

The Working Memory Advantage: Train Your Brain to Function Stronger, Smarter, Faster

By Tracy Alloway, Ross Alloway

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A bigger asset than IQ: The first book to introduce the newly discovered—and vitally important—mental skill known as working memory, showing how it is crucial to our success in work and life and how to strengthen it.

Working memory—your ability to work with information—influences nearly everything you do. What if you could find a way to better handle a crazy schedule or expertly manage risks? What if you could gain an advantage in climbing the career ladder or in school or sports? What if there were a way to improve your outlook on life, to face each day with more optimism and confidence?

Tracy and Ross Alloway, leading experts in the field, show how working memory is the key to all that and more. They present important recent findings, including research on how Facebook can help with working memory, how working memory can improve your kids' grades, how it changes as you age, and how working memory is linked with ADHD, autism, dyslexia, and Alzheimer's. The Alloways describe their Jungle Memory program, which Ross created to help children improve their working memories, and is rapidly being embraced by the education community. Most importantly, they share the best news: you can improve your memory! Their book provides three tests to find out how good your working memory is—and more than fifty targeted exercises designed to help readers both process and memorize the information to maximize effectiveness.

The Working Memory Advantage offers unprecedented insight into one of the most important cognitive breakthroughs in recent years—a vital new approach to making your brain stronger, smarter, and faster.

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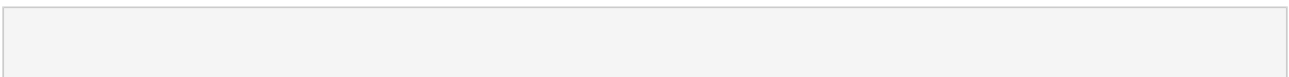
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Editorial Review

Review

"Finally a book that debunks IQ as the biggest key to success. Tracy and Ross Alloway have identified the single most important skill for determining a person's success in our modern world. The fun and friendly exercises in the book bring it out in you. A must for anyone who wants to unleash inner genius." (Dave Farrow, Two Time Guinness record Holder for Greatest Memory)

"A valuable guide for readers looking to put their minds to work." (Publishers Weekly)

"Lucid...contains useful new insights into thinking well." (*Kirkus*)

"*The Working Memory Advantage* is at its best—and its best is very good—when the Alloways provide exercises to stretch working memory...[they] make a compelling case that working memory can be strengthened through 'small but crucial tweaks in your daily habits.' It's a lesson worth remembering." (*Psychology Today*)

About the Author

Tracy Alloway, PhD, is Professor of Psychology at the University of North Florida. Formerly, she was the Director of the Center for Memory and Learning in the Lifespan. She is an expert on working memory and education, and developed the internationally recognized Alloway Working Memory Assessment. She writes a blog for *Psychology Today*.

Ross Alloway, PhD, CEO of Memosyne Ltd., brings working memory training to educators and parents. Ross developed Jungle Memory, used by thousands of students in over twenty countries.

Together, they edited an academic book on working memory (Psychology Press) and has published research on working memory in a variety of contexts, from education to aging, from happiness to lying, from barefoot running to Facebook. Their research has been featured on BBC, *ABC News*, *Huffington Post*, *Salon*, *The Washington Post*, and *Newsweek*. They have lived in El Salvador, Scotland, and currently live in Jacksonville, Florida.

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The Working Memory Advantage

1

Welcome to the Working Memory Advantage

IN DECEMBER 2005, a broker on the Tokyo stock exchange sold 610,000 shares of a company called J-Com, for the low, low price of 1 yen, an amount less than a penny. The problem is that he meant to sell one single share for 610,000 yen. Epic oops. In 2001, a London dealer sold 300 million pounds sterling' worth of shares when he intended to sell only 3 million pounds. The trade sparked a panic in the market that caused 30 billion pounds to go up in smoke.

Brokers may process mountains of information when deciding what to sell and buy, but in the heat of the moment, all it takes is just one extra piece of information—the ring of a phone, the flash of a screen, the thrill of being responsible for such a large sum of money—and their focus is lost. No longer able to process all the information, they struggle to check orders carefully. Trading is a profession that places high demands on a foundational cognitive skill called working memory.

By working memory advantage, we mean that this skill gives you a leg up, a boost in life. As you will discover, working memory offers you an advantage in a huge range of activities: from the everyday, like giving an important presentation at work, to the extreme, like ripping down an eighty-foot wave. It helped our evolutionary ancestors to advance from just surviving to thriving. It enabled our technological trajectory: from a bone club used for bashing to an iPhone used for connecting. By ignoring, overloading, or undermining your working memory, you put yourself at a huge disadvantage. But by focusing on your working memory, taking it into account, and improving it, the sky's the limit. We wrote this book in order to give everyone an opportunity to take advantage of this life-changing skill.

In the past decade, research on working memory has exploded. It is fast emerging as one of the most widely researched cognitive functions of the twenty-first century, and we have been leading participants in much of this research. Tracy developed a groundbreaking and highly accurate standardized working memory test for use by educators and has dedicated much of her research career to investigating the role of working memory in education and learning difficulties. Ross has focused his attention on developing exercises to improve working memory, and as the CEO and founder of Memosyne, Ltd., he developed working-memory-training software called Jungle Memory that has been used by thousands of students. Together, they have examined the role of working memory in a variety of contexts, such as how it changes when you get older; how it is linked to happiness; how it relates to lying; how it is affected by activities like barefoot running; and how it is influenced by social media like Facebook.

What Is Working Memory?

Working memory is our ability to work with information. More precisely, working memory is the conscious processing of information. By conscious, we mean that the information is on your mind. You are giving attention to it, shining a mental spotlight on it, concentrating on it, or making decisions about it. You are also intentionally ignoring everything else. If you are thinking about a stock trade, for example, you are filtering out the ringing phones, the jabbering of your coworkers, and the excitement of placing a \$1 million order. By processing, we mean that you are manipulating the information, working with it, making calculations with it, or reformulating it.

The classic example of a job that requires a strong working memory is that of an air traffic controller, whose job is to maintain the safe and orderly flow of air traffic. With hundreds of planes taking off and landing every hour, an air traffic controller must have the mental agility to process multiple variables, such as equipment, weather patterns, traffic volume, precise communication with pilots, and quick calculations. In times of emergency, they must be able to make split-second decisions while effectively moderating the stress of knowing that the lives of pilots and passengers are in their hands.

We see a strong working memory giving us an advantage at play in many aspects of everyday life too. It allows you to listen to your spouse while checking your smart phone and making pancakes for the kids. It lets you complete a complicated spreadsheet in spite of interruptions from your constantly ringing phone and the din of annoyingly loud coworkers. Working memory gives you the ability to remain focused on the conversation with your dinner date while ignoring the urge to check the hockey score on your mobile.

Working Memory in the Brain

For more than the past decade, scientists have been using advanced brain imaging to examine how working memory functions in the brain. Their results reveal that using working memory involves a number of areas in the brain. On the next page are some of the major players:



Major Players in Working Memory

Prefrontal cortex (PFC): The PFC is the home of working memory. Located in the front of the brain, the PFC coordinates with other areas of the brain through electrical signals and receives information from those regions so your working memory can make use of it. Brain-imaging scans show that when working memory is being used, the PFC glows while it fires thoughts to and works with information from the different brain regions. Working memory is the primary function of the PFC. Though the PFC is the area most often associated with working memory, it is important to note that scientists have also found activation in other areas of the brain, such as the parietal cortex and the anterior cingulate, when people perform a working memory task.

Hippocampus: The hippocampus is where the vast amount of knowledge you have acquired over your lifetime is housed for long-term storage. It is the location of long-term memory (LTM). Your working memory allows you to sift through all the information you have stored in your long-term memory, and pull out the bits most relevant to the task at hand. It gives you the ability to combine that stored knowledge with new information coming in, and to put new information into your long-term memory.

Amygdala: The amygdala is the brain's emotional center. When you are experiencing a strong emotion, like fear, your amygdala is activated. Working memory is also important to emotional control, managing the emotional information coming from the amygdala and preventing it from distracting you from the task you're working on. If someone yells "Fire!" in the movie theater, your working memory would help you to control the fear coming from your amygdala so that you can exit in an orderly fashion without creating a panic.

Intraparietal sulcus: Located at the top back portion of the brain, the intraparietal sulcus is the brain's math center. When you need to perform calculations, such as in choosing the best mortgage loan or guesstimating how many more miles you can go on a quarter tank of gas, your working memory relies on it to get the answer. In fact, the intraparietal sulcus is so important to math skills that when researchers used mild electrical currents in order to take it offline, participants struggled to perform simple math tasks, like deciding whether 4 was bigger than 2.

Broca's area: Situated on the left side of the frontal lobes, Broca's area is involved in language comprehension and verbal fluency. Whenever you are writing or interacting with friends, family, colleagues, or a love interest, your working memory is processing information sent from this area. Whether you are a quick-witted verbal gymnast or you tend to stumble over your words depends in part on the strength of your working memory. We recently saw this play out at a wedding when the best man stood up to give the toast and then realized he had left his notes in the car. Instead of stumbling over a bunch of "ums" and "uhs," his working memory and Broca's area worked together to help him craft an eloquent, heartfelt toast on the spot.

What Working Memory Is Not

Whenever we give a presentation about working memory, someone in the audience raises his hand and asks, “Isn’t that the same as short-term memory?” The answer is an unequivocal no. Short-term memory is the ability to remember information, such as someone’s name at a party, this person’s occupation, or the title of a recommended book, for a very short period. We usually don’t keep this information in mind for long—a few seconds or so—and we would typically struggle to recall that person’s name or the book title the following day. Working memory gives us the ability to do something with the information at hand rather than just remember it briefly.

Let’s say you’re at a business event and you meet Keith, a small-business consultant who mentions that anybody trying to start a business absolutely must read *The Essential Entrepreneur* by Smarticus McSmarty. You instantly recall that your friend Theresa is thinking about launching a new business venture, and you jot down the book’s title so you can send her a text about it later. Your working memory is what helps you recall, from long-term memory, that Theresa wants to start a business and combine that with the new information that the book is great for entrepreneurs.

Working memory is also different from long-term memory. Long-term memory is the library of knowledge you have accumulated over the years—knowledge about countries, information about random news facts, memories about events from your school days, and even those annoying advertising jingles you heard on TV when you were a kid. Information may remain stored in your long-term memory for anywhere from a few days to many decades.

Working memory is what allows you to access that information and put it to good use. You can pull out information from your long-term memory, use that information in the moment, and then file it away again. Working memory is also the mechanism used to transfer new information into long-term memory, as when you are learning a new language.

Working Memory as a Conductor

You can think of working memory as your brain’s Conductor. A conductor of music brings all the different instruments of an orchestra under control. Without the conductor, the result is a cacophony: the piccolo might tweet when the piano was supposed to play or the violins might be drowned out by a thundering percussion section. When the conductor walks out on the stage, chaos is brought to order.

In a similar way, your working memory gives you the advantage of control over the daily information onslaught: the emails, the ringing phones, the schedule that is constantly changing, the new math lesson that must be learned, your friend’s disheartening Facebook update, the Twitter updates, the presentation that must be rapidly assembled for a potential client. In this ocean of information, where everything seems to be equally important, your working memory Conductor has two main functions:

1. It prioritizes and processes information, allowing you to ignore what is irrelevant and work with what is important.
2. It holds on to information so you can work with it.

Throughout this book, we occasionally refer to working memory as the Conductor, or the working memory Conductor, when discussing these functions.

For an illustration of how the working memory Conductor can give you an advantage at work, imagine for a moment that you are Mark, a middle manager in Microsoft's Tablet PC division, and the Tablet has been taking a beating from the iPad 700, which projects holograms. iPad 700 users love seeing their pictures and spreadsheets in three dimensions. You're called to a meeting where an inventor takes out a tablet called the FeelPad that can give holograms mass. FeelPad users can project images that can be touched and felt, not just seen. You are truly amazed. And because you are lower down the pecking order, you can just sit back and be enthralled because no one ever asks you a question at these meetings. Until today.

Bill Gates turns and looks directly at you. "Mark, will this give our tablet an edge?"

It is at this moment that you realize Gates mistakenly thinks you are the product manager. Your amygdala, the emotional heart of your brain, surges with terror. You can correct him, but then you know your career won't go anywhere. Or you can go with the flow and see where it leads. The Conductor takes over, and you decide to take a risk. Because you don't know much about the FeelPad's technology, you have to work with what you have just heard and cobble together an answer that combines the key features of the technology and how you think it will fit into the marketplace.

"Well," you say, "I think that the brand recognition of the iPad 700 is so formidable that it will mean considerable financial investment to make a dent in Apple's sales, but if the FeelPad can really make projections come to life, we may have a real iPad killer on our hands."

"Great," says Bill. "Apple wants to look at the technology too, and the inventor is giving us one day to make an offer. You have ten minutes to decide if we need to buy it."

Ten minutes? You go back to your cubicle to formulate a plan. That isn't enough time to come up with a detailed proposal, but it is enough time to assemble the most important technological information, market analyses, programming issues, and budget projections. Shutting out the ringing phone, the blinking email notice, and the low-level chatter, you modify a product launch plan with which you are already familiar and show that with the right software and viral marketing programs, the FeelPad can crush the iPad 700. Bill likes your plan so much that he makes you the project manager, and within a year, the FeelPad single-handedly turns around Microsoft's fortunes and you are promoted to vice president of new product development. Congratulations!

This remarkable change of fortune is a consequence of your Conductor working at optimum levels. It allowed you to pull out relevant information that you already knew, like product launch plans, and allowed you to synthesize it with the potential requirements of the new device. It also kept you on task and blocked distracting information, such as the ringing phone, the office chatter, and the surging fear that you may blow this opportunity. It allowed you to keep in mind the hardware, software, and finance data. It also allowed you to hold on to the information long enough to structure your plan.

Daily Advantages of Working Memory

Working memory gives you the advantage of managing information in your day-to-day life from the time you're born until your golden years. Here is a quick preview of just a few of the many ways it helps you. We will explore many of these in much greater detail throughout the book.

Prioritize Information

A strong working memory helps you manage the stream of emails, texts, Facebook status updates, Tweets, and phone messages pouring into your life. Your Conductor allows you to process and prioritize all those data so you can quickly respond to the most important things first, make a mental note to deal with some things later, and efficiently shuffle the junk to the trash.

Focus on the Important Stuff

Life is filled with disruptions, and working memory helps us pay attention to what really matters. Torkel Klingberg of the Karolinska Institute in Sweden found that one of the important features of working memory is to selectively filter out distractions so we can focus on relevant information. For example, as we were putting the final touches on this book, we had a small electrical fire, our car died and had to be towed away, our refrigerator threw in the towel (resulting in mild food poisoning), and our babysitter had to take the entire week off due to a family emergency, leaving us with two rambunctious boys clamoring for our attention when we were supposed to be working. Working memory helped us deal with the emergencies, create a schedule to watch our sons, and then quickly shift our attention back to the book so we could finish and click the send button in time to meet our deadline.

Think Fast on Your Feet

You've got an interview for your dream sales job, and you are totally prepared for it—you've researched the firm, its clients, its competition, and its sales strategies. But the interviewer throws you for a loop with a wacky question out of the middle of nowhere: "You're meeting a client in an industrial park with a gated parking lot. Where do you park?" "Huh?" You hesitate, then your working memory digs into your recent memory vault to recall that the interviewer had pointed to her car—backed into the parking space next to the exit gate—during your interview, and you quickly figure that where she parks is where she would want you to park, so you say, "I'd park right next to the exit." Ding, ding, ding! You get the job.

Take Smarter Risks

Your Conductor helps you zero in on the most essential information when weighing the pros and cons of any potentially risky venture and helps keep you from blindly going with the flow or following the crowd. For example, when that Facebook initial public offering you invested in takes an immediate nosedive, it's your working memory that helps you decide whether to dump your stock or hold on to it.

Learn More Easily in School

Kids use their Conductor every time they set foot in the classroom. It helps them to inhibit distracting information—like their classmates whispering near them—and to keep track of where they are in multistep tasks. It also allows them to access all the information they need, such as numbers or words, to complete an assignment. And, it lets them hold that information in mind and complete the tasks as quickly as possible.

Make Judgment Calls

Making quick decisions about your likes and dislikes, as well as how to act in certain situations, is a working-memory-intensive task. It may come as a surprise that even judging attractiveness relies heavily on working memory. When you spot someone across a bar, your working memory riffles through your

hippocampus Rolodex for previous references of beautiful people. Then your working memory allows you to hold this information in mind while you compare the new person with the mental image and make a decision: Hot or not? The same process occurs as you decide whether you like a horror movie. Does the monster on screen measure up to the others stored in your hippocampus?

As far as actions go, your working memory is in control. If you get into a car accident and the other driver jumps out of his car and starts coming toward you in an aggressive manner, your working memory helps you quickly run through various scenarios to determine whether it's better for you to get out of the car or lock your door and call 911.

Adapt to New Situations

Have you ever wondered why some people who get laid off, divorced, or move across the country for a job transfer manage to land on their feet and thrive while others struggle to find their way? A strong working memory is the key to being able to switch gears and reinvent your career, jump back into the dating pool after years of marriage, or create a new life in a new home. Why? Because the working memory Conductor allows you to shift smoothly from thought to thought, to look at the world in a different way, and to think about old information in novel ways.

Stay Motivated to Achieve Long-Term Goals

Let's say you're a college student and you aspire to a career as a lawyer with a top firm. Achieving that goal starts with taking the LSAT. The great thing about the LSAT is that studying for it actually improves your score. So if you study diligently, you can score high, get into one of the best law schools, and reach your ultimate goal. Working memory helps you keep your goal in mind and gives you the motivation you need to put your nose to the grindstone even when your friends are heading out to a party and invite you to join them. Working memory helps you say no.

Stay Positive in the Midst of a Dire Situation

Your Conductor is wired to organize emotions into those that are relevant and those that are not. The Conductor interprets signals from the amygdala, the primitive emotional heart of the brain that generates feelings of fear and anxiety, and then modulates those emotions to help us concentrate on positive thoughts. Later, we'll show you how this played out when Mario Sepulveda, one of the thirty men rescued from a collapsed Chilean coal mine in 2010, used humor to keep the group from devolving into chaos. Even during the gloomiest days underground, Mario was able to stay upbeat by focusing on the future.

Follow Your Moral Compass

Working memory helps you do the right thing in business, in social interactions, and even in your romantic relationships. It can help you stay faithful while others stray. Research shows that a good working memory gives you romantic self-control. People with a robust working memory manage to keep their relationship goals in mind and act to protect their relationship when something threatens it—like when an attractive coworker comes on to you during a business trip. Conversely, people with poor working memory are more vulnerable to giving in if an opportunity to stray presents itself.

Be a Better Athlete

There are times when a powerful working memory can be your best teammate. Let's say you're a tennis player. When the tennis ball comes bouncing to your side of the net, what shot do you make? Forehand cross-court, backhand down the line, lob, drop shot? Working memory helps you sift through the options and choose the best one, all while keeping in mind your opponent's position on the court. The more quickly your working memory can process all this information, the more likely you are to execute the shot well.

The Best Advantage? Working Memory versus IQ

Our society has relied on IQ as the go-to measure of intellectual capability for nearly a century. The common belief is that the higher your IQ, the better your advantage in whatever you do. But a high IQ doesn't necessarily mean you will get what you want in life. On the other hand, how do some people with below-average IQ scores rise to the top to become business bigwigs, bestselling authors, or innovative inventors? What if we told you that IQ isn't the best measure of intelligence or the best predictor of lifetime success, especially not in the twenty-first century?

The modern IQ test has its roots in the early twentieth century. In 1917, as World War I raged on, the U.S. Army enlisted Richard Yerkes, the distinguished president of the American Psychological Association, to create a test to measure the intelligence of nearly 3 million army recruits. The army wanted to determine which men should be officers and which should be relegated to the lower ranks. Yerkes designed a test that measured the recruits' knowledge of facts and vocabulary, also known as crystallized knowledge.

But during wartime when nothing goes according to plan and you have to adapt to enemy tactics or lose, knowing concrete facts—say, that Rutherford B. Hayes was elected president in 1876 or that Bismarck is the capital of North Dakota—isn't really helpful. Many of the men tagged for high-ranking positions failed miserably, while some men who languished in the lower ranks proved to have excellent military minds. The army quickly realized that Yerkes's test was identifying the wrong men for the job and abandoned it after six months. But the rest of society has continued to measure intelligence based on the amount of crystallized knowledge you have, and the modern IQ test doesn't look all that different from Yerkes's test. That's a big problem.

Thanks to Google and similar search engines, the world has undergone profound transformation in how we seek out, weed out, and absorb information. We live in the Google age. In cognitive terms, Google is great. It has considerably reduced the amount of intellectual resources that we previously had to dedicate to rooting out facts before we could do something with them. Because of Google, we no longer need to rely so much on crystallized knowledge—the memorization of facts, dates, or names—associated with IQ and the traditional concept of intelligence. With nothing more than a few clicks, we can pull up just about any information we need. But the key to intelligence today is being able to put those facts together, prioritize the information, and do something constructive with it. And there is one skill that gives you the advantage of managing all this information: working memory. IQ is what you know. Working memory is what you can do with what you know.

In one of her earliest research projects, Tracy compared students' grades with their IQ and working memory scores. She found that working memory could predict what grade they would get with far greater accuracy than IQ. In fact, if Tracy knew a child's working memory, she could determine his or her grades with 95 percent accuracy. In chapter 5 we will go into much greater detail about this study and other research showing that working memory gives you more of an advantage in the classroom than IQ. Here are just a few

of the many fascinating and sometimes surprising findings we will explore in that chapter:

- A good working memory is the best advantage in school and is causally related to grades.
- Kids with good IQ scores don't necessarily have a good working memory.
- An average or even a high IQ doesn't necessarily give the student the tools for success in the classroom and beyond.
- IQ is linked to how rich or poor you are, but working memory isn't, which makes it a great equalizer.

The research on working memory also shows that the strength of a person's working memory influences far more than grades. An abundance of new evidence, which we present in this book, shows that the strength of your working memory plays a pivotal role in how successful you will be in many areas of your life, including whether you'll have the fortitude to work toward your long-term goals, whether you view the glass as half-full or half-empty, and even whether you'll be able to lay off the junk food when dieting.

How Working Memory Is Disadvantaged

Unfortunately, many things in our fast-paced 24/7 society are working against us to weaken our working memory. And when working memory isn't operating at full speed, it puts us at a big disadvantage.

Information Overload

If your working memory isn't up to snuff, you could drown in the overwhelming flood of data. Todd learned about the impact of information overload the hard way. As a serial entrepreneur, the thirty-five-year-old father of three was no stranger to the frenetic pace of a Silicon Valley high-tech start-up company. He spent every day sitting in front of four computer screens that beeped and pinged and flashed email alerts, instant messages, websites, and Twitter feeds. His clients constantly called his home office, his kids demanded attention, and he was inseparable from his iPhone as he toggled between his home and office life. For more than a year, Todd had been looking for a buyer for his company. But when a large company based on the East Coast emailed Todd saying that they were interested in acquiring his firm, the email got lost in the chaos of his life and he didn't discover it in his email inbox for over a week. If he hadn't finally stumbled across it when scanning back through his correspondence one evening at home, he might have lost what turned into a \$2-million-dollar sale.

The Lure of Instant Gratification

In our I want it now society, we want immediate satisfaction. Our quest for the fleeting thrill we get from an impulsive purchase or from eating an entire bag of chips when we're on a diet, relegates working memory to the sidelines of the decision-making process. This is why we so often opt for smaller, more immediate rewards rather than waiting for bigger and better things, like a fat bank account, or a slim waistline.

Time Constraints

Being squeezed for time burdens working memory and makes you more likely to give in to impulse—whether you're confronted with a limited-time-offer purchase, for example, or trying to select the

correct answers while taking a timed test, or even when faced with an ultimatum from a significant other to get engaged now or break up. In chapter 2, we look at how this plays out on eBay, where the ticking clock can overwhelm your working memory, making it more likely you will give into impulse and pay more than you should.

Stress

When the pressure's on, it can overload your working memory and sabotage your performance at work, at school, or even on the basketball court. Think of a star high school basketball player trying to play the game of his life knowing that college scouts are in the audience and this is his one and only chance to impress them. When it comes time to hit that last-minute three-pointer to win the game, he throws up a brick that clunks off the rim. Game over. Good-bye college scholarship.

Retirement

Sorry to burst your bubble, but if you've been dreaming about the day you can say good-bye to the 9-to-5 grind and hello to retirement, we have to inform you that retirement makes you dumb. Retirement marks not just a reduction of work, but also a reduction in thinking and, consequently, a reduction in your working memory strength.

Pain

If you've ever slammed your hand in the car door or spilled boiling water on your lap, you know that it's tough to think clearly when you're in pain. Scientists have discovered that pain, including chronic aches like a sore back or knee, may disrupt working memory.

Romance

What does romance have to do with working memory? In a 2012 study, Jeffrey Cooper and colleagues at Trinity College Dublin discovered that the PFC plays a big role in the first flush of attraction. They scanned the brains of nineteen- to thirty-one-year-olds on the prowl and showed them photos of potential mates. Some photos caused a burst of activity in parts of their PFC. Participants then went to a speed-dating event, and the researchers discovered that the stronger the activation in the PFC, the more likely the participants were to pursue a second date. If you find your working memory working overtime when you first meet someone, there is a good chance that you'll take a chance and ask them out.

Some exciting new research by Johan Karremans at Radboud University in the Netherlands offers insight into why men often become tongue-tied when meeting a woman whom they find attractive. He found that men's scores on a working memory test were lower after they'd had a brief conversation with a beautiful woman. And intriguingly, he did not find this "attraction effect" in women after they'd had a conversation with a handsome man. His interpretation of his results is that because traditional gender roles require men to take the initiative in engaging in conversation with a potential mate, their working memories are more taxed by the process.

Video Games, Smoking, and Overeating

Whatever your guilty pleasure may be, it can take your working memory offline. A healthy working memory inhibits self-destructive habits, but engaging too often in highly addictive behaviors causes changes in the brain. Basically certain brain regions gang up and recruit your working memory into fulfilling the addictive desire, rather than stopping it.

How Working Memory Can Be Improved

As little as five years ago, people thought that working memory was fixed—that you were stuck with what you were born with. But research is showing otherwise. Think of working memory as like a rubber band. Some rubber bands are big, and some are small, but they can all be stretched. In the same way, we're all born with a certain level of working memory. But regardless of our genetic predisposition for a strong or not-so-strong working memory, nearly every one of us can stretch it to get a bigger advantage in life.

The lessons we've learned from our work with students to train their working memory with the Jungle Memory software Ross developed have confirmed that significant improvements are possible. Take the case of a young girl named Jasmine. She was often told that she needed to “try harder,” but despite doing her best, she couldn't keep up at school or follow her mom's instructions at home. After being diagnosed with a working memory deficit, Jasmine used the Jungle Memory program for eight weeks and saw dramatic results. She improved her working memory by over 800 percent (an amazing result!) and started winning achievement awards at school.

Tracy has also seen significant improvements in clinical trials when she tested the working memory of students with reading and math difficulties. After they had trained regularly for eight weeks with Jungle Memory, they showed fantastic improvements in working memory; even more exciting was that their grades also improved—generally a whole grade point, such as from a C to B or a B to an A. Another study showed that they maintained all of these improvements eight months later.

Throughout this book, we introduce you to a host of simple working-memory-training exercises, so that you can get started on getting your working memory in shape as you read. And at the end of the book, we provide a quick hits training manual that you can use on the go to help keep your working memory sharp.

In the chapters that follow, we first draw on more than a decade of research and practical experience to explore why working memory is so vital in our lives and the role it plays in our general work aptitude and in our general life happiness, as well as in learning, overcoming addiction, and achieving in sports. In part II, we show you how working memory changes during our lives from childhood to old age and introduce encouraging evidence about how we can keep our working memory in good shape during later life. We also present specific tools for strengthening working memory—from the most effective brain training programs, to the best foods to eat (some of them may surprise you), to small but crucial tweaks in your daily habits that can make a big difference for your working memory. The chapters in part III imagine a future in which the world is designed to give our working memory the best advantage and look at groundbreaking research on how it gave our ancestors an evolutionary advantage.

Test Your Working Memory

To help you get a basic understanding of the strength of your working memory, here are two quick tests. For a more detailed measure of your working memory power, take the full online test at <http://testwm.com>.

Test 1

Below is a list of three-letter words. Don't look at it! Ask a friend to quiz you using the list of words. In level 1 of this test, your friend is going to read aloud two words, like cat and bat. You have to try to remember the two words, reverse them, and repeat them backward. Tab. Tac. In level 2, you have to do the same with three words. In level 3, it's four words. Most people are able to do level 1, but you need a strong working memory to complete levels 2 and 3 correctly.

Test 1. List of Words



Level 1

Dog

Lid

Level 2

Bun

Car

Tip

Level 3

Dab

Pig

Top

Net

Test 2

Level 1

1. Look at the pyramid below. Remember the triangle where the letter appears.



2. Now look at this picture. Does it start with the same letter as the letter in the triangle?



3. Here is another pyramid. Remember the triangle where the letter appears.



4. Now look at this picture. Does it start with the same letter as the letter in the triangle?



5. Now draw arrows to the triangles where the letters appeared, in the correct order.



Level 2

Follow the same directions as in Level 1.

1. Remember the triangle where the letter appears.



2. Does the picture start with the same letter as the letter in the triangle?



3. Remember the triangle where the letter appears.



4. Does the picture start with the same letter as the letter in the triangle?



5. Remember the triangle where the letter appears.



6. Does the picture start with the same letter as the letter in the triangle?



7. Now draw arrows to the triangles where the letters appeared, in the correct order.



Level 3

Follow the same directions as in Level 1.

1. Remember the triangle where the letter appears.



2. Does the picture start with the same letter as the letter in the triangle?



3. Remember the triangle where the letter appears.



4. Does the picture start with the same letter as the letter in the triangle?



5. Remember the triangle where the letter appears.



6. Does the picture start with the same letter as the letter in the triangle?



7. Remember the triangle where the letter appears.



8. Does the picture start with the same letter as the letter in the triangle?



9. Now draw arrows to the triangles where the letters appeared, in the correct order.



Scoring

The number of letters you can remember in the correct order gives you an indication of the strength of your working memory. If you are like most adults, you were probably able to complete levels 1 and 2 of this test correctly. Data from thousands of people confirm that the average five-year-old can remember and process two things. Most adults are able to remember four or five items in the correct order.

If you didn't fare so well on these tests, don't get frustrated. You can always make an improvement. If you aced these assessments, don't get too smug. You need to continually challenge your working memory to keep it in tiptop shape. Doing brain training exercises, such as the ones in this book, can help optimize your working memory.

Users Review

From reader reviews:

Janie Ross:

Reading a publication can be one of a lot of task that everyone in the world enjoys. Do you like reading book

consequently. There are a lot of reasons why people enjoyed. First reading a guide will give you a lot of new info. When you read a e-book you will get new information since book is one of a number of ways to share the information or perhaps their idea. Second, studying a book will make an individual more imaginative. When you studying a book especially tale fantasy book the author will bring you to definitely imagine the story how the characters do it anything. Third, you may share your knowledge to some others. When you read this *The Working Memory Advantage: Train Your Brain to Function Stronger, Smarter, Faster*, you can tells your family, friends and soon about yours guide. Your knowledge can inspire the mediocre, make them reading a reserve.

Gary Gonzales:

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Amy Mueller:

What is your hobby? Have you heard in which question when you got pupils? We believe that that question was given by teacher for their students. Many kinds of hobby, Everyone has different hobby. And you also know that little person such as reading or as studying become their hobby. You need to know that reading is very important as well as book as to be the issue. Book is important thing to include you knowledge, except your own teacher or lecturer. You get good news or update concerning something by book. A substantial number of sorts of books that can you choose to use be your object. One of them is this *The Working Memory Advantage: Train Your Brain to Function Stronger, Smarter, Faster*.

Adrian Johnson:

A number of people said that they feel bored when they reading a book. They are directly felt that when they get a half parts of the book. You can choose often the book *The Working Memory Advantage: Train Your Brain to Function Stronger, Smarter, Faster* to make your own personal reading is interesting. Your skill of reading ability is developing when you similar to reading. Try to choose very simple book to make you enjoy you just read it and mingle the impression about book and reading especially. It is to be initially opinion for you to like to open a book and study it. Beside that the publication *The Working Memory Advantage: Train Your Brain to Function Stronger, Smarter, Faster* can to be a newly purchased friend when you're experience alone and confuse in doing what must you're doing of their time.

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