



MindAlert

A joint program of the American Society on Aging and MetLife Foundation



Sparking the Brain With Exercise: How Physical Fitness Affects Mental Fitness



2009 Special Lecture by John J. Ratey, MD



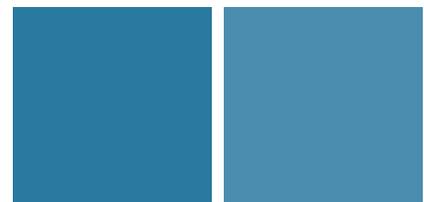
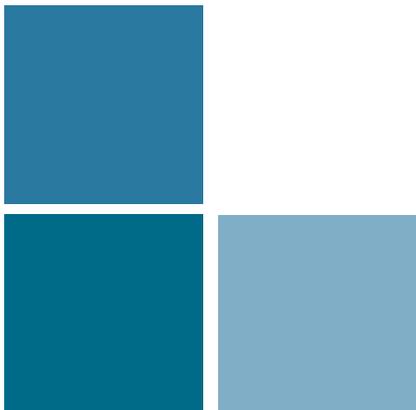
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Introduction

This MindAlert monograph delves into John J. Ratey's groundbreaking and fascinating investigation into the transformative effects of physical exercise on the brain. Citing top-notch epidemiological evidence, Dr. Ratey emphasizes the need to rethink our modern lifestyles in order to maximize cognitive performance and minimize risk for dementia. He explains that staying physically active is crucial to cognitive health because moving muscles trigger the production of proteins that enhance the brain's highest thought processes. Exercise stimulates brain cells to make what Ratey calls Miracle-Gro for the brain, thus increasing productivity, plasticity, and resiliency. "I can't overstate how important regular exercise is in improving the function and performance of the brain," he says. "It's such a wonderful medicine."

Dr. Ratey presented the special lecture on which this monograph is based at the 2009 Aging in America Conference of the American Society on Aging and the National Council on Aging as part of the MindAlert program. Sponsored by the American Society on Aging and MetLife Foundation, MindAlert is dedicated to sharing the findings of the latest research on maintaining and enhancing cognitive function in later life. Also included in this booklet are profiles of the winners of the 2009 MindAlert Awards, which recognize programs that promote mental fitness in older adults, as well as an annotated list of past MindAlert monographs.



SPARKING THE BRAIN WITH EXERCISE:

How Physical Fitness Affects Mental Fitness

JOHN J. RATEY

I'm going to explain why exercise is such an important component of daily living, especially in terms of aging. The inspiration for my new book, *Spark: The Revolutionary New Science of Exercise and the Brain*, began with a huge discovery in the mid-'90s by a MacArthur Foundation-funded international study looking at how to prevent the onset of cognitive decline in Alzheimer's disease. The researchers found three specific activities that helped delay the onset of cognitive decline in Alzheimer's: lifelong learning, caloric restriction, and physical exercise.

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Now, everyone seems to appreciate the importance of continued learning these days, so we do Sudoku and crossword puzzles, Posit Science and Brain Gym exercises, and all these other things that are available, to keep our nerve cells working. The second choice, which no one likes to hear about, is really watching what you eat, meaning not just getting thin, but eating 20 percent less food than you need. The third factor, physical exercise, threw everybody off because at that point in time, it was known that exercise helped depression and anxiety, but no one was sure just what physical exercise had to do with Alzheimer's and cognitive decline and thinking. Exercise certainly improved cardiovascular health, so the heart beat better, and maybe cleaned out the arteries a little bit and pre-

vented stroke and so forth. But no one really had appreciated all the possible benefits of exercise until this study.

THE INSPIRATION FOR SPARK

A coauthor of this big study I just mentioned, neuroscientist Carl Cotman out at the University of California, Irvine, decided he really wanted to focus on exercise and its role in brain health. Well, he had a hard time starting because none of his students—graduate students or undergraduate students in neuroscience, or in any field—wanted to work with him because everybody thought the research was useless. It was so not in, to look at how exercise affects the brain—no one believed that it really did.

But Cotman pushed forward anyway and co-opted Nicole Berchtold, a young student who was becoming a physical education teacher. The two of them went on to publish all this amazing work about how exercise affects the brain in a very, very positive way, keeping it healthy, allowing the growth of new nerve cells, making rats and mice smarter. Nicole Berchtold, who did become a PE teacher, by the way, now chairs one of the largest neuroscience departments on the West Coast.

Anyway, back then in the '90s, about one or two papers a month were published in the field of neuroscience on exercise. Now, every week, the National Library of Medicine sends me anywhere from 15 to 30 abstracts

describing research on exercise and the brain. Obviously, now there's lots of interest, activity, and excitement surrounding how exercise affects the brain. All this focus on physical and cognitive fitness really sprang from work that had been done with elders because, starting in the early '90s, everybody was worried about what would happen to us boomers as we age. So all this very, very fine research was done with exercise and aging. Anyway, the result for me was that I started viewing exercise through the lens of brain health and ended up writing *Spark*.

ANCIENT GENES, MODERN LIVES

Now, human beings evolved from hunter-gatherers, starting about 5 million years ago. Only about 10,000 years ago, humans began to farm. Since then, civilization has evolved so rapidly that here we are today, sitting in chairs in front of computer screens or TV screens, or in desks at school. All of that sitting is part of the problem, because human genes haven't changed that much at all in the last 10,000 years. We have hunter-gatherer genes, which expect us to move, but we're sitting.

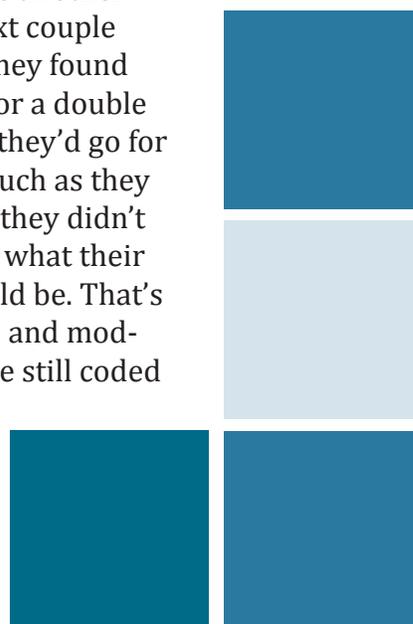
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Back then, humans were moving an average of 10 to 12 miles a day—some days nothing, some days 30 miles, but probably moving much of the time even when they were just in camp. Most modern humans don't move that much, and I think we're paying the price for that, with diseases like diabetes, and diabetes II, especially. Today's hunter-gatherer tribes—and there are a bunch of them around the globe that have been studied—don't have diabetes II, heart disease, or arthritis. They don't have much cognitive decline, either.

What all of this means is that we really have to shift priorities in the way we think about our lives. We have to deal with the fact that we have so many great cyber slaves, as I call them, that actually enslave us. From the TV clicker, to the computer, to the ease with which we prepare a meal even—the microwave or the fast-acting stoves—you know, it wasn't that way until about 50 years ago. We're now paying the price for that easier lifestyle: Most Americans will become overweight. The Centers for Disease Control and Prevention recently estimated that by the year 2040, 100 percent of the U.S. population will be overweight. Part of that problem is certainly the food, but the sedentary lives that we are immersed in, the way we're sitting all the time, is a big, big problem.

WHAT OUR GENES ARE TELLING US (AND WHY WE SHOULDN'T LISTEN)

Now, because humans evolved with what I call our thrifty genes, we are predisposed to eating the highest calorie food we can find. Think about it: When humans were hunter-gatherers, they didn't know whether there was going to be another meal in the next couple of days. So, if they found a fatty animal or a double cheeseburger, they'd go for it and eat as much as they could because they didn't know when or what their next meal would be. That's the way it was, and modern humans are still coded

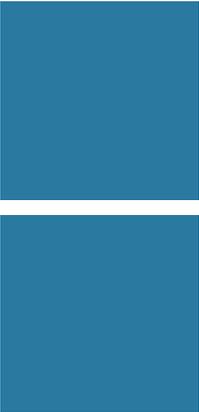


for eating those high-calorie foods. Not only that, since the '70s, we've had this great thing called corn syrup, which loads up the calories in prepared foods.

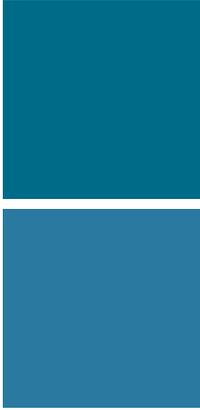
Also, our genes are telling us to take a break, to rest and relax if we're safe, warm, and full. And so we do: We sit in front of the TV, or the computer, or whatever it is, just following the dictate of our genes, which are telling us to rest because we might have to walk 40 miles tomorrow. That's the deal, we're resting up—but we're resting up all of our lives. We may not even walk 40 miles in six months. I think we need to reshape our civilization—we really need to pay attention to this. We have these great, wondrous gifts of technology that we can play with, but if we don't change our awareness of what we're doing to ourselves, we're going to continue to be in deep trouble.

THE PRICE OF CIVILIZATION

These days I'm speaking a lot to people who work with elders about the need for exercise in this population. There's a new general disorder called sedentaryism, which comes from people sitting too much, that contributes to Alzheimer's and dementia. You're twice as likely to become demented if you're obese, or have heart disease, certainly if you have diabetes, and definitely if you've got high cholesterol. Now these are what I call the diseases of civilization.



In the United States today, 33 percent of Americans over age 65 have no activity in their lives: They don't do much in the way of walking or even interacting, both of which are so important. Besides the fact that our bodies need to move, the human



brain needs to be connected to other people. We're social animals, you know, and one of our big problems now is that we're so sedentary and solitary these days—especially elders, who tend to withdraw. They feel no one wants to hear from them or wants to be with them. We have to fight against that.

Other diseases of civilization in my arena, psychiatry, are high rates of depression, anxiety, stress, attention deficit disorder, cognitive decline, and Alzheimer's. All of these problems have grown in the U.S. population, big-time, at least partly because of the increased sitting. There's a great paper called "Revenge of the 'Sit'" that mainly discusses how people's overweight problems lead directly to early dementia. In general, that paper is a scientific way of saying that we humans do not actively engage in our lives. In this modern world, we don't have to.

One of the ways of preventing all of these problems of civilization is to have a more active population that is engaged, more actively involved in life, moving.

One of the ways of preventing all of these problems of civilization—depression, anxiety, stress, attention deficit disorder, addictions, and cognitive decline in Alzheimer's—is to have a more active population that is engaged, more actively involved in life, moving. Today, we call moving exercise. The hunter-gatherers didn't call it exercise; they just called it living. They were moving out of need, not because they were training for a marathon. Moving was just part of their lives. As

modern humans, because we live in civilization, we have to reemphasize exercise.



AGING AND EXERCISE

Here's a quote from my book: "Getting old is unavoidable, but falling apart is not. Your brain doesn't have to fall apart. We're all going to age." In *Spark*, I start off the aging chapter with a story about my mother, who died at the age of 88. She was a walker all of her life before it became known and fashionable; she was really big on walking, and she wasn't a very good driver—in fact, she was a horrible driver—so all of us were glad that she walked everywhere. My mother was a fast walker, and she stayed with it a long time. Also, she started to play bridge in her late 60s, and by the time she was in her late 70s, she had about six master points (a measure of skill). The walking and the bridge playing kept her mind really sharp. She eventually succumbed to osteoporosis, broke one hip and then the other. Not being able to move around really sunk my mother's cognition fairly quickly.

Osteoporosis is a big problem for elders, especially women. Exercise is a way to prevent the bones from getting softer because exercise, especially moving through space or bouncing, stresses the bones. This kind of stress is good because it causes growth; the bones make more calcium around the edges, so they don't crumble so quickly. Obesity gets worse as people age because of inactivity mainly, and plus, there's been this trend over the last four decades that older Americans, comparing people of the same age from 40 years ago with people now, are getting heavier and heavier. With inactivity and obesity come all kinds of physical problems, including cognitive decline. We need to artificially

create the challenges our bodies and brains need.

A study done in 2008 by researchers from the National Institute on Aging showed that if you're overweight, or certainly if you're obese and you have a big belly, you are more likely to have earlier onset of cognitive decline and Alzheimer's disease. So even in middle age, it's important to keep yourself fit, not just because you'll look better, feel healthier, and have more energy but also because you'll prevent cognitive decline. Some people want to call Alzheimer's disease diabetes of the brain because a big part of the disease involves the body's mishandling of fuel sources, which leads to the overtaxing of nerve tissue and the development of all the problems that come with Alzheimer's disease.

Many of the memory problems related to cognitive decline and Alzheimer's start in an area of the brain called the hippocampus. Another part of the brain that's often involved is a small area called the substantia nigra; when that starts to wear out, you get Parkinson's disease. Both of these diseases are problems of aging—and then we have the stroke. Now, exercise works these areas of the brain, makes the cells work hard. After the workout, we have recovery—in other words, growth. When you stress a muscle, you tax it, it gets tired and overloaded, its fibers break down and then build themselves up again. With this cycle of stress and repair, the muscle becomes more resilient—and that's exactly what happens to the nerve cells in the brain. In terms of Parkinson's and Alzheimer's, physical exercise helps develop resilient nerve cells so

the brain will be able to recover from future stresses and stay healthier when we're old.

Like resiliency in the muscles and the brain, balance and posture and flexibility are hugely important in elders. Without good balance, especially, they fall over and then break their hips or whatever. Working the core of the body—the abdomen, the back, the spine—also affects the cerebellum, which is a part of the brain that deals with motor control and coordination. The cerebellum is a very busy little organ and it's very trainable. When people begin to do balance exercises, that part of the brain really gets trained—not easily, but very quickly. The Bosa Ball, yoga, Pilates, and tai chi are all incredibly good ways of training the cerebellum and improving balance, something that all elders have to deal with.

What about strength training in elders? A 2007 study done by Melov and colleagues in California had sedentary elders 65 to 75 years of age working out at the gym with an exercise physiologist for six months. The researchers took biopsies of the elders' thigh muscles before and after the strength training. What they found was, not only did the elders' strength improve but also the genes that they were using went from 70-year-old genes to the equivalent of 40-year-old genes. In other words, the genes being employed to make stuff in the elders' muscles got revitalized because they were being used. By mak-

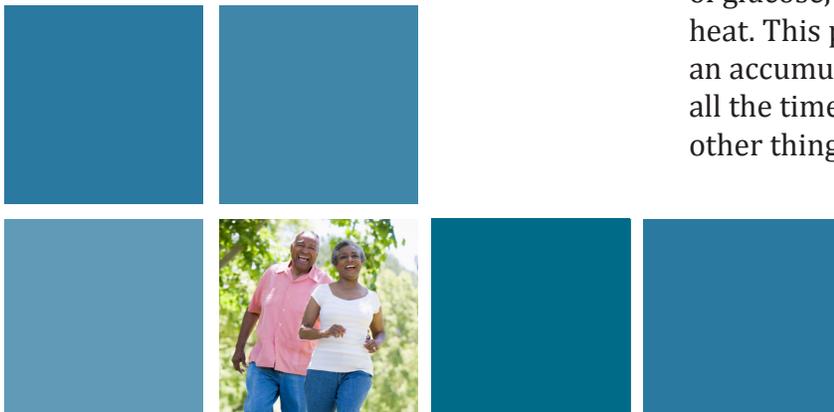
ing demands on the genes in the muscles, the genes basically ended up being younger. My point is that we have to trick our bodies into thinking that we are young by being active, which will shift the entire balance in the body. We can remain young by being physically active.

THE SIDE EFFECTS OF EXERCISE

Exercise, of course, helps out the body, decreasing hypertension, decreasing coronary artery disease, decreasing stroke. If you're an active person, you'll be less likely to get cancer, colon cancer, prostate cancer, breast cancer, diabetes, and osteoporosis as you age. More important, you're going to keep your brain cells fit. Exercise is something you really do, first and foremost, for your brain, and the body gets all these wonderful, protective side effects.

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As we age, we build up all these by-products inside our cells, called free radicals, that can wreak havoc. Free radicals come from our cells working, burning fuel in the form of glucose, a process that creates waste and heat. This process, if it's chronic, can lead to an accumulation that's toxic, if you're doing it all the time. But with exercise and with many other things, like learning, you have a rest period during which the cells not only recover but also build resilience. I like to think of it as the cells hiring more staff to take care of the waste—more



security and janitorial staff to banish the free radicals, take care of those bent proteins, sweep up the broken bits of DNA that all lead to aging and cancer and all the age-related declines.

Like an excess of free radicals, depression is another big factor that wipes out and erodes cells. The new thinking about chronic depression in people, no matter what their age, is that it's sort of like a dementing of the brain. Depression shuts down this wonderful gift that we have called neuroplasticity, meaning the brain's ability to change and learn and pick up new information. When we learn something, we change our brain. That's what plasticity means—we actually change our cells.

With depression and with aging both, it becomes harder to change the cells in the brain. Depression sort of shuts it all down and then starts an erosion, a wearing away of actual parts of the brain. The process is similar in Alzheimer's disease, which involves a shrinking of the hippocampus, the memory center in the brain. This shrinkage is what I call the wintering of the brain: As the cells lose their branches, the neuronal forest is thinner. The brain sort of shrinks very quickly and there's less brain activity in the front part of our brain, leading to more cognitive decline. When you stress the cell with learning, or caloric restriction, or exercise, but it's not too much—it's a little bit of stress that doesn't last all that long, there's a recovery period—you build up this reserve of all these good things: neurotrophic factors, meaning fertilizers that go out, like protein chaperones. These special proteins go and straighten out other proteins that have been harmed by the mitochondria (the factories inside the cell that turn glucose into energy for cell functioning) heating up. So this process leads to resistance to disease and to future stresses.

Learning, caloric restriction, and exercise all have the same kind of effect.

We have what I call it this gift from evolution, where these stressors excite a bunch of genes to make these intracellular compounds called seratins, which are the life forces. There are the death forces, like toxic levels of free radicals, and then there are the life forces, like seratin. Well, exercise and learning and caloric restriction all act as stressors to excite the genes to direct your cells to make more of this life force to keep your cells alive and functioning. Learning is also a way of stressing the cell because you're demanding more from that cell, rather than sitting watching television. You're having to work at something—and when your cells work, they burn fuel and make waste, and then the cells have to deal with it and so they call in the extra staff to clean up and replenish. So you build up this army to defend the cell in the future.

WHY STRESS IS GOOD

Now stress, I like stress. Most of us think of stress as bad because when we think of stress, we think of what's called toxic stress. Toxic stress is stress that doesn't end for a long time, like for years. When I talk about stress—good stress, that is—I'm talking about stress that ends and has a recovery period, or minimal stress that the body can deal with. Stress is really useful at the right level because it promotes growth, especially in the brain. The brain is like a muscle; it responds to activity. We need to keep it active. Just like our bodies and our cardiovascular system, the brain responds to stressing and activity.

Unlike good stress, over-the-top stress is going to get cells heating up. If you have stress

all the time, then your body and your brain have bad problems because of the buildup of more and more by-products that the body can't handle, which leads to trouble: cell degradation and decreased ability to respond to the environment, to adapt.

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Exercise combats toxic stress even though it is a type of stress—it makes you more able to combat stress in the future. When you're physically fit, aerobically fit, cardiovascularly fit, however you want to describe it, your stress response doesn't get clicked on nearly as quickly: It takes longer to get that flight-or-fight response turned on, much more so than if you're not as fit. Plus, lots of studies have shown that exercise reduces peripheral problems like diabetes and hypertension, builds a better cardiovascular tree, increases blood flow, and develops collateral circulation. Exercise also boosts the nerve cells to produce all these substances, like endorphins, that we know and love.

So, all of this good stuff happens because of stress. When you look at the process within the cell, stress means you move yourself to work harder; then, if you have recovery time, you're going to build up resilience and resistance—you're going to be tougher. This stress inoculation, meaning mild stressors with enough recovery time, prevents what's been called a death march in the cell, a pre-programmed process called apoptosis; building up resilience pushes back this apoptosis and turns it off.

As I mentioned earlier, in the old days, when humans were hunting and gathering on the plains, in a stressful situation when the food was running out, eating a lot and going for the high-calorie food was the right response. So, given this legacy, when you're stressed at night, when you come home from a hard day at work, when you've heard too much bad news, you're likely to say, "Oh, I'll just call for pizza." We're coded for that, to prepare for tough times that way, but unfortunately, eating high-calorie foods doesn't solve modern-day problems. We have to school ourselves in what we're doing. But remember, stressing the body and brain at a reasonable level, along with a recovery period, allows the nerve cells to bounce back. So chronic, small inoculations of stress are very, very helpful.

BRAIN FERTILIZER

In 1995, Carl Cotman and colleagues published a paper about some research they did with mice, where they taught them to run in these little wheels. Once they were taught, these little mice ran on their own, four kilometers a night—that's about two-and-a-half miles. They actually liked it. Cotman and colleagues found that the mice who were running, versus their littermates who weren't running, were smarter and did better on tests. At that point, the researchers measured the levels of a fairly recently discovered little factor called brain-derived neurotrophic factor (BDNF), what I call Miracle-Gro for the brain, in those mice. The brain cells themselves produce this stuff every time they work harder.

BDNF helps fertilize the brain and keep those cells perky and young—it helps with the learning process, the development process of storing information, knitting up the cells to-





gether, which is how we learn things. It helps deal with stress. It's an anti-depressant. It's an anti-anxiety agent. It's useful in a lot of different psychiatric and neurologic problems. BDNF is really and truly brain fertilizer. Cotman's research showed that exercise, whoop, threw up the BDNF in the brain to a great degree, about four times over normal. That was a surprise: Exercise wasn't just about having a better cardiovascular system anymore.

So now we know that exercise makes all these things happen so we get increased fertilizer, increased productivity, plasticity, and resiliency in general. One of the things you're aiming for with elders is to keep their plasticity, keep their brains going, so that they can learn new things, participate, and be active with their minds and their bodies. When you do this, you get what's called neurogenesis—that is, growing brand-new cells. We have stem cells in every organ in the human body, primal cells that can develop into anything. When the body wants to repair an organ, it calls up the stem cells that are around that organ, if they're available, to make new muscle cells, new heart cells, new liver cells, new kidney cells, or new nerve cells.

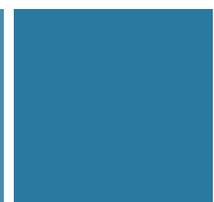
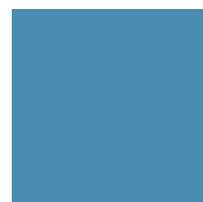
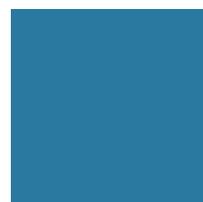
Well, our bodies make many new nerve cells every day, especially in the hippocampus, the center point of memory that controls all of the outer regions of the brain. We make new nerve cells every day, and nothing helps them grow like exercise. All kinds of things help—antidepressants, some foods, some substances—but nothing helps quite like exercise. That's why I call BDNF, which our brain cells make in response to exercise, Miracle-Gro, because it really helps new cells grow, as well

as keeps old cells working right. We need that fertilizer to help us develop these new cells from the stem cells that are involved with the brain.

EXERCISE IS A CHALLENGE

Challenge, challenge, challenge is the name of the game, especially for elders—for all of us, but certainly for elders. If people want to live longer and remain more active and involved and cognitively healthy, they need challenges. You know, that's what learning is, that's what Sudoku is, that's what the crosswords are, that's what playing chess is, that's what exercise is, that's even what social encounters can be, for some people. Quite a few foods also are useful for pumping up the brain, but their benefits are not nearly as impressive as what exercise does.

Let's face it, though, exercise is work, especially in our culture today. Most of us don't think of it as something that's fun to do, unless you're lucky and love biking, for example, or you play games, like I did for 30 years. I played squash until I ruined my shoulder. I didn't think of playing squash as work because it was fun for me, social and all that. But exercising, going for a long walk, for example, takes planning. Doing that requires discipline



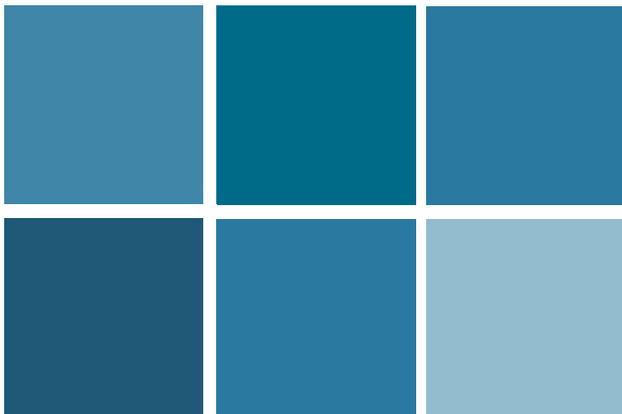
and judgment—but there’s a lot to be said for that.

Now, my own take on exercise started when I was in Boston, doing my medical training, when the marathon craze hit. Everybody was running. Five of the six people in my residency group were running to train for the marathon, and people were all excited about the endorphin rush they could get from running. Even now, people still say, “I’m going to the gym to raise my endorphins. I’ll feel better.” Well, that’s only part of the story and that rush is probably not as great as people once thought. Endorphins, the body’s own morphine, are made by our muscles when we’re moving. So it’s a painkiller, and our muscles make a lot of it when we’re moving, especially when the muscles are stressed.

Besides the morphine, the muscles also make a little bit of marijuana—substances called endocannabinoids. Our bodies make two or three of these substances, and we have receptors for marijuana, just like we have receptors for morphine. So when you stress your muscles, your body releases those substances.

A NATURAL HIGH

When you’re trying a new exercise you haven’t done in a while or you haven’t done ever, you don’t feel stress and strain that day,



but the next day. Why? Partly because the pain information doesn’t get up to your brain because you’ve got the morphine and the marijuana that your muscles are making right there to keep the nerve information from going up to the brain. We used to think it was all happening up in the brain, but now it’s become clear how important the body is for the whole business. Like the muscles, our brains also release both the endorphins and the endocannabinoids. More important, the brain also releases a lot of these other little bits of stuff called neurotransmitters—dopamine, serotonin, ortho nephrin—that allow communication in the brain by relaying, amplifying, and modulating messages between cells.

I’ve always said that a bout of exercise is like taking a little bit of Prozac and a little bit of Ritalin or Adderall

So, exercise increases the levels of these neurotransmitters because our cells are working when we’re moving, click, click, clicking away so the body makes more of all this good stuff. I’ve always said that a bout of exercise is like taking a little bit of Prozac and a little bit of Ritalin or Adderall, applied just at the right place in the brain, and it’s all done holistically. After they’ve exercised, people are better at paying attention, less impulsive, have a little bit more optimism, are not as anxious, and are not as likely to aggress. By raising the neurotransmitter levels with exercise, we optimize the brain.

Meditation has somewhat similar effects. It’s difficult to get a rat to meditate or strike a yoga pose, though, so most neuroscience research in this area just can’t be done. We do

know that meditation has some of the same effects as exercise of growing cells in the brain, calming it down, making a person more attentive, and certainly having a profound effect on the body.

MUSCLES WITH BENEFITS

Our thinking brain really evolved from our moving brain, to help us move better in the hostile environments of the human past: planning, sequencing, imagining, evaluating—all that is part of the evolution of our moving brain. We grew bigger and bigger parts of our brain to help us move better, and then we got abstract and wrote Shakespeare and had to learn French and all that. So, exercise is intimately tied with thinking. As humans, we really have to recover and revolutionize our way of thinking about movement. We need to move. We're animals, and if we don't move, we get into trouble. If we do move, we get all kinds of benefits.

Those who exercised the strongest, or the longest, had a 20 percent lower chance of being cognitively impaired.

Now, one of the things that I'm so fascinated with is that our muscles make not only more morphine and marijuana when we move them, but also all kinds of other good stuff—growth factors that help with recovery—when we're stressing our bodies. You have to stress something to activate these factors. So you move and you get BDGF (brain-derived growth factor) and IGF-1 (insulin-like growth factor) and FGF-2 (fibroblast growth factor), all of which come from damaging muscle—and they work on the muscle, repair the muscle, give the muscle new circulation and so forth. These growth factors also go up to

the brain and are very important for brain health, helping turn on the stem cells to make new stem cells.

As we age, it's harder to get those stem cells to reproduce, but if you give the brain a supply of these factors from stressing the body, you can make more. Now, this process isn't going to produce immediate, obvious results, especially in elders, but it really helps. There's another factor, a protein called ANP (atrial natriuretic peptide), that the heart makes when it's beating faster. ANP does all kinds of important things in the body, but it also goes up to the brain to turn down the stress response: a direct route to turning down anxiety, panic disorder, depression, and the feeling of stress.

EPIDEMIOLOGICAL EVIDENCE

Starting in 1976, a big study at Harvard looked at 16,000 women nurses over a six-year period of time. The nurses were separated into three groups: those who exercised pretty intensely, those who exercised moderately, and those who exercised very minimally.

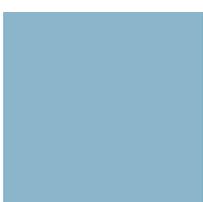
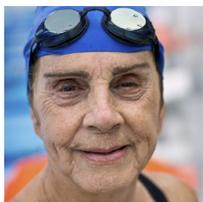
Those who exercised the strongest, or the longest, had a 20 percent lower chance of being cognitively impaired. The medium-level exercisers, those who were just walking briskly two or three times a week for 30 minutes or so, just under four hours total weekly, had as good a response as the intense-exercise people. In other words,



people didn't gain that much more cognitive benefit by running faster or harder.

However, those who didn't exercise much at all had a very different kind of picture: They showed more of this cognitive decline. There have been lots of studies, done in the United States and all over the world—big studies, small studies, all kinds of studies—showing that people who exercised starting in midlife prevented the onset of dementia, prevented it altogether by 30 percent. Pretty incredible. So exercise is a very important factor that we all need to pay attention to in our lives.

Now, as I've said, there's lots of information looking at us boomers, and a group of researchers in Illinois have studied the effect of exercise on cognition in elders. All of the results are very, very positive. This study had one group of elders who started walking for 45 minutes three or four times a week, and another group that did 45 minutes of stretching or toning three times a week. Each group did the program for three months, and were measured before and after. Those who were exercising improved 11 percent on their cognitive scores. Brain scans taken of the people in each group before and after the program showed that those who weren't exercising didn't change much, but those who had exercised showed regrowth of parts of their brain. In a three-month period of time, their brain cells, the cells that were already there, became bushier—because of the fertilizer made from exercising.



So these people who were in their 60s to 80s, who had been sedentary before the program, got bushier nerve cells and worked a little better and obviously had even improved their cognition.

A whole group of studies has looked at how exercise affects the brain and what parts of the brain are affected. All of the studies done with exercise have shown that exercise has a positive effect on the front part of the brain, what we call the pre-frontal cortex, which is the executive area of the brain—the part that has to deal with taking in new information, controlling our response to situations and the speed with which we do things and think about things and complete tasks. The pre-frontal cortex is the part of the brain that gets activated with exercise, so exercising helps with all of our so-called executive functions: planning, organizing, sequencing, working memory, and delaying response. People who have attention deficit disorder have a problem with the executive functions in the pre-frontal cortex. Exercise turns on this part of the brain, helping existing cells grow and producing new cells.

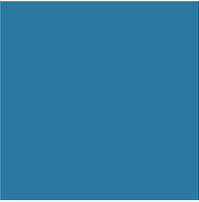
With a steady exercise program begun in your middle years, you have a 54 percent lower chance of developing Alzheimer's than if you remain sedentary.

Now, this fascinating study came out last year. The more active you are, the more likely you're going to have more nerve cells. Back in '98, Swedish and U.S. researchers investigated whether neurogenesis occurs in the human brain, as previous studies had shown it did in the brains of animals. The 1998 study gave terminal cancer patients markers that showed, in postmortem analysis of their brain tissue, that these people had made new nerve cells even in the midst of their dying.

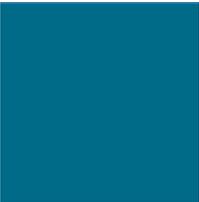
Now, this recent study looked at 35-year-old sedentary New Yorkers and had them start exercising four times a week for three months. The researchers took brain scans of the hippocampus from these people both before and after the exercise program. What they found was a 30 percent growth in the brain and in the blood supply in this little area of the brain where the stem cells are at the bottom of the hippocampus. It wasn't the entire brain, not even the whole hippocampus, that was affected, but it's promising—30 percent greater growth. In just three months, exercising four times a week, 40 minutes on the treadmill, these people grew more brain stuff. People are excited about that because being able to encourage growth in the brain, to grow new parts of the brain, is a great thing.

ONE MAN'S FIGHT AGAINST PARKINSON'S

There's a man, Paul Green, up in Connecticut who wrote to me after Spark came out. Now 84 years old, he's a Parkinson's patient who was diagnosed 12 years ago. Paul wrote this beautiful summary of what he does: He fully embraces being physically and mentally active. Exercise has a very profound effect on Parkinson's disease—it may prevent the onset of Parkinson's, but it certainly prevents the progression of the disease. If people with



Parkinson's make a commitment to moving more and continue to exercise as much as they can, they begin to rewire their brains. Also, exercise makes the medicine for Parkinson's work all that much better.



Paul is a great example, because he's done so many

things. He kept himself from getting depressed by being involved with people and maintaining relationships (joining a book club, doing volunteer work), something that is very important for elders. Paul is also an avid rower who goes out every morning to row, either at the gym or on the river. He's doing the right things: engaging in strength and balance training, taking voice lessons to counteract the lower-volume voice problems of Parkinson's, taking dancing lessons and creative writing classes to spark body and mind, learning to read and write Japanese to keep his brain and his hands flexible. Consequently, his Parkinson's hasn't progressed all that much. Paul is an active guy who's fighting back and never surrendering—an idea he took from Winston Churchill. He's getting information out there, an example for us all (see www.nevahsurrendah.org).

COMBATING ALZHEIMER'S AND DEPRESSION

A Finnish study showed that exercise affects the genes or keeps certain genes from turning on, especially the ApoE (A4) allele, which is one of the genes that's involved with Alzheimer's disease. People who exercised regularly didn't have the onset of their dementia as the nonexercisers did, and it prevented some of them from developing Alzheimer's. With a steady exercise program begun in your middle years, you have a 54 percent lower chance of developing Alzheimer's than if you remain sedentary. But you have to continue the exercise—it's not like this week or six weeks or six months, it's a lifetime—and that is hard to do, believe me. You have to be disciplined and get yourself into a ritual.

Another study pointed out the effect of exercise on depression. Duke University has led the way for using exercise as a treatment for

cardiovascular disease, angina, heart attacks, congestive heart failures, and so forth, both for prevention and for recovery, preventing reoccurrence. Researchers at Duke have done lots of studies on exercise, and in the early '80s the psychologists began to measure stuff like anxiety and depression, hostility, stress, and perceived stress levels in the people who were in those studies. Now they have their own studies, where they're looking very carefully at exercise as a treatment for people who are depressed.

This study, which included 83 sedentary people over age 65, divided the elders into three groups of about 25 people each. One group just started exercising four times a week for 40 minutes with brisk walking, going up to 75 percent of their maximum heart rate. Another group was treated with increasing doses of Zoloft, an antidepressant. The third group was given both an exercise program and Zoloft. Well, at the end of the four-month study period, the people in all three groups had dropped to about the same lower level of depression. But when the researchers followed these three groups out 10 months after the program, they found that those people who continued to exercise didn't have any recurrence of their depression, whereas those who were taking medicine, as well as those who were taking medicine and supposedly exercising, did.

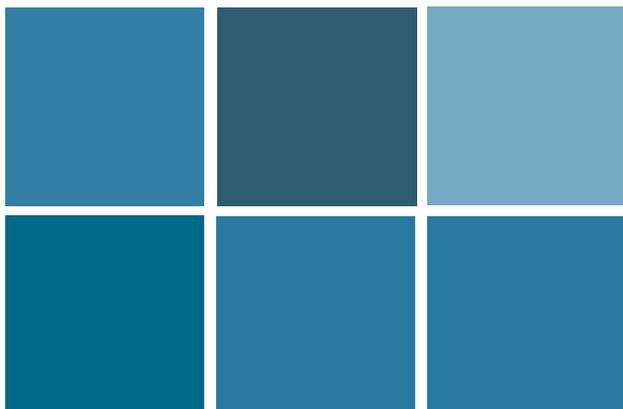
Turns out that exercise is as good as a steady dose of antidepressant medicine. But exercise is work. How are you going to get a depressed patient to walk? Well, neighborhood walking groups are one idea, where neighbors would work with elders at home. So, recognizing that people who are depressed have a hard time getting up and going out, you have somebody coming by persistently, knocking on the door and saying, "Come on. Let's go." If you get them moving, you can cure their depression. It doesn't take a drug, and the results are much better over the long haul.

EXERCISE RX

Now, my exercise prescription is basically what the U.S. Department of Health and Human Services recommends: Elders should exercise at least four out of five days a week. By the way, that's aerobic exercise, such as brisk walking, to get the heart rate up and begin to stress the body a bit. Once you attain a level of comfort at your walking pace, you want to make it a little harder by going up a hill or adding some

Plan to exercise with somebody, because you're more likely to continue if you have someone else doing it with you.

variation. Plan to exercise with somebody, because you're more likely to continue if you have someone else doing it with you. That's why walking groups in eldercare centers are so important, because exercise becomes a group activity. Plus, the more you involve other people, the better result you get for your brain, because social involvement is key and crucial for our brains also. You're much more likely to be social if you're moving rather than sitting. The more you're out there moving, the more likely you're going to have social



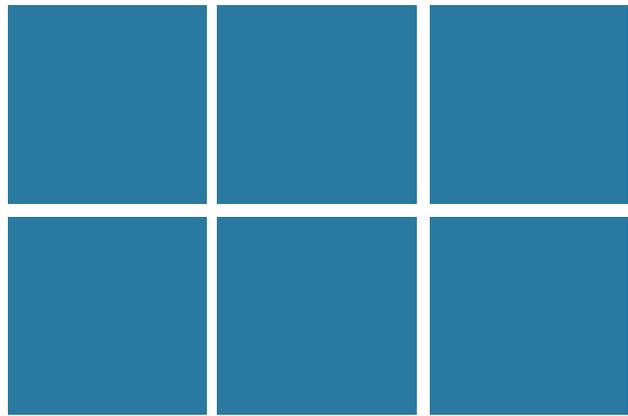
encounters and the more socially integrated you'll be.

Also, exercise intensity can be a factor. Doing 20 to 30 seconds of very intense running or leg weight lifting or swimming or biking or whatever, to exhaustion, will stimulate production of HGH (human growth hormone). HGH is really good—it melts fat and makes muscle, as well as makes you more awake, alert, aroused, and with it. Adolescents have lots of HGH because it helps them grow, but after age 30 it sort of goes away. If you trick your body into thinking you're young by sprinting, though—hey, you get a little load of HGH.

Strength training is very important as we get older because the muscles start to sag and become marbled with fat as we age. For those reasons, as you age, the time you spend exercising should include a bigger percentage of strength training. Strength training prevents osteoporosis and falls, helps improve posture and balance, and helps the body be there when you need it. Hunter-gatherers didn't need strength training because they were working their muscles all the time. Lots of activities, not just weight lifting, can serve as strength training.

DELAYING DISEASE

Besides exercise, mental challenge is another key factor related to brain health. There's this fellow from the University of Kentucky, David Snowdon, who's been studying these retired nuns up in Minnesota for many, many years. He was looking at Alzheimer's disease—who got it and who didn't. The nuns he studied were particularly active, both physically and intellectually. For example, when Time Magazine went to interview these nuns, the reporters were greeted by a receptionist who was



100 years old! These nuns were employed, active until they absolutely couldn't be, because a big part of their tradition is to remain involved. Plus, they've all donated their brains to science. The study followed the nuns' life history and also had information on their early history.

One nun, Sister Bernadette, died of a heart attack at the age of 85. She had been very active and very involved, running one of the houses. She also had two copies of the gene for Alzheimer's. Having one copy of this gene makes it likely that you're going to get Alzheimer's; having two copies means you're definitely going to get Alzheimer's disease. Well, when they did the postmortem on Sister Bernadette, the tissues in her brain showed that she had Alzheimer's disease, but she had had no symptoms, no sign of any kind of cognitive decline. She was very socially engaged and involved, and she moved all the time, running from building to building up until she had her heart attack. Even though she had Alzheimer's, she didn't show any of the signs or symptoms. So you can compensate even with the plaques and all, and it's just amazing.

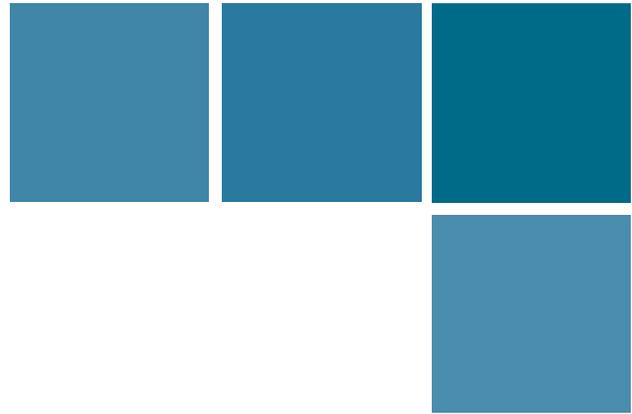
Now, a lot of studies have been done looking at what happens to people who are already well into the dementia process and, yes, they do respond to exercise. They get a little better. They certainly will be much more social, a lot more compliant and less challenging in some

ways, and more engaged participants. Exercise even brings the return of some functions in people with Alzheimer's who start exercising—certainly delaying the progression of the disease. What I said for Parkinson's goes for all the degenerative disorders, like Alzheimer's and dementia, whether they were caused by having two martinis a night, or not.

Exercise challenges all your brain cells because you're working with all of them when you're moving, creating an environment of growth rather than erosion. So brain re-growth, in certain areas, is much more possible when you exercise. That's why in the rehab facilities, even though they're working on one particular area, they'll try to get the heart rate up in general, so that they're working not just on that one area but also on the entire brain.

OK, quick review. Exercise strengthens the cardiovascular system, burns calories, creates all these great little factors, regulates the body's fuel by helping manage the glucose load, reduces obesity, improves response to stress, and helps prevent chronic disease. Plus, exercise lifts your mood, boosts your im-

mune system, fortifies your bones and muscles, improves your motivation, fosters neuroplasticity, and helps keep you cognitively sharp. So, for this century at least, exercise is the new snake oil—the fountain of youth. Keep moving, and your brain will thank you.



For Further Reading

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About the Author



John J. Ratey, MD, an associate clinical professor of psychiatry at Harvard Medical School, has authored numerous groundbreaking articles and best-selling books, including *Spark: The Revolutionary New Science of Exercise and the Brain*, his most recent work. Dr. Ratey currently teaches Harvard Medical School continuing education courses for health care practitioners, providing them with knowledge and tools they can use to help patients of all ages maximize their emotional and cognitive health with exercise.

As a clinical researcher, he has published more than 60 papers in peer-reviewed journals in the fields of psychiatry and psychopharmacology. His popular books include *Neuropsychiatry of Personality Disorders* (1995), *Shadow Syndromes: The Mild Forms of Major Mental Disorders That Sabotage Us* (1998, with coauthor Catherine Johnson), and *A User's Guide to the Brain: Perception, Attention, and the Four Theaters of the Brain* (2002). In addition to English-language editions, some of Dr. Ratey's books are available in Spanish and German.

With Edward M. Hallowell, MD, he has coauthored a series of best-selling books on attention deficit disorder. *Answers to Distraction* (1994) addresses the most frequently asked questions about the disorder; *Driven to Distraction: Recognizing and Coping With Attention Deficit Disorder From Childhood Through Adulthood* (1995) and *Delivered From Distraction: Getting the Most out of Life With Attention Deficit Disorder* (2005) help further demystify this increasingly prevalent syndrome.

In 1986, Dr. Ratey founded the Boston Center for the Study of Autism, and in 1988 he created a new group of the American Psychiatric Association focused on the study of aggression, which grew out of his research and development of novel drug treatments for aggressive behavior. Since 1998, Dr. Ratey's peers have selected him each year as one of the best doctors in America. In 2006, he received the Excellence in Advocacy award from the nonprofit organization PE4life for his promotion of regular, aerobics-based physical education.

Dr. Ratey speaks at schools and youth organizations to spread the word to teachers, coaches and gym instructors, parents, and youth leaders that exercise can optimize physical and mental health for children, as well as focus attention and boost learning. In addition, he lectures at universities and conferences about the many benefits of exercise, including controlling obesity, improving motivation, enhancing physiological function, managing mood, and aging well.

Dr. Ratey lives in Cambridge, Massachusetts, where he has a private practice. For more information about his publications and activities, visit his website at www.johnratey.com.

2009 MindAlert Awards

The annual ASA-MetLife Foundation MindAlert awards program recognizes nonprofit organizations that have developed innovative, effective, research-based mental fitness programs for older adults in diverse communities. Each winning program must show potential for replication in other communities by ease of application and financial feasibility. Winners are chosen in three categories:

- Lifelong learning and third-age educational programs
- Programs focused on enhancing mental fitness for the general population of older adults
- Programs designed to enhance mental fitness for older adults with early-stage cognitive impairment

The winners of the awards are recognized at the MindAlert luncheon held during the annual conference of the American Society on Aging and National Council on Aging. Winners provide a brief overview of their programs at the luncheon.

For more information on the MindAlert Program, including how to submit an application for the MindAlert Awards, visit www.asaging.org/mindalert.

Lifelong Learning and Third-Age Educational Programs

The Performing Arts Program

University of Delaware Academy of Lifelong Learning
Wilmington, Delaware

The University of Delaware Academy of Lifelong Learning offers opportunities for older adults to express themselves, build cognitive reserve, and form social connections through an expansive performing arts program that is integrated into the university's academic curriculum. A desire to participate is the only prerequisite. As of fall 2008, registrations in performing arts courses had grown to 1,216 older adults.

Recent research has demonstrated that experiences gained from performing arts are particularly important for enhancing cognitive fitness, promoting good health, and increasing social interactions. Learning in the arts has the power to touch emotions, as well as stimulate many parts of the brain. Participation in a performing arts program motivates learners because it allows them to share their art experience with an audience.

The Academy of Lifelong Learning Performing Arts Program—which has grown from 9 courses in 2000 to 33 courses in 2009—offers levels of instruction from beginner to advanced in singing, playing an instrument, folk dancing, and educated listening. The courses honor a wide range of musical tastes, including folk, classical, jazz, rock, Latin jazz, musicals, and opera. Beginners can choose from classes in recorder, band, or violin. Intermediate-level courses are available for those who have begun playing again after a hiatus of 40 or 50 years. The Academy's band has grown to 78 members, chorus to 65 members, and orchestra to 22 members. Members of the Circle Singers enjoy folk music, and the chamber choir explores American music. Academy members in drama courses enjoy performing original skits, as well as writing new words to familiar melodies.

Since its inception in 1980, the Academy of Lifelong Learning (www.academy.udel.edu) has offered older adults extensive opportunities for mental stimulation and social interaction. Growing from an initial 14 courses, the current semester offers 220 courses on a wide variety of topics, all taught by volunteer instructors, to approximately 2,100 members ages 50 and older. More than 700 members volunteer in a variety of capacities. Academy membership also includes travel, as well as additional cultural and educational opportunities.

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The Performing Arts Training Program

Stagebridge Theatre
Oakland, California

Founded in 1978, Stagebridge is the oldest senior theater in the United States and the only professional theater training company for older adults on the West Coast. Managed by a small professional staff, including the founding director, the company is composed of approximately 150 actors and storytellers who average 70 years of age. The National Endowment for the Arts recently honored Stagebridge as a model program for best practices in the field of creativity and aging.

Stagebridge programs advance the organization's mission—to make the performing arts an opportunity for older adults to entertain, educate, share experiences with younger generations, and change the way people think

about grow-ing old. Stagebridge has created and produced more than 30 plays about aging and has toured them to 300,000 individuals in senior centers, schools, nursing homes, libraries, and theaters throughout the San Francisco Bay Area.

Numerous Stagebridge actors have appeared in film and television productions. A pioneer in the field of healthy aging, Stagebridge created the award-winning See Me! program to train medical professionals to view older adults with more respect. The company's Storybridge program is a nationally acclaimed model for bringing older adults as storytellers into schools to mentor children. Stagebridge has performed for national and international conferences, and has appeared at the Oregon Shakespeare Festival and in international theater venues.

The Performing Arts Training Program (PATI) provides a curriculum of training in a wide range of performing arts classes, including acting, storytelling, playwriting, dance, improvisation, and singing. Weekly classes meet at the Stagebridge home in downtown Oakland, California, and are taught by noted professional actors, directors, and storytellers. Students enroll in various courses and receive diplomas at the end of their study. PATI also trains older professional artists to teach performing arts classes throughout the Bay Area senior community, thereby increasing the opportunities for older adults to participate.

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Programs Focused on Enhancing Mental Fitness for the General Population of Older Adults

Gerontechnology Consortium of Westchester

Westchester Public/Private Partnership for Aging Services, Department of Senior Programs and Services
Mount Vernon, New York

Several New York organizations—Pace University, Westchester Community College, United Hebrew Geriatric Center (UHGC), Westchester County Department of Senior Programs Services through the Westchester Alliance Program, and Fordham University—have collaborated to offer a timely, innovative, and multifaceted gerontechnology program. One facet of this collaboration creatively connects older adults to technology through civic engagement in an intergenerational environment. Specially trained undergraduate college students help elders overcome their fears of technology through a series of one-on-one personal contacts, assistive software, and various technologies. Students instruct older adults living in UHGC residences, including independent living, assisted living, and nursing home facilities.

This program not only empowers older adults but also keeps them mentally stimulated as they learn new skills. These skills include developing psychomotor skills, maneuvering the Internet, using e-mail as a new means of communication with family and friends, and creating photo greeting cards. In addition to gaining computer skills, elders benefit from the individualized and nonthreatening learning environment, bonding relationships with students, enhanced mental fitness, and increased cognitive functioning.

For students, the gerontechnology project goes beyond simply offering opportunities for volunteering. The unique gerontechnology course teaches undergraduates about the aging process, helps them hone skills for instructing elders, and keeps them up to date on the latest computing technology. Additionally, students are exposed to potential gerontology-related career opportunities and come away with improved perceptions of and attitudes toward elders.

The primary program objective includes enhancing elders' quality of life emotionally, cognitively, and socially. Nursing staff observations, as well as pre-instrument and post-instrument preliminary research data, show that adoption of technology improves elders' emotional, cognitive, and social well-being, as well as fosters increased independence. UHGC nursing staff have reported that older adults in the program feel more purposeful and have higher levels of self-confidence. Elders recovering from debilitating illness feel encouraged because they find that they are capable of learning a new skill even while they convalesce. Overall, the elders involved in this program feel more in sync with the world at large rather than left behind.

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The Memory Academy

The Memory Academy
Castro Valley, California

The Memory Academy is a sustainable, accessible, and affordable educational program that empowers older adults to take positive action

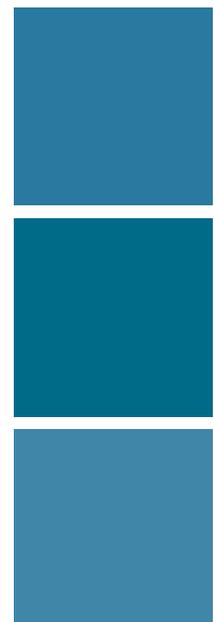
to control their cognitive future. Diana Nohr, a lifelong learning coordinator in the adult education system with 24 years of teaching experience in programs for older adults, recognized a gap between knowledge and accessibility. She sought to make the latest research on promoting a healthy brain and supporting vital aging available and affordable to all those entering the second half of life. After four years of generous support and encouragement from Hayward, San Leandro, and Castro Valley adult schools, as well as from the California Council on Adult Education, bridging that gap has become a reality.

By carefully researching the latest findings in the fields of neuroscience, aging, and memory—as well as by valuing and incorporating feedback from her students—Diana has crafted an exciting, comprehensive, and uplifting 12-week adult education program for older adults. The course curriculum teaches students what they need to do to stay strong, sharp, and independent by enhancing their mental and physical fitness. Students learn about the changes that normally accompany aging and, with research-based lectures, explore the causes of memory problems; examine the effects of stress, nutrition, and laughter on cognition; learn about brain function and anatomy; and discuss the latest research on Alzheimer’s disease and other dementias.

With their newly acquired knowledge that a healthy aging brain requires regular challenges, students can participate in a variety of group and individual activities within the Memory Academy. Designed to challenge minds by engaging and working all parts of the brain and to provide physical activities for the aging body, activities range from Sudoku to juggling. For those who wish to continue their study, Diana has added Advanced Memory Academy and Master’s Memory Academy classes. She also is expanding the program to other communities

through a new teacher training program that will enable colleagues to introduce the Memory Academy to other school districts and student populations, as well as institutional settings.

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Awards Review Committee

The American Society on Aging wishes to thank the committee members, who dedicated many hours to reviewing the applications for the MindAlert Awards:

Dean Blevins (chair), Health Services Researcher, Central Arkansas Veterans Healthcare, North Little Rock, AR

Jo Arnold, Executive Director, Portage Senior Center, Portage, MI

Christina Butler, Director, Over 60 Learning, Columbus, OH

Beverly Collier, Director, My Turn, Kingsborough Community College, Brooklyn, NY

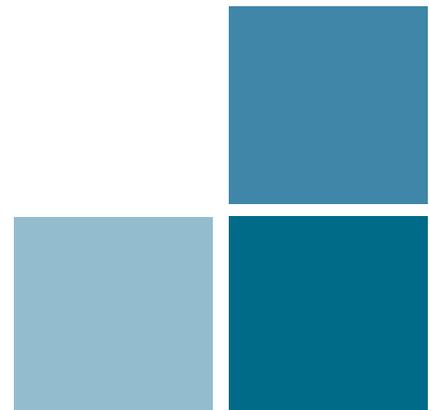
Ruth Flexman, Lifelong Learning Coordinator, University of Delaware, Newark, DE

Ruth Heller, Program Director, University of Oregon Osher Lifelong Learning Institute, Eugene/Springfield, OR

Sandi Johnson, Executive Director, Northshore Senior Center, Northfield, IL

Andrea Sherman, Founder, Transitional Keys (formerly with the New York Geriatric Education Center), Dobbs Ferry, NY

Cheryl Svensson, Educator, USC Ethel Percy Andrus Gerontology Center, University of Southern California, Los Angeles, CA



Past MindAlert Special Lectures

Good News About the Aging Brain!

Nationally known brain researchers Marian Diamond and Arnold Scheibel describe their groundbreaking studies of brain function and the optimistic implications for successful aging. (2001)

Brain Health From 1 to 100

Paul Nussbaum, a leading clinical neuropsychologist, describes what he refers to as a health promotion opportunity of unprecedented stature: the ability to foster our own brain wellness for healthy, functional aging. (2002)

Centenarians: Lessons on Living Long and Living Well

Head of the renowned New England Centenarian Study, Thomas Perls shares the findings of his research and talks about how we all can make our later years healthy, vital ones. (2003)

Uniting the Heart and Mind: Human Development in the Second Half of Life

Gene Cohen, a pioneer in the field of creative aging, explains the implications of his four developmental stages of late life and how these phases represent a richly creative period, full of personal growth and societal engagement. (2004)

Intellectual Functioning in Adulthood: Growth, Maintenance, Decline, and Modifiability

Husband-and-wife research team K. Warner Schaie and Sherry L. Willis, who gathered data from thousands of people over long periods of time in the Seattle Longitudinal Study, shed light on the differences between elders who maintain their intellectual functioning into late life and those whose cognitive abilities decline. (2005)

The Benefits of Memory Priming: Effects of Guided Autobiography and Reminiscence

James Birren, a longtime researcher and expert on guided autobiography, enumerates its many benefits for elders and for the organizations they frequent, and outlines research issues provoked by the qualitative analysis of autobiographical data. (2006)

Art and Dementia

Behavioral neurologist Bruce L. Miller explores creativity associated with the visual arts and describes the impact of brain degeneration on artistic talent, as well as how neurodegenerative disorders have become an unexpected model for thinking about the creative process. (2007)

Intervening With Late-Life Cognition: Lessons From the ACTIVE Study

Using highlights from the Advanced Cognitive Training in Independent and Vital Elders (ACTIVE) study, Michael Marsiske offers a framework for studying brain plasticity and discusses the challenge of transferring skills practiced in formal intervention programs to daily activities. (2008)

About the MindAlert Program

The MindAlert Program seeks to disseminate research and innovative practices that assist older adults in taking steps to maintain and enhance cognitive and mental function. The program, established by the American Society on Aging (ASA) in 2001 and supported with funding from MetLife Foundation, has the following components:

MindAlert Awards Program

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- Programs designed to enhance mental fitness for older adults with early-stage cognitive impairment

MindAlert Speakers Bureau

The MindAlert Speakers Bureau provides \$1,200 grants for organizations to host daylong workshops on innovative approaches to brain health. Organizations choose from a directory of trainers whose programs have received a MindAlert award.

MindAlert Lecture Series

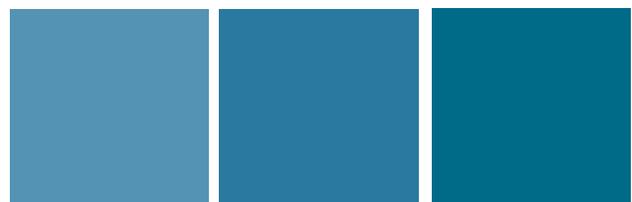
The annual MindAlert lecture features a presentation on the latest research findings for maintaining and enhancing cognitive function in late life. Monographs based on the lectures from 2001 to the present are available on the American Society on Aging website at www.asaging.org/mindalert as free, easily downloadable PDFs. In addition, videos of MindAlert lectures from 2007 to the present are available free to those who register on the MindAlert website.

MindAlert Resources on Mental Fitness

The MindAlert resource center is an online alphabetical list of resources related to mental fitness and aging. This clearinghouse of materials offers information on articles, books, bibliographic listings, and reviews of other materials, as well as links to websites and information about mental fitness programs throughout North America.

The MindAlert website also offers free, downloadable PDFs about brain health, including the results of the ASA-MetLife Foundation national poll, "Attitudes and Awareness of Brain Health."

For more information about the MindAlert program, visit www.asaging.org/mindalert or contact the American Society on Aging at mindalert@asaging.org.



The American Society on Aging



The American Society on Aging is the largest association of professionals in the field of aging in the United States. Founded in 1954, ASA seeks to promote the well-being of older adults and their families by enhancing the abilities and commitment of those who work with them. To that end, ASA sponsors a wide variety of conferences, networking opportunities, and Web-based training. The organization also publishes a quarterly journal, a bimonthly newspaper, seven quarterly newsletters, and an e-mail newsletter for its members. To obtain more information on ASA or to join, call (800) 537-9728 or visit www.asaging.org.

MindAlert Program Sponsor:

MetLife Foundation

MetLife Foundation, established in 1976 by the Metropolitan Life Insurance Company, has been involved in a variety of aging-related initiatives. Since 1986, the foundation has supported research on Alzheimer's disease through the MetLife Foundation Awards for Medical Research and has contributed more than \$9.5 million to efforts to find a cure. In addition, the foundation has provided support for a traveling exhibit on memory; a public-education video for use by caregivers and families of people with Alzheimer's disease; and support for healthy-aging projects addressing issues of caregiving, intergenerational activities, health and wellness programs, and volunteer opportunities. MetLife Foundation supports health, education, civic, and cultural programs throughout the United States. For more information about the foundation, visit www.metlife.org.

