

When stress doesn't suck

What you think is killing you
should actually make you stronger

By Michael Behar
Photographs by Christopher Griffith



“You seem tense,” my iPhone texts me, and suggests I take a brief meditation break. Is it reading my mind?

No, it's just a message from the two-inch-long gray orb attached to the waistband of my jeans, called Spire, which monitors my respiratory rhythms and alerts me whenever it senses a period of rapid, shallow breaths. Spire was invented by Neema Moraveji, Ph.D., a computer scientist who directs Stanford University's Calming Technology Lab, where his team has studied prototypes like MailO, touted as “the world's first calming e-mail client,” as well as Morphine Drip, an app for injured athletes stressed out because they can't play. “We're also trying to bring natural elements into sterile work environments,” says Moraveji. “This includes outfitting desks with real grass.”

These are just some of the latest products to join a global marketplace filled with antistress teas, body lotions, shampoos, colognes, dermal patches, even socks. On my desk is a vial of Bach Rescue Remedy Natural Stress Relief. Four drops of this homeopathic concoction on my tongue should alleviate “everyday stress,” the label claims. Like gazillions of other supplements purported to reduce stress, Rescue Remedy doesn't work. (Or at least, not in my case, according to my new monitor.) But that doesn't stop people from buying it. In fact, Americans are starved for stress salves. As of 2009, Americans spent an estimated \$14 billion on stress-relief products. And according to a 2012 report by the World Health Organization, job- and workplace-related stress annually costs American industries upwards of \$300 billion.

The problem isn't that stress is killing you—it's that you believe stress is killing you.

But unlike the marketers of herbal potions, the makers of Spire—a *truly promising* stress-relief aid—make no bold claims that their product will magically wash away your stress. In fact, Moraveji tells me, “our company is not about stress reduction. Stress is a part of life.” That's because Moraveji, along with a growing number of scientists, doesn't think stress is actually bad

for you. To echo stress researcher Shawn Achor: The problem isn't that stress is killing you—it's that you *believe* stress is killing you.

Achor should know. In 2007, while studying ethics at Harvard, he founded GoodThink, a research and consulting firm. In 2010, he wrote the book *The Happiness Advantage*, on the power of positive psychology. And in 2013, he co-authored a study, published in the *Journal of Personality and Social Psychology*, which demonstrated that “it's how people perceive stress” that determines how it impacts our health.

Stress scientists call this phenomenon the “stress paradox.” When your boss yells at you, your endocrine system dumps stress hormones—adrenaline, cortisol, norepinephrine—into your bloodstream that set off



Prop styling: Ariana Salvato/Apostrophe

Researchers believe the act of mentally embracing stress can yield physiological changes—genes firing, neurons rewiring—that measurably improve mental and physical performance.

the classic fight-or-flight response. Your heart rate and blood pressure elevate, your breathing ramps up, and your metabolism rapidly converts fat into fuel to power your muscles. An evolutionary adaptation, the stress response saved us from life-threatening situations in the wild. Too *much* stress, however, produces an overabundance of these hormones that begin dissolving vital organs, like Drano in the bloodstream. (For instance, cortisol causes oxidative stress, a process that plunders electrons from atoms within healthy cells, the way rust rips apart steel.)

The paradox, says Stanford University neuroimmunology professor Firdaus Dhabhar, Ph.D., is that those same toxic, harmful molecules we associate with stress—though in lesser amounts and for shorter periods of time—are what make you healthier and stronger.

When you engage in high-intensity exercise like CrossFit, your body reacts to the external challenge and activates similar mechanisms responsible for the fight-or-flight stress response—sometimes for several hours at a time. When released for a short period of time, defined as “minutes to hours,” the adrenaline, cortisol, and norepinephrine can function in harmony to build up your body, then dissipate over time. “Exercise can induce a beneficial stress response,” says Dhabhar.

The spike in heart rate, respiration, and energy lets you train harder, which builds muscle. The fight-or-flight response also activates your brain’s endocrine, immune, and metabolic machinery. Together, these systems dispense insulin, testosterone, and growth hormones (among other hormones) and also communicate with various genes and proteins that alter the brain, as well as muscle tissue—both skeletal and heart—to boost strength and stamina.

“Exercise creates a positive balance of chemicals that can have positive effects on the heart and the brain,” says Bruce McEwen, M.D., a professor of neuroscience at the Rockefeller University.

Of course, striking that effective balance of fight-or-flight molecules comes easier for some people than for others. And, say McEwen and Dhabhar, both pioneers in the stress-is-good-for-you research field, our ability to cope with stress derives from several factors, including both nature (McEwen has identified specific genes that are part of the body’s response to stress) and nurture (science confirms that prolonged stress during childhood, from things like abuse, malnutrition, or abandonment, will breed adults who instinctively loathe stress and, consequently, will suffer physically from it).

But how does the stress paradox work for everyone? Dhabhar and McEwen, along with a cadre of other researchers, are trying to solve that mystery. And after studying both animals’ and humans’ brains, genes, and responses to exercise, they believe not only that our mindset is the single biggest determining factor in whether stress is ultimately toxic or beneficial to health, but also that the simple act of having a positive attitude about stress can yield discernible physiological changes—genes firing, neurons rewiring—that measurably improve mental and physical performance.

It’s for this reason that Achor collaborated with Moraveji to develop Spire—because it’s much easier to embrace stress once you’ve been alerted to the fact you’re stressed in the first place, so you can identify its source. (Spoiler alert: This isn’t as easy as you might think.)

“Basically, we’ve discovered that if you think of stress as something that will impede your performance, it will do exactly that,” says Achor. But if you treat stress as a challenge, you’ll emerge stronger than ever.

You’ve just got to learn how to do it.

Everything you know about stress is wrong

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Blame the modern-day stress-is-evil epidemic on a Hungarian endocrinologist named Hans Selye. In 1934, while doing sex-hormone research at McGill University in Montreal, Selye, who was 28, began experimenting on rats. With the hapless rodents strapped to a wooden plank, he injected them with irritating substances like formaldehyde, starved them, shocked them, chilled them, and inflicted various other forms of torture, then examined their internal organs.

In a pivotal *Nature* paper he published in 1936, Selye used the word *stress* to describe how his test subjects had responded to their torment. (At the time he actually meant *strain*, but the linguistic error stuck.) He later performed similar atrocities on chickens, dogs, guinea pigs, and monkeys and went on to write in the *British Medical Journal* that his experiments produced outcomes “not unlike that occasioned by physical and mental fatigue in man.”

Alas, stress as a vague but malicious force in our lives was born.

In Selye’s 1956 book *The Stress of Life*, he introduced the concept of “general adaptation syndrome”: that stress can be a nefarious accomplice of common afflictions like heart disease, ulcers, arthritis, hypertension, and cancer. Yet, even today, 60-plus years later, there’s still no consensus on what stress actually is.

“Perhaps the single most remarkable historical fact concerning the term ‘stress’...is [the] almost chaotic disagreement over its definition,” wrote John Mason, M.D., a Yale psychiatry professor who pioneered the diagnosis of PTSD following the Vietnam War and emerged as one of Selye’s more vehement detractors. While Selye believed stress was a *physiological* reaction, like getting a fever when you’re sick, scientists in Mason’s camp considered stress a largely *psychological* condition, requiring emotional arousal to produce its main hormonal effects: In other words, if you’re physically stressed (say, hungry or exhausted) but not emotionally stressed (e.g., afraid or angry), the stress you experience will be minimal. That argument over the role of stress in our bodies continues today.

Selye embraced the idea that stress wasn’t all bad in his 1974 book *Stress Without Distress*. He thought “stress was not only the bane, but also the spice of life...for complete rest means death,” says Mark Jackson, Ph.D., a University of Exeter history of medicine professor. Though he wasn’t the first: In the 1800s, while studying the causes of insanity, British psychiatrist Charles Mercier wrote that poor health could often be traced to “the boredom of insufficient stress.”

“Even at the beginning, people were saying a certain amount of stress can be good for you and that we shouldn’t just live quiet, calm lives,” says Jackson, author of *The Age of Stress: Science and the Search for Stability*. “Some pressure, some stressful preoccupation is actually very healthy. It’s always been double-edged.”

Among scientists, learning how to harness stress to boost performance has been a more recent endeavor. GoodThink’s Shawn Achor got the idea for his mindset study while he was in Marine boot camp. “To pay for Harvard, I had to do a military scholarship,” he says. “There

was no praise. I was just getting yelled at for not doing pushups fast enough. It taught me from the beginning that when stress happens, I have to embrace it. Like, ‘Cool, I get to go for a run’ instead of ‘I can’t believe I have to go for a run.’” He remembers that anyone in boot camp who didn’t man up to the hardships eventually dropped out—“They broke because the stress was too much for them”—and decided to find out if there was an underlying physiological reaction at play.

For his 2013 study, Achor partnered with Stanford’s Alia Crum, Ph.D., and recruited 388 employees of major financial institutions, mostly investment bankers and wealth managers. Crum asked each participant a lengthy set of questions to gauge their stress level, physical health, and mental well-being and found that all were acutely stressed out—which made sense, Achor says, since the study began not long after the start of the 2008 global financial crisis. Next, they showed half the subjects a short uplifting video—think: a soundtrack right out of a happy Disney film—that presented scientific evidence on the “enhancing nature of stress,” while the other half viewed a slow-moving downer bemoaning the “debilitating nature of stress.”

The upshot: When questioned again, those who’d watched the positive video felt less stressed and in the following months had 23% fewer stress-related health problems—and all from one corny video.

In a subsequent study, Achor and Crum gathered 63 university undergrads and told them to prepare to speak publicly in front of their classmates, who would evaluate their performance—a scenario that would freak most people out. They then interviewed each student to determine how he or she perceived stress (love it, hate it), then took saliva samples to measure the stress hormone cortisol. Sure enough, the students who claimed they thrived on stress had a quick spike in cortisol that then dropped off precipitously, suggesting a robust and healthy fight-or-flight response that elevates focus and energy. But in those who feared the speech, the cortisol lingered for far longer. (Remember the “Drano in the bloodstream”?)

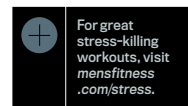
The findings led Achor and Crum to work with Moraveji on developing the Spire stress monitor, which—along with its competitors, like PIP, Tinké, PhyoDe, Olive, and Embrace—could have a profound effect on how the average person perceives stress. As I found when wearing the monitor for several days (see the sidebar at right), the obvious triggers for stress—job woes, family tensions, traffic jams—didn’t actually trip my fight-or-flight response. Most often it was something mundane that activated the Spire stress alarm. For instance, I discovered that perusing my e-mail inbox routinely makes me tense, as does the chirping of incoming text messages.

“Knowing what really riles you is the first step toward harnessing the power of stress to make you healthier and happier,” says Achor. But, how to game stress to your advantage?

You can make stress work for you

Rockefeller U.’s McEwen has spent years studying the impacts of stress on the body and believes the notion of mindset—the trendier term is *mindfulness*—is more than just some hippythink abstraction: Evidence is growing that what you think can change your body right down to your cells. It’s all related to “neural plasticity,” the concept that many factors—environment, emotions, injuries—can cause the brain to “rewire” itself to compensate, for better or for worse.

Greg Broom



Monitoring my stress monitor

What our correspondent learned after spending a week under the watchful gaze of the newest body tracker

Countless new gadgets advertise the ability to monitor your stress. Some log heart rate; others record electrical impulses. Granted, the only 100% bombproof method would be collecting saliva and blood samples to chart your stress hormones. Even so, wearables do a really good job. For one week, I wore a Spire monitor (\$150, spire.io), which tracks respiratory rhythms. Here are three things I learned. —M.B.

1) Stress Monitors Are Really Great at Measuring Calm

Spire parses moods into four categories—calm, tense, activity, and focus—and knows how long you’re in each realm. It’s most valuable teaching you what makes you calm. I discovered that my longest stress-free “calm” periods occurred when I cooked for my family or read to my 5-year-old son before bedtime. I plan to do more of both.

2) Booze Agitates (But Pot Performs as Advertised)

In what I thought were two very stressful events—an argument with my wife and a reprimand to my kid—Spire’s only reaction was to inform me I was “active” (duh, I was pacing). Perhaps this is good news? My big surprise: Alcohol triggers stress. A martini roused Spire’s “tense” alert after the first sip. But red wine didn’t. And since I live in legalized Colorado, I couldn’t resist testing Spire’s precision with a bit of cannabis. Predictably, it shifted into “calm” mode for two hours.

3) A Stress Monitor Is a Helicopter Mom

While working, the Spire—pressed against my skin on my belt line—often drove me bonkers. Every 10 minutes it would text me (via my iPhone) that I was “tense,” then vibrate against my belly until my stress abated. At first this only made me more stressed! To keep calm—and meet my deadline—I shoved Spire into a file drawer. But even in exile, Spire kept at it, dispatching its admonitions: “You’ve been pretty sedentary for 60 minutes. Time to stretch your legs?” Yet I plan to keep using it.

The new Spire stress monitor, developed at Stanford.



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Toxic, uncontrolled stress is one factor that can cause this brain change—and not in a good way. Using medical imaging on animal models and human subjects, researchers found evidence that stress withered not just the brain's hippocampus, where memories are stored, but its prefrontal cortex, which handles complex problem solving and helps regulate behavior and mood. It swelled the amygdala, the brain's fear center, as well.

His latest research also found that, during chronic stress, blocks of “junk DNA”—human DNA once thought to have no biological function because it didn't transmit genetically coded instructions to cells—actually awaken and wreak havoc on the body. On the bright side, engaging the right mindset has the power to both reverse and prevent damage caused by stress, McEwen says.

TACTIC NO. 1: Understand the difference between physical stressors (like exercise) that often physiologically benefit you, and emotional stressors (anger, frustration) that, if allowed to persist, can keep your body's chemical stress machinery running too long—and lead to that “Drano effect.”

In the case of the latter, it's about finding the right mindset: “Deal with the present, and don't worry about things you don't have any control over,” says McEwen. When you do that, “studies have shown...meaningful brain changes in terms of connectivity patterns.”

You can take it a step further and engage in mindful meditation: For just a few minutes, relax, clear your mind, and focus on your breath. It's a powerful technique that can sprout new brain cells—like a gecko regrowing a severed tail. Studies show you'll have a longer life, a stronger immune system, and better cardiovascular activity, which will boost your physical performance by getting more oxygen into your blood.

In athletes, bad stress directly affects performance. During his research, Achor met with NFL Hall of Fame defensive end Michael Strahan, who told him that the fear of getting injured was a near-constant stressor. “He was worried he'd blow out his ACL at any moment,” Achor says. “But in his final year, he decided to just enjoy the sport and embrace being there—and had his best statistical year by far, which he attributed to that mindset.” Former NFL players Brett Favre and Tiki Barber both used a similar strategy, he says. “They acknowledged the stress, then rechanneled their energy toward the task at hand.”

TACTIC NO. 2: Fine-tune the intensity and duration of workouts to take full advantage of physical stress—but don't go overboard.

Using brain scans, McEwen has seen

that regular aerobic exercise—even just a brisk walk—stimulates neural growth and blood flow to the brain, as do weightlifting and interval training. But according to Jay Hoffman, Ph.D., a professor of exercise science at the University of Central Florida, it takes intense physical activity to ultimately increase strength and performance. Charging hard deluges the body with stress hormones. These hormones energize your metabolism, which helps you train “at a higher level than you're accustomed to,” says Hoffman. Doing so “creates stress that will cause some small damage. But the resulting recovery will enhance the physiological system”—for obvious performance gain.

But if you get carried away at the gym, the paradox begins to work against you.

When McEwen and researchers at Japan's University of Tsukuba put rats on treadmills at different paces, they found that running at a moderate intensity provided the most physical benefits from stress.

In humans, this suggests that during intense exercise, you should hover right around your VO₂ max (the measure of your body's ability to metabolize oxygen during exercise). Going above VO₂ max is OK—but

not too far, and only in short stints, Hoffman says. More, and you're overtraining, risking toxic stress. You'll know when it's happening. “If you normally run an eight-minute-mile pace, then have difficulty maintaining that [hours or even days after a hard workout], you may need to back off till you recover.”

Hoffman also proved this in studies he conducted on NBA and NCAA basketball players. In both, he found that when coaches compelled players to perform too far beyond their physical capabilities, the benefits of training dropped off—they couldn't jump as high or squat as much weight; their reaction time slowed and endurance dwindled.

“If it's easy for you to lift 100 pounds, you have to lift 110, then do the same number of repetitions till it gets easier,” says Hoffman. “This is considered ‘progressive overload’: As soon as the body adapts to a new kind of stress, you then increase the stress.”

But suddenly jump from 110 to 150 pounds, and the stress can create “a pathological, not a physical adaptation,” he explains. All that overtraining forces the fight-or-flight response into a feedback loop, breeding a type of exercise-induced chronic stress that can lead to thyroid and immune disorders, high blood pressure, heart disease, weight gain, and depression. For it to supercharge health and fitness, the fight-or-flight response must be short-lived—from a few minutes to a couple of hours—and not persist for days or weeks, which makes it toxic.

Normally, exercise stress stimulates your immune system to protect against infections and other diseases, including cancer. Studies by Dhabhar at Stanford show that a moderate workout prior to surgery can speed recovery. But there's always a danger of stress overload. In marathoners, Hoffman has seen “an increase in upper-respiratory-track infections and other changes to the immune system,” he says. Group exercise can be particularly problematic because a trainer or coach doesn't know each individual's limits.

“The body's very good at not trying to kill itself,” he says. “We have an innate mechanism that tells us when to slow down. We run into issues when we have an external force—like a CrossFit coach—pushing somebody past where they feel comfortable.” His advice: Listen to your body, not an overzealous trainer barking about feeling the burn.

TACTIC NO. 3: Have more sex. It's the perfect twofor, says Dhabhar, because it mitigates the harmful effects of chronic stress while also triggering the kind of chemical response you get from exercise. Plus, it's the one activity that produces positive stress that even the most virile dudes can't overdo. ■

How to tell if you're stressed (without a newfangled monitor)...

Do a body check

■ Got cold or sweaty palms, tense or twitching muscles, diarrhea, nausea, or dizziness? Is your heart pounding? Are you breathing rapidly? Clenching your jaw? The body releases adrenaline and cortisol when stressed, raising heart rate and BP—so any physical symptom can be a sign.

Do a head check

■ Suddenly unable to concentrate? Dwelling on negative thoughts or nagging worries? Irritable, or freaking out over small mistakes? Beating yourself up, or feeling overwhelmed? Anxious for a cigarette or a drink? Yup, that's probably stress.

...and what to do if you are

Take physical action

■ Anything that relaxes you quickly is probably a stress beater. So take a few deep breaths—better yet, do a breathing exercise (see mensfitness.com/breathe to learn how); listen to a guided mindfulness exercise (no eye-rolling—it really works) from marc.ucla.edu; listen to calming music; watch a funny YouTube clip; or do five minutes of a favorite workout move or a 60-second yoga pose.

Take psychological action

■ If emotional changes—fear, anger, frustration—accompany physical stressors, the actual stress will be greater, Yale's John Mason found. So nip it in the bud by immediately ID'ing any stress-causing emotions and using positive self-talk—along with the physical strategies suggested above—till you're calm again. —ADAM BIBLE