

brain rules

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

JOHN MEDINA



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"John Medina's new book, **BRAIN RULES**, dissects the workings of the brain in plain English, explaining its role in the workplace and classroom. What could be a daunting subject becomes enjoyable through a writing style that makes words leap off the page."

- *USA Today*

"Multitasking is the great buzz word in business today, but as developmental molecular biologist Medina tells readers in a chapter on attention, the brain can really only focus on one thing at a time. This alone is the best argument for not talking on your cell phone while driving. Medina presents readers with a basket containing an even dozen good principles on how the brain works and how we can use them to our benefit at home and work...the author employs an appealing style, with suggestions on how to apply his principles, which should engage all readers."

- *Publishers Weekly*

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12 Principles for Surviving and Thriving at Work, Home, and School By Dr. John Medina

Renowned molecular biologist John Medina takes readers on a journey into the inner workings of the brain, revealing the ways we can most effectively improve our lives at school, work and home. Medina's non-traditional arguments and proven insights can be found in his highly acclaimed **BRAIN RULES: 12 Principles for Surviving and Thriving at Work, Home, and School**, now available in paperback (April 2009; Pear Press/Perseus Books Group; \$15.00). Filled with fascinating case studies and findings, all made accessible through Medina's humorous tone and perspective, **BRAIN RULES** offers readers tips and theories on how they can get the most practical benefits from their brains, such as improved cognition, brain power and productivity.

Would you wear gym clothes instead of a suit to your next board meeting? Dr. John Medina, a molecular biologist at the University of Washington School of Medicine and the director of the Brain Center for Applied Learning Research at Seattle Pacific University, thinks that is exactly what you should do! Why? Because we know that exercise boosts brain power (Brain Rule #1). In a recent issue of *Harvard Business Review*, Medina outlines a brain-friendly workplace where board meetings are conducted on treadmills and desks are equipped with stationary bicycles. Medina says, "In a competitive climate, exercise is as close to a magic productivity bullet as you'll get." The magazine selected Medina's work on exercise as one of its "breakthrough ideas for 2008."

Medina's breakthrough work doesn't stop there. He combines all the latest research on the brain's "performance envelope" with real-world ideas of how we can change the way we work and learn in **BRAIN RULES**. In each chapter, he describes a **brain rule**—*what scientists know for sure about how our brains work*, presents the science supporting each, and then offers ideas for how the rules might apply to everything we do, especially in our workplace and schools. Medina's passion for brain science is

contagious. The book is packed full of fascinating stories, enlightening case studies, and humor, making it accessible to all of us. A helpful summary of each brain rule is included at the end of each chapter. Along the way you'll discover:

- There is no greater anti-brain environment than the classroom and cubicle.
- Multi-tasking is a myth. Research shows your error rate goes up 50% and it takes you twice as long to do things.
- It takes years to consolidate a memory. What you learned in first grade is not completely formed until your sophomore year in high school! Medina's dream school is one that repeats what was learned, not at home, but during the school day, 90-120 minutes after the initial learning occurred.
- Taking a nap at 3PM might make you more productive. In one study, a 26-minute nap improved NASA pilots' performance by 34 percent. Sleeping is powerfully linked with the ability to learn.
- Stress damages virtually every kind of cognition that exists. The stress you are experiencing at home will affect your performance at work, and vice versa.
- It is so easy to forget—and so important to repeat new knowledge. In partnership with the University of Washington and Seattle Pacific University, Medina tested Brain Rules in real classrooms of 3rd graders. They were asked to repeat their multiplication tables in the afternoons. The classrooms in the study did significantly better than the classrooms that did not have the repetition. If brain scientists get together with teachers and do research, we may be able to eliminate the need for homework since learning would take place at school, instead of at home.

And so much more! In addition, there are interactive tutorials for readers at www.brainrules.net, making it easy to jump from the book to the online video, featuring Medina's lively tour of the 12 brain rules.

Medina has put all his research into **BRAIN RULES**, a user-friendly guide which Publishers Weekly attests "should engage all readers." For the Brain Rules DVD trailer, YouTube videos, high resolution photos, excerpts from the audio book and more, visit: www.brainrules.net

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About the Author

Dr. John J. Medina is a developmental molecular biologist and research consultant. 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. In addition, Medina 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 addition to *Brain Rules*, Medina's books include: *The Genetic Inferno*, *The Clock of Ages*, *Depression*, *What You Need to Know About Alzheimer's*, *The Outer Limits of Life*, *Uncovering the Mystery of AIDS*, and *of Serotonin, Dopamine and Antipsychotic Medications*. Medina is also the regular "Molecules of the Mind" contributing columnist for *Psychiatric Times*. He lives in Seattle with his wife and sons.

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Praise for
BRAIN RULES

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"John Medina's new book, **BRAIN RULES**, dissects the workings of the brain in plain English, explaining its role in the workplace and classroom. What could be a daunting subject becomes enjoyable through a writing style that makes words leap off the page."

- *USA Today*

"**BRAIN RULES** is a highly readable guide to using the latest neuroscience research to improve your life and work. Medina's prose never overwhelms the lay reader with jargon but still manages to convey the scientific underpinnings of his recommended strategies for enhancing learning, health, memory, and more. Remarkably, this molecular biologist is a gifted communicator who is able to write for both the scientist and the layperson."

- *Psychiatric Times*

"Few people are better qualified to help managers sift through all the hype than John Medina."

- *Harvard Business Review*

"Oliver Sacks meets *Getting Things Done*."

- **Cory Doctorow, co-editor of *Boing Boing***

"A marvelous job in simplifying the best ways to get the most out of our brains. He is funny, tender, and completely engaging. Everyone should read this book."

- **John Ratey, MD, author of *Spark* and *A User's Guide to the Brain***

"**BRAIN RULES** is one of the most informative, engaging, and useful books of our time."

- **Garr Reynolds, author of *Presentation Zen***

the 12 brain rules



Rule #1: Exercise boosts brain power.



Rule #2: The human brain evolved, too.



Rule #3: Every brain is wired differently.



Rule #4: We don't pay attention to boring things.



Rule #5: Repeat to remember.



Rule #6: Remember to repeat.



Rule #7: Sleep well, think well.



Rule #8: Stressed brains don't learn the same way.



Rule #9: Stimulate more of the senses.



Rule #10: Vision trumps all other senses.



Rule #11: Male and female brains are different.



Rule #12: We are powerful and natural explorers.

ABOUT DR. JOHN MEDINA AUTHOR OF *BRAIN RULES*



DR. JOHN J. MEDINA is a developmental molecular biologist focused on the genes involved in human brain development and the genetics of psychiatric disorders. He has spent most of his professional life as a private research consultant, working primarily in the biotechnology and pharmaceutical industries on research related to mental health. Medina holds joint affiliate faculty appointments at Seattle Pacific University, where he is the director of the Brain Center for Applied Learning Research, and at the University of Washington School of Medicine, in its Department of Bioengineering.

Medina 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 been named Outstanding Faculty of the Year at the College of Engineering at the University of Washington; the Merrill Dow/Continuing Medical Education National Teacher of the Year; and, twice, the Bioengineering Student Association Teacher of the Year. Medina has been a consultant to the Education Commission of the States and a regular speaker on the relationship between neurology and education.

Medina's books include: **BRAIN RULES: 12 Principles for Surviving and Thriving at Work, Home, and School** (Pear Press/ Perseus Books Group; March 18, 2008), *The Genetic Inferno*, *The Clock of Ages*, *Depression*, *What You Need to Know About Alzheimer's*, *The Outer Limits of Life*, *Uncovering the Mystery of AIDS*, and *of Serotonin, Dopamine and Antipsychotic Medications*. Medina is also the regular "Molecules of the Mind" contributing columnist for *Psychiatric Times*.

Medina has a lifelong fascination with how the mind reacts to and organizes information. As the father of two boys, he has an interest in how the brain sciences might influence the way we teach our children. In addition to his research, consulting, and teaching, Medina speaks often to public officials, business and medical professionals, school boards, and nonprofit leaders. He lives in Seattle with his wife and sons.

For more information, visit: www.brainrules.net.

ABOUT RICK STEVENSON DIRECTOR OF *BRAIN RULES* BONUS DVD

RICK STEVENSON (*Director/ Writer/ Producer*) is a Seattle native known for his work in film and television in the United States, Canada and Great Britain.

Stevenson's production credits include *PRIVILEGED* (1983) starring Hugh Grant; *RESTLESS NATIVES* (1985) starring Ned Beatty, *PROMISED LAND* (1987) starring Meg Ryan and Kiefer Sutherland; *SOME GIRLS* (1989) starring Patrick Dempsey, Jennifer Connelly and Andre Gregory; and *CROOKED HEARTS* starring Jennifer Jason-Leigh, Noah Wylie, Juliette Lewis and Peter Coyote. Stevenson made his feature film directorial debut in 1995 with *MAGIC IN THE WATER*, starring Mark Harmon and Joshua Jackson.

His next, widely lauded, feature film was *THE DINOSAUR HUNTER* with Christopher Plummer (1999). This was followed by *ANTHRAX* (2001) starring Cameron Daddo, David Keith, William B. Davis, Ed Begley Jr. Most recently, Stevenson directed, co-wrote and produced *EXPIRATION DATE* (2006) starring Robert Guthrie, Dee Wallace Stone and David Keith.

Stevenson has directed many programs for television including *ED* for NBC and his work as a director of television commercials has garnered a myriad of awards.

In 2004, Stevenson founded **thefilmschool** with Tom Skerritt and Stewart Stern. He holds a PhD from Oxford University, a master's degree from the London School of Economics and a bachelor's degree in history from Whitman College in Washington State. Rick is married with four children.

For more information, visit: www.brainrules.net/film.

ABOUT PEAR PRESS PUBLISHER OF *BRAIN RULES*

PEAR PRESS is a small publisher that publishes big books. We plan to publish no more than one book every year or two because it takes time to deliver quality content.

We believe books are still important in the 21st century. We strive to combine the best of old-world publishing and new-world media. Our mission is to maximize the reach of our content around the world, and so the content takes many forms: printed book, audio book, documentary film, e-book, video, blog, Web tutorial, e-mail newsletter or live presentation by one of our authors.

Pear Press books are distributed by the Perseus Book Group. For more information, visit: www.pearpress.com.

TALKING POINTS FOR DR. JOHN MEDINA

AUTHOR OF *BRAIN RULES*



EXERCISE | Rule #1: Exercise boosts brain power.

- **There's a direct link between exercise and brain power.** Start exercising couch and desk potatoes and their brains benefit. Even couch potatoes who fidget show increased benefit over those who do not. Our brains perform at their best when we are in motion.
- **Exercise improves "executive function":** solving problems, maintaining attention, and inhibiting emotional impulses. All it takes for your brain to benefit is aerobic exercise 2-3 times a week.
- **Sitting is not "brain friendly."** For millions of years we walked 12 miles a day. Today we sit in cars, couches, cubicles, and classrooms. We think best when we are moving.
- **The greatest predictor of successful aging is the presence or absence of a sedentary lifestyle.** Exercise improves cardiovascular fitness, which reduces the risk for diseases like heart attacks and stroke. It improves your strength and balance, reduces your risk for many types of cancer, bolsters your immune system, and buffers against toxic effects of stress.
- **It's time to integrate exercise into our 8 hours at work or school.** Take a call while walking, hold a walking meeting, or go for a walk at lunch.



SURVIVAL | Rule #2: The human brain evolved, too.

- **The brain is a survival organ.** It is designed to *solve problems* related to *surviving* in an *unstable outdoor environment* and to do so in *nearly constant motion* (to keep you alive long enough to pass your genes on). We were not the strongest on the planet but we developed the strongest brains, the key to our survival.
- **The strongest brains survive, not the strongest bodies.** Our ability to solve problems, learn from mistakes, and create alliances with other people helps us survive. We took over the world by learning to cooperate and forming teams with our neighbors.
- **Our ability to understand each other is our chief survival tool.** Relationships helped us survive in the jungle and are critical to surviving at work and school today.
- **If someone does not feel safe with a teacher or boss, he or she may not perform as well.** If a student feels misunderstood because the teacher cannot connect with the way the student learns, the student may become isolated.
- **There is no greater anti-brain environment than the classroom and cubicle.**



WIRING | Rule #3: Every brain is wired differently.

- **What YOU do and learn in life physically changes what your brain looks like – it literally rewires it.** We used to think there were just 7 categories of intelligence. But categories of intelligence may number more than 7 billion—roughly the population of the world.
- **No two people have the same brain, not even twins.** Every student's brain, every employee's brain, every customer's brain is wired differently.
- **You can either accede to it or ignore it.** The current system of education ignores it by having grade structures based on age. Businesses such as Amazon are catching on to mass customization (the Amazon homepage and the products you see are tailored to your recent purchases).
- **Regions of the brain develop at different rates in different people.** The brains of school children are just as unevenly developed as their bodies. Our school system ignores the fact that every brain is wired differently. We wrongly assume every brain is the same.
- **Most of us have a "Jennifer Aniston" neuron** (a neuron lurking in your head that is stimulated only when Jennifer Aniston is in the room).



ATTENTION | Rule #4: We don't pay attention to boring things.

- **What we pay attention to is profoundly influenced by memory.** Our previous experience predicts where we should pay attention. Culture matters too. Whether in school or in business, these differences can greatly effect how an audience perceives a given presentation.
- **We pay attention to things like emotions, threats and sex.** Regardless of who you are, the brain pays a great deal of attention to these questions: Can I eat it? Will it eat me? Can I mate with it? Will it mate with me? Have I seen it before?
- **The brain is not capable of multi-tasking.** We can talk and breathe, but when it comes to higher level tasks, we just can't do it.
- **Driving while talking on a cell phone is like driving drunk.** The brain is a sequential processor and large fractions of a second are consumed every time the brain switches tasks. This is why cell-phone talkers are a half-second slower to hit the brakes and get in more wrecks.
- **Workplaces and schools actually encourage this type of multi-tasking.** Walk into any office and you'll see people sending e-mail, answering their phones, Instant Messaging, and on MySpace—all at the same time. Research shows your error rate goes up 50% and it takes you twice as long to do things.
- **When you're always online you're always distracted.** So the always online organization is the always unproductive organization.



SHORT-TERM MEMORY | Rule #5: Repeat to remember.

- **The human brain can only hold about seven pieces of information for less than 30 seconds!** Which means, your brain can only handle a 7-digit phone number. If you want to extend the 30 seconds to a few minutes or even an hour or two, you will need to consistently re-expose yourself to the information. Memories are so volatile that you have to repeat to remember.
- **Improve your memory by elaborately encoding it during its initial moments.** Many of us have trouble remembering names. If at a party you need help remembering Mary, it helps to repeat internally more information about her. "Mary is wearing a blue dress and my favorite color is blue." It may seem counterintuitive at first but study after study shows it improves your memory.
- **Brain Rules in the classroom.** In partnership with the University of Washington and Seattle Pacific University, Medina tested this Brain Rule in real classrooms of 3rd graders. They were asked to repeat their multiplication tables in the afternoons. The classrooms in the study did significantly better than the classrooms that did not have the repetition. If brain scientists get together with teachers and do research, we may be able to eliminate need for homework since learning would take place at school, instead of the home.



LONG-TERM MEMORY | Rule #6: Remember to repeat.

- **It takes years to consolidate a memory.** Not minutes, hours, or days but *years*. What you learn in first grade is not completely formed until your sophomore year in high school.
- **Medina's dream school is one that repeats what was learned, not at home, but during the school day, 90-120 minutes after the initial learning occurred.** Our schools are currently designed so that most real learning has to occur at home.
- **How do you remember better?** Repeated exposure to information / in specifically timed intervals / provides the most powerful way to fix memory into the brain.
- **Forgetting allows us to prioritize events.** But if you want to remember, remember to repeat.



SLEEP | Rule #7: Sleep well, think well.

- **When we're asleep, the brain is not resting at all.** It is almost unbelievably active! It's possible that the reason we need to sleep is so that we can learn.
- **Sleep must be important because we spend 1/3 of our lives doing it!** Loss of sleep hurts attention, executive function, working memory, mood, quantitative skills, logical reasoning, and even motor dexterity.
- **We still don't know how much we need!** It changes with age, gender, pregnancy, puberty, and so much more.
- **Napping is normal.** Ever feel tired at 3PM? That's because your brain really wants to take a nap. There's a battle raging in your head between two armies. Each army is made of legions of brain cells and biochemicals – one desperately trying to keep you awake, the other desperately trying to force you to sleep. At 3PM, 12 hours after the midpoint of your sleep, all your brain wants to do is nap.
- **Taking a nap at 3PM might make you more productive.** In one study, a 26-minute nap improved NASA pilots' performance by 34 percent.
- **Don't schedule important meetings at 3pm.** It just doesn't make sense.



STRESS | Rule #8: Stressed brains don't learn the same way.

- **Your brain is built to deal with stress that lasts about 30 seconds.** The brain is not designed for long term stress when you feel like you have no control. The saber-toothed tiger ate you or you ran away but it was all over in less than a minute. If you have a bad boss, the saber-toothed tiger can be at your door for years, and you begin to deregulate. If you are in a bad marriage, the saber-toothed tiger can be in your bed for years, and the same thing occurs. You can actually watch the brain shrink.
- **Stress damages virtually every kind of cognition that exists.** It damages memory and executive function. It can hurt your motor skills. When you are stressed out over a long period of time it disrupts your immune response. You get sicker more often. It disrupts your ability to sleep. You get depressed a lot.
- **The emotional stability of the home is the single greatest predictor of academic success.** If you want your kid to get into Harvard, go home and love your spouse.
- **You have one brain.** The same brain you have at home is the same brain you have at work or school. The stress you are experiencing at home will affect your performance at work, and vice versa.



SENSORY INTEGRATION | Rule #9: Stimulate more of the senses.

- **Our senses work together so it is important to stimulate them!** Your head crackles with the perceptions of the whole world, sight, sound, taste, smell, touch, energetic as a frat party.
- **Smell is unusually effective at evoking memory.** If you're tested on the details of a movie while the smell of popcorn is wafted into the air, you'll remember 10-50% more.
- **Smell is really important to business.** When you walk into Starbucks, the first thing you smell is coffee. They have done a number of things over the years to make sure that's the case.
- **The learning link.** Those in multisensory environments always do better than those in unisensory environments. They have more recall with better resolution that lasts longer, evident even 20 years later.



VISION | Rule #10: Vision trumps all other senses.

- **We are incredible at remembering pictures.** Hear a piece of information, and three days later you'll remember 10% of it. Add a picture and you'll remember 65%.
- **Pictures beat text as well, in part because reading is so inefficient for us.** Our brain sees words as lots of tiny pictures, and we have to identify certain features in the letters to be able to read them. That takes time.
- **Why is vision such a big deal to us?** Perhaps because it's how we've always apprehended major threats, food supplies and reproductive opportunity.
- **Toss your PowerPoint presentations.** It's text-based (nearly 40 words per slide), with six hierarchical levels of chapters and subheads—all words. Professionals everywhere need to know about the incredible inefficiency of text-based information and the incredible effects of images. Burn your current PowerPoint presentations and make new ones.



GENDER | Rule #11: Male and female brains are different.

- **What's different?** Mental health professionals have known for years about sex-based differences in the type and severity of psychiatric disorders. Males are more severely afflicted by schizophrenia than females. By more than 2 to 1, women are more likely to get depressed than men, a figure that shows up just after puberty and remains stable for the next 50 years. Males exhibit more antisocial behavior. Females have more anxiety. Most alcoholics and drug addicts are male. Most anorexics are female.
- **Men and women handle acute stress differently.** When researcher Larry Cahill showed them slasher films, men fired up the amygdale in their brain's right hemisphere, which is responsible for the gist of an event. Their left was comparatively silent. Women lit up their left amygdale, the one responsible for details. Having a team that simultaneously understood the gist and details of a given stressful situation helped us conquer the world.
- **Men and women process certain emotions differently.** Emotions are useful. They make the brain pay attention. These differences are a product of complex interactions between nature and nurture.



EXPLORATION | Rule #12: We are powerful and natural explorers.

- **The desire to explore never leaves us despite the classrooms and cubicles we are stuffed into.** Babies are the model of how we learn—not by passive reaction to the environment but by active testing through observation, hypothesis, experiment, and conclusion. Babies methodically do experiments on objects, for example, to see what they will do.
- **Google takes to heart the power of exploration.** For 20 percent of their time, employees may go where their mind asks them to go. The proof is in the bottom line: fully 50 percent of new products, including Gmail and Google News, came from "20 percent time."