

# brain rules

*for*



How to Raise a Smart and Happy Child  
from Zero to Five

JOHN MEDINA



**Pear**  
Press

# brain rules



## pregnancy

*Healthy mom, healthy baby*



## relationship

*Start with empathy*



## smart baby

*Feeling safe enables learning*

*Face time, not screen time*



## happy baby

*Make new friends but keep the old*

*Labeling emotions calms big feelings*



## moral baby

*Firm discipline with a warm heart*

## introduction

Every time I lectured to a group of parents-to-be about baby brain development, I made a mistake. The parents, I thought, had come for a tasty helping of science about the brain in utero—a little neural crest biology here, a little axonal migration there. But in the question-and-answer session after each lecture, the questions were always the same. The first, delivered by a very pregnant woman one rainy night in Seattle, was, “What can my baby learn while she is still in my womb?” Another woman asked, “What’s going to happen to my marriage after we bring our baby home?” A dad delivered the third question, with some intensity: “How do I get my kid into Harvard?” An anxious mom asked the fourth question: “How can I make sure my little girl is going to be happy?” And the fifth belonged to a downright noble grandmother. “How do I make my grandchild *good*?” she asked. She had taken over parenting responsibilities from a drug-addicted daughter; she did not want the same thing to happen again.

No matter how many times I tried to steer the conversation toward the esoteric world of neural differentiation, parents asked

variations on these same five questions—over and over again. Finally, I realized my mistake. I was giving parents Ivory Tower when they needed Ivory Soap. So, this book will not be concerned with the nature of gene regulation in the developing rhombencephalon. *Brain Rules for Baby* instead will be guided by the practical questions my audiences keep asking.

“Brain Rules” are what I call the things we know for sure about how the early-childhood brain works. Each one is quarried from the larger seams of behavioral psychology, cellular biology, and molecular biology. Each was selected for its ability to assist newly minted moms and dads in the daunting task of caring for a helpless little human.

I certainly understand the need for answers. Having a first child is like swallowing an intoxicating drink made of equal parts joy and terror, chased with a bucketful of transitions nobody ever tells you about. I know firsthand: I have two boys, both of whom came with bewildering questions, behavioral issues, and no instructions. I soon learned that’s not all they came with. They possessed a gravitational pull that could wrest from me a ferocious love and a tenacious loyalty. They were magnetic: I could not help staring at their perfect fingernails, clear eyes, and dramatic shocks of hair. By the time my second child was born, I understood that it is possible to split up love ad infinitum and not decrease any single portion of it. With parenting, it is truly possible to multiply by dividing.

As a scientist, I was very aware that watching a baby’s brain develop feels as if you have a front-row seat to a biological Big Bang. The brain starts out as a single cell in the womb, quiet as a secret. Within a few weeks, it is pumping out nerve cells at the astonishing rate of 8,000 *per second*. Within a few months, it is on its way to becoming the world’s finest thinking machine. These mysteries fueled not only wonder and love but, as a rookie parent, I remember, anxiety and questions.

## Too many myths

Parents need facts, not just advice, about raising their children. Unfortunately, those facts are difficult to find in the ever-growing mountain of parenting books. And blogs. And message boards, and podcasts, and mother-in-laws, and every relative who's ever had a child. There's plenty of information out there. It's just hard for parents to know what to believe.

The great thing about science is that it takes no sides—and no prisoners. Once you know which research to trust, the big picture emerges and myths fade away. To gain my trust, research must pass my “grump factor.” To make it into this book, studies must first have been published in the refereed literature and then successfully replicated. Some results have been confirmed dozens of times. Where I make an exception for cutting-edge research, reliable but not yet fully vetted by the passage of time, I will note it.

To me, parenting is about brain development. That's not surprising, given what I do for a living. I am a developmental molecular biologist, with strong interests in the genetics of psychiatric disorders. My research life has been spent mostly as a private consultant, a for-hire troubleshooter, to industries and public research institutions in need of a geneticist with mental-health expertise. I also founded the Talaris Institute, located in Seattle next to the University of Washington, whose original mission involved studying how infants process information at the molecular, cellular, and behavioral levels. That is how I came to talk to groups of parents from time to time, like on that rainy Seattle night.

Scientists certainly don't know everything about the brain. But what we do know gives us our best chance at raising smart, happy children. And it is relevant whether you just discovered you are pregnant, already have a toddler, or find yourself needing to raise grandchildren. So it will be my pleasure in this book to answer the big questions parents have asked me—and debunk their big myths, too.

Here are some of my favorites:

**Myth:** Playing Mozart to your womb will improve your baby's future math scores.

**Truth:** Your baby will simply remember Mozart after birth—along with many other things she hears, smells, and tastes in the womb (see “Babies remember,” page 31). If you want her to do well in math in her later years, the greatest thing you can do is to teach her impulse control in her early years (see “Self-control,” page 105).

**Myth:** Exposing your infant or toddler to language DVDs will boost his vocabulary.

**Truth:** Some DVDs can actually reduce a toddler's vocabulary (page 147). It is true that the number and variety of words you use when talking to your baby boost both his vocabulary and his IQ (see “Talk to your baby—a lot,” page 127). But the words have to come from *you*—a real, live human being.

**Myth:** To boost their brain power, children need French lessons by age 3 and a room piled with “brain-friendly” toys and a library of educational DVDs.

**Truth:** The greatest pediatric brain-boosting technology in the world is probably a plain cardboard box, a fresh box of crayons, and two hours. The worst is probably your new flat-screen TV. (See “Hurray for play!” on page 131.)

**Myth:** Continually telling your children they are smart will boost their confidence.

**Truth:** They'll become *less* willing to work on challenging problems (see “What happens when you say, ‘You're so smart,’” page 140). If you want your baby to get into a great college, praise his or her effort instead.

**Myth:** Children somehow find their own happiness.

**Truth:** The greatest predictor of happiness is having friends. How do you make and keep friends? By being good at deciphering nonverbal communication. (See “Helping your child make friends,” page 167.) Learning a musical instrument (page 209) boosts the ability by 50 percent. Text messaging (page 151) may destroy it.

Research like this is continually published in respected scientific journals. But unless you have a subscription to the *Journal of Experimental Child Psychology*, this rich procession of findings may pass you by. This book is meant to let you know what scientists know—without having a Ph.D. to understand it.

## **What brain science can't do**

I am convinced that not having a robust-enough scientific filter is one of the reasons so many parenting books come to such opposing conclusions. Just try to find a consensus from parenting experts about how to get your baby to sleep through the night. I can't imagine anything more frustrating for first-time parents.

This underscores the fact that brain science can't solve every single parenting situation. It can give us overarching rules, but it is not always good at the specifics. Consider the story one parent posted on TruuConfessions.com, a source I use throughout the book:

*Took dear son's door off last night. No yelling or anything. Warned him if he shut it again after I told him not to, then I was taking it off. Walked down the hall to find it shut again, came back with a power drill and the door went to the garage for the night. Put it back up today, but I'll take it right back down again if I need to. He knows I mean business.*

Can brain science weigh in on this situation? Not really. Research

tells us that parents must have clear rules and swift consequences for rule violations. It can't tell us whether or not you should take off a door. In truth, we are just starting to learn what good parenting looks like. Parenting research is tough to do, for four reasons:

### *1. Every kid is different*

Every brain is literally wired differently. No two kids are going to react to the same situation in an identical manner. So there is no such thing as one-size-fits-all parenting advice. Because of this individuality, I appeal to you to get to know your children. That means spending a lot of time with them. Knowing how they behave and how their behaviors change over time is the only way to discover what will and will not work in raising them.

From a researcher's perspective, the brain's willingness to respond to its external environment is pretty frustrating. Individual complexity is muddled in cultural differences, complete with their very own value systems. On top of that, families in poverty have very different problems from those of upper-middle-class families. The brain responds to all of this (poverty can influence IQ, for one). No wonder this stuff is so hard to research.

### *2. Every parent is different*

Kids raised in two-parent households are confronted with not one parenting style but two. Moms and dads often hold different parenting priorities, a source of great conflict in some relationships. A combination of the two styles guides the child. Here's one example:

*I go nuts watching my brother and sister-in-law with their kids. She parents occasionally, from the couch. So he overcompensates by yelling at them for EVERYTHING. From the outside perspective, it looks like the reason the kids don't behave is that they have NO IDEA what the rules are, they just know they'll get in trouble no matter what they do and they stop trying to behave.*

Two styles indeed. This argues for 100 percent cooperation between father and mother about how their children will be raised. That, of course, is impossible. Child-rearing in two-parent households will always be a hybrid proposition. Eventually, the children begin responding back to the parents, which will influence future parenting behavior. All of these changes complicate the research.

### 3. *Kids are influenced by others*

Life gets even more complex as a child grows up. School and peer interactions play an increasingly powerful role in shaping children (anybody out there have a horrible high-school experience you still think about?). One researcher has gone on record saying that peers—especially of the same sex—shape a child’s behavior much more than parents do. As you might suspect, this idea has met with a great deal of skepticism. But not outright rejection. Children do not live in an exclusive social ecology dominated by parents and nobody else.

### 4. *We can say ‘linked to’ but not ‘causes’*

Even if all brains were wired identically and all parents behaved in a cookie-cutter fashion, a great deal of current research would still be flawed (or, at best, preliminary). Most of the data we have are associative, not causal. Why is that a problem? Two things can be associated without one causing the other. For example, it is true that all children who throw temper tantrums also urinate—the association is 100 percent—but that doesn’t mean urination leads to temper tantrums.

The ideal research would be to a) find the behavioral secret sauce that makes smart or happy or moral kids who they are, b) discover parents who were missing the secret sauce and give it to them, and c) measure the kids 20 years later to see how they turned out. That sounds not only expensive but impossible. This is why most research we have about parenting is associative, not causal. But these data

will be shared in the spirit that the perfect should not be the enemy of the good. The other frustrating and wondrous thing is this:

*Human behavior is complicated!*

We can look simple and calm on the surface, like a glassy sea, but below that you find craggy canyons of emotion, murky ruminations, and floating, barely rational motivations. Occasionally, these characteristics—different ones for each person—will bubble to the surface. Consider one common emotional reaction to a toddler:

*Well that's it, it's official. I have not one drop of patience left. The well is dry. My two-year old son has managed to use up my life-time supply of patience, all before the age of 3. It's gone, and I don't see how it might be replenished to its original depths without concentrated effort... i.e. a week in the Caribbean w/ an endless supply of Mai Tais.*

As a brain scientist, I can count at least eight separate behavioral research issues in this woman's short paragraph. She is responding to stress, and the way her body does that was carved out long ago on the plains of the Serengeti. How she loses her patience depends in part on her genes, events while she was in the womb, and how she was raised as a little girl. Hormones are involved too, as are the neurological signals she uses to perceive her recalcitrant toddler. A memory of relief is also apparent—perhaps she is recalling a cruise?—as is her desire to escape. In only five sentences, she has taken us from the African savannah to the 21st century.

And brain researchers, from evolutionary theorists to memory specialists, study all of it.

So there *are* some solid things researchers can say about raising kids. Otherwise I would not have plopped down my own contribution to the pile of 40 gazillion books for parents. It has taken many good researchers many years to mine these nuggets of information.

## Relevant for kids through age 5

*Brain Rules for Baby* encompasses brain development in children ages 0 to 5. I know you're likely to inhale parenting information when you're pregnant, and you're less likely to return later for more. So the title of the book is intended to catch your attention early on. But what you do in your child's first five years of life—not just the first year—profoundly influences how he or she will behave as an adult. We know this because a group of researchers had the patience to follow 123 low-income, at-risk preschoolers for four decades, until their 40th birthdays. Welcome to the HighScope Perry Preschool Study, one of the most extraordinary studies of its kind.

In 1962, researchers wanted to test the effects of an early-childhood training program they had designed. Kids in Ypsilanti, Michigan, were randomly assigned to one of two groups. The first attended the preschool program (which eventually became a model for other preschool programs nationwide, including Head Start). The second group did not. The differences between the two groups powerfully illustrate the importance of a child's early years.

The kids in the program academically outperformed the controls in virtually every way you can measure performance, from IQ and language tests in the early years to standardized achievement assessments and literacy exams in the later years. More graduated from high school (84 percent vs. 32 percent for the girls). Not surprisingly, they were more likely to attend college. The kids who were not in the program were four times more likely to require treatment for a mental-health problem (36 percent vs. 8 percent). They were twice as likely to repeat a grade (41 percent vs. 21 percent).

As adults, those who had been in the program were less likely to commit crimes and more likely to hold steady jobs. They made more money, more often had a savings account, and were more likely to own a home. Economists calculated that the return on society's investment in such a program was 7 to 10 percent, about what you'd

historically get in the stock market. Some estimate a substantially higher return: \$16 for every tax dollar invested in early childhood.

## **Seed and soil**

The HighScope study is a prime example of the importance of environment in raising children. But nature plays just as large a role. Often, they are tough to separate, as in this old joke: A third-grade boy comes home and hands his father his report card. His father looks at it and says, “How do you explain these D’s and F’s?” The boy looks up at him and says, “You tell me: Is it nature or nurture?”

I was once at a lively, noisy science fair with my own third-grade son, and we were touring some of his classmates’ efforts. Several experiments involved seeds, soil, and growth curves. One memorable little girl took great pains to explain to us that her seeds had started with identical DNA. She had planted one in a nutrient-rich soil and watered it carefully. She had planted the other in a nutrient-poor soil and watered it carefully, too. Time passed. The seed nurtured with terrific soil made a terrific plant, which she proudly let me hold in my hands. The seed nurtured in poor soil made a pitiful, withered plant. She let me hold that, too. Her point was that the seed material provided identical growth opportunities for both plants, but that an equal start was not enough. “You need both seed and soil,” she explained to me—nature and nurture—to get the desired results.

She’s right, of course, and it’s a metaphor I use in this book to organize the research on raising smart and happy kids. There are some factors parents can’t control and some they can. There’s seed, and there’s soil. All of the nurture in the world won’t change the fact that 50 percent of your child’s potential is genetic. Good news: As a parent, you can only do your best. That said, even as a professional geneticist, I am convinced we can exert far more influence over our kids’ behavior than is popularly imagined. It’s a very, very big job that takes a lot of work. The reason has deep evolutionary roots.

## Why do we need parenting, anyway?

It's a question that bothers many evolutionary scientists: How come it takes so long to raise a human child? Aside from perhaps a whale or two, we have the longest childhood on the planet. Where did this decades-long sojourn come from, and why don't other animals have to go through what we do? Just a couple of delightful things we human parents endure:

*I feel so drained. JJ pooped in his diaper right after I got him off the potty, he threw up on the carpet, tipped his potty over and got pee on the carpet again, then he peed on the carpet AGAIN at bathtime. I've come so far and feel like I can't do this mommy thing, then I realize - I'm doing it...*

*Both my husband and I have rather colorful vocabularies. We never swear at our dear daughter, and try to watch our language around her, but we're obviously failing miserably--My mom asked her what her baby's name is, and she responded, "Asshole." Oops.*

Yes, you have to teach children *everything*—even how to regulate their body fluids. And they are built to learn, which means you have to watch even your most cavalier behaviors. Both take a tremendous amount of energy. So evolutionary biologists have to wonder: Why would anyone willingly take on this line of work?

The interview for the job, that single act of sex, is certainly fun. But then you get hired to *raise a child*. There are wonderful moments, but the essence of the contract is simply: They take. You give. You never get a paycheck with this job, only an invoice, and you'd better be prepared for some sticker shock. You'll be out more than \$220,000—before the college loans. This career comes with no sick days or vacation time, and it puts you permanently on call nights and weekends. Its successful execution will probably turn

you into a lifelong worrywart. Yet thousands of people every day say yes to this job. There must be some compelling reason.

### **Survival, first and foremost**

Of course, there is. The brain's chief job description—yours, mine, and your hopelessly adorable children's—is to help our bodies survive another day. The reason for survival is as old as Darwin and as young as sexting: so we can project our genes into the next generation. Will a human willingly overcome self-interest to ensure the survival of his or her genes into the next generation? Apparently, yes. Enough of us did hundreds of thousands of years ago that we grew up to take over the Serengeti, then take over the world. Taking care of a baby is a sophisticated way of taking care of ourselves.

But why does it take so much time and effort?

Blame our big, fat, overweight, gold-plated, nothing-else-like-it brains. We evolved to have larger brains with higher IQs, which allowed us to move from leopard food to Masters of the Universe in 10 million very short years. We gained those brains through the energy savings of walking on two legs instead of four. But attaining the balance necessary to walk upright required the narrowing of the *Homo sapiens* pelvic canal. For females, that meant one thing: excruciatingly painful, often fatal births. An arms race quickly developed, evolutionary biologists theorized, between the width of the birth canal and the size of the brain. If the baby's head were too small, the baby would die (without extraordinary and immediate medical intervention, premature infants wouldn't last five minutes). If the baby's head were too big, the mother would die. The solution? Give birth to babies before their skulls become too big to kill mom. The consequence? Kids come into the world before their brains are fully developed. The result? *Parenthood*.

Because the bun is forced to come out of the oven before it is done, the child needs instruction from veteran brains for years. The relatives are the ones who get the job, as they brought the child

into the world in the first place. You don't have to dig deep into the Darwinian playbook to find a cogent explanation for parenting behavior.

That's not the entire mystery of parenting, but it underscores its importance. We survived because enough of us became parents good enough to shepherd our pooping, peeing, swearing, breathtakingly vulnerable offspring into adulthood. And we have no real say in the matter. A baby's brain simply isn't ready to survive the world.

Clearly, childhood is a vulnerable time. More than a decade passes between the birth of a baby and its ability to reproduce—an eternity compared with other species. This gap shows not only the depth of the brain's developmental immaturity but also the evolutionary need for unflinchingly attentive parenting. As we evolved, adults who formed protective and continuous teaching relationships with the next generation were at a distinct advantage over those who either could not or would not. In fact, some evolutionary theorists believe that language developed in all its richness just so that this instruction between parent and child could occur with greater depth and efficiency. Relationships among adults were crucial to our survival as well—and they still are, despite ourselves.

### *We are social beings*

Modern society is doing its level best to shred deep social connections. We move constantly. Our relatives are often scattered across hundreds, even thousands, of miles. These days we make and maintain our friendships electronically. One of the chief complaints new parents have in the transition to parenthood is the great isolation they feel from their social circle. To their relatives, baby is often a stranger. To their friends, baby is often a four-letter word. That's not how it was supposed to be. Take a moment to mark all of the times the writer of this story references her friends and family:

*I moved back home with my grandparents to save money for*

*school. I grew up here. My roots run deep. One of our dearest neighbors died and his family is getting the house together to sell. Tonight, a bunch of us, including his son, congregated in the garage, drank wine and reminisced about so many of the neighbors and family who are no longer with us. There was laughter and tears, but there was such a precious feeling of the ones who had gone before us were there, and laughing too. It was so amazing!*

We are so darn social. Understanding this about the brain is fundamental to understanding many of the themes in this book, from empathy to language to the effects of social isolation. Because the brain is a biological organ, the reasons are evolutionary. Most scientists believe we survived because we formed cooperative social groups. This forced us to spend lots of time in the land of relationships, getting to know one another's motivations, psychological interiors, and systems of reward and punishment.

Two benefits emerged. One was the ability to work as a team—useful for hunting, finding shelter, and defending against predators. The other was the ability to help raise one another's children. The battle between birth-canal size and baby-skull size meant females needed time to recover from giving birth. Somebody had to take care of the kids. Or take over the nurturing if she died. The task fell mostly to females (males can't lactate, after all), though many scientists believe the most successful groups were ones where males played an active role in supporting the females. That communal need was so strong, and so critical to our survival, that researchers have given the phenomenon its own name: alloparenting. If as a parent you feel as though you can't do it alone, that's because you were never meant to.

Though no one has a time machine capable of whisking us back to the Pleistocene, evidence for these tendencies abounds today. A baby is born eager to connect with his family and is prewired to

relate to others. One mother reported watching *American Idol* with her son, age 2. As the host interviewed the crying contestants who didn't make it, the boy jumped up, patted the screen, and said, "Oh no, don't cry." This skill requires deep relational skills, illustrating as much a biological process as it does a sweet kid. All of us have natural connecting abilities.

If you understand that the brain has a deep need for relating to others, and that the brain is interested foremost in survival, the information in this book—the things that best develop your baby's brain—will make sense.

## **A few notes before we begin**

### *Defining family*

Maybe you saw this soft-drink commercial. The camera follows a pleasant-looking, college-age young man at a social event in a large house. It's the holidays, and he is busy introducing you to his various friends and family, singing a song, and passing out soft drinks. There's his mom, his sis, his brother, his "surprisingly cool stepmother," and the two kids his stepmom had before meeting his dad, plus aunts, cousins, office mates, his best friend, his judo coach, his allergist, even his Twitter fans. It was the clearest example I have seen that the definition of the American family is changing. Rapidly.

It never was stable. The definition of a nuclear family—one man, one woman, and 2.8 kids—has been around only since Victorian times. With a divorce rate of 40 percent to 50 percent circling like a vulture over American marriages for more than three decades and remarriage common, the "blended" family is now the more typical family experience. So is the single-parent household, with more than 40 percent of all American births occurring to unmarried women. More than 4.5 million kids are being raised not by their biological parents but by their biological grandparents. One in 5 gay couples is now raising children.

Many of these social changes have moved too quickly for the scientific community to adequately study them. You can't do a 20-year study, for example, on gay marriages that have only recently been made legal. Over the years, the best parenting data have been mined from heterosexual relationships in a traditional 20th-century marriage. Until researchers have had a chance to investigate the dynamics of more modern families, we simply won't know if the insights described here directly apply to other situations. That's why I use the terms "marriage" and "spouse" instead of "partner."

### *The sources of the stories*

Many of the first-person stories in this book come from TruuConfessions.com, a website where parents can post anonymously to get things off their chests, seek advice, or share their parenting experiences with the world.

Other stories come from experiences my wife and I have had parenting our two sons, Josh and Noah, who are just entering adolescence at this writing. We have kept a diary of their growing-up years, writing down fragments of observations, scavenging our memories of a holiday, a trip, or some wonderful thing our kids taught us that day. Both boys reviewed every story in which they were involved, and I asked their permission to put each one in the book. Only the ones they said yes to made it into these pages. I applaud both their courage and their sense of humor for letting dear old dad share slivers of their early lives.

### *The sources of the data*

In these pages, there are places where virtually every sentence is referenced. But for readability of the book, the references have migrated online to [www.brainrules.net/references](http://www.brainrules.net/references). The Brain Rules website, [www.brainrules.net](http://www.brainrules.net), is chock full of additional supporting material, including animations of the basic concepts. Certain subjects I leave out altogether, some to keep the book at a reasonable length, others because there is just not enough supporting documentation.

*My wife's kitchen*

We're just about ready to get started. Given the tremendous amount of information in this book, I wanted a metaphor to help organize it. The solution comes from my wife, who, among countless talents, is a gifted cook. Our kitchen is stocked with many things, from mundane items like oatmeal (yes, our family eats "porridge") to bottles of exotic wine. She makes lots of comfort food, so there are ingredients for beef stew and spice rubs for chicken. Kari also keeps a garden of fruits and vegetables outside the kitchen door, and she uses a variety of natural fertilizers to enrich the soil. A three-legged stool in the kitchen helps our boys reach the cabinets and participate in the cooking. You'll recognize these items throughout the chapters, including the seeds and soil of the garden. I hope that visualizing my wife's garden and kitchen will render these many ideas in a friendly, accessible form.

Ready to grow a smart, happy baby? Pull up a chair. You are going to read about a truly magical world. The most important job you've ever signed up for may also be the most interesting thing you'll ever do.