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## THE Secrets OF Successful Aging

### WHAT SCIENCE TELLS US ABOUT GROWING OLDER—AND STAYING HEALTHY

By TARA PARKER-POPE

**T**ODAY, the average person in the U.S. lives for nearly 78 years. But what about those people who beat the average? Why do some men and women defy the chronological odds to live longer and in good health?

Increasingly, the scientific community is shifting its focus to this elite group, these "successful agers" who seem to be doing a better job of getting old than the rest of us.

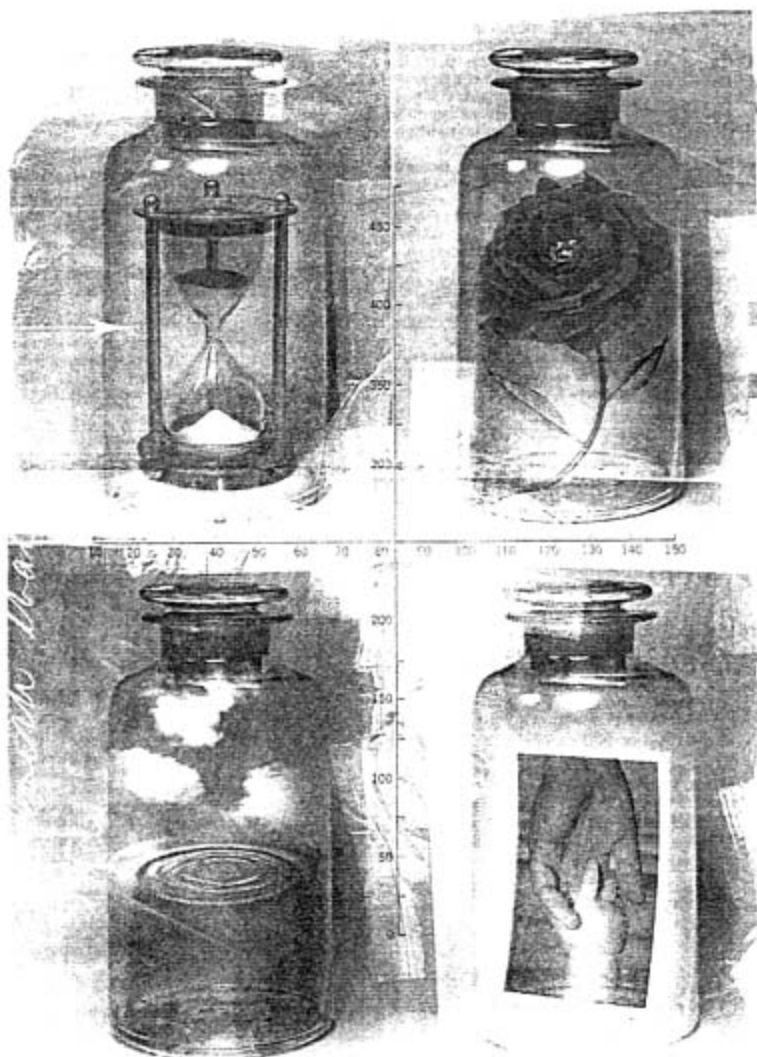
And what they're finding isn't what you'd expect.

Some of the reasons people age well are obvious. For years we've been told that the best way to stay healthy is to eat the right foods, maintain a healthy weight, exercise—and hope you have good genes. While all of that is true, a voluminous body of aging research shows that some of the most significant enemies of old age are far more insidious than a penchant for fried food or a couch-potato lifestyle. Instead, how well we age may be intrinsically tied to our most basic personality traits, the social relationships we have formed and—perhaps most important—our ability to cope with stress.

"We now know that aging is about a body that doesn't deal well with stress anymore," says Robert Sapolsky, a Stanford University neuroendocrinologist and a leading stress researcher.

#### Living to the Max

Scientists estimate that the maximum potential life span of the human body is about 120 years, give or take.



They came to this conclusion after observing the oldest ages achieved by a variety of organisms, noting that aging, no matter what the species, seemed to follow a consistent mathematical formula. The maximum age achieved by any species appears to equal about six times the number of years from birth to biological maturity. So humans, who take about 20 years to reach maturity, have the potential to live six times as long as that—or about 120 years. Notably, the oldest well-documented human age is 122.

Genetics likely plays some part in the ability to reach an extreme old age, and scientists are on a heated quest to identify the so-called longevity genes. But genetics can only take you so far. Studies of Swedish twins who were raised apart showed that only about 30% of aging can be explained by genes. In other words, successful agers aren't still around simply by luck of the genetic draw. They have far more control over the aging process than once thought.

"One of the myths of aging is to choose your parents wisely," says John W. Rowe, who, before becoming chairman of Aetna Inc., served as director of the MacArthur Foundation Research on Successful Aging, one of the largest aging studies in the country. "People feel there is a genetic program they are playing out. But since only about one-third of aging is heritable, the rest is acquired—that means you are responsible for your own old age."

So, how do you age successfully?

PHOTOILLUSTRATION BY STUART BRADFORD

Please Turn to Page R1, Column 1

## PREVENTION

# The Secrets of Successful Aging

Continued From Page R1

Aging researchers are beginning to get some answers. Numerous studies of rats, monkeys, nuns, British government workers and centenarians have unlocked many of the secrets of successful aging.

Many of the answers were expected. People age better if they don't smoke, don't abuse alcohol, maintain a healthy weight and get regular exercise.

But one of the biggest culprits in unhealthy aging also gets the least respect from both the medical community and individuals: stress. Increasingly, researchers are viewing stress—how much stress we face in a lifetime, and how well we cope with it—as one of the most significant factors for predicting how well we age.

It may be hard to believe that stress, which most people view as an emotional state, can wreak such havoc on our physical well being. But aging studies consistently show that the healthiest agers are particularly adept at shedding stress.

## How Stress Works

To understand why it's so important to learn to manage stress, you have to understand what happens inside your body when you experience stress. The body rapidly mobilizes energy, delivering glucose to your muscles. The heart rate, blood pressure and breathing rate increase so that more oxygen can be delivered more quickly throughout your body. Functions that aren't needed in an emergency—such as digestion, sex drive and even your immune system—are eventually suppressed. Meanwhile, stress hormones that help dull pain and sharpen your senses are released. Blood vessels constrict and clotting factors increase to slow bleeding in case you are wounded.

An animal fleeing a predator, a soldier at war or a mother fleeing a burning house with her child all benefit from the fact that the body, under stress, responds by giving your muscles, your heart and your lungs an added boost to help you flee or fight for your life. Ideally, this stress response is turned on for a short time, just long enough to get you out of danger.

The problem is, it doesn't take much to switch on the stress response. Worrying about a job deadline or fighting with your spouse can both trigger it. If you're good at coping with stress, then your stress response will eventually turn off.

But unremitting stress—in a person who can't shed it—leaves the stress response in the "on" position. All those changes that protect you in a moment of crisis suddenly turn on you. Now you're just a person with unregulated blood sugar, high blood pressure, blood clots, a depressed sex drive and an immune system buckling under all the strain.

It sounds a lot like getting old.

## Measuring Stress

Though many people consider stress an amorphous psychological concept, its cumulative physiological effect can actually be measured. A complex formula that involves blood pressure, cholesterol, the variability of a person's heart rate and stress-hormone levels (including cortisol, norepinephrine, epinephrine and DHEA-S), as well as a person's waist-to-hip ratio, all add up to something called the "allostatic load." In studies, a high allostatic load was highly predictive of mortality and signaled risk for heart disease, mental decline and other problems.

Unfortunately, there's no way for the average person to get a reading of his or her allostatic load. Scientists at Rockefeller University in New York, which has led research on the concept, have yet to find a corporate sponsor interested in transferring this important research tool so it can be used by patients and their doctors.

But even without a high-tech measurement of our stress burden, most people are well aware of the stress in their lives. We do know that poor, less-educated people tend to have a higher allostatic load than highly educated, wealthy ones. People who are sleep deprived or who don't exercise tend to have higher allostatic loads than those with good sleep and exercise habits. People who have strong social and family relationships tend to have a lower allostatic load than loners.

## By the Numbers

**11** • The number of additional years a 75-year-old man can expect to live

**13** • The number of additional years a 75-year-old woman can expect to live

**17** • The number of additional years a 65-year-old man can expect to live

**20** • The number of additional years a 65-year-old woman can expect to live

**30** • The percentage of 80- to 102-year-old women still having sex

**35** • The age at which you begin losing more bone than you make

**40** • The waistline measurement, in inches, at which risk for heart attack increases dramatically

**45** • The age at which disease becomes a bigger mortality threat than accidents

**63** • The percentage of 80- to 102-year-old men still having sex

**65** • The number of validated "supercentenarians" in the world, still alive at 110 or beyond

**70** • The new 65, based on the health of 65-year-olds in 1973

**74** • Average life expectancy for a boy born in 2001

**80** • Average life expectancy for a girl born in 2001

**85-94** • The fastest-growing age group in America

**120** • The estimated potential life span of humans, if nothing goes wrong

**122** • The oldest fully authenticated age to which any human has lived

Sources: Living Better, Living Longer; Harvard Health Publications; National Vital Statistics Reports; Centers for Disease Control and Prevention

To get an idea of how workplace stress can have long-term effects on health and aging, consider the Whitehall studies, a series of studies of British civil-service workers while Margaret Thatcher was prime minister and her administration was pushing aggressively to privatize government functions. In one government department, scientists found notable increases in body-mass index, cholesterol, stroke incident and need for sleep among the workers there. The employees with the most authority and power posted the lowest blood-pressure rates, while low-level workers, who lacked power and feared most for their job security under privatization, posted the highest blood-pressure rates.

"If you feel you're in control, you do a lot better than if you lack control," says Rockefeller neuroendocrinologist Bruce McEwen, an expert on allostatic load and author of "The End of Stress as We Know It." He adds: "If you lack control, this leads to being stressed out."

Another study shows that chronic stress increased risk for catching a cold. One Carnegie Mellon University study surveyed 300 volunteers about stress and then injected them with a cold virus. The people who had reported little chronic stress didn't get sick—

But about one-third of the men, nervous about public speaking and plagued by low self-confidence, continued to post high cortisol levels. High cortisol levels have been linked with diabetes, heart disease and even obesity.

## The Price of Being Alone

One reason successful agers may be better at handling stress is that they tend to have a lot of social support. Successful agers are not loners. People who age well tend to be close to extended family and have a strong network of friends and social relationships. Marriage in particular protects men from the perils of aging. (Among women, it doesn't seem to matter if they are married or not, as long as they have other close relationships.)

The importance of family life and social relationships on physical health has been shown consistently in both animal and human studies. For instance, in a series of rat studies, baby rats that were handled briefly in infancy produced fewer stress hormones in adulthood than rats that were neglected.

In primate studies, relationships also make a difference in the quality of old age. "One of the crappiest positions you can get late in life is to be an old baboon in a troupe where you were once a young baboon," says Dr. Sapolsky of Stanford. The reason: Baboons, particularly high-ranking ones, spend their lives terrorizing those with lower rankings. But rankings slide. Powerful baboons get old, and the young baboons they once terrorized eventually end up in a position to get revenge.

But there is one subset of male baboons that escapes the stress of old age. These are the animals that spent their middle age establishing close relationships with the females in the troupe. Late in life, these baboons get harassed just as much as any other baboon, but they stick around anyway, because they've got a network of nice, female baboons that keep them company, groom them and generally act as a buffer against what would otherwise be a miserable life.

"Connectedness in old age is enormously important," Dr. Sapolsky says.

The same thing that helps baboons age successfully also helps humans. Study after study has shown that relationships make an important difference in the ability to achieve old age. Even centenarians, who have pretty much outlived most everyone they know, have a history of strong social relationships.

Significantly, it isn't the practical support of relationships—having somebody to cook for you, for instance, or drive you to a doctor's appointment—that seems to make the most difference.

The MacArthur Foundation study, which evaluated 4,000 older people from Massachusetts, North Carolina and Connecticut, focused on the one-third of the group that had the highest mental and physical function at the outset. Researchers then followed up with them at three and eight years into the study. As it turned out, whether or not the study subjects had a high frequency of emotional support—meaning they spoke and met often with family and friends—was a powerful predictor of who in the group ended up improving their physical function over time. Having friends and family in your life increases the likelihood that you will get out more, keep moving and actually improve with age, rather than decline.



*'Connectedness in old age,' a doctor says, 'is enormously important'*

their immune systems battled the virus. But volunteers who had reported chronic stress that lasted for a month or longer—such as unemployment or family crisis—fell ill.

And in a series of stress studies by German researchers, volunteers were asked to perform the stressful double whammy of public speaking while performing difficult math problems. Investigators took saliva samples each day to measure levels of the stress hormone cortisol.

Initially, the task caused everyone to show signs of stress. But most of the men began to relax by the second day and their stress hormones leveled off as well.

## Think Happy Thoughts

Personality traits such as optimism, adaptability and a willingness to try new things also seem to be linked to better aging. This became apparent in the Nun Study, which for three decades has collected data from the School Sisters of Notre Dame living in Mankato, Minn., as well as elsewhere in the Midwest, East and South.

The study is important because extensive family, medical and social history from the nuns is available. The goal of the Nun Study is to determine the causes and prevention of Alzheimer's disease and other brain diseases, as well as the mental and physical disability associated with old age.

Among many notable findings has been a study of handwritten autobiographies from 180 nuns, who wrote them, on average, at the age of 22. The writings were scored for emotional content and compared with survival rates from the age of 75 to 95. What researchers noticed is that the nuns who wrote with the most positive attitude at a very young age were 2½ times more likely to be alive in late life than the sisters who came across with a more negative point of view at a young age.

What's notable about the Nun Study, is that so much in these women's lives is the same—the food they eat, the quality of medical care they receive, the life they lead—and that's why the differences are so striking. Consistently, the nuns who age well are those with distinct personality traits such as a sense of humor and adaptability. Many of these nuns still developed illnesses and health problems associated with aging—but those who aged the most successfully were those who adapted to each new challenge, including illness or disability.

"Everyone experiences normal day-to-day stress, and we all have the same physiological response in terms of higher blood pressure and higher stress hormones," says David Snowdon, the University of Kentucky neurology professor who founded the Nun Study. "But because of their positive outlook, our suspicion is that [the sisters who have aged well] can come back down to their baseline level quicker. They didn't grind on their stress. They had their stress response, and they got over it."

## Mental Decline

The Nun Study and others have also taught us that managing stress may be particularly important in staving off mental decline.

Consider what happens to the brain during times of stress. For about the first 30 minutes of a stressful event, the body boosts glucose delivery to the brain. The short-term effect of this is that senses are sharpened and memory is improved. But if the stress lasts longer, the body calculates that all that extra glucose is probably more urgently needed by muscles engaged in fighting or fleeing. And so, even if you are actually just sitting in a chair stressing out over a job deadline and you really want that extra brainpower, the body shifts gears anyway and stress hormones begin to inhibit glucose delivery to the brain.

The impact of this is readily apparent in the hippocampus, the part of the brain associated with memory and learning. Stress hormones not only inhibit the development of neurons in the hippocampus, but they kill neurons as well.

The end result of all this carnage is a smaller hippocampus. Notably, strokes, long-term depression and trauma can all shrink the hippocampus. And, as brain studies of the nuns after their deaths have shown, a smaller hippocam-

pus is also a tell-tale signal of Alzheimer's disease.

This doesn't mean that everyone who experiences high stress will develop Alzheimer's or that every person with Alzheimer's developed the disease because of stress. But anyone who has faced the stress of a family illness, divorce or job crisis knows how mentally taxing such a life event can be. And based on the science, it's increasingly clear that the aging brain is not immune to the damaging effects of stress.

## What Do We Do About It?

Clearly, stress takes a significant physical toll on our bodies. Complicating matters is the fact that not only does stress appear to accelerate aging, but also the older we get, the longer it takes for our bodies to turn off the stress response. So while managing stress is important at any age, it's absolutely crucial as we get older.

So how do we do it? The first step, of course, is to cover the basics—eat well, manage your weight and exercise. If you take care of yourself, you're essentially giving stress less to work with—a healthy body is more resilient against the onslaught of stress.

But that's not enough. At some point in life, everyone faces chronic stress—whether it's uncertainty at work, in a marriage or about health. Successful agers have faced the same stressors as the rest of us. They just have better coping skills. The good news is that the rest of us can change and learn better coping strategies.

■ **SEEK CONTROL WHEN YOU CAN.** The issue of control—or the lack of it—is a common theme among stress researchers. Successful agers typically feel in control of their day-to-day lives, but they don't fret about issues they can't control. In his book "Why Zebras Don't Get Ulcers," Dr. Sapolsky cites a nursing-home study in which one group of residents was given far more control over their daily lives. They were given responsibility for meals, social activities and even caring for plants in their rooms. Soon, those residents became noticeably more active, more engaged in social activities and were generally happier. Death rates among the residents given more control were half that of other residents during the study period.

Animal studies show that losing control can also produce a powerful physical reaction. In one experiment, rats are taught to press a lever to avoid a mild shock. Remove the lever and the rat becomes highly stressed. Simply disconnect the lever and the rat is less stressed.

Even though both rats are being shocked, the rat with the nonworking lever feels more control over the situation and produces fewer stress hormones than the rat with no lever at all.

The lesson is that stress is easier to cope with—and produces fewer physical effects—if we feel a sense of control. So while work stress is inevitable, it's less harmful if you can control various aspects of your day—such as when you take a lunch break or the type of projects you want to work on.

■ **INFORMATION CAN RELIEVE STRESS.** Stress doesn't take as much of a toll if we can predict it. For instance, the nervous public speakers loosened up after a few days of the task. They knew what to expect, and they were less stressed. In rat studies, animals given food on a predictable

lower blood pressure. Breast-cancer patients who join support groups have lower stress-hormone levels. And the nervous public speakers had lower blood pressure if they had a friend in the audience. Study after study shows social support makes a measurable difference in how we cope with stress and how we age.

■ **EXERCISE YOU HATE WON'T HELP AS MUCH AS EXERCISE YOU LIKE.** Exercise is the solution for pretty much every health problem, but it especially makes sense in dealing with stress. That's because the stress response is all about boosting energy to the muscles, so using those muscles during exercise is the obvious outlet for releasing stress.

But exercise, by definition, is a form of stress. If you overdo it, you're not helping yourself. At the same time, finding an exercise you like not only will increase the likelihood you will stick with it, but also may give you more benefit. Studies show that rats freely allowed to trot on the exercise wheel have lower stress hormones. But rats forced onto the wheel are stressed by the experience and end up with a high stress response.

In terms of exercise and stress reduction, it's also important to know that the benefits of exercise disappear almost overnight. "It's the exercise you're doing now that's important," Dr. Snowdon says. "If you were a college athlete, it's not going to do anything for you in middle age."

The good news is that it's never too late to reap the benefits of exercising. In fact, the older you are, the more immediate benefit you get from exercise.

■ **GET MORE SLEEP.** When you start to lose sleep, your body responds the way it always does in a crisis—it activates the stress response. It has been shown that sleep deprivation increases allostatic load. Study subjects who get only four hours of sleep for several nights had higher nighttime levels of cortisol and blood glucose—indicating higher allostatic load. But let the participants sleep 10 to 12 hours a night and the allostatic load disappears.

■ **PICK AND CHOOSE YOUR STRESS RELIEF.** In the end, everyone deals with stress and aging differently. Stress-management classes, meditation, massage, yoga, religious services—all of them can relieve stress in the right person and cause stress in the wrong one. A person with a cynical outlook on life might find a touchy-feely stress-management course discomfiting. Few experiences are more stressful than trying to keep up with a fast-paced aerobics class—but some people love the experience.

"Even successful agers differ according to how they handle their life experiences," Dr. Snowdon says. "It's something individuals have to manage themselves. You know if you're in trouble." ■



*'If you feel you're in control, you do a lot better,' says one researcher*

schedule become highly stressed when given the same amount of food on a random schedule.

The lesson is to seek accurate information in the face of a stressful situation. If you are worried about a job layoff and uncertainty at work, arm yourself with information about the job market and opportunities elsewhere. If you are facing cancer, long-term fears are certain to cause stress, but you can minimize the overall stress of the illness by learning about treatments and side effects so you know what to expect.

■ **KEEP FRIENDS AND FAMILY CLOSE.** Baboons that take part in social grooming have

MS. PARKER-POPE, WHO WRITES THE WALL STREET JOURNAL'S WEEKLY HEALTH JOURNAL COLUMN, SERVED AS CONTRIBUTING EDITOR OF THIS REPORT. SHE CAN BE REACHED AT HEALTHJOURNAL@WSJ.COM.