

Brain Rules

12 Principles for Surviving and Thriving at Work, Home, and School

by John Medina

Brain Boost

Understand How You're Wired



QUICK OVERVIEW

Dr. John Medina is a scientist who truly gets that not everyone enjoyed tenth-grade biology. He makes not only science, but neuroscience, accessible in a way rarely seen in books about the brain. Medina's *Brain Rules* is at once informative, intriguing, funny, touching, inspiring and challenging. In short, this molecular biologist and researcher has demystified a great deal of what we know about one of the human body's most complex and sophisticated organs.

Medina does this by presenting 12 rules about the way the brain works, from its need for oxygen through exercise, to its inability to multitask when paying attention. A few of the rules, particularly the ones about sleep and stress, are invaluable to those in the business world. Consider: Sleep loss hurts learning, attention and problem-solving. Stress, especially the prolonged kind, leads to excessive sick days and on-the-job errors. The bottom line is that people whose brains are stressed, tired or unfocused are at a significant disadvantage in the marketplace.

Medina rounds out his book with a nod to those who want to continue learning throughout their life. His final rule, exploration, urges readers to understand that their brains are, in some areas, as malleable as a baby's. Humans, no matter their age, are fully capable of harnessing their curiosity and natural tendency to explore the world around them.

APPLY AND ACHIEVE

Medina shows us that adult humans don't outgrow their thirst for knowledge. In fact, some regions of the adult brain stay as malleable as a baby's brain and are capable of growing new connections and strengthening existing ones. In some cases, the brain can actually create new neurons. That means, humans are designed to be lifelong learners. We can explore the world around us well into old age.

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SUCCESS Points

In this book you'll learn:

- Why regular exercise aids learning
- Why everyone's brain is wired differently
- How a regular sleep cycle affects mental agility
- How stressed-out employees cost your business money
- Why the human brain cannot multitask

SUMMARY

Brain Rules

At Internet search-engine giant Google, exploration is a top priority. For 20 percent of their time at work, employees can venture wherever their minds suggest they go. By all accounts, their uniquely structured workday is a success. The proof is their bottom line: Half of their new products, including Gmail and Google News, came from that 20-percent time. It makes perfect sense. Such freedom removes the stressors of deadlines, conformity and expectation, and allows total discovery-based learning.

Perhaps you could start with just 20 minutes a day. Let yourself explore and create and see what you can accomplish.

Go ahead and multiply the number 8,388,628 x 2 in your head. Can you do it in a few seconds? There is a young man who can double that number 24 times in the space of a few seconds. He gets it right every time. There is a boy who can tell you the precise time of day at any moment, even in his sleep. There is a girl who can correctly determine the exact dimensions of an object 20 feet away. There is a child who at age six drew such lifelike and powerful pictures, she got her own show at a gallery on Madison Avenue. Yet none of these children could be taught to tie their shoes. Indeed, none of them have an IQ greater than 50.

The brain is an amazing thing.

My goal is to introduce you to the 12 things we know about how the brain works. I call these Brain Rules. For each rule, I present the science and then offer ideas for investigating how the rule might apply to our daily lives, especially at work and school. A sampling of the ideas you'll encounter:

- For starters, we are not suited to sitting at a desk for eight hours a day. From an evolutionary perspective, our brains developed while working out, walking as many as 12 miles a day. The brain still craves that experience, especially in sedentary populations like our own. Exercisers outperform couch potatoes in long-term memory, reasoning, attention, and problem-solving tasks.
- As you no doubt have noticed if you've ever sat through a typical PowerPoint presentation, people don't pay attention to boring things. You've got seconds to grab someone's attention and only 10 minutes to keep it. Also, the brain needs a break. That's why I use stories in this book to make many of my points.

- Ever feel tired about three o'clock in the afternoon? That's because your brain really wants to take a nap. You might be more productive if you did: In one study, a 26-minute nap improved NASA pilots' performance by 34 percent. And whether you get enough rest at night affects your mental agility the next day.
- We'll find out why the terrible twos only look like active rebellion but actually are a child's powerful urge to explore. Babies may not have a lot of knowledge about the world, but they know a whole lot about how to get it. We are powerful and natural explorers, and this never leaves us, despite artificial environments we've built for ourselves.

Power Up Your Presentations

- Avoid the nap zone—that period of afternoon sleepiness—and schedule your meetings in the morning.
- Communicate with pictures more than words. The more visual the input becomes, the more likely it is to be recognized and recalled.
- Toss your PowerPoint presentations. It's far too text-based and averages 40 words per slide.
- Present your information and ideas in 10-minute segments. In each segment, cover a large, general idea that is always explainable in one minute. For the remaining nine minutes, provide a detailed description of the general concept.
- By the end of the first 10 minutes, you want to bait the hook. Give your audience something that triggers emotion, fear, laughter, happiness, nostalgia, incredulity.
- Choose a narrative, anecdote or joke that is relevant, compelling and will stay within the flow of your material and still illustrate your point.

SURVIVAL OF THE FITTEST

Though a great deal of our evolutionary history remains shrouded in controversy, the one fact that every paleoanthropologist on the planet accepts can be summarized in two words: *We moved*. A lot.

When our bountiful rainforests began to shrink, collapsing the local food supply, we began walking back and forth across arid savannahs, which required a lot of stamina.

“About 10 to 20 kilometers a day with men,” says famed anthropologist Richard Wrangham, “and about half that for women.” That’s the amount of ground scientists estimate we covered on a *daily* basis back then—up to 12 miles a day. That means our fancy brains developed not while we were lounging around but while we were working out.

- All of the evidence points in one direction: Physical activity is cognitive candy. We can make a species-wide athletic comeback. All we have to do is move.
- When you exercise you increase blood flow across the tissues of your body.
- The more you exercise, the more tissues you can feed and the more toxic waste you can remove. This happens all over the body. That’s why exercise improves the performance of most human functions.

CAN I HAVE YOUR ATTENTION, PLEASE?

It was about three o’clock in the morning when I suddenly was startled into consciousness by the presence of a small spotlight sweeping across the walls of our living room. In the moonlight, I could see the six-foot frame of a young man in a trenchcoat, clutching a flashlight and examining the contents of our house. His other hand held something metallic, glinting in the silvery light. As my sleepy brain was immediately and violently aroused, it struck me that my home was about to be robbed by someone younger than me, bigger than me, and in possession of a firearm. Heart pounding, knees shaking, I crept to the phone, quickly called the police, turned on the lights, went to stand guard outside my children’s room, and prayed. Miraculously, a police car was already in the vicinity and activated its sirens within a minute of my phone call. This all happened so quickly that my would-be assailant left his

The brain appears to be designed to solve problems related to surviving in an unstable outdoor environment, and to do so in nearly constant motion.

get-away car in our driveway, engine still running. He was quickly apprehended.

That experience lasted only 45 seconds, but aspects of it are indelibly impressed in my memory, from the outline of the man’s coat to the shape of his firearm.

Does it matter to learning if we pay attention? The short answer is: You bet it does. My brain fully aroused, I will never forget that experience as long as I live. The more attention the brain pays to a given stimulus, the more elaborately the information will be encoded—and retained. That has implications for your employees, your students, and your kids. A strong link between attention and learning has been shown in classroom research both a hundred years ago and as recently as last week. The story is consistent: Whether you are an eager preschooler or a bored-out-of-your-mind undergrad, better attention always equals better learning.

- Emotionally arousing events tend to be better remembered than neutral events.
- We might forget minute details of an interstate fender bender, for example, yet vividly recall the fear of trying to get to the shoulder without further mishap.
- Studies show that emotional arousal focuses attention on the “gist” of an experience *at the expense* of the peripheral details. Many researchers think that’s how memory normally works—by recording the gist of what we encounter, not by retaining a literal record of the experience.
- With the passage of time, our retrieval of gist always trumps our recall of details. This means our heads tend to be filled with generalized pictures of concepts or events, not with slowly fading minutiae.

THE BRAIN CANNOT MULTITASK

Multitasking, when it comes to paying attention, is a myth. The brain naturally focuses on concepts sequentially, one at a time. At first that might sound confusing; at one level the brain does multitask. You can walk and talk at the same time. Your brain controls your heartbeat while you read a book. Pianists can play a piece with their left hand and right hand simultaneously. Surely this is multitasking. But I am talking about the brain's ability to pay attention. It is the resource you forcibly deploy while trying to listen to a boring lecture at school. It is the activity that collapses as your brain wanders during a tedious presentation at work. This attentional ability is not capable of multitasking.

- Studies show that a person who is interrupted takes 50 percent longer to accomplish a task. Not only that, he or she makes up to 50 percent more errors.
- Cell-phone talkers are a half-second slower to hit the brakes in emergencies, slower to return to normal speed after an emergency, and more wild in their “following distance” behind the vehicle in front of them.
- More than 50 percent of the visual cues spotted by attentive drivers are missed by cell-phone talkers.
- One study showed that simply reaching for an object while driving a car multiplies the risk of a crash or near-crash by nine times.

SLEEP WELL, THINK WELL

It goes by many names—the midday yawn, the post-lunch dip, the afternoon “sleepies.” We’ll call it the nap zone, a period of time in the midafternoon when we experience transient sleepiness. It can be nearly impossible to get anything done during this time, and if you attempt to push through, which is what most of us do, you can spend much of your afternoon fighting a gnawing tiredness. It’s a fight because the brain really wants to take a nap and doesn’t care what its owner is doing.

At first, scientists didn’t believe the nap zone existed except as an artifact of sleep deprivation. That has changed. We now know that some people feel it more intensely than others. We know it’s not related to a big lunch (although a big lunch, especially one with carbs, can greatly increase its intensity). It appears, rather, to be a part of our evolutionary history. Some scientists think that a long sleep at night and a short nap during the midday represent human sleep behavior at its most natural.

Sleep Loss = Brain Drain

- The brain is in a constant tension between wanting to sleep and staying awake.
- Some people are “early chronotypes” and feel more alert in the morning. Others are “late chronotypes” and are more energized late at night.
- When you get robbed of sleep—whatever amount is right for you—it takes a heavy toll on your brain.
- Sleep loss hurts thinking.
- Sleep loss has an adverse affect on attention, immediate memory, mood, quantitative skills, logical reasoning and general math knowledge.
- If severe enough, sleep loss can hurt manual dexterity and fine motor control and even gross motor movements, such as using a treadmill.
- When people become sleep-deprived, their ability to utilize the food they are consuming falls by about 30 percent.
- Prolonged sleep loss can accelerate parts of the aging process.
- The effects of sleep deprivation are thought to cost U.S. companies more than \$100 billion a year.

Regardless, the nap zone matters, because our brains don’t work as well during it. If you are a public speaker, you already know it is darn near fatal to give a talk in the midafternoon. The nap zone also is literally fatal: More traffic accidents occur during it than at any other time of the day. On the flip side, one NASA study showed that a 26-minute nap improved a pilot’s performance by more than 34 percent. Another study showed that a 45-minute nap produced a similar boost in cognitive performance, lasting more than six hours. If that’s what a nap can do, imagine the benefits of a full night’s sleep.

HOW STRESS IMPACTS YOUR BRAIN

You can feel your body responding to stress: Your pulse races, your blood pressure rises, and you feel a massive release of energy. That's the famous hormone adrenaline at work. It's spurred into action by your brain's hypothalamus, that pea-size organ sitting almost in the middle of your head. When your sensory systems detect stress, the hypothalamus reacts by sending a signal to your adrenal glands, lying far away on the roof of your kidneys. The glands immediately dump bucketloads of adrenaline into your bloodstream. The overall effect is called the fight or flight response.

But there's a less famous hormone at work, too—also released by the adrenals, and just as powerful as adrenalin. It's called cortisol. You can think of it as the “elite strike force” of the human stress response. It's the second wave of our defensive reaction to stressors, and in small doses, it wipes out most unpleasant aspects of stress, returning us to normalcy.

Why do our bodies need to go through all this trouble? The answer is very simple. Without a flexible, immediately available, highly regulated stress response, we would die. Remember, the brain is the world's most sophisticated survival organ.

Stress at Work

Stress attacks the immune system, increasing employees' chances of getting sick. Stress elevates blood pressure, increasing the risk of heart attack, stroke, and autoimmune diseases. That directly affects health-care and pension costs. Stress is behind more than half of the 550 million working days lost each year because of absenteeism. Stressed employees tend to avoid coming to work at the slightest excuse, and they often show up late. Yet executives often give stress the shortest shrift. The Centers for Disease Control and Prevention asserts that a full 80 percent of our medical expenditures are now stress-related.

- “The perfect storm of occupational stress appears to be a combination of two malignant facts: a) a great deal is expected of you and b) you have no control over whether you will perform well.”
- Prolonged stress can cause depression, which alters the ability to think—a direct assault on a corporation's intellectual capital.
- Fluid intelligence, problem-solving abilities (including

quantitative reasoning), and memory formation are deeply affected by depression. The result is an erosion of innovation and creativity, just as biochemically real as if were talking about joints and muscles.

- The cost of depression to the work force in 1990 was estimated to be \$53 billion. The loss of productivity contributed the most, about \$33 billion of the total.
- Stress causes companies to lose between \$200 billion and \$300 billion a year—as much as \$75 billion of red ink a quarter.

A LIFETIME JOURNEY

My two-year-old son Noah and I were walking down the street on our way to preschool when he suddenly noticed a shiny pebble embedded in the concrete. Stopping midstride, the little guy considered it for a second, found it thoroughly delightful, and let out a laugh. He spied a small plant an inch farther, a weed valiantly struggling through a crack in the asphalt. He touched it gently, then laughed again. Noah noticed beyond it a platoon of ants marching in single file, which he bent down to examine closely. They were carrying a dead bug, and Noah clapped his hand in wonder. There were dust particles, a rusted screw, a shiny spot of oil. Fifteen minutes had passed, and we had gone only 20 feet. I tried to get him to move along, having the audacity to act like an adult with a schedule. He was having none of it. And I stopped, watching my little teacher, wondering how long it had been since I had taken 15 minutes to walk 20 feet.

The greatest Brain Rule of all is something I cannot prove or characterize, but I believe in it with all my heart. As my son was trying to tell me, it is the importance of curiosity.

For his sake and ours, I wish classrooms and businesses were designed with the brain in mind. I will never forget the moment this little professor taught his daddy about what it meant to be a student. I was thankful and a little embarrassed. After 47 years, I was finally learning how to walk down the street.

SUMMARY

Brain Rules

➔ ACTION STEPS

Get more from this SUCCESS Book Summary by applying what you've learned. Here are a few questions and thoughts to get you started today.

1. What can you do this week to keep your brain more fit? How can you incorporate exercise into your daily routine? Try converting a coffee break into a brisk walk down the street or around the parking lot.
2. Are you reducing your effectiveness by multitasking? Today, make it a point to focus on one project or activity at a time.
3. When was the last time you really captured a client's attention? How would you enhance your presentations and messaging with more emotion and compelling hooks? Remember: The brain doesn't pay attention to boring things.
4. Are you setting yourself up for mediocrity by not getting enough sleep at night? Are you scheduling challenging meetings during the afternoon "nap zone" or attempting to tackle difficult tasks on little sleep?
5. Can you recognize the physical and emotional signs of stress? Are you aware of the physical toll it can take on the body, and the brain? What can you do to reduce the stress in your life?
6. Get curious. Take time to notice the world around you.
7. How can you become a lifelong learner? Are you making time for whimsical exploration? Do you ever let yourself meander or create at random times? How can you recapture your sense of wonder about life?

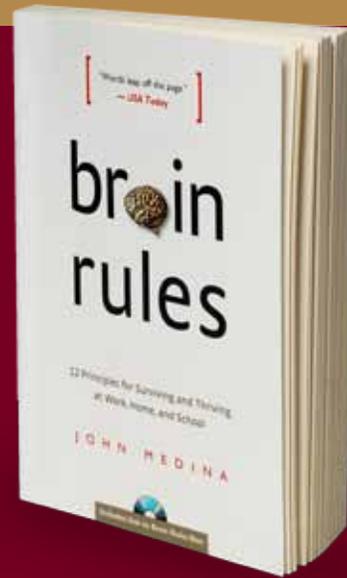
Recommended Reading

If you enjoyed the summary of **Brain Rules**, check out:

Spark: The Revolutionary New Science of Exercise and the Brain by John J. Ratey, M.D.

10 Days to Faster Reading by Abby Marks-Beale

Why Nothing Works: The Anthropology of Daily Life by Marvin Harris



About the Author

Dr. John Medina is a developmental molecular biologist focused on the genes involved in human brain development and the genetics of psychiatric disorders. He has cultivated a lifelong interest in the brain sciences and has spent much of his professional life as a private research consultant, working in the biotechnology and pharmaceutical industries on research related to mental health. Medina holds joint affiliate faculty appointments at the University of Washington School of Medicine, in its Department of Bioengineering, and at Seattle Pacific University, where he is the director of the Brain Center for Applied Learning Research. He was the founding director of the Talaris Research Institute, a Seattle-based research center originally focused on how infants encode and process information at the cognitive, cellular and molecular levels. In 2004, Medina was appointed to the rank of affiliate scholar at the National Academy of Engineering. He has written several books, including *Brain Rules for Baby*, *The Genetic Inferno*, *Clock of Ages*, and *Depression*. Medina lives in Seattle with his wife and two sons.

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