second nature

HOW PARENTS CAN
USE NEUROSCIENCE
TO HELP KIDS DEVELOP
EMPATHY, CREATIVITY,
AND SELF-CONTROL

ERIN CLABOUGH, PhD

SOUNDS TRUE
BOULDER, COLORADO

Contents

Illustrations

Preface

WHEN MY OLDEST child was 8, he said to me, “Mama, does my brain control me, or do I control my brain?” My 6-year-old asked if alcohol was a kind of poison (as I hid my wineglass). My 4-year-old wanted to know what cheeks are for. And my 2-year-old would gleefully smack me not so gently in the face, laugh, and run away so I’d chase him.

They were each at different stages of discovery. These stages change as children grow and their brains continue to develop on the continuum of maturity. My kids are my real connection to the science I engage in every day. Even as a person trained in molecular biology, I’ve found the strength of their genetics overwhelming. How could they all share the same gene pool and yet be so unique? Each of them approaches problems differently, struggles with different things, and performs different skills with innate effortlessness. As their mom, it didn’t take long before I started to wonder how I could meet each of their individual needs—while parenting all of them at the same time.

I started looking at my own profession for answers to this question. I’m a professor of biology at a small college. In my lab, I do basic research on how our brains develop, how neurons connect, and how the things that we’re exposed to can alter who we are as people. What could the neuroscience I was teaching and researching tell me about how to raise my kids?

As I explored this question, I discovered that much of neuroscience applies directly to parenting, including the fundamental facts about how humans learn on a cellular level, how and when certain areas of the brain develop, how brain development is linked to behaviors we see every day, how practice works to make something a habit, and how making decisions has a powerful impact on both parents and kids.

My research also showed me that our society emphasizes some qualities at the expense of others. We say we value things like creativity, empathy, and self-control, but we don’t act like we do. Based on what I learned, I now believe that these are the things that kids really need to be successful, and to be good people, throughout their lives. I also figured out that, contrary to popular belief, these qualities are not innate traits or talents, but skills that can be learned. And we, as parents, can help our kids learn them.

Building Specific Brain Connections

To understand how to cultivate creativity, empathy, and self-control in our kids, as well as teach them how to use these skills purposefully (in the act of self-regulation), we need to understand how our parenting is shaping our children's brains. ***Synaptic plasticity***, or ***neuroplasticity***, is a highly dynamic process in which connections between **neurons** (signaling brain cells) fade away or strengthen depending on how frequently they're used. Everything we do as parents strengthens some neuronal connections in our children's brains while leaving other connections undeveloped or underdeveloped.

If we want our kids to develop creativity, we need to help their brains build the neuronal connections that allow them to be creative. It's the same with empathy, self-control, and self-regulation. And the key to building the neuronal connections for any skill is practice. Neuroscience shows us that just as practice helps our kids learn relatively simple skills like walking, throwing a curveball, or rapping the lyrics to one of the songs in *Hamilton*, practice can also enable them to learn the more complicated skills of being creative, expressing empathy, and maintaining their self-control. There's nothing special about the way we learn these skills; they may be more complicated, but the brain uses the same machinery to incorporate them into who we are as people. (At the same time, we can help our children to *not* practice the behaviors we would love to see disappear so that the neuronal connections underlying those behaviors weaken.)

The beauty of neuroscience is that once we demystify things like creativity and empathy and break them down into teachable components, it becomes clear that our brains all follow the same rules; we're all governed by the neural networks that we activate. Despite the clear and sometimes overwhelming individual differences in the ways we behave, our similarities on a neuroscientific level are staggering. We see that our parenting efforts, particularly early in development, can literally change the architecture of the brain in lasting ways.

Your Road Map

This book explains why the skills of creativity, empathy, and self-control, plus the all-encompassing skill of self-regulation, are so important, and it provides a road map to parenting for these skills. In part 1, I share why I've become convinced that these are essential skills that every kid needs to learn—for both their short- and long-term happiness. I explore the neuroscience behind these skills and the intersections between them. Then I show you how you can bring all of this information together, using parenting techniques that both create space and provide guidance for kids to be able to function independently in ways that make us proud and make them happy.

Then I focus on each of the skills and what we can do as parents to help our kids develop them through practice. Part 2 explores the importance of creativity (both in itself and as a platform for higher-level thinking) and how parents can focus on creativity in a more purposeful way. Part 3 shows you multiple ways of looking at the idea of empathy and the enormous benefits that fostering empathy has for kids. Then it provides activities to help kids practice it.

Part 4 focuses on self-control and how to enhance it, but also discusses the somewhat misguided view that self-control is the *most* important skill needed as kids grow up. While good self-control may keep us out of jail, self-regulation is the key ingredient to a happy and successful life because humans need so much more than simply not being bad. The most fulfilling experiences are not about inaction, but rather they come from being able to manage situations well when we need to put ourselves out there, when we work toward a goal, and when we can manage to get what we want without hurting anyone else. Part 5 provides information about how self-control, empathy, and creativity come together in the brain, theories behind self-regulation, and parenting tactics to keep your kids as motivated as possible and working toward being autonomous.

There are two ways to use this book. To get an overall parenting perspective, it can be read all the way through. For each of the skills, there is at least one quick, rudimentary test to see where your child is in the skill developmental process. You can see which skills your kid has already developed and where some practice would be useful. Alternatively, if you already know what you want to work on with your kids, you can jump to part 2, 3, or 4. Remember that self-regulation is what we're actively working toward, so part 5 will be important for everyone.

Your kids won't need to actively work on all aspects of these qualities because they likely already have some of them; they're part of what we think of as their personalities. You'll see that each skill is broken down into several parts: Creativity is defined as either self-expression or as innovative problem solving (applied creativity), and both definitions are important. Empathy is divided into emotional, cognitive, and applied empathy, all of which are valuable, though applied empathy is what we're talking about when we mention a compassionate kid. Self-control is an essential step on the way toward great self-regulation. These skills all come together in the ability to be a resilient problem solver, and that's what we're ideally working toward.

Finding your own children among these definitions will help you get to know their character better, and it helps you figure out how to best parent each child. For example, one of my daughters is highly expressive with her creativity and is very emotionally empathetic. During conflicts, she will have hurt feelings and can get frozen, so we actively work on applied creativity and cognitive empathy as problem-solving techniques. In contrast, one of my sons can solve any problem using creativity and has high levels of cognitive empathy, but he has little emotional empathy. Every day, he and I talk about the impact of actions on others, and we work on self-control so that he doesn't plow right through conflict situations. The skills my kids were born with are different, but the values we work on are the same.

Short-Term Gains and Long-Term Goals

Although it's important to be long-sighted when parenting, it's not just about the endgame. Parents deal with daily crises. If you commit to working on creativity, empathy, and self-control and self-regulation with your kids, you will be resolving the immediate threats to family harmony: those tantrums, the lying, and the bickering. Why? Because nearly all behavior problems kids have are associated with these skills—or an underdevelopment of them.

But beyond that, developing these skills in your children means you are fostering their default way of thinking about any given situation. You are providing a platform for their perspective. Just as important are the actions they will be able to take because of that perspective. The ability to think critically and then make decisions plays a vitally important role in a person living the life they choose. You can feel creative or empathetic all you want, but if you don't act on your creativity and empathy, then those things will never make an impact. If you don't interact with the world, no one will ever know what you think inside.

So, when we parent to cultivate these three specific skills, we're not just putting out parenting fires, we're also laying the neural groundwork for our kids to become happy, successful, emotionally resilient adults. It benefits them (and us) not only in the short-term, but also in the long-term. In other words, using neuroscience to inform our parenting can determine not only how our kids behave now, but also what kind of adults they will become.

Every parent reading this book is reading it because of love. We're trying to fit together all the ways we know to love someone well into a parenting push that might launch our child's boat in the best direction.

We all come with certain starting material. But that's all it is—a starting place. Parenting works by supporting or not supporting certain connections within our child's brain. That's the internal map we're crafting and the literal mind-set that our child will navigate by. Despite all our best intentions, we can't tell our kids how to live; we have to show them, and they have to experience it. Just as we can't expect a child to start running without practicing walking first, we can't expect her to be creative, be empathetic, or exercise self-control without practice.

Neuroscience tells us that neuronal pathways that are used frequently while we're young are more likely to be used in the future. It's our job as parents to help this connective process along, making sure that certain behaviors in our kids become *second nature.* They may not have been born with these characteristics, but you'd never know it when you're talking to them as adults. It will become their default way of being—the platform from which they approach the world—and developing these pathways is what this book is all about.

part 1

SECOND NATURE PARENTING

1

Creativity, Empathy, and Self-Control

Why These Are the Skills Kids Need

WE LIVE IN A WORLD where we can Google any fact, where voice recognition software will make spelling accuracy irrelevant, where computers can read books to us. This means that as parents, we should rethink the skills that we're placing emphasis on. Of course, we want to raise kind people, but it's also true that we want our kids to have relevant skills and a valued place in society when they grow up. We need to keep our kids from being replaceable or outsourced. To prepare our kids for future lives in a computer-dominated world, we need to hone skills in our kids that are vastly different from the things that computers can do so easily. We have to incorporate things like flexibility, rulemaking, and problem-solving into our school curricula and our homes. We have to deemphasize procedure and facts. And we need to give our kids practice—tons of practice—doing the uniquely human things that still elude computers, like the capacities to surprise, to empathize, to create, and to love.

We Aren't Computers

Our society has a love affair with computers. We admire them, but we've started to view our own skill sets through the eyes of technology and to think about human memory and learning differently because of it. We relate to computers, compare our brains to them, and identify with them in ways that are contrary to the principles of neuroscience, such as thinking about our brains as being hardwired for certain skills or having a limited amount of memory space.

As computers have changed the landscape of our collective ability, we have shaped our lives around the benefits that technology provides. Our value system has changed, and as a result, we're parenting differently. We're cultivating the skills of a computer in our kids, such as multitasking, quick computation, and fact memorization, sometimes at the expense of the things that make us truly human.

(We forget that the brain can't turn off like a computer. Our brains are always learning something, always working, even during sleep.) As a result of cultivating the wrong skills, we're setting up our kids for failure and frustration because they won't be prepared for the jobs of the future—jobs that we may not be thinking about yet, human jobs that no computer can do.

Humans and computers approach problems in fundamentally different ways. Computers require two things to work: (1) information coming in and (2) a set of rules to process that information. Computers execute those rules, and they do it rapidly, whereas humans process incoming information in a more flexible way. Computers specialize in tasks that need to be done quickly, while humans are better at finding solutions to messy situations. Compared to computers, humans are exceptionally good at leadership, social collaboration, goal setting, teaching, coaching, encouraging, and selling things. Humans can also more easily decide what is relevant when working with new information.

These differences mean that humans are better than computers at certain types of jobs. These jobs include roles with no strict sets of rules to follow, such as a designer writing a new web application or a doctor diagnosing someone with highly unusual symptoms. They include jobs where you need to easily decide what is relevant when working with new information, such as underwater exploration or convincing your manager that a new type of human resource management system will serve the company better than the current one. In addition, jobs that require a "human touch," like counseling, customer service, and delivering medical diagnoses, will always be preferentially given to humans.

Humans retain more flexibility than computers because of ***synaptic plasticity***—the way our nervous system can pivot and adapt to change (we'll discuss this in chapter 2). Computer memory grows by adding more computer chips. Human memories grow by strengthening the connections between neurons—no chips or more storage needed. Constant modification and refinement of these connections is what allows us to learn, remember, and hold an unlimited amount of information. We are constantly adapting, and doing so in a way that computers cannot, by choosing which of our brain's neuronal pathways get activated and then honing how those circuits are used, using an adaptive flexibility that is never exhausted.

If future humans will need to solve problems and clean up everything messy in ways that computers cannot, then we're going to need creativity, empathy, and self-control—three qualities that make us uniquely human—and we're going to need a lot of them.

Creativity

Creativity is key to competitiveness in a global economy. In a competitive workplace, applied imagination may mean the next big thing happens at your company. According to a 2013 *Time* magazine poll about the role of creativity in the American workplace, schools, and government, more than 8 in 10 people surveyed thought America should be considered a global leader in creativity, and many of those who said America is *not* a global leader in creativity felt that American schools are not building creativity in students (31%) or that the American government is not doing enough to support creativity (30%).[1]

Creativity is associated with genius in tangible ways. Albert Einstein was able to imagine the theory of relativity, Leonardo da Vinci was able to think up a helicopter in the 1500s, Alexander Bell was a prolific inventor, and Mozart's lasting musical works are surely hallmarks of creative genius. We know genius runs in families. Sir Francis Galton proposed a genetic basis for genius back in 1869 in his book *Hereditary Genius*. However, if you consider that the majority of inventions come from unknown inventors, we see that creativity is the rule, not the exception, in humans.[2]

There are business journals dedicated entirely to finding creative talent and effectively managing it. Finding creative people takes time and money; it's hard because they are rare. When we encounter a creative adult, it's like sighting a unicorn because so few of us make it through our school gauntlet with our creativity and imagination unscathed. We wonder how those creative people still have that spark as adults. We often conclude that they must have just been born creative. We think of creativity more as a talent than a skill, and we certainly don't teach or cultivate it. But there's a disconnect here between what we are taught and what we need: the majority of the 2,040 adults polled by *Time* (62%) say that creativity is more important to success in the workplace than they anticipated when they were in school.[3]

Building creativity in your child from the ground up serves two purposes: First, creativity will give your child a career boost—not just for jobs with an artistic slant, but also in business, entrepreneurship, engineering, teaching, law, and medicine. But creativity is also essential for effectively solving problems, which will make your child more successful at life, regardless of career choice. Imagination, a natural bridge between empathy and self-regulation, is intimately associated with decision-making. For our children to have confidence in diverse situations and to be effective leaders, we need to teach them to think creatively about problems and then act on their ideas. We won't be always there to point out to our kids all the possible decision routes that are available during a conflict, so they'll have to take the creative lead in conflict resolution themselves. To do this, they'll need to develop creative pathways. Creativity is not a bonus or the finishing touch in our children's development; it should be part of their core curriculum.

CREATIVITY DEFINED

There's a fundamental difference between ideas about creativity in Western and Eastern cultures, and both views contain important concepts. Western culture sees creativity as divergent thinking—thoughts that take the road less traveled. Western culture values creativity in terms of innovation and the act of harnessing these insights for a specific purpose.[4] Creativity is defined by the presence of two components: originality and effectiveness. America, it seems, wants to know your ideas *and* what you can *do* with your ideas.

The Eastern definition of creativity, on the other hand, describes a sense of self-fulfillment or self-realization. The Eastern tradition involves an awareness of the truth about yourself, an event, or an object: it's more about finding a new point of view rather than breaking from tradition. We're perhaps not as familiar with this view, but we shouldn't be quick to dismiss it. Practices such as yoga and mindfulness/meditation can help cultivate self-regulation (as we'll discuss in chapter 10).

Not surprisingly, parents also have very different ideas about what creativity means. Sometimes we think about creativity in a Western way, like Doug, who defines creativity as "making thought visible in a tangible product," or Catherine, who describes creativity as "being able to solve problems by taking what you know, adding new knowledge, and coming up with solutions. Then picking the best solutions and trying them out. Then adjusting them, if necessary." These definitions reflect a way of thinking about creativity as unique thought with a purpose. In his 1993 textbook *Human Motivation*, Robert Franken defines creativity as "the tendency to generate or recognize ideas, alternatives, or possibilities that may be useful in solving problems, communicating with others, entertaining ourselves and others."[5] His Western definition taps into other human aspects, like critical thinking, keen perception, empathy, and honed social skills.

Other parents see creativity in a more Eastern way: When Brit says, "Creativity is self-expression on every level," she's identifying more with the Eastern tradition; she's seeing messy paints and unique outfits. She's joined by Kevin, who says that creativity is the "ability to express oneself artistically, verbally, in writing in ways that are from one's heart," and by Rachel, who thinks of creativity as "being artsy—having the ability to create beauty out of anything." And Katie says creativity is "the ability to express yourself as a child in various ways/modes and be free-form and unstructured in these explorations." This is self-expression based on knowing yourself, the idea that we should let our kids become who they want to be.

Parents who define creativity as self-expression may feel that creativity is like dessert after a healthy dinner: it's a plus, but you'll be fine without it. Some parents may see finding your own truth as paramount to foster in kids, while other parents might place cultivating creative self-expression at the bottom of a long list of parenting to-dos.

Different definitions lead to differences in how we talk about creativity and how much we value it, ultimately leading to either prioritizing or marginalizing creativity in our lives. For example, when parents define creativity as a purposeful process, as active problem-solving, then it often pops to the forefront of parenting attention. Doug, because of his wholly Western definition of creativity, probably sees creativity as extremely important to foster in his own parenting style. But because Brit sees creativity as simple self-expression, she doesn't work creativity into her parenting choices. She feels no need to self-express while parenting.

No matter how we define it, creativity is worth cultivating. The Eastern and Western traditions are two sides of the same coin, and one can build on the other. Creativity is truth with utility that can take many forms.

CREATIVITY IS A BIOLOGICAL QUALITY

Creativity involves innovation, which is why computers aren't so great at it. Repurposing by finding new uses for old things and problem-solving by making connections between seemingly disparate items necessitate an attitude toward rules that eludes computers. It requires both a bending of the rules and an understanding of why the rules are there to begin with.

Is it possible for computers to be creative? There are computers that can generate works of art: They have no visual system but can be programmed to work with hues and saturation. They can be programmed to do what a human artist would do in a given situation. But in the end, the pictures that the computer creates are actually created by the computer's programmer, right? Unless the computer has a sense of self, its creativity is limited.

CREATIVITY IS THE FOUNDATION FOR EMPATHY AND SELF-CONTROL

Imagination is intricately linked to both empathy and self-awareness.[6], [7] There are several types of neurons involved in these processes, including the mirror neurons (in empathy) and von Economo neurons (in self-awareness), and they likely play a role in imagination as well.[8] Individuals with autism have a greatly diminished capacity for imagination, and they also show alterations in both of these types of neurons.[9–12]

Imagination seeps over into empathy, as we can actively imagine what others must be feeling or experiencing, and this empathy often happens during the creative process.[13] If you are more creative, you can easily see things from a different point of view, which is the definition of empathy. And the inverse is also true: if you have an ill-defined sense of empathy, you are less likely to be creative.

Creativity and empathy are so linked that it can be hard to tease them apart, but it's easy to tap into both simultaneously. In one study, when 126 undergraduate students were asked to draw a neuron, all but three reproduced a standard version of a neuron they had learned about in a textbook. However, when undergrads did exercises first that made them see or act like a neuron—like fanning out in the classroom in a way that mimicked the fanlike growth of a neuron—then their drawings were better and more varied.[14] Having empathy for a neuron by imagining the neuron's perspective enhanced their creativity. Teaching in this creative way makes variation okay, makes play acceptable, opens assessment up so that there are multiple "right" answers, and increases the students' ownership of learning, and so enhances conceptual understanding.

Creativity is equally important for self-control since it's much easier to have good self-control if you can generate more solutions to a problem (we'll see this in chapter 4). And it's easier to regulate your own behavior if you can entertain yourself with thoughts instead of fixating on the one thing you're not supposed to be doing, like getting out of your seat, for example. Clearly imagining both the causes and consequences of behavior is a creative act that can motivate you to control yourself. Imagining causes and outcomes is also a fundamental part of self-regulation: taking action to make your life the way you want it to be.

Empathy

Most parents say empathy is being able to take another person's perspective and understanding what someone else is feeling. More empathy will build trust between people, which will lead to a better future and world peace, right?

Yup, that's an excellent pageant answer. But when my son whacks his sister—again—it's pretty tough to convince him that being empathetic and kind to others is worthwhile. After all, "It's not going to make me rich or anything," he says. (To my 11-year-old, the best imaginable adult outcome is to be rich.)

However, research clearly shows that empathetic people will be more successful at navigating social situations in the long-term. They have better interpersonal relationships, and they stay married.[15], [16] They end up being better bosses and more effective leaders, and they make better life decisions because they can better predict the future.[17], [18] They *may* even be richer. And happier. Empathy turns out to have many hidden benefits:

It makes kids safer. An empathetic child may be safer in life both physically and emotionally. Empathy gives your child a superpower: the ability to predict someone's behavior, and thus the future, in very real ways. Empathetic people are better at reading faces and emotional cues to figure out how people are feeling, and that's important for survival in a basic, back-alley way. When dealing with others, it helps them know when to stay still, when to fight, and when to take flight. If your child can anticipate that his playmate will respond angrily when his toy gets broken, your child can plan ahead, share his own toy, move away, and be ready. Empathy also reduces bullying in older kids; higher levels of empathy mean better conflict resolution and a willingness to come to the defense of a bullied peer.[19], [20]

It turns kids into leaders. Empathy-enriched children often turn out to be leaders since they're more socially competent.[21] Why? They have an enhanced ability to manage other people's perspectives and expectations, which is a skill that transcends age. Leaders on the playground become company leaders, where empathy can increase employee motivation, job commitment, and productivity.[22]

It makes kids happy. As an added reward for good behavior, benevolent acts make us feel good inside. Giving gifts to another person makes us feel happier than giving gifts to ourselves. Researchers gave people cash and instructed half the participants to spend the money on themselves, while the other half was instructed to spend the money on someone else. The people who were instructed to spend the money on someone else reported being happier over the course of the day, regardless of the amount of money they spent.[23]

It makes us feel rich. When we give money away, our sense of abundance and wealth increases.[24] When we act in empathetic ways, our sense of time expands. It is actually the *perception* of having things, like time and money, that matters more than the actual measured amount. That enriched perception makes us happier.

It's healthy for us. Empathetic grown-ups have healthier and more satisfying relationships, and they're more likely to stay married.[25–30] After an injury or surgery, they heal more quickly.[31] Research has shown that compassion may even lengthen our life spans, possibly due to decreased inflammation and a tempered stress response in those who help others.[32], [33] Older people who are happy have a 35% lower risk of dying than their unhappy counterparts, and so if having empathy makes us happy, maybe we'll live longer, happier lives.[34], [35]

Although empathy brings safety, happiness, leadership skills, abundance, and wealth, studies have shown that self-reported empathy has been declining for the last 30 years. Research shows that empathy, concern for others, and the ability to take other people's perspectives have sharply declined in American college students, particularly since 2000.[36] Why? We can blame it on smartphones and on the social isolation propagated by our vast number of virtual Facebook friendships compared to our shrinking number of deep friendships. We can say that perhaps it's the increase in violent media that numbs the empathetic response. But maybe it's even simpler than that: maybe our children just don't practice it.

Lucky for us, empathy isn't just an innate trait but also a teachable skill. There are programs designed to teach empathy, and they work. Many research studies have found that mindfulness/meditation and service learning/community partnerships are proven, simple ways to enhance empathy. Specific evidence-based programs target empathy, social learning, and conflict resolution, including Roots of Empathy (K–8), Positive Action (K–12), Responsive Classroom (K–5), and Second Step (Pre-K–8).[37]

Teachers are figuring out that if kids don't come into the classroom with empathy, it's worth taking the time to teach it to them. Not only will empathetic kids not disrupt the class for other students, but research has also shown that empathetic individuals are better learners. An analysis of 213 social- and emotional-learning programs involving over 270,000 kindergarten through high school students showed that interventions increased academic performance by 11%, as well as decreased aggression/emotional distress and increased helping behavior in students.[38] Empathy training results in higher student GPAs, better reading comprehension, and more developed critical thinking skills.[39–41] In the absence of one of these school programs, parents can teach kids empathy simply by making time to do it.

EMPATHY DEFINED

For some, it's hard to see empathy as an adaptation that nature would select for. In fact, we tend to think of empathy as a skill specific to the more sensitive types—or even as a weakness. And yet empathy is a human quality conserved by evolution. Why is empathy so important? The human relationship with empathy is a complicated issue, and it hinges on our personal definition of empathy.

The concept of empathy evolved from a theory of art appreciation, invented only about 150 years ago. (The word *empathy* comes from the Greek *en*, meaning "in," and *pathos*, meaning "feeling.") The idea was that to fully appreciate a work of art, you have to project your own self into the art. And the art could make you feel. Psychology stole the word *empathy* from the art world and turned it into a thinking verb: *empathize.* To empathize, you need to understand someone else's point of view and put yourself into that person's world. You must be able to imagine what your friend is feeling, imagine what might make her feel better.

But even if you are great at feeling sad for others, and you can see things from the sad person's point of view, for empathy to truly be useful to the human condition, empathy must lead to compassion, or applied empathy. There's how we *think* about emotions, there's how we *feel* emotions, and there's what we *do* about the emotional content in the world around us (that is, express compassion). Recognizing these different types of empathy is the first step in helping our kids become doers of good things in the world around them.

EMPATHY IS A BIOLOGICAL QUALITY

Empathy is another quality that sets us apart from computers. Computers can't do compassion. Computers could be programmed to follow the rules for cognitive empathy and say the appropriate thing to a grieving person or to offer a discount on the next order to a disgruntled customer, but taking another's perspective requires imagination. Compassion involves encouragement, good communication, social collaboration, and often, personal sacrifice to solve someone else's personal problem.

Have you ever picked out the perfect birthday present for someone and couldn't wait for them to open it? If so, you can probably understand why giving money to charity activates the same pleasure centers in the brain as receiving money yourself, and why empathy is a great contributor to personal happiness.[42] This means that when both parents and children choose to regard caring for others as important, happiness will come along too.

EMPATHY REQUIRES SELF-CONTROL AND CREATIVITY

Acting compassionately, based on empathetic thoughts or feelings, takes both self-control and creativity. Self-control is required to stop yourself from acting on your gut impulses, like not hitting when someone takes your ball away. And then you need to have creativity to process the situation—to try to figure out the "why" of it. It takes creative thinking to realize, for example, that there is only one ball for twelve kids to share, and the kid who took it away from you was playing with it before he left it to run to the bathroom. At its root, empathizing is an active, creative exercise—a kind of subtle art form. You have to imagine someone else's experience. As such, empathy increases creativity, and creativity increases empathy.

Self-Control

Researchers say that the most important skill you can help your child to develop is self-control. A study of 1,000 children showed that the amount of self-control that a child has predicts health, wealth, and crime rates by age 32, and self-control can predict those things better than intelligence or social class can.[43] Self-control can predict grade performance better than IQ scores can.[44] People with high self-control are more emotionally stable, are rated as better bosses, and are in better relationships.[45], [46] They are happier people.[47]

The authors of the 1,000-children study defined self-control as the ability to "delay gratification, control impulses, and modulate emotional expression."[48] Most parents would define it in a similar way: self-control is the ability to not do the things you shouldn't be doing. Good self-control means that you can override seemingly automatic urges that interfere with your own goal-directed behavior. Good self-control means *you* won't get in the way of *yourself.*

And on the other hand, self-control failure means you experience interpersonal conflict, lower intellectual achievement, irrepressible appetites, addictions, and many other adverse outcomes.[49], [50]

It sure seems like if we can give our child adequate self-control, we will be giving him the gift of control over his own life—the freedom to become anything he wants to be—and that we will be saving him from self-destructive behaviors. So, as parents, we work on it nearly constantly with our kids. And research clearly shows that development of self-control is a very long process, reaching far past the elementary school years. One mom, Jenn, told me, "One of our daughters has insane self-control, but the other has none. Her impulse to hit or pinch her sister instead of telling her why she's upset is a huge problem. We are trying to actively work on it, through everything from consequences to thinking through scenarios with her to model how she could use her words rather than resort to physical aggression. No success yet!"

We know that some kids just naturally need more help with self-control than others. Studies show that between 50% and 90% of self-control is dictated by genetics, but we also know that self-control is tied to the structure and function of the brain's prefrontal cortex.[51] The formation of the prefrontal cortex is set in motion by genetics, but it is also susceptible to environmental influences. That means that the part of self-control that's not genetically regulated is learned through experience. Parents can be the environmental influence, and parents can direct experience.

SELF-CONTROL IS A BIOLOGICAL QUALITY

Self-control is always about an urge, followed by a choice not to act. Computers obviously can't choose not to do something they want to do; they simply execute rules. The struggle and balance between what we want and what is in our best interests never happens in a computer. A computer never has multiple impulses competing for its attention, nor does it ever need to battle its own impulses. There's never a moment of indecision within a computer. The type of self-listening required to weigh the best option happens when brain circuits are firing and signals are being summed up. The split second when a person is deciding whether to follow a base instinct is a remarkably human moment. And, as we'll see, the moment that comes next—the moment of self-regulation—is even more important.

SELF-CONTROL REQUIRES CREATIVITY OR EMPATHY (OR BOTH)

The actual act of self-control has nothing to do with creativity or empathy, but the decision to have self-control absolutely does. In fact, there are only two reasons someone can have good self-control. One is if she can see the impact that the behavior will have on other people. (She has enough empathy to understand how others will feel.) The other reason is if she can see a better way of getting what she wants. (She can imagine the consequences of behavior, and she has enough creativity to see a different path to achieve her goal.) Both of these reasons have us pulling ourselves up out of the current situation, and both require us to think bigger than ourselves.

Building One Skill Also Builds the Others

The skills of creativity, empathy, and self-control are interconnected. One always bleeds over into the others. Neuroscience shows that the circuits that govern each of these are so deeply connected that to separate them from each other is virtually impossible. Building ability in one area can translate to greater ability in the other two. If you cultivate any one of these skills, you are also bolstering the other two, as well as many more traits that tap into these skills (see figure 1.1).

Self-Regulation Is the Culmination of Creativity, Empathy, and Self-Control

Creativity, empathy, and self-control culminate in effective self-regulation, which is the process of weighing the past, present, and future and making a single decision to act. Self-regulation means acting in a way that is contrary to your natural instincts in order to solve a problem or be compassionate. By itself, self-control is a straight "no." There's no personal reward for not doing something you want to do or not having something you want to have. So really, there's no intrinsic motivation to have self-control.

By contrast, self-regulation says, "You can't do or have what you want in this way, but let's figure out another way to do it or get it." Self-regulation is a complicated skill, mostly because it taps into so many other skills. It's a tightrope walk that's just as hard for the wallflowers as it is for the class clowns. But practicing self-regulation is so important to defining the person that your child becomes, for instilling the kernels of confidence to both know the right thing and to choose the right thing, and for teaching kids how to claim personal happiness in a way that builds others up in the short-term and the long-term. In fact, it's really the end skill that we're trying to cultivate in our children and worth every second of effort that we can put into it.

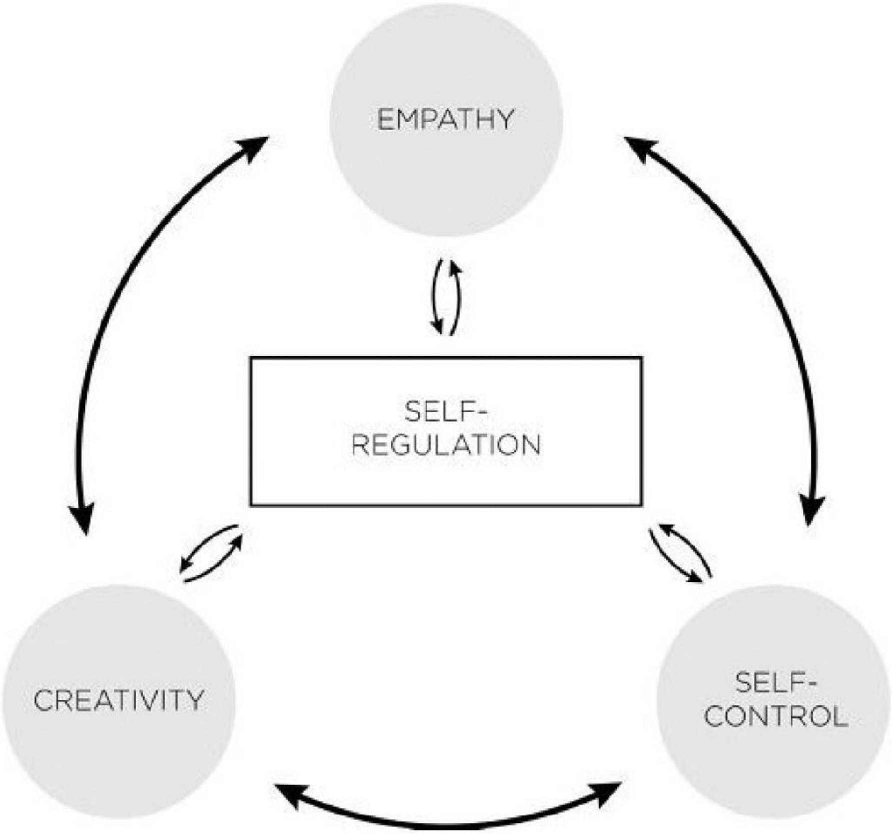

Figure 1.1 The skills of creativity, empathy, and self-control are interconnected. If you cultivate any one of these skills, you are also bolstering the other two.

Use Neuroscience to Raise an Awesome Person—Starting Now

We should not wait until we feel that our kids have attained a certain level of development to begin teaching them creativity, empathy, and self-control.

Traditional psychological theory holds that abstract reasoning isn't developed until adolescence; consequently, early education has not pursued the development of building abstract connections. In fact, it is a widely held belief that until a certain developmental stage, young kids can't begin to connect abstract ideas. When my son was in second grade, his soccer coach told me that his team could finally start executing plays because they were just starting to think abstractly.

But studies show that infants can detect metaphors and that preschoolers commonly use metaphors in their own speech.[52], [53] A metaphor—a descriptive term applied to something it wasn't originally meant to describe, but instead captures aspects of the meaning—is the embodiment of abstract thought. And *babies* understand them.

Neuroscience tells us that there are elements of self-control, empathy, and creativity that even very young children can learn. The brain is always developing; connections between neurons are always being refined. So, when we practice these skills, we build the connections for them in our kids, regardless of their ages. This simply requires a refocusing of the parental lens, starting with an agreement that these skills are important. In 1890, William James observed that "my experience is what I agree to attend to."[54] This is true for our kids as well: they will pay attention to the things that we as parents require them to experience and, eventually, to the things that they habitually notice.

Focused attention is rare and unbelievably important because what parents pay attention to are the things that families end up valuing the most, whether intentionally or not. If we as parents focus on empathy, creativity, and self-control in an environment that allows for autonomy in personal decision-making, then we will raise creative thinkers who get things done in a way that benefits others as well as themselves. In a kid, these skills come together in the form of self-regulation and ownership. If life is presented as a problem that you figure out, then you accept the conclusions you come to, and you accept responsibility for not just your thoughts and actions, but also your own learning.

By-products of developing these skills are increases in grit, critical thinking, social responsibility, resilience, and personal accountability—all those missing ingredients that we're trying to instill in our kids, so they are not weak reeds in a windy world. We're not here to raise bystanders. Instead, let's raise a generation of people predisposed toward kindness and proficient at being uniquely human.

2

Practical Neuroscience for Parents

Key Facts and Processes

IT IS IMPORTANT for parents to have a basic understanding of how the brain and its neurons work. An awareness of the nuts and bolts of brain connectivity allows us to see how our parenting is shaping our children's brains—specifically, how connections between neurons are forming in the short-term. From there, we can see how to use that information to reach our long-term parenting goals.

If you think I'm going to suggest that you learn all the parts of the brain, don't worry—I'm not. You don't need to know tons of anatomy to understand how the brain works. You only need to learn how individual neurons and neuronal connections are formed. Which neuronal connections survive and strengthen, and which ones fade away, depends on how much each is used. And we parents are perfectly placed to influence which connections in our children's brains get used the most. We can modify our child's experiences to refine her brain, define it, and encourage the development of certain aspects of it. This refinement is possible on both a cellular level and on a circuit level. If you *are* interested in delving further into brain anatomy, I've included a crash course in appendix 1, "Commonsense Neuroanatomy."

Meet the Neuron

Most things in biology follow the "structure dictates function" rule. If you had never seen a chair before, you could probably deduce what it's for simply by looking at its shape. Neurons follow this rule too: they're perfectly shaped to communicate. These special cells in the brain can receive and transmit signals over long distances through their long, fragile cell extensions called **axons**.

Although you've probably never seen an actual neuron, you may already be familiar with its structure. Neurons look like trees (see figure 2.1). Information comes in at the uppermost dendrite branches and gets transmitted down the axon trunk, and then the roots pass the information on to the next neuron. The signal can only go in one direction down the axon, like lightning hitting the tree from the sky. Information is never sent back up to the branches.

The neurons connect with each other to make pathways (see figure 2.2), and the pathways can go in multiple directions, like roadways, to form circuits (see figure 2.3).

Brainpower isn't centered in a neuron or even a group of neurons. The number of neurons we have doesn't matter as much as the amount of interconnectivity between them.

Timing Is Everything: The Stages of Brain Development

It is well-documented that early childhood experience is vitally important in determining adult competence, health, and overall well-being.[1] But when does our parenting make the most impact on our kids' brain development? A lifetime of brain development can be broken down into three stages (see figure 2.4):

Stage 1: When the first neurons are made and migrate to the places they will occupy in the body (neuron birth and migration)

Stage 2: When connections between neurons form and unform (synaptogenesis)

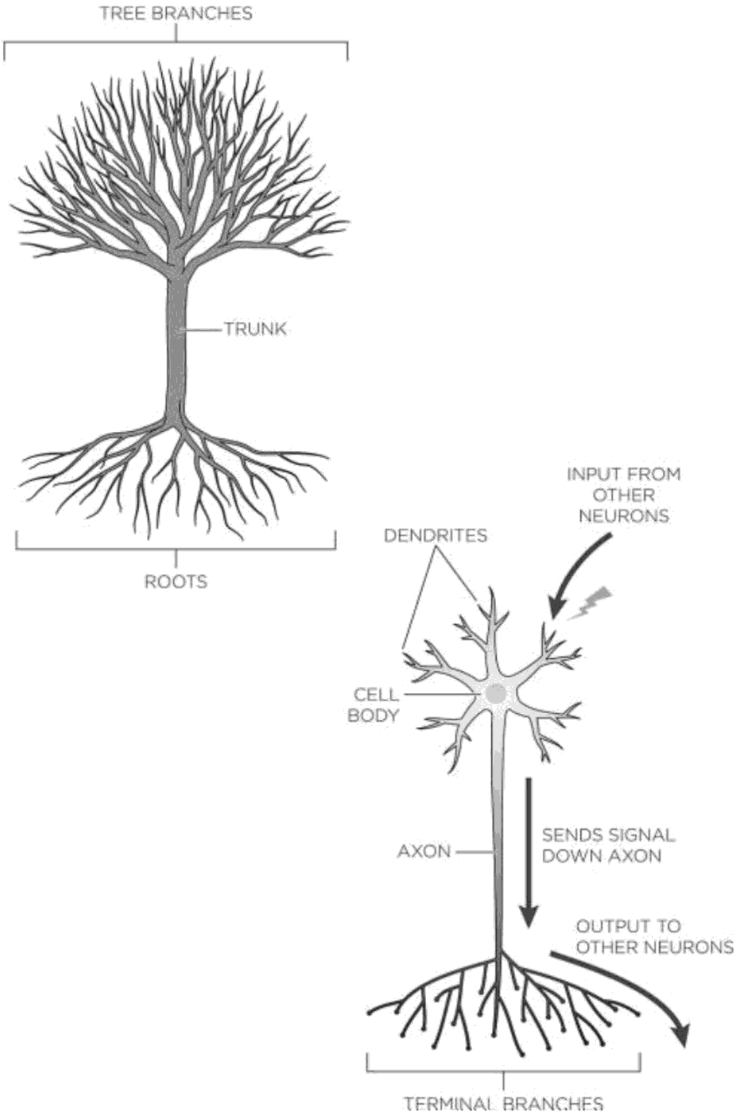

Figure 2.1 Neurons and trees may look similar, but they are designed to serve highly different functions. A neuron receives information from other neurons only at the dendrites, which resemble a tree's top branches. These signals travel through the axon (like the tree trunk) and down to the terminal branches (where the roots would be). It's like lightning striking a tree—the electricity always comes from above, and it is always conducted toward the ground. The neuronal signal can never travel back up into the branches.

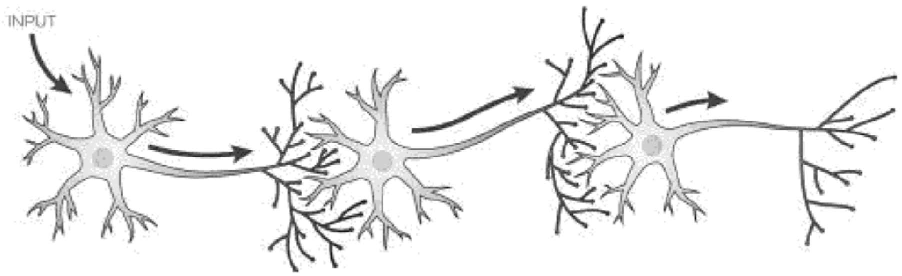

Figure 2.2 Neurons line up in pathways, primed for communication.

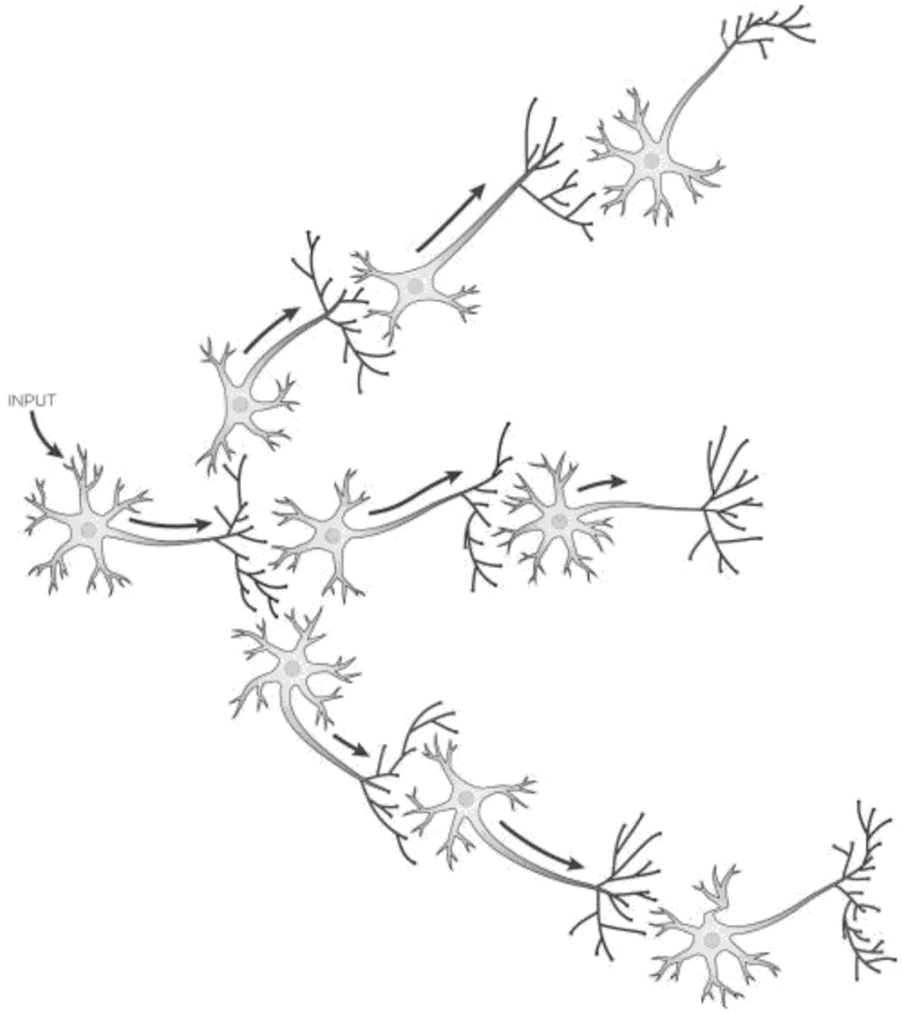

Figure 2.3 Neuronal pathways can then branch, like roadways, to form circuits. Each neuron can communicate with many different surrounding neurons.

Stage 3: When information traveling through neuronal pathways can speed up (myelination)

Stage 1 of brain development is pretty much hands-off, but parents can make a big impact during stages 2 and 3 of neurodevelopment, which—not coincidentally—occur mostly after you finally get to meet your baby. And even after brain development is technically over at the age of 25 or so, our brains are constantly changing in little ways as we interact with our environment, even as adults.

The two brain stages that continue after birth are when the brain is more responsive to outside stimulation, so during these stages, the way parents act can change the way the neurons work. This timing makes sense from an evolutionary point of view, but it's also a completely amazing opportunity for parenting: when we're around to make an impact, our child's brain is primed to respond to our parenting.

Neuronal connections are formed at an astounding rate during the early years in response to early experiences. As the brain matures, the developmental focus shifts to pruning away the connections that are not needed, while supporting essential connections and forming new ones.[2]

The three stages are genetically predetermined to happen, but *experience* always allows for neural modification throughout every stage of development.

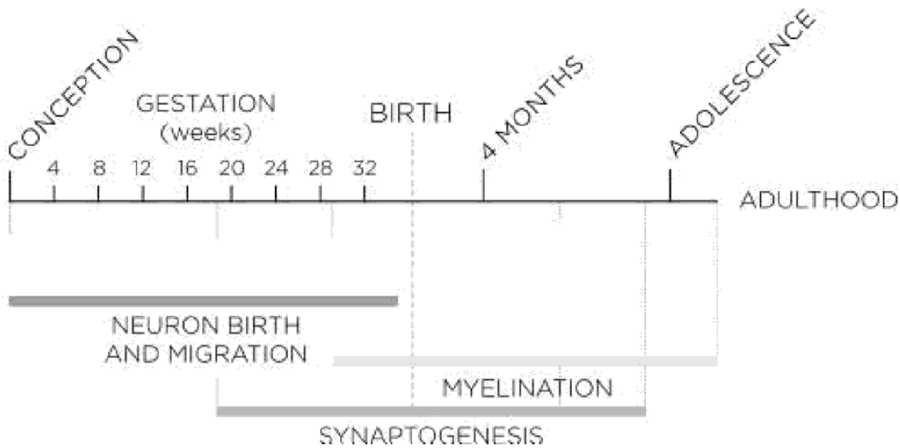

Figure 2.4 Brain development can be broken down into three stages: (1) neuron birth and migration, (2) synaptogenesis (the process of forming the first neuronal connections), and (3) myelination (when neurons become faster). Though it's not depicted on this timeline, synaptic plasticity, or the ability to change synaptic connections in response to the environment, never stops.

STAGE 1 THE FIRST NEURONS ARE MADE AND MOVE INTO PLACE

The first part of this stage, called neurulation, is completed during the first few weeks of pregnancy, so by the time you find out you're going to have a baby, it's probably already happened. This is when the embryo sets aside the cells that will become the brain. The body is actively making neurons during this small early pregnancy window, and the neurons that are formed during this period of development are pretty much all you're going to get.

Then the neurons migrate to their correct places, and the process of eliminating unneeded neurons begins. Neurons have found their way to the positions they will occupy in the mature brain by the sixth prenatal month, but only the neurons that make healthy connections will survive.

As a parent, can you change the processes of neurulation or neuronal migration in your child? Only slightly, because they're mostly dictated by genes. Parents aren't in charge of where a neuron ends up sitting in their child's brain. We want to let nature take its course here because the default pattern of organization is the most efficient. This stage will happen completely during pregnancy and, in the absence of genetic problems, will occur like clockwork, without parental awareness. Our job as parents during this first brain development stage is to avoid exposing our babies to substances that are known to alter these processes, such as outside toxins or alcohol. We can also get regular prenatal care, pay careful attention to our diet, and take our prenatal vitamins.

STAGE 2 NEURONAL CONNECTIONS FORM AND UNFORM

After neural migration, neurons mostly remain anchored in their same places, but each neuron eventually makes thousands of connections with other neurons. An adult brain contains *trillions* of connections in each square centimeter of the cortex, and young children have even more.[3]

Neurodevelopment Is a Continuum

Throughout history, scientists have argued about whether babies were simply mini-adults, or whether (equally wrong) a baby's brain started to form at birth. But with the invention of neuroimaging techniques, we can see a lot more of what is going on inside the young brain, how exquisitely formed the baby's brain is at birth, and how vastly different the landscape looks from an adult's brain.

Your child's brain is *not* a blank slate at birth. Fetal behavior begins as reflex movements and it gradually expands into behavior that is distinct and responsive as the birth date nears. Even during the birth process, he is already collecting sensory information, evaluating his environment, using sophisticated neural machinery, and—perhaps most impressive—constantly remodeling his brain in response to what he senses. Neurodevelopment is a continuum. There is no magical neural event that occurs at birth. Instead, the baby can use the pathways he's been laying down for months in preparation for life in air instead of in liquid.

Neurons are electrical cells. Neurons don't touch at their connections; they are separated from each other by a tiny space called a synaptic cleft that is only about 20 nanometers (billionths of a meter) wide. If neurons physically touched at each connection, the electricity could spread through all connected neurons unchecked, resulting in symptoms much like a seizure. Instead, the body has developed an amazing way of tightly controlling how neurons talk to each other through the use of neurotransmitters, which are chemical signals that traverse these tiny spaces between the neurons (see figure 2.5).

An activated neuron sends a very mild electric current, called an **action potentia**l, down to the **synapse**, where it is turned into a chemical signal that is then received by the next neuron and turned back into an electrical signal. So one message will be electrical, then chemical, then electrical again as it goes from neuron to neuron. Sometimes the next neuron will be asked to fire, and sometimes the next neuron will be inhibited. This extra layer of control shows the power of using a neurotransmitter system instead of simple electricity, which would always be a "go" signal. A synapse, then, refers to the end of one neuron, the synaptic cleft, and the beginning of the next neuron, and there are many, many ways we can change neuronal communication at the synapse.

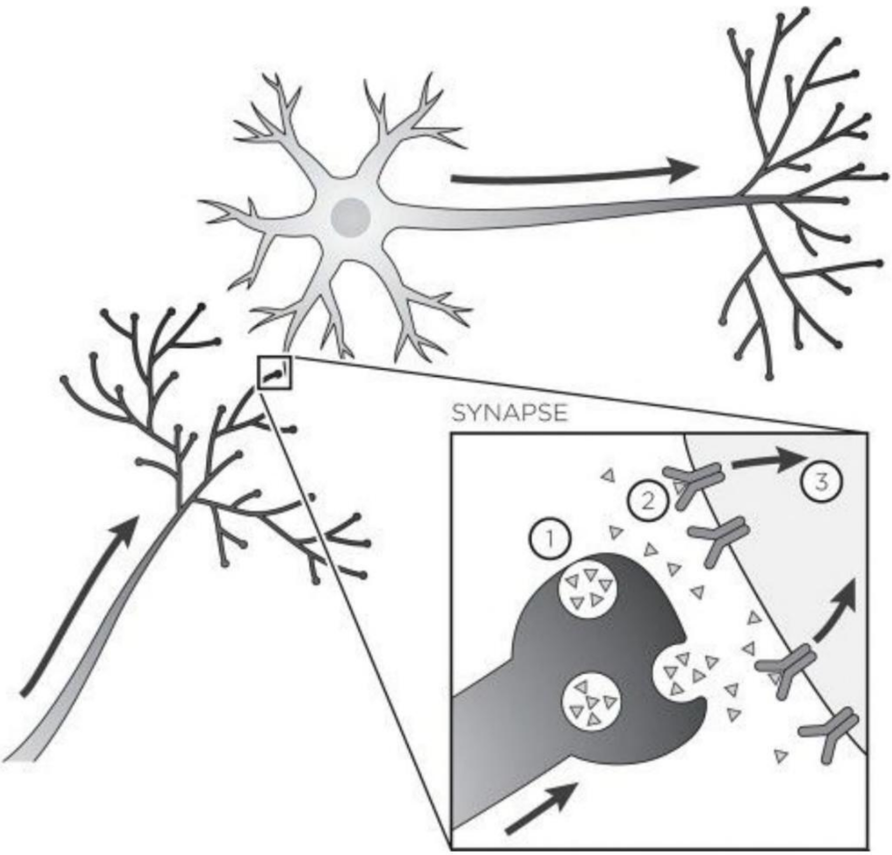

Figure 2.5 Synapses are connection sites between neurons that can be strengthened with repeated use. Every synapse has a giving and receiving neuron, separated by a small space. (1) An activated neuron sends an electrical signal down its axon toward another neuron. (2) Rather than passing that electricity directly to the next neuron, when the signal reaches the end of the neuron, it's converted into chemical neurotransmitters that must traverse the tiny synaptic gap between the two neurons. Once on the other side, the neurotransmitters can bind to the other receptors there. (3) If the neurotransmitters are *excitatory*, then the second neuron will turn that chemical signal back into electricity and send an action potential down the next neuron. If the neurotransmitters are *inhibitory*, then the second neuron won't fire.

Synapses are the basic units of all brain functioning, and the process of forming synapses is called synaptogenesis. The peak period of synapse formation occurs from about 34 weeks after conception through the initial newborn stages. During this peak period, new synapses are being formed at a staggering rate, with *each* synapse eventually retaining about 7,000 synaptic connection.[4] These synaptic connections organize neurons into circuits, columns, and functional areas, which allow the brain to do things like remember a street sign, recognize the smell of bread baking, fear a snake, and love a favorite blanket.

Crafting Who We Are

Some brain systems, such as the visual system, need only a minimal amount of stimulation to form properly. But other systems require experience-dependent synapse formation (also known as activity-dependent synapse formation). This means that synapses may be refined, strengthened, or lost based on what we experience and the neurons that activate when we experience it. Connections can be shaped by experience in a powerful way. These experience-dependent brain changes end up being highly individualized, depending on what experiences a person is exposed to.

Proper brain development also includes synapse elimination, or pruning. We initially create more neuronal connections than we need in our brains, and then much of the rest of our development is spent getting rid of the ones we don't need. By the time your child is a teenager, about half of her synapses may have been discarded in a normal process, and the landscape of her brain will continue to shift and change in minute ways for the rest of her life. We keep what we need. We keep what we use.

Can parenting change synapse formation? Yes. We have an invaluable opportunity to help this process because the connections between neurons remain highly dynamic. Neurons get better or worse at talking to each other, and these processes are both experience and activity dependent. This means that *what* you are exposed to matters, and *how many times* you are exposed to it matters.

You can actively change your own brain simply by paying attention to different things, practicing different skills, or choosing to act in a different way. And you can influence your children's brains by encouraging them to do the same things. The pathways your kids use will be strengthened, and over time, their brains will eliminate the connections that have been ignored. This is especially true during the period of synaptic refinement that occurs during early childhood. Kids have the most synapses in the cortex at about 8 to 9 months; after that, they experience the natural pruning of synapses that are not needed, until stabilization occurs at about 11 years of age.[5] During this refinement period, the neurons can change which other neurons they talk to. Whole axons can be pruned away, or synapses can simply be eliminated. If we strengthen the right synapses, then we keep the desired neurons and the desired connections.

Parenting the Synapse

In my own research, I spend a lot of time figuring out what synapses do when something bad happens to them—like when a baby's brain is exposed to prenatal alcohol, for example. But the flip side of synaptic plasticity can be equally powerful: our parenting can also positively change synapses through the processes of gene regulation.

This is the fundamental way that neurons learn: Every time your child learns something, gene expression changes to support the strengthening of a new synapse and long-term memory. Genes make proteins, and proteins make nearly everything in your cells. (This is explained in more detail in appendix 2, "Epigenetics.") You can't create something from nothing. Genes must turn on because learning requires that the neuron makes some functional and/or structural changes.

Brain Development Facts

Ever heard that you only use 10% of your brain? It's not true. The human body is very streamlined, particularly when it comes to doling out resources. If a cell was not needed in the body, it would not be there. *Every* neuron will be used, so the brain will carefully choose which ones survive.

The number of neurons in the brain reaches its highest peak 28 weeks after fertilization—long before birth. Adults have nearly 100 billion neurons, and every child is born with most of his neurons already in place. The inner layers of the brain form first, followed by the outermost layers. That's why attention and maturity—which are regulated in the outer cortex—take so long to develop in our kids!

But brain development is different from the development of all other body parts. Neurons don't usually divide or make more neurons. They're not like skin cells or muscle cells that are constantly turning over. New neurons are rarely formed in an adult. That's why the periods of prenatal and childhood brain development are crucial. They set the road map for life interactions.

Neurons respond to experience by changing their actual structure. Synapses are concentrated in highly dynamic structures called spines, found at the interface between neurons. Typically, the more spines that are present, the more connections a neuron makes—a single neuron may have hundreds or thousands of spines. The spines look like leaves on a tree branch, but they come and go in response to activity levels. Sometimes this can happen in a way that appears to be almost spontaneous, and sometimes it happens in response to stimuli or the lack of stimuli.

There's a lot we don't know about spines, but there are some key points that parents need to know:

- Reinforcement spines are sent to the synapses that we need, and the ones we don't need are not maintained. Once a spine is there, changes in activity can lead to spine enlargement or shrinkage.

- Spines are much more dynamic in kids than in adults. Right after birth, spines can come and go in under a minute, and as neurons get older, there are less-dynamic spine changes.

- Animal studies have shown that environmental enrichment leads to increases in spine density.

- Skill training leads to the formation of new spines, while also destabilizing old spines. In other words, you're remodeling the neural circuits at work as you learn. You can literally see synaptic spines developing or shrinking under a high-powered microscope (see figure 2.6). Spine changes have been observed within hours after learning something new (for example, when a songbird learns to sing a new song or when a young mouse is trained to reach for and grab a seed).[6, 7]

Importantly, even though spines can be fickle structures, repeated training on a task will make the spines get bigger, become mature, and be more likely to stick around. Research shows that the process of forming and stabilizing spines means that behavior associated with those spine changes also gets stronger. Prolonged use of these brain pathways will make lasting, presumably permanent, memories.[8]

STAGE 3 MYELINATION—SPEEDING UP THE MESSAGE

If synapses are key to connections within the brain, then **myelin**, a white matter covering that forms around a neuron's axon, is the key to the brain's efficiency. When neurons start to become myelinated, they can pass messages to each other faster.[9] Myelination is a simple process, but it's very important to the way our brains work. Brain support cells, called **oligodendrocytes**, wrap around the axon of a neighboring neuron to provide insulation (which is important for conducting electricity; see figure 2.7). This myelin insulation speeds up how fast a neuron passes an action potential by a factor of 10.[10, 11]

The development of myelin is a maturity indicator. In fact, the timing of the appearance of this white matter is so precise that the age of a baby in the womb can be calculated based simply on which neuronal pathways have been myelinated. Myelination starts about halfway through pregnancy, and this developmental stage lasts a long time—continuing into the fourth and fifth decades of life.[12, 13]

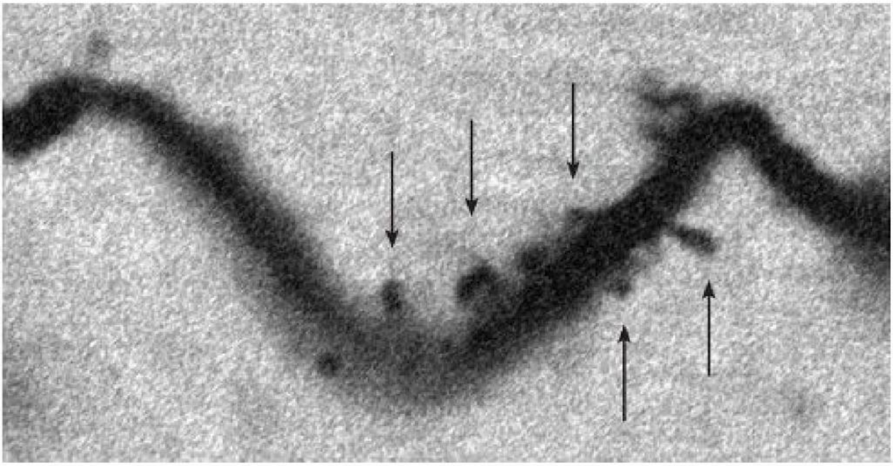

Figure 2.6 Human neurons are virtually indistinguishable from mouse neurons. This is a photograph of a dendrite from a neuron in the striatum of a mouse brain, magnified 1,000 times. I filled this individual neuron with a dark dye so we can see its structure, while the surrounding neurons remain invisible. This dye combined with high magnification allows us to see spines protruding from this dendrite (black arrows). These spines are dynamic structures and are able to come and go to support changes in neuronal activity.

Huge increases in myelination have been reported across the brain from ages 5 to 12 years, but not all axons get myelinated at the same time or rate.[14, 15] Instead, myelination occurs in waves, moving across different functional areas. Areas among the last to develop myelination include the reticular formation (responsible for wakefulness), parts of the **cerebellum** (which controls fine-motor coordination), and the **association cortexes** (which help us make sense out of all the signals coming in).

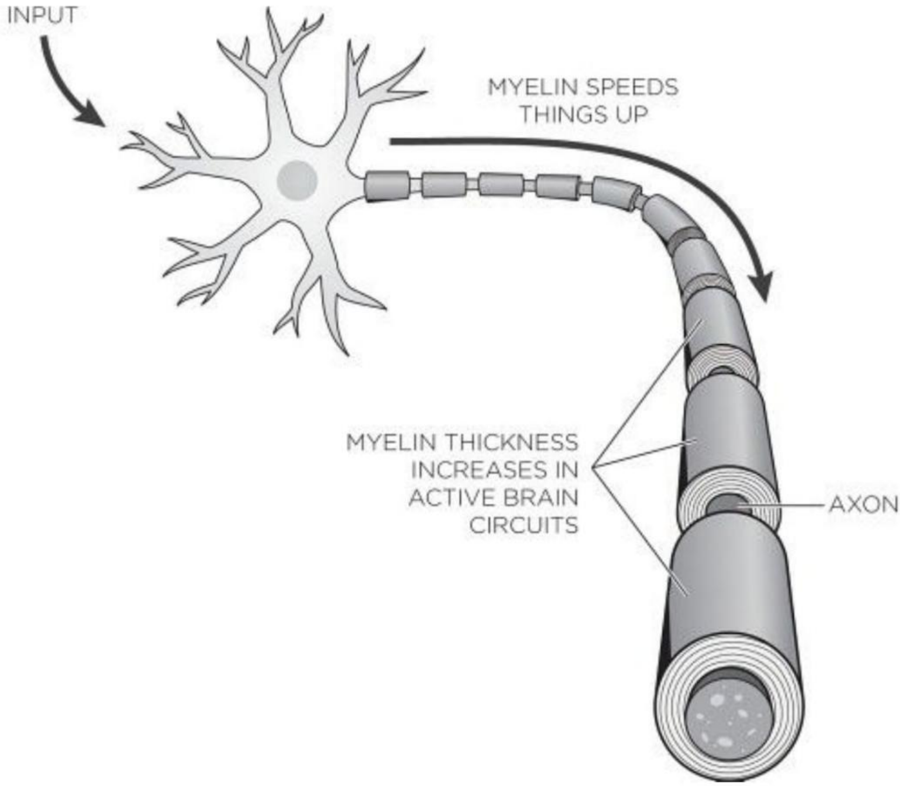

Figure 2.7 Neuronal axons transmit signals very quickly, but myelinated neuronal axons are even faster. Myelin wraps around the axon to provide electrical insulation for a traveling action potential. This speeds things up. This process happens normally as our brains mature, but myelination can also be enhanced by activity so that frequently used neurons can swiftly communicate.

As a parent, it probably won't surprise you to know that the last areas to be myelinated are in the frontal lobes—those responsible for mature judgment, impulse control, and decision-making. Neurodevelopment is still incomplete in these areas when kids turn 18, the age of legally required grown-up decision-making, and it's still incomplete in our college-aged kids when they start navigating the world on their own.

Although myelination is obviously a highly regulated, normal developmental event, recent studies have proposed that myelination can also be influenced by functional interaction with the environment, and *this* is where parenting can make a difference. Just as there is activity-dependent synapse formation, there's also such a thing as activity-dependent myelination: activity based on experience can encourage myelination of axons. This happens particularly during early development, but it also continues into old age.[16]

Human neuroimaging studies have shown that practicing skills, including things like practicing playing the piano, can change the amount of brain white matter present.[17–19] As we learn skills, new neurons can be myelinated, the myelin can get thicker on neurons in the circuit that is active, and new oligodendrocytes can be made in order to support this process. Importantly, the brain circuit that is getting used is the pathway that gets more myelin and becomes faster.[20] This is a directed, focused process, not a global phenomenon, so parents have to pick and choose what is important to practice.

We know that myelination can profoundly affect how incoming signals are integrated by the neuron, and therefore it can change how we process information. But myelination is also a sign that the neurons in the brain are highly connected, and parents can help foster that interconnectivity by encouraging children to practice the skills that activate those connections. Using neuronal pathways to change white matter is a less known (but equally important) way that we can encourage our children's brains to change and learn.

Myelination Can Alter Synaptic Plasticity

Speeding up neurons by changing myelination can alter synaptic plasticity, too. Neuronal connections also can be altered depending on when signals arrive at the next neuron to cause that neuron to fire an action potential and pass the signal on. When a message arrives right before or exactly when firing occurs, that synapse will be strengthened. But if a signal arrives even a few milliseconds afterward, the synapse is actually weakened.[21]

Using Brain Plasticity to Parent Better

Your parenting choices have the power to dramatically shape the neuronal connections that survive in your child's brain as it develops. Neuronal activity determines what connections she keeps, and therefore it determines who she becomes. These connections will then determine what she should expect from the world around her and how she should interact with others and will ultimately shape her own parenting skills.[22] So we as parents need to start thinking about experience as a parenting tool that can actually change our child's physiology. We know that to keep our kids healthy we need to feed them right and encourage them to exercise. It's the same with the experiences our kids practice. We should select experiences for them as carefully as we choose foods for them to eat.

BRAIN PLASTICITY DEPENDS ON PRACTICE

image
not
available

PRACTICE CHANGES THE WAY GENES ARE USED

Neuroscience tells us that deliberate practice will change the way the neurons fire and connect. We know that restimulating the same brain circuit results in increased synaptic strength, and we know that practice works best when it's not intermittent. But even if a year goes by between the first and second time a pathway is used, the response to the second use will still be stronger than the first. Practice is a precise controller of gene regulation, of how loud or quiet genes are. Practice allows the genes that dictate learning to be turned up, new protein to be made by these genes to support the enhanced connection, and new synapses to be formed (see appendix 2, "Epigenetics," for more details on this process). This means that practice leads to progress no matter how old the brain is.

PRACTICE MAKES HABITS

What we practice becomes habit. A habit is a series of actions that were, at one time, actively initiated by a person, but have since become automatized. If you set up your child to practice a skill often enough, eventually it will become a habit with an anatomical neurological basis to it. First, habitual activity enhances synaptic strength. Second, the behavioral skill becomes easier due to enhanced information flowing through this behavioral circuit. And third, the ease of flow predisposes the circuit to being used in the same way in the future.[26]

Parents have this miraculous opportunity to push certain neurons down paths, and neuroscience shows us that once a neuron has activated a particular pathway, it's more likely to fire that way again. There's not only a physical strengthening at the synapse through the dedication of neuronal components to support that connection, but the neuron also has a heightened response to being stimulated.

Presumably, habits form simply so we can avoid the stressful process of deliberate decision-making for situations where a rational decision has already been made. Habits are essentially the same as instinct, but they are acquired behaviors rather than innate behaviors. Once a habit has formed, brain activity is highest when the habitual activity starts; it quiets down as the habitual activity continues, and starts up again when the task is finished. During the habitual activity itself, the brain does not have to think about what it's doing—such is the nature of a habit. For example, getting up daily at 6:00 a.m. to exercise before work can become habitual behavior. At first it requires some effort, but soon it take less, until eventually getting up at that time becomes relatively effortless. Every habit was once a goal-directed behavior. Once it's nailed down, it becomes second nature.

Neuroscience defines habits not as automatic behaviors that we repeat, but instead as a stable predisposition to act in a certain way. Habits do not necessarily

image
not
available

Index

Sounds True
Boulder, CO 80306

This book is not intended as a substitute for the medical recommendations of physicians, mental health professionals, or other health-care providers. Rather, it is intended to offer information to help the reader cooperate with physicians, mental health professionals, and health-care providers in a mutual quest for optimal well-being. We advise readers to carefully review and understand the ideas presented and to seek the advice of a qualified professional before attempting to use them. Some names and identifying details have been changed to protect the privacy of individuals.

Published 2019

Cover design by Rachael Murray
Book design by Beth Skelley

Illustrations by Shelley Li Wen Chen

Printed in Canada

Library of Congress Cataloging-in-Publication Data
Names: Clabough, Erin.
Title: Second nature : how parents can use neuroscience to help kids develop empathy, creativity, and self-control / Erin Clabough, PhD.
Description: Boulder, CO : Sounds True, Inc., [2019] | Includes bibliographical references.
Identifiers: LCCN 2018019365 (print) | LCCN 2018027963 (ebook) | ISBN 9781683640806 (ebook) | ISBN 9781683640790 (pbk.)
Subjects: LCSH: Empathy in children. | Creative ability in children. | Self-control in children. | Child development.
Classification: LCC BF723.E67 (ebook) | LCC BF723.E67 C54 2018 (print) | DDC 155.4/1241—dc23
LC record available at https://lccn.loc.gov/2018019365