Brain (2015) unlocks the key concepts of critical neurological research in language that makes it accessible for the average reader to discover what's really going on in their heads.

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Introduction

When you think about it, we can't really get away from our brains. As much as you might like to escape it sometimes, your brain is always there, serving as an internal monologue, regulating your thoughts, choices, and emotions, and aligning all the factors that make you "you." But have you ever wondered what makes your brain tick? And- perhaps more frighteningly- have you ever wondered whether or not your personality really exists? That's where this book comes in. By applying neurological research to these questions, Eagleman has generated a series of fascinating answers that will take you on a comprehensive tour of your brain. Through the course of this summary, you'll learn:

- Why London taxi drivers' brains are physiologically different from other people's
- How your sense of smell impacts your moral compass and
- Why Botox can literally make you a bad person

Your Changing Brain

Can people really change? Although this concept is hotly debated in both print and visual media, with the answer altered to affect the plot of your favorite book or movie, the truth is that people are always changing. In fact, neurologically speaking, that change may be the only consistent element of human existence. And if you hold that idea up to the light of your own personal experience, you've probably seen that to be true. After all, you're not the same person you were at two years old, are you? You're probably not even the same person you were two years ago, if you take a moment to reflect on the evolution of your preferences, tastes, and attitudes.

But how does that happen? And why do we change? The simplest answer is that it's all about the changing connections in our brains. That's because synapses- the connectors which transmit information- change as we age, and we even lose connections that aren't reinforced through repetition. In childhood, these synapses inform our ability to learn and understand speech; we pick it up because it's repeated to us and we maintain the ability because speech is an integral part of our future lives. But it also applies to our personalities because every new piece of information we acquire-- every new book we read, every new TV show we binge watch, and every new person we meet-- forms new connections and shapes who we are. This ability is made possible thanks to plasticity or our brain's ability to learn through repetition. And although children's brains are higher in plasticity because they're so new and adaptable, adult brains can still learn new tricks too!

Researchers at the University College of London wanted to test their own theory about plasticity and they did so by conducting a study on some of the city's cabbies. After scanning the brains of some London taxi drivers, they found that these individuals actually possessed larger hippocampi-- the part of the brain that's responsible for our spatial memory-- than their control group of average people. What set the cabbies apart was the fact that they have what's colloquially referred to as "the Knowledge." Their intimate memory of London's 25,000 streets, 20,000 landmarks, and 320

different routes-- all acquired during their four years of training-- strengthened this area of their brains. And because that knowledge was being put to practical use every day on the job, their brains were basically getting a workout all day every day of their lives! That constant exercise literally made their brains bigger.

Your Sense of Reality is Determined by Your Brain's Interpretation of Sensory Data

You know what reality is, right? It's what you use to ground yourself any time you start feeling like you're going a little crazy. It's what you snap back to when your mind's wandering in a meeting. Reality is meant to be objective, consistent, real. But have you ever wondered how real your reality is exactly? And whether your reality is different from someone else's? That might sound scary to think about, but when you break down the concept of reality through neuroscience, it's actually really cool!

For example, just think about optical illusions. We circulate them all across social media so we can marvel at how something that looked like a duck just minutes ago actually now looks like a rabbit. And this is a great example of how the brain can suddenly seem to just "change its mind" about what's real-- and how it can do so in more scenarios than just playful optical illusions. This process occurs because of the way your brain handles new information. Because your understanding of reality isn't informed by logic alone; in fact, it's a construct that's molded by your sensory organs which control your perception of sight, taste, and smell. To understand how this works in practice, just take a look at the paralympic skier Mike May.

May lost his sight at the age of three. And although he went through a surgery designed to restore his eyesight in his forties, the procedure wasn't the rousing success he and his family had hoped it would be. Because May had already spent the majority of his life adapting to being blind-- and even cultivating a skiing career in this state--his other senses compensated by growing stronger. However, when his sight was restored, his entire perception of reality was disrupted. Instead of being thrilled that he could see now, as he'd expected, his brain was so overloaded with new visual stimuli that the world became a frightening and overwhelming place. After he'd learned to know his family through touch and smell, he found that he couldn't recognize his children with his eyes and this left him confused and

disoriented. Skiing also became a lot harder as he struggled to adapt to the visual stimulation.

This confusion occurred because his brain hadn't yet learned to see. Though we often tend to assume our eyes function as video cameras which relay information to our brain, advances in neuroscientific research have proven that this is actually not the case. Instead, sight is a collaborative effort between our eyes and our brains, and the way we process visual reality depends on the way these two communicate. If communication between our eyes and our brains are disrupted, our perception of reality is altered accordingly. And because other areas of May's brain had adapted to process information primarily through his other senses, the process of learning how to see was more difficult than he'd anticipated.

This is just one example which illustrates the complexities of our brains, but there are multitudes of fascinating conditions that can occur as a result of something so simple as a misplaced wire in the brain. For example, synesthesia is a perceptual phenomenon which occurs when sensory perceptions get mixed up in the brain. In this case, the parts of the brain that usually react when someone is admiring something visual-- like the colors in a sunset-- can also be activated when hearing a piece of music and this results in people with synesthesia reporting experiences like being able to taste words on a page or hearing music as a color. Synesthesia is not a disability-- if anything, it makes the world a lot more colorful!-- but it is a great example of how your brain's ability to process reality is inextricably linked to your sensory organs.

Most Decisions Are Made Subconsciously

That might sound a little puzzling when you consider how many decisions you deliberately make every day. You consciously decide to get up in response to your alarm. You are aware of your choice to drink a morning cup of coffee. But from a neurological perspective, you actually have less control than you think over the part of your brain which controls your everyday decisions. But don't let that alarm you-- this is actually a helpful feature of your brain! Because while your decision to get coffee is simple enough, imagine if you went through the process of breaking down each individual part of that process. If you actually thought out, "First, I'm going to reach out my arm. Then, I'm going to uncurl my fingers and wrap them around the handle of this coffee pot..." your life would be incredibly boring and every thought would be draining. But thankfully, your brain processes all of this subconsciously because most of your daily tasks are practiced skills which your brain can run on autopilot.

This means that we're actually better at doing things when we're not overthinking them, as ten-year-old Austin Naber can tell you. That's because Austin is a champion sport stacker. He's an expert at competing with others to stack cups and different shapes and he was willing to give the author a run for his money in a fun competition where they were both hooked up to EEG machines that measure the brain's activity. The test results showed that although Eagleman was expending a significant amount of brain energy to perform this unfamiliar task, Austin's brain was perfectly at rest as he raced through the tasks with ease. Because he'd performed this routine so many times, he no longer needed to engage his conscious brain to do so, meaning that he could still compete effectively while on autopilot.

You might be inclined to interpret that lack of conscious engagement as laziness, but in fact, studies show that, once we reach a certain level of proficiency with a task, we're more likely to make mistakes when our conscious brain is engaged. A study conducted on baseball players, for

example, found that they hit the ball without making an intentional choice to do so and that this actually works in their favor because the human brain is not fast enough to accurately determine the speed of the ball and the correct moment at which to swing the bat. Your conscious brain is also working for you when you're not playing competitive sports, as evolutionary psychologist Geoffrey Miller discovered. While conducting a study to determine how much money female strip dancers earned at different stages of their menstrual cycles, Miller learned that dancers who were ovulating earned twice as much in tips. He theorized that this was because men picked up on subtle changes in their appearances that were caused by higher estrogen levels and responded accordingly.

That might sound like a weird coincidence, but other studies actually report similar results. For example, you're much more likely to form a negative impression of someone if there's a bad smell in the air when you meet them. You're also more likely to describe your relationships with others warmly if you're holding a warm drink in your hand at the time. This all goes to show that our brains are highly sensitive to the type of subconscious activity known as "priming," and as a result, our decision-making is constantly being influenced by our sensory perceptions, even when we don't realize it.

Our Decisions Are Also Influenced by Our Desire For Instant Gratification

So, now that we've examined the way our brains make subconscious choices, let's take a look at the factors which influence our conscious decision-making process. The simple answer is that our choices are formed when sensory and emotional cues trigger different parts of our brains until we act on them. That means that when you think about choosing chicken tenders over a burger for lunch, you're actually activating a variety of different sensory and emotional associations to help you make that choice! This decision-making process can activate a feedback loop with positive or negative associations. If you make a decision that you enjoy, for example, your brain releases dopamine and that pleasurable sensation will be factored into your decision-making the next time you're presented with that option.

One way we further our understanding of the brain is by studying cases where communication between the brain and the body has been severed. Take, for example, the case of Tammy Myers. After suffering a motorbike accident, Tammy experienced damage to the parts of her brain that inform her of her physical and emotional state. As a result, she can no longer tell when she's tired, in pain, thirsty, or even happy. Her brain is also incapable of helping her weigh the value of two options to make a decision. From this example, you can clearly see just how catastrophic it is when the brain doesn't know how to communicate with your body! But our bodies are also influenced by our brain's preference for short-term satisfaction or instant gratification, as it's most commonly known. Because our brains don't enjoy waiting for satisfaction that arrives in a far-off future, they tend to privilege immediate rewards, which is why we cheat on our diets because we want a cupcake now or why we skip the gym to watch Netflix because we really want to see that next episode.

And if you've ever procrastinated or made a poor choice, you might be interested in learning how to break that habit. One great way to trick your

brain into doing so is to sign a “Ulysses Contract.” The name of this lifehack comes from the Greek myth about Ulysses, a captain whose ship sailed past the island of the Sirens, a tribe of dangerous women whose songs were impossible to resist and which lured their victims to their death. Knowing that he would otherwise be unable to resist, Ulysses instructed his crew to stuff their ears with cotton and tie him to the ship’s mast to prevent him from steering their ship towards the Sirens. It worked for him and you can do the same thing by locking yourself out of your temptations. Setting foolproof failsafes is a great way to help yourself stick to your commitments and it’s not even that hard to do! If you want to stick to your new workout routine, find an accountability partner who can practically force you to go to the gym. If you want to stay off your phone and concentrate on your work, delete the apps that distract you or ask a friend to change your password!

Socialization is One of the Brain's Main Functions

In case you haven't noticed from our obsessive love of social media, human beings are very social creatures. So much so, in fact, that our brain activity reflects our desire for human connection! That's because our attempts to read other people and connect with them is facilitated through empathy or the ability to relate to others and their emotions. In practice, we understand empathy as putting ourselves in someone else's shoes and understanding how they feel. But if we approach this from a neurological perspective, we can see that empathy actually occurs through mirroring. Mirroring is the process of reflecting someone else's facial expressions to cue our brains in to what they're thinking and feeling.

Eagleman wanted to understand just how important mirroring is in our ability to connect with others and so he conducted an experiment which involved a focus group of people who had had Botox injections and a control group of people who hadn't. He then attached the participants to a device that measured facial muscle movement and showed each group a series of pictures which depicted different facial expressions. His results showed that members of the focus group weren't just less expressive-- they also had trouble identifying the facial expressions of others, which indicated lower levels of empathy! Additional studies have also observed that empathy is a critical factor in our determination of who deserves our support.

This was brilliantly illustrated through an experiment conducted by researchers at the University of Leiden in the Netherlands. Participants in this study were shown pictures of homeless people and researchers observed that they showed significantly lower levels of brain activity when looking at these images than when they were presented of people who were not homeless. Put simply, the pictures of homeless people generated a low-empathy response which indicated that, to the participants, these unfortunate people were not worthy of their empathy or support.

Technology Can't Replace Our Brains

As we live in an age of unprecedented technological advances, many people have fears like, “The robots are coming for our jobs!” or that technology will make human beings obsolete. However, nothing could be further from the truth. Although it may soon be possible to cultivate an era of transhumanism-- in which we fuse our bodies with technology-- it's impossible to truly replace the value of the human brain. And while many people fear advances like transhumanism, the truth is that it's nothing to be afraid of; instead, it would simply enable us to harness the power of electronic devices like cochlear implants-- which are used to help hearing-impaired people-- to generate new forms of communication.

To understand this process a little better, just think about how cochlear implants work; quite simply, they're devices that relay a digital “signal” to the brain. On its own, this might be a lot like learning a new language and could be meaningless to the brain. But when it's connected to your other senses, your brain is able to interpret this as a hearing aid and allows you to process sound through this device. So, if electronic devices can tap into our brain's wiring and facilitate hearing, what's to say that we couldn't upload other forms of knowledge using similar tools? What if we were one day able to get traffic alerts and push notifications uploaded instantly to our brains instead of via our phones?

Fusing our brains-- the most powerful computers known to man-- with superior technology would make history and forge an entirely new frontier of human existence. And as such, it wouldn't make the mind obsolete-- it would simply upgrade it! That's because computers can't come close to mimicking the awareness of a human being. After all, when you ask Google a question, it doesn't understand you the way another person would and it's not capable of having a conversation with you. Rather, it simply uses a complex algorithm to find you an answer, and that ability can never replace the power of a human connection.

Final Summary

Our brains inform everything we understand about the world, but we often don't understand much about our brains. Understanding a little more about concepts like plasticity, empathy, and sensory process can help us get to know our brains and appreciate the intricate and complex processes that guide our daily lives. This knowledge can also help us to feel confident in learning new things, retraining our brains, and cultivating empathy to achieve better connections with others.



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