

Cognitive Fitness

by Roderick Gilkey and Clint Kilts

New research in neuroscience shows how to stay sharp by exercising your brain.

Winston Churchill was outspoken on the sacred rites of smoking cigars and drinking alcohol before, after, and during meals—and in the intervals in between. But he was also exceptionally active mentally. As historians have duly noted, Churchill went on to live until 90. That speaks volumes for the information that is now coming to light about how the brain can affect the body.

Of course, few executives would be willing to follow Churchill's example in taking such poor care of their physical health. As life expectancy continues to rise, people are doing more and more to ensure that their lives, if long, are going to be healthy. The American Heart Association now recommends 30 minutes of moderate exercise five days a week. Not surprisingly, most large companies offer health club memberships as a perk; many provide gyms on-site. Find yourself on the road, and you're almost guaranteed to have a fitness center in your hotel. You may even have to get in line to use the equipment.

Until recently, however, there seemed to be no guidelines for active efforts you could make to stay *mentally* healthy. There were no brain exercises—no mental push-ups—you could do to stave off the loss of memory and analytic acuity that comes as you grow older. In the worst-case scenario, you could end up with Alzheimer's disease, for which there are no proven treatments.

But a concentrated commitment of resources by the National Institutes of Health, the National Institute of Mental Health, and the Library of Congress during the 1990s—which the White House proclaimed the “decade of the brain” to heighten public awareness of the need for neuroscience research— yielded a broad front of research and training that has upended some deeply held beliefs about the brain. One such belief is that the brain necessarily diminishes with age. It turns out that neurons, the basic cells that allow information transfer to support the brain's computing power, do *not* have to die off as we get older. In fact, a number of regions of the brain important to functions such as motor behavior and memory can actually expand their complement of neurons as we age. This process, called neurogenesis, used to be unthinkable in mainstream neuroscience.

What does all this have to do with you? The process of neurogenesis is profoundly affected by the way you live your life. The brain's anatomy, neural networks, and cognitive abilities can all be strengthened and improved through your experiences and interactions with your environment. The health of your brain isn't just the product of negative and positive childhood experiences and genetic inheritance; it reflects your adult choices and experiences as well. That's extremely good news. Sigmund Freud and those who followed him both in the neurological sciences and in the psychoanalytic tradition thought for years that brain development ceased in childhood or early adolescence. Although these periods do hold the greatest potential for neural development, we now know there is a regimen you can follow to retain and even build mental capacity as you age.

Brain-imaging studies indicate, for example, that acquired expertise in areas as diverse as playing a cello, juggling, speaking a foreign language, and driving a taxicab expands and makes more communicative the neural systems in the parts of the brain responsible for motor control and spatial navigation. In other words, you can make physical changes in your brain by learning new skills. You can even make changes in how your brain functions by exercising conscious will. In a recent experiment using real-time brain imaging, scientists demonstrated that individuals learned to mitigate the sensation of pain by consciously controlling the observable activity of the rostral anterior cingulate cortex, an area of the brain involved in pain processing. In theory, therefore, it's possible for people to alleviate pain through neurofeedback, without drugs.

These advances in neuroscience suggest that there is no reason why your brain at 60 can't be as competent as it was at 25. That would not have been news to thinkers such as Socrates, Copernicus, and Galileo, who were all still at the peak of their intellectual powers in their sixties and seventies. Nor would it surprise business leaders such as Alan Greenspan, Warren Buffett, and Sumner Redstone. These icons and others like them have intuitively understood that the brain's alertness is the result of what we call cognitive fitness—a state of optimized ability to reason, remember, learn, plan, and adapt that is enhanced by certain attitudes, lifestyle choices, and exercises. The more cognitively fit you are, the better you will be able to make decisions, solve problems, and deal with stress and change. Cognitive fitness will allow you to be more open to new ideas and alternative perspectives. It will give you the capacity to change your behaviors and forecast their outcomes in order to realize your goals. You can become the kind of person your company

values most. Perhaps more important, you can delay senescence for years and even enjoy a second career.

So how can you become cognitively fit? Drawing selectively from the rapidly expanding body of neuroscience research as well as from well-established research in psychology and other mental health fields, we have identified four steps you can take. These steps are by no means exhaustive. They overlap and reinforce one another. Together they capture, we believe, some of the key opportunities for maintaining an engaged, creative brain.

Step 1: Understand How Experience Makes the Brain Grow

The experience-dependent nature of cognitive health has long been appreciated by psychologists. As early as the middle of the twentieth century, they noted that rich experience helped very young children to interact with their environment. We've also known for some time that experience has a physiological impact on the brain. In the late eighteenth century, the Italian anatomist Vincenzo Malacarne conducted a famous series of controlled experiments on dogs and birds. He separated each litter or set of eggs into pairs, giving extensive care and training over time to one animal from every pair, and good care but no training to the other. His later autopsies revealed that the trained animals' brains were more anatomically complex, with more folds and fissures. This research was the first to identify the impact of experience and education on the structure of the brain. To build on an example mentioned earlier, the expansion of the motor area representing a hand that plays a cello is greater in someone who started lessons early in life than in someone who didn't.

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While the neuroscience community has known for quite a while about the biological impact of expanding experience, we've only recently figured out how the brain actually processes experience in order to encode learning and build performance capacity. The discovery of dedicated neural systems that represent objects, people, and actions provides a new explanation of the mechanism involved. The so-called mirror neurons making up these systems aid the speed and accuracy of our perception by mentally simulating objects and

actions in our environment. Knowing that mirror neurons allow us to internally reflect our external world is a quantum leap in our understanding of how humans comprehend and master their environment. Experience gained through observation activates these performance-enhancing neurons, which accelerate learning and the capacity to learn.

Traditionally, scientists have assumed that people gain new skills through practice—that is, through direct experience—but the existence of mirror neurons means you can also gain skills through observation and indirect experience. Think about this for a moment: When a golf pro demonstrates the correct stance and swing for you to imitate, mirror neurons are activated, enabling you to learn from his experience by supplying you with the mental image of the correct actions. And it's not just physical skills that can be picked up this way. Your social cognitions are similarly aided by specialized neurons that reflect facial expressions, gestures, and other signals, and develop your ability to read other people's actions and expressions by matching them with internal representations you have acquired.

This suggests that mental imagery—for instance, trying to re-create the golf pro's swing through a mental picture—is a valid mode of learning and acquiring new competences. Indeed, sports professionals often attribute their exceptional abilities to being able to “see” the ball and its flight prior to striking or catching it. The brain's ability to learn in this way makes a biological case for the use of simulations and case studies as tools in your quest for development as a leader. Such approaches not only promise effective ways of learning but are also potentially very efficient. You can conceivably gain the brain benefits of other people's long-term direct experience through, for example, short-term exposure to simulation. Simulated experiences can establish neural readiness for real experiences.

Of course, direct experience remains the keystone of a person's brain development—but we increasingly understand how to pave the way for such experience. One of the most powerful tools available for strengthening the executive brain is the walkabout. In business, this is known as management by walking around—the practice of getting out of your office and talking to employees. It's not just good business practice; it is also a sound form of cognitive exercise.

The walkabout is named after an Australian rite of passage in which aboriginal adolescents undertake a prolonged and challenging physical journey, sometimes for several months, in search of psychological and spiritual self-definition and maturity. The

timing is just right, since it is during adolescence that the brain establishes and integrates the neural networks in the prefrontal cortex that encode a sense of self-identity, as well as moral and social conduct. This process culminates in late adolescence, when the brain's neurons are fully myelinated (coated with insulation) and interconnected in networks that help the mature brain function in an efficient, organized manner. The walkabout is not, of course, the only rite-of-passage ritual; it's quite remarkable how many similar rituals occur in different cultures at precisely the same stage in people's lives. There is a generally accepted understanding that adolescents need such "peak" experiences to consolidate their personal histories and their physical development into a viable, more advanced identity.

This sort of journey, more broadly speaking, can also have a strong influence on an executive's career, particularly if the timing is right. Warren Buffett is one leader who realizes this. When Anne Mulcahy, the CEO of Xerox, sought his advice about how to help the company emerge from a financial crisis that was rapidly pushing it toward bankruptcy, he urged her to engage in a walkabout. His advice was that she should learn what Xerox employees and customers were thinking and worry less about what the financial analysts and shareholders were saying. It made excellent sense from a neurological standpoint for Mulcahy to acquire at the beginning of her tenure as CEO a deeper understanding of the people who would be following her, because the neural networks that would enable her decision making as a leader would not yet be fully formed. If she had stayed isolated in the corner office, those networks would certainly have ended up looking different than they do today.

Step 2: Work Hard at Play

Another one of the most effective ways you can promote your cognitive health is to engage in the serious business of play. As the philosopher Henri Bergson wrote, "To exist is to change, to change is to mature, to mature is to go on creating oneself endlessly." To do this well requires consciously drawing on one of the great legacies of childhood—our ability to play, which lies at the heart of our capacity to imagine and invent.

The origin of the word "play" is telling: It is derived from the Old English word "plegian," which means to exercise. As a verb, "play" is often defined in terms of individual or group

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imaginative activity that promotes discovery and learning, or social activity that promotes what psychologist Daniel Goleman would call emotional and social intelligence. As a noun, it refers to activity engaged in for enjoyment or recreation. In both senses, it is closely tied to pleasure and strongly associated with the brain's reward systems. Indeed, Jaak Panksepp's neuroscientific research on mammals identified play as a primary human drive and the brain's source of joy, which is linked to the release of a specific neurochemical that modulates gene expression critical to the development of a child's social brain. Joy provides what has been described as "emotional fuel," which helps the brain develop and expand its synaptic networks. In early life, this neurochemical appears in lower subcortical regions, which later, according to Panksepp and his colleagues, contribute to the growth and development of higher brain functions associated with the frontal cortex. So play is not only a psychological precursor of social and emotional maturity in adulthood; it is a physiological one as well.

As you go about the hard work of your career, it is critical to remember to play. That's because in adult life, play engages the prefrontal cortex (our most highly evolved and recently acquired brain areas), nourishing our highest-level cognitive functions—those related to incentive and reward processing, goal and skill representation, mental imagery, self-knowledge, and memory, just to name a few. Play, therefore, improves your ability to reason and understand the world. Our most brilliant thinkers and leaders know this. Albert Einstein, for example, saw his ability to grasp profound insights into the nature of the universe as a result of combinatory play. When asked to describe his experience in developing the theory of relativity, he observed that it began as a "physical sensation" that later became a set of visual images and finally emerged as a written formula that he could begin to describe in words and symbols. This sounds less like an adult's process of analytical reasoning than like a child's creation of a fantasy world, where characters magically pop into being, which no doubt is why Einstein concluded that "imagination is more important than knowledge."

Play is a tool that we must consciously use, as the demands on us increasingly call for greater levels of emotional control—but as we get older, we unfortunately tend to play less often. Here's how Daniel Goleman describes the process: "As a child matures, the circuitry for emotional control will slowly suppress the effervescent urge to giggle and romp. As the regulatory circuits of the prefrontal cortex develop in late childhood and the early teen years, children are more able to meet the social demands to 'get serious.'" The

consequence is that play is relegated to the realm of distant memory, and its revitalizing capacities are reduced.

Some organizations go out of their way to let people experiment and play. A host of hard-driving Silicon Valley companies, such as Google and Apple, provide environments that encourage some kind of play, referred to variously as Zen dens, play spaces, and chat chambers. As the leaders of these companies realize, a legitimate and comfortable environment for brains to play can be a powerful tool for allowing people to develop their creative capacities and cognitive health. Conversely, in companies that stifle play, brainpower may actually decrease as it does in children with failure-to-thrive syndrome, a condition created by experientially deprived or abusive environments. One of the prototypical examples is ITT (particularly under former CEO Harold Geneen), which was once described in the *Wall Street Journal* as “a company that’s continually going to disappoint you however low your expectations are.”

A big challenge in finding the right environment for your brain to thrive is striking a balance between risk and security. You must have a stake in the game you play if you are to really engage in it; risk alerts the brain and activates capacities for both reason and imagination. If you don’t allow for some risk in your career, you may become like an overprotected child who fails to explore the world with any autonomy and thus never fully achieves his potential. But too great a personal stake in the game creates stress, which activates the amygdala and other limbic brain areas that constitute the brain’s homeland security system. When the limbic system kicks in, your brain reverts to instinctive, preprogrammed survival behaviors rather than engaging in higher-order learned ones. In extreme situations, stress can trigger anxiety disorders and chaotic behaviors. And the more driven you are, the greater the risk this will happen. Ambitious people don’t like failing or looking stupid. As the social scientist Chris Argyris (one of the fathers of organizational learning theory) put it, smart people have trouble learning because it involves so much floundering and failure. Play is hard work.

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Step 3: Search for Patterns

As most people know, the brain is composed of two hemispheres that have interconnected but very different functions. Neuroscience technology and research have provided us with a more complete picture of the left and right hemispheres' specialized roles. The left hemisphere is the primary source of neural information that a person uses to carry out routine tasks. The right deals with novelty, including experience and data that are less linear and less structured linguistically or mathematically. The right hemisphere is the more "poetic" part of the brain; it operates in metaphorical, image-based, imaginative ways. In this section of the article, we'll focus on what you as a leader can do to improve the functions of the left hemisphere, which often gets taken for granted as essentially determined by genetic inheritance.

Ironically, many cognitive fitness exercises directed at businesspeople focus on stimulating the right hemisphere—the creative, playful side. In part this is because of the classic stereotype of businesspeople as dull men in gray suits who need to loosen up. It's also true that in recent years creativity has come to be seen as the panacea for corporate ills. Although it's important to stimulate creative, divergent thinking, you'll derive just as much benefit, and perhaps more, from stimulating the analytic neural networks that are often viewed as left-hemispheric. These networks comprise the standard operating procedures that you use throughout a given day—a vast cognitive repository or library that is automatically activated to handle familiar tasks and challenges.

Why is the left hemisphere so important? Recent neuroimaging investigations have identified one of the engines that serve left hemisphere performance: constellations of neurons that neuroscientists such as Elkhonon Goldberg call attractors, which mediate critical executive functions in the brain. While attractors are not exclusively located in the left hemisphere, they are especially supportive of the role played by that hemisphere. They are organized to orchestrate thought and action with great efficiency and effectiveness. Together they form the basis of what the Nobel laureate Herbert Simon referred to as pattern recognition, which he considered to be the most powerful cognitive tool we have at our disposal. Pattern recognition is the brain's ability to scan the environment; discern order and create meaning from huge amounts of data; and thereby quickly assess a situation so that appropriate action can be taken right away and with a high degree of accuracy. It is a complex chain reaction that uses the highest-level capacities for

abstraction and reflection that are based on the deepest repositories of stored experience. The power of pattern recognition, a critical competence of the executive brain, can be seen in the capacity to simplify without being simplistic. For executives trying to make sense of a rapidly changing business environment, superiority in pattern recognition is perhaps the greatest competitive advantage that can be developed.

There's a lot that you can do to develop your left-hemispheric capabilities. First and foremost, challenge your existing mind-set, enlarge it, and make it more complex. Listen to different viewpoints, read new kinds of articles and books, and visit places with a focused set of learning objectives. All these experiences—particularly those related to your own organization or job—will expand your vocabulary, your conceptual

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storehouse, and your general perspective. Such immersions will call into question your own mind-set and improve your abilities in pattern recognition.

Hitachi Data Systems provides a good example of the kind of foray we're talking about. Working with BrightHouse, a consulting company based in Atlanta, Hitachi executives were invited to an ideation-strategy session with a distinguished classics professor to help them think about how to reposition their business. As a result of what they learned, some of the executives have been working on reorganizing the company along the lines of the Greek agora, with a view to creating an open marketplace for the exchange of ideas and knowledge. We're not saying that the classics professor told Hitachi what to do; rather, Hitachi's leaders combined what the classicist had to say about ancient Athens with what they knew about their company to create a new and potentially better way to share information.

With activities such as these, it is of utmost importance that you do them often. Make a consistent, ongoing commitment to immersing yourself in new systems and ways of thinking. It cannot be an occasional event, because the point is to expose yourself to a variety of cases and situations that cumulatively encode rich experience in your brain.

Just as you'll need to vary your own experiences to maximize your cognitive fitness, you'll also want to make sure that the experiences of your management team members are

varied. Avoid filling the team with people who've all followed the same path upward. This advice may seem obvious, but we suggest taking a cold, hard look at how executives make it to the top in your organization. Isn't there a tendency for one route to dominate? This is natural, given that those who are looking for advancement tend to benchmark, and those at the top tend to warm to subordinates with experiences similar to their own. Evolutionary biology could give you any number of explanations for the survival value of these behaviors. But if you care about your company's cognitive fitness and, in particular, your management team's overall ability to discern patterns, then you need to be on guard against the inclination to pick only one kind of leader. Selection and succession programs that draw from the same limited population of executives promote an aggregation of cognitive templates based on shared experience and common pattern recognition. When a perspective becomes codified, people stop looking for new patterns and your company sacrifices some of its cognitive fitness— and competitiveness.

Step 4: Seek Novelty and Innovation

We have looked at the role of the left hemisphere in achieving the highest levels of cognitive fitness; now let's turn to the right hemisphere's contribution. The importance of expanding the brain's capacity to deal with novelty, a capacity typically associated with right-hemisphere functioning, becomes particularly obvious when we consider the fact that the right hemisphere deteriorates faster with age than the left.

The right hemisphere was once described by some neuroscientists as the "inferior" hemisphere in terms of cognitive functions, because it is the left side that governs our abilities in language and basic or linear logic. For many years, it wasn't clear how critical a role the right hemisphere played in obtaining the knowledge and wisdom that is later encoded in the left side. Research is now revealing that the right hemisphere is the exploratory part of the brain, dedicated to discovery and learning. When a child studies a language or an adult takes up painting— any time people look at and experience the world in a novel way—the right hemisphere is exercised. Later, the new knowledge (language, for instance) migrates to the left, exploitative hemisphere, where it is organized, encoded, and made available for day-to-day retrieval and use. If the left hemisphere is about language expression, then the right is about language acquisition.

As on the left side, the neural networks on the right benefit from exercise. The more new things you learn, the better you become at learning. Actively engaging in novel,

challenging activities capitalizes on your capacity for neuroplasticity—the ability of your brain to reorganize itself adaptively and enhance its performance. Studies of older adults usually show that those who live this way possess more complex neural networks than those who do not. The people who remain engaged in life consistently display an attitude of openness to new and unexpected experiences. Abraham Goldstein followed such a regimen of cognitive fitness. As a lawyer living in Manhattan and a professor emeritus at Baruch College, Goldstein continued to tutor law students and lead a physically and mentally active life to the age of 103.

Continuous learning can provide another important benefit. Research shows that the Abraham Goldsteins of this world are more resistant to Alzheimer's disease and other forms of dementia. Take the case of Richard Wetherill, a retired university lecturer and a talented chess player who could think eight moves ahead. In early 2001, Wetherill noticed that his chess ability had diminished; he could see only five moves ahead. Convinced that this was a signal that something was wrong with him, he consulted a neurologist. He took the usual diagnostic tests and passed them all. His brain scans looked quite normal. He died two years later, and an autopsy was conducted. Postmortem brain pathology showed that Wetherill had suffered from advanced-stage Alzheimer's, which would have rendered most individuals cognitively nonfunctional. Wetherill's case illustrates how those who are cognitively fit thanks to vigorous intellectual stimulation can be protected from the mental decline that comes with age.

People who are receptive to novelty and innovation also tend to be good in a crisis, because they are open to seeing opportunity in even the direst situations. Gene Krantz's reaction to the darkest moment of the *Apollo 13* emergency is a case in point: "I believe this will be our finest hour." Krantz had a long history of challenging convention, policy, and practice at NASA. He organized special teams that drew talent out of traditional silos and across boundaries. He also gave outside vendors office space in his complex to build expertise and relationships. He was featured in Michael Useem's book *The Leadership Moment* as a paragon of effective creative leadership. There's no way to verify this without neural imaging, but we would expect Krantz's brain to have a highly connected network of neural pathways in the right hemisphere. His mind-set and experiences lead to the kind of right-hemisphere development that is so critical to cognitive fitness.

More generally, what we're talking about is having an open attitude that Buddhist monks refer to as the beginner's mind, a willingness to step back from prior knowledge and

existing conventions in order to start over and cultivate new options—a challenge that typically activates right-hemisphere cognitions. If you are really serious about creating innovative options, you couldn't do better than to turn to Buddhist thinking. In *Zen Mind, Beginner's Mind*, Shunryu Suzuki describes the Zen mind as one that is open, allowing for both doubt and possibility, and one that has the ability to see things as fresh and new. As he observed, "In the beginner's mind there are many possibilities, but in the expert's there are few."

We also advocate adopting a protégé. While it's widely known that being a protégé benefits rising executives, an ongoing stream of research reveals that the person who often gets the most value from a mentoring relationship is the mentor, who is exposed to information, queries, and ideas from which she may otherwise be too remote. In the field of medicine, for example, senior attending physicians can learn a lot from the insightful questions raised by students.

Cognitive fitness can affect every part of your life. On an organizational level, it may be the ultimate lever for sustainable competitive advantage. Your critical task as a leader is to promote the highest levels of organizational performance by creating environments where people can achieve their brains' full potential. Thinking through the four steps and deciding how they apply to the strategic challenges your company faces is a good way to begin. Not all companies will come up with exactly the same mix of practices and policies; the cognitive profile required by a large company in the automobile industry may differ from what you'd need to run a biotech start-up. The former might emphasize left-hemisphere activity (for example, spotting hidden patterns in demand), while the latter might call mainly for right-hemisphere activity (for example, coping with a series of failed R&D projects). Whatever the best approach for your organization may be, a brain-positive culture that encourages people to put their whole brains to work can become a reality only with the right kind of committed leadership. The future belongs to companies with leaders who develop cognitive fitness for themselves and their organizations. CEOs need to be cognitive coaches to those whose work and decisions collectively create and propel the company's strategy.

Exercising Your Brain: A Personal Program

Because the brain is an interactive system, any activities that stimulate one part of it can easily stimulate other parts. Therefore, our cognitive fitness categories need to be understood as approximations—this is particularly the case with hemispherically focused activity. Although some stimuli may initially create greater activations in, say, the right hemisphere, both hemispheres will ultimately be involved in the process of mastering new challenges. While there is much to learn about the intricacies of cognitive enhancement, we believe that the following exercises are a good selection.

Manage by walking about. Leave the executive dining room and drop by the company cafeteria, production floor, or loading docks. This could put you in unfamiliar territory, which is a good thing for broadening your perspective. What's more, the very act of walking and moving about invigorates your brain. That's why when you have a mental block on some problem you are solving, getting up and changing your environment can lead to an "aha" moment.

Read funny books. Humor promotes insight and enhances our health—even the immune system seems to love a good joke, as it is strengthened by the use of humor and the perspective it offers.

Play games. Activities like bridge, chess, sudoku, and the *New York Times* crossword puzzle all provide good neural workouts. There are ever more possibilities online, too, with the growing popularity of role-playing games. Try new games that challenge your left hemisphere, such as pool.

Act out. At its best, play is discovery—and what you discover through improvisation is your inner actor, who can try on many roles. (Believe it or not, a number of outstanding comedians started their careers as accountants.) You will be surprised to see that such play expands your behavioral repertoire— your brain has immense stored potential for enhancing your personality and leadership capacities. You can even experiment in meetings. Trying out different ways of interacting with colleagues, for example, increases cognitive fitness.

Find what you're not learning. If you're like most executives, you tend to ask very similar questions day to day in your professional and personal lives. So listen to yourself and figure out what you don't seek. Asking a promising young subordinate what she thinks is a

good place to start. Or vary your reading list. If you normally throw yourself into history and biography, try literary fiction; if it's mostly thrillers, try science.

Get the most out of business trips. Travel provides excellent opportunities for jolting your brain. Your time investment need not be too intensive. Visit a museum; read a novel set in the city you are visiting; devote a couple of hours to talking with locals around town. These activities not only increase your cultural IQ—they are also a good form of cognitive exercise.

Take notes—and then go back and read them. One of the world's greatest entrepreneurs, Richard Branson, carries a bound book with blank pages wherever he goes. Every time he sees or hears something interesting and new, he jots it down. He says that many of these ideas have become new businesses.

Try new technologies. Playing with that new touch screen and downloading that goofy video from YouTube on your iGadget to display on your megascreen TV activates innumerable brain channels linking your auditory, visual, and tactile networks with your limbic system and your prefrontal cortex. Talking about it and sharing your emotional energy with your friends will extend the activity throughout the brain. Even your brain stem, which keeps you wakeful and engaged, will get a workout.

Learn a new language or instrument. Studying a new language puts you at the pinnacle of mental athleticism. Learning a musical instrument or really playing that old clarinet in the closet gives your brain a big boost, too. Take lessons.

Exercise, exercise, exercise. Your brain is not an island—it is part of a system that benefits from cardiovascular exercise, good diet, and proper sleep habits. One of the most consistently identified defenses against developing Alzheimer's disease is a good exercise regimen. Very specific beneficial biochemical changes, such as increases in endorphins and cortisol, result from both cardiovascular and strength training. Those benefits literally flow through your blood vessels and reach your muscles, your joints, your bones, and, yes, your brain.

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